Accurate assessment of exposure using tracer gas measurements

Room airflow interaction, particularly in the breathing zone, is important to assess exposure to indoor air pollution. A breathing thermal manikin was used to simulate a room occupant with the convective boundary layer (CBL) generated around the body and the respiratory flow. Local airflow against the face of the manikin was applied to increase the complexity of the airflow interaction. CO2 was released at the armpits and N2O at the groin to simulate the respective bio-effluents generated at these two body sites. The tracer gas concentration at the mouth/nose of the manikin was measured with gas analyzers with short and long response times, respectively. The tracer gas concentration was characterized by the mean, standard deviation and 95th percentile values. The results revealed that the measurement time needed to determine, with sufficient accuracy, these parameters decreased substantially with a decrease in the response time of the gas analyzer. When only CBL was present, shorter measurement time was needed for the accurate concentration measurement of the tracer gas released close to the breathing zone. For more complex flow, as a result of CBL interaction with the exhalation flow, the needed measurement time was longer. It has been concluded that the accurate exposure assessment requires that the concentration measurements are performed only during the inhalation period. Therefore, gas analysers with low response time and sampling time that is considerably shorter than the inhalation period have to be used.
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 2.001
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BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.028 SNIP 1.865
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.924 SNIP 1.38
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.788 SNIP 1.778
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.03 SNIP 1.63
Scopus rating (2005): SJR 0.955 SNIP 1.225
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.548 SNIP 1.266
Scopus rating (2003): SJR 0.948 SNIP 0.921
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.998 SNIP 1.39
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Scopus rating (1999): SJR 0.564 SNIP 1.175
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A Comparison Between the Accuracy of Two-Dimensional and Three-Dimensional Strain Measurements

This investigation determined the effect of specimen out-of-plane movement on the accuracy of strain measurement made applying two-dimensional (2D) and three-dimensional (3D) measurement approaches using the representative, state-of-the-art digital image correlation (DIC)-based tool ARAMIS. DIC techniques can be used in structural health monitoring (SHM) by measuring structural strains and correlating them to structural damage. This study was motivated by initially undetected damage at low strains in connections of a real-world bridge, whose detection would have prevented its propagation, resulting in lower repair costs. This study builds upon an initial investigation that concluded that out-of-plane specimen movement results in noise in DIC-based strain measurements. The effect of specimen out-of-plane displacement on the accuracy of strain measurements using the 2D and 3D measurement techniques was determined over a range of strain values and specimen out-of-plane displacements. Based upon the results of this study, the 2D system could measure strains as camera focus was being lost, and the effect of the loss of focus became apparent at 1.0 mm beam out-of-plane displacement while measuring strain of the order of magnitude of approximately 0.12%. The corresponding results for the 3D system demonstrate that the beam out-of-plane displacement begins to affect the accuracy of the strain measurements at approximately 0.025% strain for all magnitudes of out-of-plane displacement, and the 3D ARAMIS system can make accurate strain measurements at up to 2.5 mm amplitude at this strain. Finally, based upon the magnitudes of strain and out-of-plane displacement amplitudes that typically occur in real steel bridges, it is advisable to use the 3D system for SHM of stiff structures instead of the 2D system.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aarhus University, Purdue University
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A fire risk assessment model for residential high-rises with a single stairwell

As few or none prescriptive guidelines for fire risk assessment of residential high-rise buildings exist, it has been unclear which fire safety design features constitute an acceptable (adequate) safety level. In order to fill this gap a simplified risk-based decision-support tool, the Fire Risk Model (FRM), was developed. The FRM evaluates both the risk level to the occupants and the property risk level as a function of the building characteristics, height and fire safety features for single stairwell residential high-rise buildings. The acceptability of a high-rise design is then defined through comparison with the risk level associated with a 22 m high prescriptive design. The FRM and its applicability are introduced by summarily revisiting the concept of equivalency and adequate safety. The underlying assumptions and the pitfalls of equivalency assessments are discussed, and the associated performance of the FRM evaluated. It was found that compartmentation and the door configurations in the egress path play an important role, along with sprinklers, in order for the design to successfully keep the stairwell free from smoke. Specifically, modern curtain wall facades were found to result in a reduced safety level compared to traditional facades with a spandrel. When opting for a modern curtain wall, additional safety features were found to be required in order to obtain an equivalent safety level.

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Ghent University, Technical University of Denmark, NIRAS A/S
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Main Research Area: Technical/natural sciences
Analysis and validation of a quasi-dynamic model for a solar collector field with flat plate collectors and parabolic trough collectors in series for district heating

A quasi-dynamic TRNSYS simulation model for a solar collector field with flat plate collectors and parabolic trough collectors in series was described and validated. A simplified method was implemented in TRNSYS in order to carry out long-term energy production analyses of the whole solar heating plant. The advantages of the model include faster...
computation with fewer resources, flexibility of different collector types in solar heating plant configuration and satisfactory accuracy in both dynamic and long-term analyses. In situ measurements were taken from a pilot solar heating plant with 5960 m$^2$ flat plate collectors and 4039 m$^2$ parabolic trough collectors in series in Taars, Denmark from Sep. 2015 to Aug. 2016. The simulated thermal performances of both the parabolic trough collector field and the flat plate collector field have a good agreement with the measured performances. The thermal performance of the hybrid solar district heating plants is also presented. The measured and simulated results show that the integration of parabolic trough collectors in solar district heating plants can guarantee that the system produces hot water with relatively constant outlet temperature. The daily energy output of the parabolic trough collector field can be more than 5 kWh/m$^2$, while the daily energy output of the flat plate collector field is less than 5 kWh/m$^2$ under Danish climate conditions. The simplified and validated TRNSYS model can be a useful tool to simulate and optimize thermal performance of solar heating plants with both flat plate and parabolic trough collectors.

**General information**

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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Tian, Z. (Intern), Perers, B. (Intern), Furbo, S. (Intern), Fan, J. (Intern)
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Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.609 SNIP 2.043 CiteScore 4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.814 SNIP 2.725
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.729 SNIP 2.313
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.106 SNIP 1.444
Analysis of Track Responses to Train Braking

The objective of this study was to suggest a response-analysis framework for railway tracks subjected to braking. An analytical formulation was developed, in which the rail was modeled as an infinite beam supported by an orthogonal Winkler foundation consisting of springs in perpendicular directions. Braking loads were simulated as representative sets of vertical and longitudinal forces, either concentrated or distributed. Considering a realistic set of model parameters, the approach was demonstrated by evaluating track responses for a single axle and for a full train. The computations included determination of axial rail stresses, forces at the base of a sleeper, and the associated friction demand required to resist longitudinal slippage. Based on these analyses, it is concluded that longitudinal track responses have a much longer influence zone compared to vertical track responses. This implies that calculations involving a full train must be done on a case-by-case basis, i.e., they cannot be deduced from a single axle analysis. It is also found that high values of friction demand may develop at the sleeper bases - indicating possible slippage. Overall, the proposed formulation provides a highly adaptable and easily implementable first-order mechanistic tool for analysis of track responses to decelerating vehicular loads.
A New Technique for Deep In situ Measurements of the Soil Water Retention Behaviour

In situ measurements of soil suction and water content in deep soil layers still represent an experimental challenge. Mostly developed within agriculture related disciplines, field techniques for the identification of soil retention behaviour have been so far employed in the geotechnical context to monitor shallow landslides and seasonal volume changes beneath shallow foundations, within the most superficial ground strata. In this paper, a novel installation technique is presented, discussed and assessed, which allows to extend the use of commercially available low cost and low maintenance instruments to characterise deep soil layers. Multi-depth installations have been successfully carried out using two different sensors to measure the soil suction and water content up to 7m from the soil surface. Preliminary laboratory investigations were also shown to provide a reasonable benchmark to the field data. The results of this study offer a convenient starting point to accommodate important geotechnical works such as river and road embankments in the traditional monitoring of unsaturated soil variables.

General information
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, University of Bologna, METER Group, University of Newcastle
Authors: Rocchi, I. (Intern), Gragnano, C. G. (Ekstern), Govoni, L. (Ekstern), Mentani, A. (Ekstern), Bittelli, M. (Ekstern), Castiglione, P. (Ekstern), Buzzi, O. (Ekstern), Gottardi, G. (Ekstern)
An experimental evaluation on air purification performance of Clean-Air Heat Pump (CAHP) air cleaner
The escalation of energy consumption in buildings and heightened concerns about acceptable indoor air quality stimulate interest in the usage of air cleaner as an adjunct for indoor environmental conditioning. A regenerative desiccant wheel integrated into a ventilation system termed Clean-Air Heat Pump (CAHP) can improve the air quality during the process of dehumidification without using additional energy. An experimental study in a field lab was performed to investigate the air cleaning performance of CAHP. Photoacoustic gas analyzer-INNOVA was used to characterize chemical removal of indoor air pollutants by the CAHP. The results revealed that all the detected VOCs were removed effectively by the CAHP with an average single pass efficiency of 82.7% when the regeneration temperature for desiccant wheel was 60 °C. The mass balance between adsorption and desorption of the desiccant wheel was 96.8%, which indicated that the most of gaseous pollutants were not accumulated in the CAHP. The regeneration temperature for the wheel could affect the air purification performance of CAHP. At 70 °C of regeneration temperature, the air-cleaning efficiency reached 96.7%. Up to 70% of the outdoor air ventilation can be saved with the operation of CAHP. The clean air deliver rate (CADR) was over threefold of the outdoor air supply rate when CAHP was in operation.
Application of Frequency Domain Decomposition Identification Technique to Half Spectral Densities

Because of its simplicity and robustness, the Frequency Domain Decomposition (FDD) identification technique have become very popular in the operational modal analysis community. The basic idea behind this technique consists of computing the singular value decomposition of the power spectral densities estimated with the periodogram (also known as "Welch's" periodogram) approach to identify the natural frequencies and mode shape vectors. In this paper, the benefits of the application of the FDD technique to half spectral densities - the power spectral densities estimated from the positive part of the correlation functions - are investigated. In order to illustrate such benefits from a practical perspective, the FDD identification results obtained from the half spectral densities, of both simulated and real structures, are compared to those from the classical periodogram-driven FDD.
A Simulation Study on the Performance of Radiant Ceilings Combined with Free-Hanging Horizontal Sound Absorbers

Radiant heating and cooling systems, and Thermally Active Building Systems (TABS) in particular, have several advantages such as benefiting from the low temperature heating and high temperature cooling principle, coupling with renewable energy sources, peak shifting and peak load reductions.

When using TABS, most building simulation models assume an uncovered ceiling; however, this might not be the case in practice, due to the use of free-hanging horizontal (or vertical) sound absorbers for the control of room acoustic conditions. The use of sound absorbers will decrease the performance of radiant ceiling cooling systems. Therefore, the quantification of the effects during the design phase is important for predicting the resulting thermal indoor environment and for system dimensioning.

In this study, a two-person office room equipped with TABS was simulated using a commercially available simulation software with a recently developed plug-in that allows simulating the effects of horizontal sound absorbers on the performance of TABS and on the thermal indoor environment. The change in thermal indoor environment and in performance of TABS were quantified, and the simulation results were compared to measurement results.

The measurement results show that with horizontal sound absorbers, the cooling performance of TABS decreases by 11%, 23% and 36% for ceiling coverage ratios of 43%, 60% and 80%, respectively. The developed simulation model was able to predict closely the cooling performance reduction of TABS, the ceiling surface temperature, and the thermal indoor environment in most cases. While the model can be improved in certain aspects (prediction of mean radiant temperature and cooling capacity coefficient), the accurate prediction of the surface temperature of the TABS makes the model useful for further studies, which may use differently constructed radiant surface heating and cooling systems.
Comparison of indoor air distribution and thermal environment for different combinations of radiant heating systems with mechanical ventilation systems

A hybrid system with a radiant heating system and a mechanical ventilation system, which is regarded as an advanced heating, ventilation and air-conditioning (HVAC) system, has been applied in many modern buildings worldwide. To date, almost no studies focused on comparative analysis of the indoor air distribution and the thermal environment for all combinations of radiant heating systems with mechanical ventilation systems. Therefore, in this article, the indoor air distribution and the thermal environment were comparatively analyzed in a room with floor heating (FH) or ceiling heating (CH) and mixing ventilation (MV) or displacement ventilation (DV) when the supply air temperature ranged from 15.0°C to 19.0°C. The results showed that the temperature effectiveness values were 1.05–1.16 and 0.95–1.02 for MV+ FH and MV+ CH, respectively, and they were 0.78–0.91 and 0.51–0.67 for DV + FH and DV + CH, respectively. The Predicted Mean Vote values were from 0.24 to 0.45 and from 0.11 to 0.43 for MV+ FH and MV+ CH, respectively, and from 0.01 to 0.23 and from -0.41 to 0.10 for DV + FH and DV + CH, respectively. Hence, MV + FH had the largest temperature effectiveness and Predicted Mean Vote, and DV + CH had the smallest values. In addition, the vertical air temperature differences for MV+ FH and MV+CH were all within the comfort zone according to ISO 7730, but exceeded the comfort zone for DV + FH and DV + CH when the supply air temperature was less than 17°C and 19°C, respectively. The air distribution effectiveness values for MV+ FH and MV+CH were close to the recommended value for MV in the ASHRAE Standard 62.1, and those for DV + FH and DV +CH were slightly less than the recommended value for displacement ventilation. The results in this article are relevant and useful in the process of selection and design of a hybrid system with a radiant heating system and a mechanical ventilation system in practice.
Comparison of two (geometric) algorithms for auto OMA
In this paper we compare two geometric algorithms for automatic Operational Modal Analysis (OMA). The compared algorithms are the Shortest Path Algorithm (SPA) that considers shortest paths in the set of poles and the Smallest Sphere Algorithm (SSA) that operates on the set of identified poles to find the set of smallest spheres, containing physical poles. Both algorithm are based on sliding filter stability diagrams recently introduced by Olsen et. al. We show how the two algorithms identify system parameters of a simulated system, and illustrate the difference between the identified parameters. The two algorithms are compared and illustrated on simulated data. Different choices of distance measures are discussed and evaluated. It is illustrated how a simple distance measure outperforms traditional distance measures from other Auto OMA algorithms. Traditional measures are unable to discriminate between modes and noise.

Coupled thermo-geophysical inversion for permafrost monitoring
This dissertation summarizes results of 5 years of field, laboratory and modeling studies of permafrost properties in Ilulissat, West Greenland. Ilulissat town and airport are located in an area of frost-susceptible, ice-rich marine sediments with residual salinity content in pore water, which effectively lowers the freezing point of the soil. Consequently, these sediments have strength properties similar to thawed ground in spite of ground temperatures well below 0 °C. In the view of increasing pressure on infrastructure development, better knowledge of such permafrost types, distribution, thermal and geotechnical properties is needed for informing sound and sustainable design choices. Monitoring approaches using geophysical methods have become more widespread in permafrost studies, as they are
indicative of spatial variation and in-situ processes rather than isolated properties in time and space. However, they only provide indirect information about the properties in question. To enable quantitative interpretation of in terms of thermal properties and ground ice changes, there is a need for extensive calibration and validation data. In this project, we experimented with use of time lapse geoelectrical data for calibration of thermal model simulating heat transfer in active layer and permafrost. To acquire necessary calibration/validation data, we built a station for monitoring of ground temperature, electrical resistivity and soil moisture regimes. Automated resistivity measuring system was optimized for time lapse acquisitions in this environment characterized by extremely variable electrode grounding conditions between thawed vs. frozen season. Dense data series collected over three years provided insight into relationships between soil petro-physical parameters. We observed that temperature-dependent ground physical properties depend strongly on history of freeze-thaw cycles. Magnitudes of observed water content and resistivity hysteresis respectively have implications for thermal modeling and interpretation of resistivity changes in terms of temperature and ground ice content changes.

Thermal regime of the ground at the site can be simulated by one-dimensional model of conductive heat transfer in saturated porous medium. Sensitive thermal parameters were calibrated in an automated optimization scheme using gradient-search algorithm. When calibrated on borehole temperature data, the model reproduced training ground temperature dataset within ±0.55 °C, provided that the freeze-thaw water content hysteresis was accounted for. The calibrated model predicted the temperature variation in two testing datasets within ±0.32 to ±0.62 °C, depending on length of the testing timeseries.

The coupled inversion approach showed that the time lapse resistivity data contain information that constrains the optimization of thermal parameters of the heat model. In spite of not fully appropriate resistivity model, the thermal calibration was useful and reproduced the training dataset within ±0.65 °C, which is comparable to calibration on borehole temperatures. Thermal parameters optimized in coupled inversion predicted the temperature variation in the two testing datasets within ±0 °C to 0 °C.

A number of possibilities and paths for improvement of both coupled and uncoupled optimization approaches has been identified and identification of these bottlenecks is considered one of the contributions of this thesis.

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Decision support for large-scale remediation strategies by fused urban metabolism and life cycle assessment
Purpose: This paper seeks to identify the most environmental friendly way of conducting a refurbishment of Broendby Strand, with focus on PCB remediation. The actual identification is conducted by comparing four remediation techniques using urban metabolism fused with life cycle assessment (UM-LCA) in combination with information relating to cost and efficiency of the compared techniques. The methodological goal of our paper is to test UM-LCA as a decision support tool and discuss application of the method in relation to large refurbishment projects. Methods: To assess the environmental performance of PCB-remediation techniques, the UM-LCA method was applied. By combining UM and LCA methodologies, the total environmental impact potentials of the remediation techniques were calculated. To build an inventory for each technique, we contacted and interviewed experts and studied existing literature, cases, and projects in order to compile information on practical details of the techniques. To process the collected inventory data, we used the simplified product system modeling software Quantis Suite 2.0 (QS2.0). In order to validate the results from the simplified software, we carried out the exact same analysis using a more complex tool–OpenLCA 1.5. Based on the assessment results, we compared the remediation techniques and identified the techniques with the smallest and largest environmental impact potentials. Results and discussion: The results obtained are presented, and the technique with the smallest impact identified. A comparison between the two software tools applied is made, and differences between the two are discussed in detail. Further discussed is how possible inventory errors affect the results and if any assumptions should
be considered as critical for the final results. Furthermore, are the remediation efficiencies of each technique and the cost of each method considered and compared. Finally, UM-LCA’s ability to work as a tool for decision support is discussed and possible ways of implementing the method in sustainable decision-making is considered. Conclusions: In this study, it is found that the most environmental friendly PCB-remediation technique is thermal desorption, whereas the technique with the largest environmental impact potential is sand blasting, due to the environmental impacts induced in relation to disposal of the building waste. It is concluded that the UM-LCA method can be applied as a tool for decision support, and if economic aspects are incorporated, the UM-LCA approach could be an essential approach for designing sustainable buildings.

**General information**

State: Accepted/In press
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Scopus rating (2016): CiteScore 3.43 SJR 1.328 SNIP 1.423
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Scopus rating (2015): SJR 1.504 SNIP 1.554 CiteScore 3.49
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Scopus rating (2014): SJR 1.736 SNIP 1.738 CiteScore 3.65
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BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.666 SNIP 1.979 CiteScore 3.35
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Scopus rating (2012): SJR 1.515 SNIP 1.701 CiteScore 2.89
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 2
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ISI indexed (2011): ISI indexed yes
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BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.447 SNIP 1.861
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.201 SNIP 1.592
Web of Science (2009): Indexed yes
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Scopus rating (2008): SJR 0.863 SNIP 1.33
Web of Science (2008): Indexed yes
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Design and Modeling of Structural Joints in Precast Concrete Structures

Precast reinforced concrete components are widely used for construction of buildings in many industrialized countries. The benefits of the precast method, as compared to the cast in-situ method, lie primarily in the easier quality and production control of the structural components and in the onsite construction speed. The challenges appear in the on-site assembly phase, where structural integrity has to be ensured by in-situ cast connections in narrow zones. These connections are essential for the overall structural behavior and for this reason, strong and ductile connections that at the same time comply with the construction sequences for the particular structure, are important for a well-performing solution.

Current best practice for design of shear connections has been developed over decades and has primarily been aimed at solutions that are easy to implement on the construction site. The related calculation methods are mostly based on experience and empirical formulas. The strength and ductility of the current connection design are not necessarily adequate for structures, where large loads have to be transferred. The potential for improvement of the structural connections is therefore significant, as better solutions may enhance the overall structural behavior and lead to more economic designs. This study concerns an investigation of in-plane connections between precast shear walls. A new design with ‘2-on-2’ loop connections is suggested. The significance of the new design is the orientation of the U-bar loops and the use of a double T-headed rebar in the overlapping area of the Ubars. The investigation covers several independent research topics, which in combination provides a broad knowledge of the behavior of keyed shear connections.

As the first topic, the structural behavior of mortar is investigated. This is relevant as mortar with small aggregates is typically used to grout the narrow connections between the precast components. The study comprises triaxial tests and push-off tests aiming to investigate the behavior of mortar during failure. Next, the tensile capacity of the new loop connection design is tested and analyzed by use of upper bound plasticity models. This study is relevant as the ability of the U-bar loops to transfer tension is a prerequisite for the shear connection to transfer shear loads. The established models, supported by tests, can be used to design the loop connection in such a way, that the tensile capacity is governed by yielding of the U-bars and not by a brittle failure of the grout. This is important in order to obtain a ductile response when the connection is loaded in shear.

The main focus of the thesis is test and modeling of keyed shear connections. An extensive experimental program is presented. The particular layout of the test specimens allows for a direct comparison of the conventional shear connection design with the new design concept. The performance of the two designs is evaluated and it is found that the new design is superior in terms of strength and ductility. Upper and lower bound plasticity models are developed for strength prediction and satisfactory agreements are obtained when comparing the models with the test results. A theoretical exact solution is not possible to obtain, as the models are based on assumptions that are not fully identical. However, the establishment of both types of models provides a range of expected results and thus valuable information for practical applications. Finally, second-order plastic modeling is used to establish the load-displacement relationship for a casting joint loaded in shear and transversely reinforced with rebars. Despite the simplicity of the model, rather satisfactory agreement with tests is found. The model may be used to predict the available plastic energy and has potential for practical assessment of structural robustness.

General information
State: Published
Organizations: Department of Civil Engineering, Section for Structural Engineering
Authors: Sørensen, J. H. (Intern)
Elasticity and electrical resistivity of chalk and greensand during water flooding with selective ions

Water flooding with selective ions has in some cases lead to increased oil recovery. We investigate the physical processes on a pore scale that are responsible for changes in petrophysical and mechanical properties of four oil-bearing chalk and four oil-bearing greensand samples caused by flooding with brines containing varying amounts of dissolved NaCl, Na₂SO₄, MgCl₂ and MgSO₄. Ultrasonic P-wave velocity and AC resistivity measurements were performed prior to, during and after flow through experiments in order to identify and quantify the processes related to water flooding with selective ions. Low field Nuclear Magnetic Resonance (NMR) spectrometry measurements were performed at full water saturation, at irreducible water saturation, after aging and after flooding. CT-scanning, X-ray diffraction (XRD), backscatter electron microscopy images (BSEM), mercury injection capillary pressure (MICP) curves and specific surface analysis (BET) reveal the mineralogy and texture of the rock samples before and after the injection. Low field NMR data indicates changes in the pore fluid distribution and wettability of chalk after aging of one of the samples. NMR data for other samples indicate that chalk is water-wet after flooding. Greensand remained mixed wet throughout the experiments. Electrical resistivity data are in agreement with this interpretation. The electrical resistivity data during flooding revealed that the formation brine is not fully replaced by the injected water in both chalk and greensand. Changes in the elasticity of chalk during flooding illustrate the softening effect of magnesium bearing brines as compared to the sodium bearing brines. The stiffness of greensand was not affected by water flooding with selective ions as determined from the elastic wave measurements. Precipitation of fines during flooding of chalk samples is indicated by an increase in specific surface area and a shift in the MICP to lower values but no fines were detected by NMR. No changes were observed for greensand samples.
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Scopus rating (2016): CiteScore 2.56 SJR 0.764 SNIP 1.631
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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.801 SNIP 1.652 CiteScore 2.38
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.692 SNIP 1.751 CiteScore 1.95
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.822 SNIP 1.901 CiteScore 1.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.774 SNIP 1.666 CiteScore 1.42
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.648 SNIP 1.41 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.746 SNIP 1.724
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BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.072 SNIP 1.852
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BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.841 SNIP 1.435
Scopus rating (2007): SJR 0.732 SNIP 1.386
Scopus rating (2006): SJR 0.92 SNIP 1.387
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Scopus rating (2004): SJR 0.823 SNIP 1.302
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.617 SNIP 1.077
Scopus rating (2002): SJR 0.849 SNIP 0.788
Scopus rating (2001): SJR 0.481 SNIP 0.705
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**Bibliographical note**
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Electrodialytic extraction of Cr from water-washed MSWI fly ash by changing pH and redox conditions

Electrodialytic process offers a range of possibilities to waste management by electrodialytic separation (EDS) of heavy metals, depending on how the process is designed. Using three EDS cell setups (two two-compartment and one three-compartment) and their combinations, the extraction of Cr from municipal solid waste incineration fly ash by changing pH and redox conditions was investigated in the present work. The experiments were designed into single, two and three steps, based on the number of setups (by changing EDS cells) or effective setups (by shifting working electrode pairs) used. Prior to EDS the ash studied went through pretreatments such as water-washing and dry-sieving with a 50 µm sieve. The results showed that Cr was strongly bound in the ash, and the major fraction remained bound after the different treatments. Two/three-step treatment, which obtained the maximum Cr extraction rate of 27.5%, is an improvement on the single-step that extracted maximum 3.1%. The highest extraction was obtained due to the combined extraction of Cr(III) under low pH (accompanied with high redox) conditions and Cr(VI) under high pH (low redox) conditions subsequently. The Cr leaching from the treated ashes with acidic pH was lower than from those with alkaline pH; after the three-step treatment, Cr leaching was much lower from the coarse fraction (> 50 µm), as compared to the fine (≤ 50 µm) or the unsieved ash. As for the coarse fraction, two/three-step treatment reduced the leaching of Cr compared to the single-step in the same pH range (either acidic or alkaline).

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Scopus rating (2016): CiteScore 4 SJR 1.354 SNIP 2.044
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.739 SNIP 2.256 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.777 SNIP 2.482 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.822 SNIP 2.435 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.611 SNIP 2.184 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.698 SNIP 2.085 CiteScore 2.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Evaluation of freeze-thaw durability of pervious concrete by use of operational modal analysis

It is well-known that laboratory testing of pervious concrete’s freeze-thaw performance is too harsh and does not agree well with field observations. The most commonly used laboratory freeze-thaw test method for pervious concrete is similar to that used for conventional concrete even though the void structure of the two materials is completely different. In the present study, a new freeze-thaw test method for pervious concrete is suggested and tested on one baseline mix, with three different contents of entrained air. The evaluation of freeze-thaw damage on pervious concrete beams was evaluated from the decrease in mass and from operational modal analysis which provides an accurate determination of the change in natural frequencies with freeze-thaw exposure. Operational modal analysis was also used to determine the Young’s modulus, shear modulus, and Poisson’s ratio of the pervious concrete mix.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, Technical University of Denmark
Authors: Lund, M. (Intern), Hansen, K. K. (Intern), Brincker, R. (Intern), Jensen, A. H. (Ekstern), Amador, S. D. (Intern)
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Experimental study of the performance of intumescent coatings exposed to standard and non-standard fire conditions

Three different experimental setups corresponding to three different fire scenarios were used to investigate how different heating conditions and heating rates affect the behaviour of two different thin intumescent coatings (a solvent-based and a water-based paint). Coated steel samples were exposed to different standard and non-standard fire conditions in an electric oven, in a gas furnace and in a cone heater. A common trend was observed in the thermal resistance...
development of the tested coatings and three phases (inert phase, transient phase and steady phase) were identified according to four critical points: activation, end of reaction, binder exhaustion and steel austenitization point. The results also showed that the water-based paint performed better at low heating rates, while the tested solvent-based paint performed better at high heating rates and did not activate or provide proper insulation at very low heating rates. In summary, the study confirms that the current procedure for the design of intumescent coatings has shortcomings, as different paints have different performances according to the heating conditions and, in particular, according to the fire heating rate.

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Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Lucherini, A. (Ekstern), Giuliani, L. (Intern), Jomaas, G. (Intern)
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Web of Science (2018): Indexed yes
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.03 SJR 0.932 SNIP 1.627
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.887 SNIP 1.518 CiteScore 1.69
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.904 SNIP 1.937 CiteScore 1.49
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.878 SNIP 2.845 CiteScore 2.05
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.986 SNIP 2.707 CiteScore 2.21
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.224 SNIP 2.712 CiteScore 2.47
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.963 SNIP 1.612
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.806 SNIP 2.137
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.627 SNIP 1.617
Scopus rating (2007): SJR 0.53 SNIP 1.629
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.781 SNIP 2.278
Scopus rating (2005): SJR 0.986 SNIP 1.917
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.479 SNIP 1.837
Scopus rating (2003): SJR 0.781 SNIP 1.059
Web of Science (2003): Indexed yes
Experimental study on an innovative enthalpy recovery technology based on indirect flash evaporative cooling
An indirect flash evaporative cooling enthalpy recovery technology used for building ventilation was proposed based on counter flow plate heat exchanger combing with ultrasonic atomizer. The technology is aimed at enhancing enthalpy recover efficiency and preventing contaminant transfer of heat recovery unit. The principle of the technology is to over saturate indoor exhaust air by ultrasonic atomizing humidification. The evaporation of ultrafine mists cools down indoor exhaust air to its wet-bulb temperature and makes not only sensible heat transfer but also moisture condensed in outdoor supply air to realize total heat recovery. Compared with conventional indirect evaporative cooling, the application of ultrasonic atomizing enhances cooling effect through increasing water mists evaporation area and decreasing heat transfer resistance between exhaust air and supply air. No mass permeation, carrying-over or sorption occurs in this heat exchange process which guarantees no contaminant transfer from exhaust air to supply air. A prototype unit of the proposed technology was developed and tested in climate chambers. Temperatures and humidity ratios at inlets and outlets of the heat recovery unit were measured to investigate and analyze its energy recover efficiencies. The results showed that in hot and humid climate, up to 71% of total heat recover efficiency could be achieved by the prototype unit, and more than 50% of the enthalpy recovered was contributed by moisture condensation in the outdoor supply air.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, China Academy of Building Research, Beijing University of Civil Engineering and Architecture
Authors: Nie, J. (Intern), Yuan, S. (Ekstern), Fang, L. (Intern), Zhang, Q. (Ekstern), Li, D. (Ekstern)
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Main Research Area: Technical/natural sciences

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Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.734 SNIP 1.898 CiteScore 3.32
Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.516 SNIP 2.5 CiteScore 3.31
ISI indexed (2013): ISI indexed yes
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Finite Element Model Updating Using the Local Correspondence Principle

In this paper, an overview of a Finite Element (FE) model updating technique based on the Local Correspondence (LC) principle is presented. The main idea behind the LC technique is to update the FE model by replacing the mode shape vectors and natural frequencies with their corresponding experimental counterparts obtained from an output-only modal testing. This is accomplished by taking advantage of the fact that the inverse mass and stiffness matrices can be expressed as a linear combination of outer products of the mode shape vectors. Aiming at discussing the LC technique from a practical perspective, a simulation study is presented to illustrate its ability to improve the Maximum Assurance Criterion (MAC) between the FE and experimental mode shape vectors so that it gets close to unity.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aarhus University
Authors: Diord Rescinho Amador, S. (Intern), Ørhem, M. Ø. (Ekstern), Friis, T. (Intern), Brincker, R. (Intern)
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Fire-induced reradiation underneath photovoltaic arrays on flat roofs

The impact of the reflection of fire-induced heat from a gas burner was studied experimentally to gain knowledge on the interaction between photovoltaic (PV) panels and a fire on flat roofs. The heat flux was measured in a total of eight points at the same level as the top of the gas burner. The gas burner was placed underneath the center of a PV panel, installed in a geometry similar to a commercial east-west orientated mounting system, and the eight points were symmetrical pairs.
of two at four different distances from the burner. Measurements were compared with tests with no PV panel, and thereby without the reflection from the PV panel. A significant increase of the received heat flux was recorded, with ascending percentage-wise difference for increased heat release rates. This indicates that PV panels can have a significant contribution in roof fires, primarily because they stimulate fire spread over the roof on which they have been mounted. The received heat flux is higher underneath the most elevated part of the PV panel, due to two important, flame-related reasons: 1) the flame deflection toward the most elevated part of the panel and 2) a nonhomogeneous temperature distribution on the PV panel surface, due to the deflected flame, and thereby a nonhomogeneous emission from the heated PV panel. Finally, the results were very similar for a brand new PV panel and a PV panel tested for the fourth time, except during the period when the thin combustible film underneath the new PV panel is burning, supporting that it is the fire dynamics and not the fire load associated with the PV panels that is promoting fire spread associated with PV panels on flat roofs. With this in mind, the current results are relevant not only for PV panels but also for any inclined roof covering panel with limited combustibility.

**General information**

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Authors: Kristensen, J. S. (Ekstern), Merci, B. (Ekstern), Jomaas, G. (Intern)
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- Scopus rating (2016): CiteScore 1.37 SJR 0.414 SNIP 0.898
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 0.598 SNIP 0.899 CiteScore 1.42
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 0.759 SNIP 1.485 CiteScore 1.37
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 0.611 SNIP 1.506 CiteScore 1.48
- ISI indexed (2013): ISI indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 0.622 SNIP 1.413 CiteScore 1.38
- ISI indexed (2012): ISI indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 0.84 SNIP 1.361 CiteScore 1.37
- ISI indexed (2011): ISI indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 0.808 SNIP 1.37
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.764 SNIP 1.471
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 0.59 SNIP 1.072
- Scopus rating (2007): SJR 0.495 SNIP 1.384
- Scopus rating (2006): SJR 0.406 SNIP 1.211
- Scopus rating (2005): SJR 0.728 SNIP 1.194
- Scopus rating (2004): SJR 0.434 SNIP 0.825
- Scopus rating (2003): SJR 0.8 SNIP 1.053
- Scopus rating (2002): SJR 0.475 SNIP 1.012
Flow characteristics in occupied zone – An experimental study with symmetrically located thermal plumes and low-momentum diffuse ceiling air distribution

Airflow interaction between thermal plumes and vertical air distribution may cause significant effects on airflow characteristics such as velocity and temperature fields, turbulence intensity and fluctuation frequency. The flow interaction creates a random flow motion, vortical structures and turbulent mixing that can further yield a draught discomfort in an occupied zone. The main objective was to investigate large-scale airflow patterns and fluctuations as a result of interaction of buoyancy flows and diffuse ceiling flow. Experiments were performed in a test room of 5.5 m (length) x 3.8 m (width) x 3.2 m (height) with symmetrical set-up of cylindrical heat sources that gave a thermal load of 40–80 W/floor-m². The ventilation air was supplied through a diffuse ceiling with 0.5% degree of perforation. The observations indicate that the mean air speed and the airflow fluctuation increase with thermal load. Furthermore, the results show that a range of length scales increases with thermal load and with mean air speed. The results indicate that it can be difficult to fulfill the standard air velocity criteria for highly occupied spaces, where the maximum allowable mean air velocity is relatively low, i.e. 0.15–0.20 m/s. This is because the buoyancy flows from heat sources accelerate locally the flow field.
The paper describes the impact of different measures to improve the thermal performance of a solar heating plant for district heating applications. The impact of the different measures was evaluated through a validated TRNSYS-Matlab model. The model included details such as effect of the flow regime in the absorber pipes on the collector efficiency, flow distribution in the collector field, thermal capacity of the pipes and shadows from row to row. The improvement measures included variation of the operating temperatures, accurate input to the control strategy, feedback control on the outlet temperature of the collector field, control strategy based on weather forecast and use of different heat transfer fluids. The results showed that accurate input to the control strategy improved the yearly energy output of the plant by about 3%. If accurate input is not technically or economically feasible, a feedback control on the field outlet temperature seemed to be a valid alternative. The integration of weather forecast in the control strategy did not give relevant improvements. Higher glycol concentrations in the solar collector fluid gave better results than lower concentrations, as the higher frost protection guaranteed by the former outweighed the better thermophysical properties of the latter.
Improving thermal performance of an existing UK district heat network: a case for temperature optimization

This paper presents results of a research study into improving energy performance of small-scale district heat network through water supply and return temperature optimization technique. The case study involves establishing the baseline heat demand of the estate’s buildings, benchmarking the existing heat network operating parameters, and defining the optimum supply and return temperature. A stepwise temperature optimization technique of plate radiators heat emitters was applied to control the buildings indoor thermal comfort using night set back temperature strategy of 21/18 °C. It was established that the heat network return temperature could be lowered from the current measured average of 55 °C to 35.6 °C, resulting in overall reduction of heat distribution losses and fuel consumption of 10% and 9% respectively. Hence, the study demonstrates the potential of operating existing heat networks at optimum performance and achieving lower return temperature. It was also pointed out that optimal operation of future low temperature district heat networks will require close engagement between the operator and the end user through incentives of mutual benefit.

General information
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Organisations: Department of Civil Engineering, Section for Building Energy, Loughborough University, University of Nottingham, Nottingham Trent University
Authors: Tunzi, M. (Ekstern), Boukhanouf, R. (Ekstern), Li, H. (Intern), Svendsen, S. (Intern), Ianakiev, A. (Ekstern)
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Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.506 SNIP 2.536 CiteScore 3.23
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.631 SNIP 2.081
Initiatives for the energy renovation of single-family houses in Denmark evaluated on the basis of barriers and motivators

The renovation of single-family houses in Denmark is progressing only slowly. Changes in current policy are needed if the political goal of a fossil-free building sector as part of a fossil-free society is to be achieved. Known barriers and motivators for energy renovation are identified, and arranged in a framework with three main fields (Information, Finance and Process), with a total of 14 sub-areas. With this framework, current Danish policy is analysed to identify shortcomings, found to mainly exist in connection with financing and decision support. Using experience from other countries, suggestions are made for improvement in four areas: (1) focus on non-energy benefits rather than investment, (2) enhancement of subsidy system, (3) including relevant renovation plans in the energy performance certificate (EPC), and (4) long-term regulation on the maximum allowed energy consumption of houses.

Initiatives for the energy renovation of single-family houses in Denmark evaluated on the basis of barriers and motivators

The renovation of single-family houses in Denmark is progressing only slowly. Changes in current policy are needed if the political goal of a fossil-free building sector as part of a fossil-free society is to be achieved. Known barriers and motivators for energy renovation are identified, and arranged in a framework with three main fields (Information, Finance and Process), with a total of 14 sub-areas. With this framework, current Danish policy is analysed to identify shortcomings, found to mainly exist in connection with financing and decision support. Using experience from other countries, suggestions are made for improvement in four areas: (1) focus on non-energy benefits rather than investment, (2) enhancement of subsidy system, (3) including relevant renovation plans in the energy performance certificate (EPC), and (4) long-term regulation on the maximum allowed energy consumption of houses.

General information
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Organisations: Section for Building Energy, Department of Civil Engineering
Authors: Grøn Bjørneboe, M. (Intern), Svendsen, S. (Intern), Heller, A. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Interior insulation—Characterisation of the historic, solid masonry building segment and analysis of the heat saving potential by 1d, 2d, and 3d simulation

When considering interior insulation of historic, multi-storey buildings with solid masonry walls, it is important to focus on two important factors: How big is the building segment to which it can be applied, and what is the significance of how the multi-dimensional geometry of these facade walls is considered in the assessment of the heat saving potential. The findings show that a large proportion of Danish multi-storey dwellings with solid masonry walls, high energy consumption,
and uniform characteristics were found to originate from the period 1851–1930. This segment accounts for 25% of all multi-storey apartments in Denmark. It was investigated, which relative reduction of the average thermal transmittance could be obtained by interior insulation when simulated in different dimensions, degrees of insulation and thickness. The analysis showed that partial insulation of the spandrels below windows on the 2nd/3rd highest storeys accounted for up to 40% of the average thermal transmittance reduction achievable by fully insulating inside walls, while covering 17% of the space needed in the full insulation strategy. Furthermore, the analysis showed an underestimation of average thermal transmittance by 2-dimensional compared to 3-dimensional simulation by up to 57%, indicating that 3-dimensional analysis is needed to obtain realistic results.
Exterior walls in historic multi-storey buildings compared to walls in modern buildings have low thermal resistance, resulting in high energy loss and cold surfaces/floors in cold climates. When restrictions regarding alteration of the exterior appearance exist, interior insulation might be the only possibility to increase occupant comfort. This paper describes an investigation of the hygrothermal influence when applying 100 mm of diffusion open interior insulation to a historic multi-storey solid masonry spandrel. The dormitory room with the insulated spandrel had a normal indoor climate with a maximum observed monthly average humidity by volume excess of 3.2 g/m³ during the experiment. Relative humidity and temperature were monitored manually using wooden dowels over 2 years and 8 months in two solid masonry spandrels: one insulated wall and one untreated wall. The investigation showed that installing insulation on a solid masonry spandrel induced hygrothermal changes: Uniformly distributed higher relative humidity and lower temperature throughout the masonry, compared to an un-insulated wall. The relative humidity of the un-insulated masonry wall was in the range 50% on the inside to 60% on the outside, while the insulated wall showed uniformly distributed values around 80%. The risk of moisture-induced damage was evaluated based on mathematical models for mould and decay of wood, visual inspection for frost and mould, and on-site measurements for presence of mould spores. The damage evaluation showed no risk of damage from the changed hygrothermal conditions when applying interior insulation to a solid masonry spandrel.
Inverse analyses of effective diffusion parameters relevant for a two-phase moisture model of cementitious materials

Here we present an inverse analyses approach to determining the two-phase moisture transport properties relevant to concrete durability modeling. The proposed moisture transport model was based on a continuum approach with two truly separate equations for the liquid and gas phase being connected by the sorption kinetics. The moisture properties of ten binder-systems containing fly ash, calcined clay, burnt shale and gray micro-filler, were investigated experimentally. The experiments used were, (i) sorption test (moisture fixation), (ii) cup test in two different relative humidity intervals, (iii) drying test, and, (iv) capillary suction test. Mass change over time, as obtained from the drying test, the two different cup test intervals and the capillary suction test, was used to obtain the effective diffusion parameters using the proposed inverse analyses approach. The moisture properties obtained with the proposed inverse analyses method provide a good description of the test period for the ten different binder-systems.
Laboratory Approaches to Studying Occupants

Laboratories offer the possibility to study occupant behavior in a very detailed manner. A wide range of indoor environmental scenarios can be simulated under precisely controlled conditions, and human subjects can be selected based on pre-defined criteria. The degree of control over experiments is high and a large number of physical, physiological, and psychological quantities can be monitored. This chapter gives an overview of various types of test facilities in the world and their main features in terms of experimental opportunities. It then presents typical technical equipment and sensor technologies used in laboratory environments. Finally, questions on appropriate laboratory design and experimental set-ups are discussed. One conclusion is that, in spite of many advantages, there are limits to investigating occupant behavior in a laboratory’s “artificial” environment, in part due to the fact that subjects always feel observed to some extent. However, valuable results can be achieved if the specific opportunities of laboratories are utilized both by appropriate design and precise experiments during operation.

Mass detection, localization and estimation for wind turbine blades based on statistical pattern recognition

A method for mass change detection on wind turbine blades using natural frequencies is presented. The approach is based on two statistical tests. The first test decides if there is a significant mass change and the second test is a statistical group classification based on Linear Discriminant Analysis. The frequencies are identified by means of Operational Modal Analysis using natural excitation. Based on the assumption of Gaussianity of the frequencies, a multi-class statistical model is developed by combining finite element model sensitivities in 10 classes of change location on the blade, the smallest area being 1/5 of the span. The method is experimentally validated for a full scale wind turbine blade in a test setup and loaded by natural wind. Mass change from natural causes was imitated with sand bags and the algorithm was observed to perform well with an experimental detection rate of 1, localization rate of 0.88 and mass estimation rate of 0.72.
Modelling of pedestrian level wind environment on a high-quality mesh: A case study for the HKPolyU campus

Quality and efficiency of computational fluid dynamics (CFD) simulation of pedestrian level wind environment in a complex urban area are often compromised by many influencing factors, particularly mesh quality. This paper first proposes a systematic and efficient mesh generation method and then performs detailed sensitivity analysis of some important computational parameters. The geometrically complex Hong Kong Polytechnic University (HKPolyU) campus is taken as a case study. Based on the high-quality mesh system, the influences of three important computational parameters, namely, turbulence model, near-wall mesh density and computational domain size, on the CFD predicted results of pedestrian level wind environment are quantitatively evaluated. Validation of CFD models is conducted against wind tunnel experimental data, where a good agreement is achieved. It is found that the proposed mesh generation method can effectively provide a high-quality and high-resolution structural grid for CFD simulation of wind environment in a complex urban area.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Hong Kong Polytechnic University
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Occupancy and Occupants’ Actions
Occupants’ presence and actions within the built environment are crucial aspects related to understanding variations in energy use. Within this chapter, first, a nomenclature for the field of research dealing with occupants in buildings is defined. This nomenclature distinguishes between occupants’ presence and behavior, states and actions, adaptive triggers, non-adaptive triggers, and contextual factors. Second, an extensive list of occupant behaviors is provided and categorizations of occupants’ actions are introduced. The list includes most of the possible phenomena that researchers may wish to study, measure, and ultimately model. The categories are physiological, individual, environmental, and spatial adjustments. Third, a list of adaptive and non-adaptive triggers together with contextual factors that could influence occupant behavior is presented. Individual elements are further grouped into physical environmental, physiological, psychological, and social aspects. Finally, a comprehensive table of studies related to occupant behavior and the corresponding significant and non-significant predictors, based on an extensive literature review, is shown. This table highlights areas of research where numerous studies have been conducted, as well as areas where hardly any research has been published. The conclusion highlights the importance of publishing future occupant monitoring campaigns with sufficient detail to inform future researchers and save redundant effort. Such detail is especially necessary in relation to the methodology, including, for example, a clear description of the type of variables monitored, and in relation to the results, where both the influencing factors that were found to be significant and insignificant should be documented.
On the Value of Monitoring Information for the Structural Integrity and Risk Management

This article introduces an approach and framework for the quantification of the value of structural health monitoring (SHM) in the context of the structural risk and integrity management for systems. The quantification of the value of SHM builds upon the Bayesian decision and utility theory, which facilitates the assessment of the value of information associated with SHM. The principal approach for the quantification of the value of SHM is formulated by modeling the fundamental decision of performing SHM or not in conjunction with their expected utilities. The expected utilities are calculated accounting for the probabilistic performance of a system in conjunction with the associated structural integrity and risk management actions throughout the life cycle, the associated benefits, structural risks, and costs and when performing SHM, the SHM information, their probabilistic outcomes, and costs. The calculation of the expected utilities necessitates a comprehensive and rigorous modeling, which is introduced close to the original formulations and for which analysis characteristics and simplifications are described and derived. The framework provides the basis for the optimization of the structural risk and integrity management based on utility gains including or excluding SHM and inspection information. Studies of fatigue deteriorating structural systems and their characteristics (1) provide decision support for the performance of SHM, (2) explicate the influence of the structural component and system characteristics on the value of SHM, and (3) demonstrate how an integral optimization of SHM and inspection strategies for an efficient structural risk and integrity management can be performed.

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- Scopus rating (2014): SJR 0.948 SNIP 2.518 CiteScore 4.58
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- Scopus rating (2013): SJR 1.038 SNIP 2.121 CiteScore 5.07
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Porosity and density measurements of sodium acetate trihydrate for thermal energy storage

Sodium acetate trihydrate (SAT) can be used as phase change material in latent heat storage with or without utilizing supercooling. The change of density between liquid to solid state leads to formation of cavities inside the bulk SAT during solidification. Samples of SAT which had solidified from supercooled state at ambient temperature and samples which had solidified with a minimal degree supercooled were investigated. The temperature dependent densities of liquid and the two types of solid SAT were measured with a density meter and a thermomechanical analyzer. The cavities formed inside samples of solid SAT, which had solidified after a high or minimal degree of supercooling, were investigated by X-ray scanning and computer tomography. The apparent density of solid SAT depended on whether it solidified from a supercooled state or not. A sample which solidified from a supercooled liquid contained 15% cavities and had a density of 1.26 g/cm³ at 25 °C. SAT which had solidified with minimal supercooling contained 9% cavities and had a density of 1.34 g/cm³ at 25 °C. The apparent densities of the solid SAT samples were significant lower than the value of solid SAT reported in literature of 1.45 g/cm³. The density of liquid and supercooled SAT with extra water was also determined at different temperatures.

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Organisations: Department of Civil Engineering, Section for Building Energy, Department of Physics, Neutrons and X-rays for Materials Physics, Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics, University of Zaragoza, Technical University of Denmark, Graz University of Technology
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Scopus rating (2014): SJR 1.576 SNIP 2.206 CiteScore 3.16
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Scopus rating (2013): SJR 1.516 SNIP 2.5 CiteScore 3.31
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Pumice stones as potential in-situ burning enhancer

Small-scale and mid-scale experiments were conducted in order to evaluate pumice stones as a potential enhancement for in-situ burning (ISB). Four oil types, several emulsification degrees of one crude oil were studied. In general, it was observed that the pumice stones did not improve the burning efficiency (BE). In fact, for large pumice coverage ratios, the BE was affected negatively, especially for the emulsified crude oil, which is the most likely condition of the oil that may be subjected to ISB. Furthermore, it was observed that a relatively large amount of the pumice stones were sinking during and after the burn, thus bringing the oil into the water column. Finally, the species production of CO and CO₂ was not reduced. Based on the presented results, pumice stones have a negative impact on the efficiency of ISB, and they are ruled out as an ISB enhancer and should not be used in relation to ISB.
Quantifying demand flexibility of power-to-heat and thermal energy storage in the control of building heating systems

In the future due to continued integration of renewable energy sources, demand-side flexibility would be required for managing power grids. Building energy systems will serve as one possible source of energy flexibility. The degree of flexibility provided by building energy systems is highly restricted by power-to-heat conversion such as heat pumps and thermal energy storage possibilities of a building. To quantify building demand flexibility, it is essential to capture the dynamic response of the building energy system with thermal energy storage. To identify the maximum flexibility a building’s energy system can provide, optimal control is required. In this paper, optimal control serves to determine in detail demand flexibility of an office building equipped with heat pump, electric heater, and thermal energy storage tanks. The demand flexibility is quantified using different performance indicators that sufficiently characterize flexibility in terms of size (energy), time (power) and costs. To fully describe power flexibility, the paper introduces the instantaneous power flexibility as power flexibility indicator. The instantaneous power flexibility shows the potential power flexibility of TES and
power-to-heat in any case of charging, discharging or idle mode. A simulation case study is performed showing that a water tank, a phase change material tank, and a thermochemical material tank integrated with building heating system can be designed to provide flexibility with optimal control.
Although the residual shear strength of ASR-damaged slab bridges without shear reinforcement has been discussed for several decades, the amount of published research on this topic is very limited. This paper presents the results of a test series on 18 reinforced beams sawn from a severely ASR-damaged flat slab bridge. Flexural failure as well as shear failure were observed. The test results indicate that the ASR cracks in the beams strongly influenced the propagation of load-induced cracks. Generally, the calculated moment capacity of beams tested in three-point bending was lower than the maximum moment carried by the beams. For the beams tested in asymmetric four-point bending, an increase in the shear span-to-effective depth ratio resulted in a decrease in the measured shear strength. The measured shear strengths were compared with calculated shear strengths using the Eurocode 2. Calculations based on the compressive strength of drilled cores were rather conservative at low shear span-to-effective depth ratios. However, the conservatism of the Eurocode 2 decreased with increasing shear span-to-effective depth ratios. With the inclusion of ASR-induced pre-stress effect, the calculated shear strengths correlated better with the measured shear strengths. The test results indicated that the ASR-induced pre-stress effect can, to some extent, compensate for the significant loss in material properties.
Sensory evaluation and chemical analysis of exhaled and dermally emitted bioeffluents
Conditions in which exhaled and dermally emitted bioeffluents could be sampled separately or together (whole-body emission) were created. Five lightly dressed males exhaled the air through a mask to another, identical chamber or without a mask to the chamber in which they were sitting; the outdoor air supply rate was the same in both chambers. The carbon dioxide concentration in the chamber with exhaled air was 2000 ppm. Chamber temperatures were 23°C or 28°C, and ozone was present or absent in the supply airflow. When dermally emitted bioeffluents were present, the perceived air quality (PAQ) was less acceptable, and the odor intensity was higher than when only exhaled bioeffluents were present. The presence or absence of exhaled bioeffluents in the unoccupied chamber made no significant difference to sensory assessments. At 28°C and with ozone present, the odor intensity increased and the PAQ was less acceptable in the chambers with whole-body bioeffluents. The concentrations of nonanal, decanal, geranylacetone, and 6-MHO were higher when dermally emitted bioeffluents were present; they increased further when ozone was present. The concentration of squalene then decreased and increased again at 28°C. Dermally emitted bioeffluents seem to play a major role in the sensory nuisance experienced when occupied volumes are inadequately ventilated.

General information
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Web of Science (2009): Indexed yes
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Simulation Study of Active Ceilings with Phase Change Material in Office Buildings for Different National Building Regulations

The aim of this study was to examine the performance of phase change material (PCM) in active ceilings for an office room under different Danish building regulations for both heating and cooling purposes. A model of a two-person office room was simulated with the only heating and cooling source being radiant ceiling panels containing PCM. The target was to reduce energy use for the simulation models and still meet the recommended criteria of Category II for the European Standard EN 15251:2007 namely, 23°C – 26°C (73.4°F – 78.8°F) during summer and between 20°C – 24°C (68.0°F – 73.4°F) during winter. The office model was simulated for a whole year and analyzed for three Danish building regulations BR10 (2010), BR15 (2015) and BR20 (2020). The results show that the indoor environment was within the desired Category II, according to EN 15251 for the whole occupancy period. The predicted percentage of dissatisfied (PPD) was below the desired 10% for Class II of EN15251 during 95% of the occupied hours in a year for BR10, 94% for BR15 and 100% for BR20. The use of PCM model decreased energy use by 45% for BR10, 35% for BR15, while it increased by 17% for BR20. The results indicate that active ceilings with integrated PCM could help maintain a satisfactory thermal indoor environment while reducing the energy use. This demonstrated a great potential for PCM to be used to achieve strict energy frame requirements for future low energy buildings.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
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Simulation Study of Active Ceilings with Phase Change Material in Office Buildings under Extreme Climate Conditions

This study examined the performance of Phase Change Material (PCM) in active ceiling panels under extreme climate conditions. The purpose was to reduce the annual energy use and still maintain an indoor climate corresponding to Category II in the European Standard, EN15251. Dynamic yearly simulations were run with a building simulation software for eight climates. The chosen climates were Dubai –UAE, Istanbul – Turkey, Lima – Peru, Moscow – Russia, Nuuk – Greenland, Salvador – Brazil, Tokyo – Japan and Tromsø – Norway. Two models of a two-person office were made for each climate; one model with active ceiling with PCM and an all-air ventilation model without PCM to compare the models and investigate the effects of using PCM in active ceilings. The results results show that the PCM models lowered the peak room temperature during the cooling season. None of the PCM models had temperatures outside the desired ranges, and in general provided a more comfortable thermal indoor climate than the all-air system. The PPD level was lower for the PCM models in all of the tested climates, except for the hot climates Dubai and Salvador. The largest differences in energy use were found in the cold climates, namely Moscow, Nuuk and Tromsø. The PCM model of Nuuk used 42% less energy annually than the all-air system, while the PCM models of Tromsø and Moscow had 39% and 30% lower annual energy use, respectively. The PCM models of Istanbul and Dubai showed an energy use 24% and 13% lower compared to the all-air models. The subtropical climates Tokyo and Salvador had an 7% and 2% lower energy use, respectively. Lima was the only climate where the PCM model had a negative effect on the energy use with -20%. The implementation of PCM showed to have the largest benefit in terms of energy use under cold climate conditions; however, all climates, except for Lima, showed that active ceilings with PCM could be implemented with positive effects by lowering the peak room temperatures and the energy use in buildings.

General information
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Test and lower bound modeling of keyed shear connections in RC shear walls

This paper presents an investigation into the ultimate behavior of a recently developed design for keyed shear connections. The influence of the key depth on the failure mode and ductility of the connection has been studied by push-off tests. The tests showed that connections with larger key indentations failed by complete key cut-off. In contrast, connections with smaller key indentations were more prone to suffer local crushing failure at the key corners. The local key corner crushing has an effect on the load-displacement response, which is relatively more ductile. In addition to the tests, the paper also presents lower bound modeling of the load carrying capacity of the connections. The main purpose of the lower bound model is to supplement an already published upper bound model of the same problem and thereby provide a more complete theoretical basis for practical design. The two models display the same overall tendencies although identical results are not possible to obtain, due to differences in the basic assumptions usually made for upper and lower bound analysis of connections. It is found that the test results, consistent with the extremum theorems of plasticity, are all lying within the gap between the upper and the lower bound solution. The obtained results finally lead to a discussion of how the two models can be used in practice. The primary merit of the upper bound model lies in its simplicity (a closed-form equation). On the other hand, the lower bound model provides safe results, but is more complicated to apply. It is therefore argued that the upper bound model may be used in cases, where calibration with tests has been carried out. The lower bound model should be applied in situations, where the design deviates significantly from the configurations of the available tests.

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The application of municipal renewable energy policies at community level in Denmark: A taxonomy of implementation challenges

The implementation of national renewable energy targets requires policies at the local level. Communities are considered as key arenas of transforming policies into actions, where technical configurations intersect with socioeconomic interests. Local governments put great efforts into developing and applying energy strategies. Although many frontrunner projects are well-documented, insufficient attention is paid to the average-performing municipalities that are challenged in linking technical energy scenarios with socioeconomic realities.

The following implementation gap between national policy and local practice leads to a non-attainment of national energy targets. This paper analyses the Strategic Energy Plans (SEP) of 17 Danish municipalities based on their development, scope, and inclusion of local communities. As a synopsis, the main technical, physical, organizational and socioeconomic challenges for local energy policy implementation were illustrated. Internal organization, lacking municipal capacities, combined with the complexity of communities leads to procedural deficits in strategy production. The resulting neglect of socioeconomics and other community peculiarities by technology-driven strategies impede strategy implementation. As a consequence, a community-oriented taxonomy of implementation challenges is introduced. This approach might help to improve the scope of SEPs, ensure a local anchoring of energy strategies, and raise awareness for challenges already present during strategy production to facilitate strategy implementation.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
The Influence of a Radiant Panel System with Integrated Phase Change Material on Energy Use and Thermal Indoor Environment

This study examined the effect on energy use and thermal comfort when combining microencapsulated phase change material (PCM) with radiant ceiling panels in a two-person office. The performance of the system was studied during the cooling season in the climates of Copenhagen, Denmark, and Rome, Italy, using a basic cooling strategy and a night cooling strategy. Negligible effect was observed in both Copenhagen and Rome with PCM integration using the basic cooling strategy with a constant cooling set point of 26°C (78.8°F). This caused nearly constant temperatures in the office, preventing full utilization of the PCM potential as charge and discharge of the PCM was averted. Application of night cooling strategy created more optimum temperature conditions for PCM activation with cooling of the office during night down to 23°C (73.4°F), enabling discharge of the PCM. This decreased the peak cooling power by 15% and increased the occupied hours in Category I of the European standard EN 16798-1 (EN 2016) by 8% in Copenhagen. Clearer effects were observed in Rome, decreasing the peak cooling power by 17% and increasing the occupied hours in Category I by 18%. These enhancements were achieved due to reduced operative temperature fluctuations caused by the construction thermal mass increase when integrating PCM. The study was based on both measured and theoretical properties of the ceiling panels, and greater enhancements of thermal indoor conditions were obtained using the theoretical panel specifications.

General information

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**Theory of timber connections with slender dowel type fasteners**

A theory on the lateral load-carrying capacity of timber connections with slender fasteners is presented. The base of the theory is the coupled mechanical phenomena acting in the connection, while the wood and the slender fastener deform and yield prior to failure. The objective is to derive a sufficient description of actions and responses which have determining influence on the load-carrying capacity of timber connections with slender fasteners. Model assumptions are discussed and made, but simplifications are left out. Even so, simple mathematical equations describing the lateral capacity are derived from mechanical equilibrium of the deformed fastener. The herein proposed theory is verified against tests. The tests were designed to vary the influence of isolated mechanical phenomenon as much as possible. The theory shows a very high accuracy and precision when predicting the load-carrying capacity of the tested connections.

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Organisations: Department of Civil Engineering, Danish Timber Information
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Materials Science (all), Deformed state equilibrium, friction, laminated veneer lumber, mechanical testing, plastic hinge, Fasteners, Friction, Load limits, Loads (forces), Mechanical testing, Timber, Deformed state, Laminated veneer lumber, Lateral capacity, Mathematical equations, Mechanical equilibrium, Model assumptions, Plastic hinges, Timber connections, Locks (fasteners)
Thermo-active building systems and sound absorbers: Thermal comfort under real operation conditions

Radiant systems are established today and have a high ecological potential in buildings while ensuring thermal comfort. Free-hanging sound absorbers are commonly used for room acoustic control, but can reduce the heat exchange when suspended under an active slab. The aim of this study is to evaluate the impact on thermal comfort of horizontal and vertical free-hanging porous sound absorbers placed in rooms of a building cooled by Thermo-Active Building System (TABS), under real operation conditions. A design comparing five different ceiling coverage ratios and two room types has been implemented during three measurement periods. A clear correlation between increase of ceiling coverage ratio and reduction of thermal comfort could not be derived systematically for each measurement period and room type, contrarily to what was expected from literature. In the first two monitoring periods in the larger office rooms, rooms with higher coverage ratios reported higher operative temperatures. This correlation was however not clear from the monitoring in the smaller offices and other measurement periods. In all monitored rooms, a strong influence of the user behaviour on thermal comfort has been observed. A higher temporal offset between ceiling and operative temperature was also observed in rooms equipped with absorbers.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Burohappold Engineering, Fraunhofer Institute for Solar Energy Systems ISE, Saint-Gobain Ecophon AB
Authors: Köhler, B. (Ekstern), Rage, N. (Ekstern), Chigot, P. (Ekstern), Hviid, C. A. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
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Thermo-Active Building Systems, Thermal comfort, Room acoustics, Sound absorbers, Long-term monitoring, Field study

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Utilisation of Electrodialytically Treated Sewage Sludge Ash in Mortar

Phosphorous is a scarce resource and there is a need to develop methods for recovery of this irreplaceable nutrient from secondary resources, e.g. from sewage sludge ash (SSA). Today SSA is most often disposed of and the resource is lost. In the present study, about 90% phosphorous was recovered from SSA by electrodialytic separation in a bench scale set-up, and the particulate residue after the extraction (SSA-ED) was evaluated for use as cement replacement in mortar. The SSA-ED and untreated SSA were grinded for 0, 30 s and 10 min in order to obtain fractions with different degrees of fineness. Each fraction was tested as cement replacement with 20% substitution in mortar. The technical and aesthetical properties of mortars containing the two SSAs were compared to the properties of ordinary mortar. The SSA-ED was acidic; however, this did not significantly influence the mortar properties on short term investigated here. For example, the compressive strength of the mortar with SSA-ED only decreased by 8% compared to ordinary mortar. The workability of mortars with SSA or SSA-ED was reduced compared to the reference. The colour of mortar with SSA-ED was warm reddish, and more intense than the colour of the mortar with SSA. The intense colour was due to the increased concentration of hematite during ED. This study showed potential for separating SSA to two resources by combining electrodialytic extraction of phosphorous and subsequent utilization of the residual mineral ash in mortar.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Kappel, A. (Intern), Pares Viader, R. (Intern), Kowalski, K. P. (Intern), Kirkelund, G. M. (Intern)
Number of pages: 13
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Main Research Area: Technical/natural sciences

Publication information
Journal: Waste and Biomass Valorization
ISSN (Print): 1877-2641
Ratings:
BFI (2018): BFI-level 1
Wind-induced single-sided natural ventilation in buildings near a long street canyon: CFD evaluation of street configuration and envelope design

Wind-induced single-sided natural ventilation in buildings was widely investigated based on isolated buildings. However, owing to the presence of surrounding buildings, the wind flow pattern around a building in an urban area becomes very different from that around an isolated building. Considering an urban context, this study investigates the wind-induced single-sided natural ventilation in buildings near a long street canyon under a perpendicular wind direction using CFD method. Four aspect ratios (AR) of the street canyon, from 1.0, 2.0, 4.0 to 6.0, are investigated to examine the influence of street configuration, while eight envelope features are compared to explore the possibility of envelope design in improving natural ventilation performance of urban buildings. Ventilation rate of rooms in buildings is particularly analyzed. AR influences ventilation rate and its distribution among rooms along height of buildings. The percentage decrease of ventilation rate of buildings reaches 67% when AR of a street canyon is increased from 1.0 to 6.0. Envelope design provides a possibility to enhance the adaptability of buildings to dense urban environments. A good envelope design, such as a horizontal feature at the middle of an opening, can break effectively the along-facade flow and thus create a large pressure difference to drive ventilation. The findings of this study are intended to increase the understanding of natural ventilation performance in urban buildings and thus provide information for urban planning and building design.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Hong Kong Polytechnic University
Authors: Ai, Z. (Intern), Mak, C. (Ekstern)
Number of pages: 11
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Main Research Area: Technical/natural sciences

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Journal: Journal of Wind Engineering and Industrial Aerodynamics
Volume: 172
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.61 SJR 1.002 SNIP 1.92
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Yearly thermal performances of solar heating plants in Denmark – Measured and calculated

The thermal performance of solar collector fields depends mainly on the mean solar collector fluid temperature of the collector field and on the solar radiation. For Danish solar collector fields for district heating the measured yearly thermal performances per collector area varied in the period 2012–2016 between 313 kWh/m² and 577 kWh/m², with averages between 411 kWh/m² and 463 kWh/m². The percentage difference between the highest and lowest measured yearly thermal performance is about 84%. Calculated yearly thermal performances of typically designed large solar collector fields at six different locations in Denmark with measured weather data for the years 2002–2010 vary between 405 kWh/m² collector and 566 kWh/m² collector, if a mean solar collector fluid temperature of 60 °C is assumed. This corresponds to a percentage difference between the highest and lowest calculated yearly thermal performance of about 40%. This variation is caused by different weather conditions from year to year and from location to location. Approximately half of the variations of yearly thermal performances can be related to variable weather conditions.
LANDSPLANREDEGØRELSEN 2017 – lever ikke op til behovet for en fremadrettet plan

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern), Poppel, B. (Ekstern), Jørgensen, U. (Ekstern)
Publication date: 17 Nov 2017

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Newspaper: Sermitsiaq
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Main Research Area: Technical/natural sciences
Electronic versions:
171113_Sermitsiaq_kronik_LPR2017_Master_1_.pdf
Source: PublicationPreSubmission
Source-ID: 139633114
Publication: Communication › Feature article – Annual report year: 2017

Povl Ole Fanger’s impact ten years later
This paper pays tribute to Povl Ole Fanger, the late professor at the Technical University of Denmark. His scientific studies, focused on the main parameters affecting indoor environmental quality, have inspired (and still inspire) professional design engineers and academic researchers on human thermal comfort and indoor air quality over the last five decades. In addition, he strongly contributed to the creation of a “European School” that addressed engineering issues and was well integrated with the American School, which was characterised (at that time) by a physiological approach. Ten years after his death, this paper is a memorial of his research in the field of thermal comfort and some aspects of indoor air quality. Only the original papers of this Danish scientist will be discussed. The analysis of each single topic of his research and of its impact on past and present research would require more space than would be available in a review article. The authors are confident that the research described in this paper will serve as a beacon for researchers working on thermal comfort now and in the future.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Universita di Salerno, University of Naples Federico II
Authors: d’Ambrosio Alfano, F. R. (Ekstern), Olesen, B. W. (Intern), Palella, B. I. (Ekstern)
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Publication information
Journal: Energy and Buildings
Volume: 152
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Ratings:
METHOD OF MANUFACTURING A COMPOSITE STRUCTURE INCLUDING A TEXTILE FABRIC ASSEMBLY

The invention relates to a textile fabric assembly (1) comprising at least two textile layers (2). The textile layers (2) are joined at a plurality of points (3) and/or along a plurality of lines (6) so that they form inner and outer walls, respectively. The invention also relates to a method of manufacturing a composite structure (10). The method may comprise providing a form (8) that has a shape corresponding to a desired shape of an internal cavity in the composite structure (10) to be manufactured. The textile fabric assembly (1) is arranged around the form (8), and a curable material (9) is filled into the at least one inner space (4) between the textile layers (2). The form (8) may be inflatable. Alternatively, the method may comprise arranging the textile fabric assembly (1) around an initial structure and/or mechanically fastened to a surface of an initial structure to be reinforced and then filling it with a curable material (9).

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Centre for oil and gas – DTU
Authors: Fischer, G. (Intern)
Publication date: 14 Jun 2017

Publication information
SEQUENTIAL ELECTRODIALYTIC EXTRACTION OF PHOSPHORUS COMPOUNDS

The present invention relates to an apparatus for electrodialytic extraction of phosphorus from a particulate material in suspension and to a method for electrodialytic phosphorus recovery, which uses the apparatus. The method may be applied for wastewater treatment, and/or treatment of particulate material rich in phosphorus. The present invention provides an apparatus for electrodialytic extraction of phosphorus from a particulate material comprising acidic and/or alkaline soluble phosphorus compounds, in suspension, comprising: • a first electrodialytic cell comprising a first anolyte compartment comprising a first anolyte, and a first catholyte compartment comprising a first catholyte, wherein the compartments of the first cell are separated by a cation exchange membrane, wherein the first anolyte is the particulate material in suspension, the first electrodialytic cell configured for exposing the particulate material to acidic conditions; • a second electrodialytic cell comprising a second anolyte compartment comprising a second anolyte, and a second catholyte compartment comprising a second catholyte, wherein the compartments of the second cell are separated by an anion exchange membrane, wherein the second anolyte is the particulate material in suspension, the second electrodialytic cell configured for exposing the particulate material to alkaline conditions; and • filtration means in fluid communication with the first and second electrodialytic cells, and configured to filter the first anolyte, and transfer the residual into the second catholyte compartment to be comprised in the second catholyte, and transfer the filtrate into the second anolyte compartment to be comprised in the second anolyte.

ELECTROKINETIC DEVICE AND METHOD FOR CONSOLIDATING POROUS MATERIALS

The invention relates to a device and an associated electrokinetic method which allows the pores (superficial and deep) of a porous material to be filled, by forcing the precipitation therein of a product of low solubility in water by creating an electric field which will mobilise the cations and anions supplied by previously selected solutions. This method comprises two phases. In the first phase, the pores located at a specified distance from the surface of contact between the porous material and the anodic or cathodic compartment are plugged. In a second phase, the rest of the pores, mainly those which are on the surface level, are collapsed. As a result of the designed device and the plugging system contained therein, the porous material is not affected at any moment by chemical alteration processes caused by contact with extreme pH values. This device allows the treatment to be applied to vertical surfaces.
A plot-scale study of firn stratigraphy at Lomonosovfonna, Svalbard, using ice cores, borehole video and GPR surveys in 2012-14

Spatial heterogeneity of snow and firn properties on glaciers introduces uncertainty in interpretation of point and profile observations and complicates modelling of meltwater percolation and runoff. Here we present a study of the temporal and spatial dynamics of firn density and stratigraphy at the plot-scale (≈10 m × 10 m × 10 m) repeated annually during 2012-14 at the Lomonosovfonna icefield, Svalbard. Results from cores, video inspections in boreholes and radar grid surveys are compared. Ice layers 0.1-50 cm thick comprised ≈8% of the borehole length. Most of them are 1-3 cm thick and could not be traced between boreholes separated by 3 m. Large lateral variability of firn structure affects representativeness of observations in single holes and calls for repeated studies in multiple points to derive a representative stratigraphy signal. Radar reflections are poorly correlated with ice layers in individual boreholes. However, the match between the high amplitude peaks in the grid-averaged radar signal and horizons of preferential ice layer formation revealed by averaging the video surveys over multiple boreholes is higher. These horizons are interpreted as buried firn layers previously exposed to melt-freeze or wind-driven densification and several of them are consistently recovered throughout three field campaigns.

General information
State: Published
Organisations: Department of Civil Engineering, Arctic Technology Centre, Uppsala University, University Centre in Svalbard, University of Zurich, Norwegian Polar Institute
Authors: Marchenko, S. (Ekstern), Pohjola, V. A. (Ekstern), Pettersson, R. (Ekstern), Van Pelt, W. J. (Ekstern), Vega, C. P. (Ekstern), Machguth, H. (Ekstern), Beggild, C. E. (Intern), Isaksson, E. (Ekstern)
Number of pages: 12
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.57 SJR 2.121 SNIP 1.231
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.284 SNIP 1.095 CiteScore 3.09
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.087 SNIP 1.274 CiteScore 3.09
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Achieving low return temperature for domestic hot water preparation by ultra-low-temperature district heating

District heating (DH) is a cost-effective method of heat supply, especially to area with high heat density. Ultra-low-temperature district heating (ULTDH) is defined with supply temperature at 35-45 degrees C. It aims at making utmost use of the available low-temperature energy sources. In order to achieve high efficiency of the ULTDH system, the return temperature should be as low as possible. For the energy-efficient buildings in the future, it is feasible to use ULTDH to cover the space heating demand. However, considering the comfort and hygiene requirements of domestic hot water (DHW) preparation, supplementary heating devices should be combined, which can affect the return temperature in different extents. This study analysed the return temperatures of different types of substations for DHW preparation with ULTDH, and developed improvements in the substation for better energy efficiency. Both the instantaneous and storage-type electric heating methods were Long-term measured as supplementary heating for ULTDH in the case substations in Denmark. We analysed the seasonal impacts of the return temperature from the DHW loop on the overall return temperature of district heating. To achieve lower return temperature and higher efficiency for DHW supply, an innovative substation was devised, which replaced the bypass with an instantaneous heat exchanger and a micro electric storage tank. The energy performance of the proposed substation and the resulting benefits for the DH system by the lower return temperature were investigated (C) 2017 The Authors. Published by Elsevier Ltd.
A comparison between tracer gas and aerosol particles distribution indoors: The impact of ventilation rate, interaction of airflows, and presence of objects

The study investigated the separate and combined effects of ventilation rate, free convection flow produced by a thermal manikin, and the presence of objects on the distribution of tracer gas and particles in indoor air. The concentration of aerosol particles and tracer gas was measured in a test room with mixing ventilation. Three layouts were arranged: an empty room, an office room with an occupant sitting in front of a table, and a single-bed hospital room. The room occupant was simulated by a thermal manikin. Monodisperse particles of three sizes (0.07, 0.7, and 3.5 μm) and nitrous oxide tracer gas were generated simultaneously at the same location in the room. The particles and gas concentrations were measured in the bulk room air, in the breathing zone of the manikin, and in the exhaust air. Within the breathing zone of the sitting occupant, the tracer gas emerged as reliable predictor for the exposure to all different-sized test particles. A change in the ventilation rate did not affect the difference in concentration distribution between tracer gas and larger particle sizes. Increasing the room surface area did not influence the similarity in the dispersion of the aerosol particles and the tracer gas.
A GBT-framework towards modal modelling of steel structures

In modern structural steel frame design, the modelling of joints between beams and columns are based on very simple assumptions. The joints are most often assumed to behave as a perfect hinge or as a rigid joint. This means that in the overall static analysis relative rotations and changes in the moment curves due to joint deformations are neglected. This simplification eases the modelling but it is at the cost of losing a detailed understanding of the behaviour of the joint. This happens even though the European code has introduced the so-called component method in order to determine the rotational stiffness of a connection. Based on a modelling of any beam-to-column joint using finite shell elements and springs for single components such as bolts, it is the primary hypothesis that it is possible to formulate a generalized connection model with few degrees of freedom related to a relevant set of deformation modes. This hypothesis is based on the idea of modal decomposition performed in generalized beam theories (GBT). The question is – is it possible to formulate an eigenvalue problem with a solution corresponding to mode shapes for the deformation of the joint by using the finite element model and some type of GBT beam elements? It is believed that this is possible. The paper will address our investigations and show the progress of our research.

Alkali Release from Typical Danish Aggregates to Potential ASR Reactive Concrete

Alkali-silica reaction (ASR) in concrete is a well-known deterioration mechanism affecting the long term durability of Danish concrete structures. Deleterious ASR cracking can be significantly reduced or prevented by limiting the total alkali content of concrete under a certain threshold limit, which in Denmark is recommended to 3 kg/m³ Na₂Oₑq. However, this threshold limit does not account for the possible internal contribution of alkali to the concrete pore solution by release from aggregates or external contributions from various sources. This study indicates that certain Danish aggregates are capable of releasing more than 0.46 kg/m³ Na₂Oₑq at 13 weeks of exposure in laboratory tests which may increase the risk for deleterious cracking due to an increase in alkali content in the concrete.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Hansen, A. B. (Intern), Jönsson, J. (Intern)
Number of pages: 9
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Main Research Area: Technical/natural sciences

General Alkali information

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Rambøll Danmark A/S
Authors: Thomsen, H. C. B. (Intern), Grelk, B. (Ekstern), Barbosa, R. A. (Intern), Hansen, K. K. (Intern)
Number of pages: 4
Publication date: 2017
Alteration of steenstrupine-(Ce) from the Ilímaussaq alkaline complex, South Greenland

Steenstrupine-(Ce) from two localities, Taseq and Mellemelv, both in the Ilímaussaq complex of South Greenland has been studied. At Taseq ussingite veins contain idiomorphic steenstrupine-(Ce) crystals with decomposed central parts, marginal zones of very thin rhythmically/oscillatory precipitated layers exceptionally rich in Th (up to 10.6 wt% ThO₂) and rim zones with distinctly lower Th values (min. 5.5 wt% ThO₂). The low content of Na (between 0.9 and 3.8 wt% Na₂O) in the mineral has presumably been caused by protonation exchange of Na⁺ by H⁺. Two types of late- to post magmatic alteration have attacked the crystals. Decomposition is strictly confined either to distinct zones inside the crystals or to their cores and has resulted in the formation of extremely fine-grained crystalline phases. The other alteration product cuts into steenstrupine-(Ce) crystals as irregularly shaped botryoidal bodies, composed presumably of amorphous products. Hexagonally shaped crystals of britholite-(Ce) and presumably a new mineral species labelled A4 with square outlines and the composition Na₁.₄₁(Ca₀.₁₄Fe₀.₃₉Mn₀.₂₄)∑₀.₇₇(REE₅.₃₉Th₀.₂₂)∑₅.₆₁(Si₅.₃₆P₀.₆₄)∑₆.₀₀F₀.₅₅O₂₂.₀₂−n(OH)₂n are enclosed as idiomorphic crystals in many steenstrupine-(Ce) crystals. Britholite-(Ce) also forms radiating aggregates in adjacent silicate minerals. Britholite-(Ce) is characterized by exceptionally high contents of REE (73.0 wt% REE₂O₃) and low contents of CaO (2.2 wt%).

At the Mellemelv locality, both fresh and completely decomposed steenstrupine-(Ce) occurs in a complex naujaite pegmatite. Fresh steenstrupine-(Ce) differs in composition from steenstrupine-(Ce) from Taseq. It may represent a new steenstrupine-(Ce) variety. Two secondary and chemically well-defined minerals, labelled A5, (Na₀.₀₂K₀.₀₁)∑₀.₀₃(Ca₀.₇₀Fe₀.₀₇Mn₀.₀₃)∑₁.₂₀(REE₃.₅₉Th₀.₂₂)∑₃.₇₉(Nb₀.₀₁Ti₀.₀₁Zr₀.₀₁)∑₀.₀₃(Si₄.₈₁P₀.₅₆Al₀.₆₃)∑₆.₀₀F₀.₅₇Cl₀.₀₅O₁₉.₈₈−y(OH)₂y·nH₂O, and A6, (Na₀.₁₀K₀.₀₃)∑₀.₁₃(Ca₀.₃₆Fe₀.₆₅Mn₀.₁₉)∑₁.₂₁(REE₃.₅₉Th₀.₂₂)∑₃.₇₉(Nb₀.₀₁Zr₀.₂₅)∑₀.₃₄(Si₄.₈₁P₀.₅₆Al₀.₆₃)∑₆.₀₀F₀.₅₇Cl₀.₀₅O₁₉.₈₈−y(OH)₂y·nH₂O, appear to be new mineral species. They constitute major alteration products in the decomposed steenstrupine-(Ce) crystals; A5 also occurs closely associated with the unaltered steenstrupine-(Ce) variety.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, University of Copenhagen
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Scopus rating (2016): CiteScore 1.35 SJR 0.531 SNIP 0.94
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.807 SNIP 0.942 CiteScore 1.38
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.722 SNIP 0.895 CiteScore 1.34
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.936 SNIP 0.943 CiteScore 1.47
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.905 SNIP 1.061 CiteScore 1.44
Analytical and numerical investigation of bolted steel ring flange connection for offshore wind monopile foundations

The monopile foundation is the dominant solution for support of wind turbines in offshore wind farms. It is normally grouted to the transition piece which connects the foundation to the turbine. Currently, the bolted steel ring flange connection is investigated as an alternative. The monopile–transition piece connection has specific problems, such as out-of-verticality and installation damage from driving the MP into the seabed and it is not fully known how to design for these. This paper presents the status of the ongoing development work and an estimate of what still needs to be covered in order to use the connection in practice. This involves presentation of an analytical and non-linear FE analysis procedure for the monopile–transition piece connection composed of two L flanges connected with preloaded bolts. The connection is verified for ultimate and fatigue limit states based on an integrated load simulation carried out by the turbine manufacturer.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, COWI AS
Authors: Madsen, C. (Ekstern), Kragh-Poulsen, J. (Intern), Tage, K. (Ekstern), Andreassen, M. J. (Intern)
Number of pages: 16
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Main Research Area: Technical/natural sciences
Bolted steel ring flange connection, L flange, Offshore monopile foundation, Ultimate limit state, Fatigue limit state, Markov matrices
Source: PublicationPreSubmission
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Publication: Research - peer-review › Paper – Annual report year: 2017


Maintaining daylight quality while ensuring thermal comfort during periods of high solar gain proves to be a challenge in renovated multi-story housing. The objective of this study was to develop guidelines for facade renovation, where overheating problems can only be avoided through façade solutions. As a first step, different shading systems have been investigated and compared in terms of their daylight performance, visual comfort and gaze responsive characteristics. This
trend evaluation method is going to be further developed and used for a larger set of selected shading devices.

**General information**

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- Scopus rating (2016): CiteScore 5.17 SJR 1.999 SNIP 1.798
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 2.276 SNIP 2.046 CiteScore 5.03
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 2.647 SNIP 2.63 CiteScore 5.7
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2

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An evaluation of interferences in heat production from low enthalpy geothermal doublets systems

Required distance between doublet systems in low enthalpy geothermal heat exploitation is often not fully elucidated. The required distance aims to prevent negative interference influencing the utilisation efficiency of doublet systems. Currently production licence areas are often issued based on the expected extent of the reinjected cold water plume on the moment of thermal breakthrough. The production temperature, however, may not immediately drop to non-economic values after this moment. Consequently, heat production could continue increasing the extent of the cold water plume. Furthermore, the area influenced by pressure because of injection and production spreads beyond the cold water plume extent, influencing not only the productivity of adjacent doublet systems but also the shape of cold water plumes. This affects doublet life time, especially if adjacent doublets have different production rates. In this modelling based study a multi parameter analysis is carried out to derive dimensionless relations between basic doublet design parameters and required doublet distance. These parameters include the spacing between injector and producer of the same doublet, different production rates, aquifer thickness and minimal required production temperature. The results of this study can be used to minimize negative interference or optimise positive interference aiming at improving geothermal doublet deployment efficiency. (C) 2017 The Authors. Published by Elsevier Ltd.

**General information**

State: Published
Organisations: Department of Civil Engineering, Centre for oil and gas – DTU, Delft University of Technology, University of Leuven
Authors: Willems, C. J. L. (Ekstern), Nick, H. M. (Intern), Weltje, G. J. (Ekstern), Bruhn, D. F. (Ekstern)
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A new scenario-based approach to damage detection using operational modal parameter estimates

In this paper a vibration-based damage localization and quantification method, based on natural frequencies and mode shapes, is presented. The proposed technique is inspired by a damage assessment methodology based solely on the sensitivity of mass-normalized experimental determined mode shapes. The present method differs by being based on modal data extracted by means of Operational Modal Analysis (OMA) combined with a reasonable Finite Element (FE) representation of the test structure and implemented in a scenario-based framework. Besides a review of the basic methodology this paper addresses fundamental theoretical as well as practical considerations which are crucial to the applicability of a given vibration-based damage assessment configuration. Lastly, the technique is demonstrated on an experimental test case using automated OMA. Both the numerical study as well as the experimental test case presented in this paper are restricted to perturbations concerning mass change.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aarhus University, Universidad de Oviedo
An improved electrokinetic method to consolidate porous materials

Consolidation is considered one of the major restoration treatments applied on cultural heritage. This kind of treatment is focused on to preserve the external weathered layers of stone reducing their degradation caused by external alteration agents (mainly water and soluble salts). However the consolidation using commercial products have some limitations, such as: (1) low penetrability; (2) no chemical and mineralogical affinity with the material to treat and (3) release of toxic compounds (VOCs), during the solvent evaporation. In the last years, a new consolidation method based on electrokinetic techniques was developed. This method allows filling some pores by the precipitation of an inorganic compound. As a result the method allows increasing the penetration depth of current consolidation treatments. However, this method needs to be improved since: (1) no special care is taking in controlling the pH of the solutions in contact with the porous material, which can damage it and (2) it is difficult to determine in which area the consolidation takes place. In this study an electrokinetic consolidation method, which has two steps between which the current is reversed, is proposed to solve all of these problems. The results show that the proposed treatment achieves better results in terms of penetrability and durability of current consolidation treatments, and moreover prevent that the treated material to be exposed to extreme pH values.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Vigo
Authors: Feijoo, J. (Ekstern), Ottosen, L. M. (Intern), Nóvoa, X. R. (Ekstern), Rivas, T. (Ekstern), de Rosario, I. (Ekstern)
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BFI (2015): BFI-level 1
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.207 SNIP 1.524 CiteScore 1.55
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.49 SNIP 1.758 CiteScore 1.71
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.448 SNIP 1.838 CiteScore 1.63
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ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.08 SNIP 1.396
Web of Science (2010): Indexed yes
Anisotropic Concrete Compressive Strength

When the load carrying capacity of existing concrete structures is (re-)assessed it is often based on compressive strength of cores drilled out from the structure. Existing studies show that the core compressive strength is anisotropic; i.e. it depends on whether the cores are drilled parallel or perpendicular to the casting direction. Engineers may therefore misjudge the load carrying capacity. Thus structures may be strengthened or rebuilt unnecessarily or left in service with high failure probability. This paper presents a literature review and an experimental study on the anisotropy and its correlation to the curing time. The experiments show no correlation between the anisotropy and the curing time and a small strength difference between the two drilling directions. The literature shows variations on which drilling direction that is strongest. Based on a Monte Carlo simulation of the expected variation it is argued that the variation of the anisotropy may be statistically coincidences.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, University of Southern Denmark
Authors: Gustenhoff Hansen, S. (Ekstern), Jørgensen, H. B. (Ekstern), Hoang, L. C. (Intern)
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Annual measured and simulated thermal performance analysis of a hybrid solar district heating plant with flat plate collectors and parabolic trough collectors in series

Flat plate collectors have relatively low efficiency at the typical supply temperatures of district heating networks (70–95 °C). Parabolic trough collectors retain their high efficiency at these temperatures. To maximize the advantages of flat plate collectors and parabolic trough collectors in large solar heating plants for a district heating network, a hybrid solar collector field with 5960 m² flat plate collectors and 4039 m² parabolic trough collectors in series was constructed in Taars, Denmark. The design principle is that the flat plate collectors preheat the return water from the district heating network to
about 70 °C and then the parabolic trough collectors would heat the preheated water to the required supply temperature of the district heating network. Annual measured and simulated thermal performances of both the parabolic trough collector field and the flat plate collector field are presented in this paper. The thermal performance of both collector fields with weather data of a Design Reference Year was simulated to have a whole understanding of the application of both collectors under Danish climate conditions as well. These results not only can provide a design basis for this type of hybrid solar district heating plants with flat plate collectors and parabolic trough collectors in the Nordic region, but also introduce a novel design concept of solar district heating plants to other high solar radiation areas.

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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Tian, Z. (Intern), Perers, B. (Intern), Furbo, S. (Intern), Fan, J. (Intern)
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Main Research Area: Technical/natural sciences

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Scopus rating (2013): SJR 3.164 SNIP 3.377 CiteScore 6.59
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Scopus rating (2012): SJR 2.854 SNIP 3.108 CiteScore 5.69
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 1
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BFI (2010): BFI-level 1
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BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.003 SNIP 1.781
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.974 SNIP 1.215
Web of Science (2008): Indexed yes
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Web of Science (2007): Indexed yes
A novel algorithm for demand-control of a single-room ventilation unit with a rotary heat exchanger

Energy renovations seek to improve the airtightness of dwellings and thus require ventilation and heat recovery to maintain or improve energy-efficiency, indoor climate, and durability. These ventilation systems often control the indoor air of an apartment as a single climate zone, which neglects the different demands of individual rooms. Renovations result in greater retention of heat and air inside the building envelope, so rooms become especially sensitive to gains from solar radiation, occupancy, moisture loads and pollutants. Single-room ventilation units are able to provide balanced ventilation with heat recovery in individual rooms. This provides a unique opportunity to meet the demands of each room with an appropriate ventilation rate, supply temperature and drying capacity.

In prior publications, the authors described the development of a single-room ventilation unit with a rotary heat exchanger, which is commercially available in Denmark. The unit includes temperature sensors at the inlet and outlet of the supply and exhaust airflows. At the exhaust inlet, a relative humidity sensor is standard and a CO2 sensor is optional. Together these sensors detect thermal comfort and air quality in the indoor environment. Based on these values, a demand-control algorithm varies fan speeds to change airflow rates and varies the rotational speed of the heat exchanger to modulate heat and moisture recovery. The algorithm varies airflow rates to provide free cooling and limit CO2 concentrations and varies the coupled heat and moisture recovery to ensure the appropriate supply temperatures for heating or cooling and to modulate drying capacity. In the default setting, the algorithm is not aware of the heating set-point temperature in each room, so the algorithm decides when to bypass heat recovery without compromising efficiency. Moisture control takes higher precedence in the algorithm and overrides temperature and CO2 controls. In previous publications, the authors demonstrated that modulating regenerative heat recovery could control relative humidities in ‘dry rooms’, so the algorithm first attempts to limit moisture recovery by varying the rotational speed and then safely unbalances airflows in a worst-case scenario. In the algorithm, frost protection and minimum supply temperature take the highest priority and override other controls. This paper documents the proposed demand control algorithm and analyses its impacts on compliance of building regulations in Denmark. The paper presents an algorithm that manufacturers can program into their controls. The commercially available single-room ventilation unit with a rotary heat exchanger uses this algorithm coded in the C language. Future work will document the effectiveness of the algorithm and how it behaves in a system.

A numerical model to evaluate the flow distribution in a large solar collector field

This study presents a numerical model to evaluate the flow distribution in a large solar collector field, with solar collectors connected both in series and in parallel. The boundary conditions of the systems, such as flow rate, temperature, fluid type and layout of the collector field can be easily changed in the model. The model was developed in Matlab and the calculated pressure drop and flow distribution were compared with measurements from a solar collector field. A good agreement between model and measurements was found. The model was then used to study the flow distribution in different conditions. Balancing valves proved to be an effective way to achieve uniform flow distribution also in conditions...
different from those for which the valves were regulated. For small solar collector fields with limited number of collector rows connected in parallel, balancing valves are not strictly necessary if the pressure drop across the collector rows is much higher than the pressure drop along the longest distribution pipe.

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Authors: Bava, F. (Intern), Dragsted, J. (Intern), Furbo, S. (Intern)  
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BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 1.419 SNIP 2.161  
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Scopus rating (2009): SJR 1.301 SNIP 2.158  
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Scopus rating (2007): SJR 1.708 SNIP 2.101  
Web of Science (2007): Indexed yes  
Scopus rating (2006): SJR 1.645 SNIP 2.278  
Web of Science (2006): Indexed yes  
Scopus rating (2005): SJR 1.27 SNIP 1.577
Operating wind turbines in northern and/or mountainous regions create the demand for effective ice detection and ice removal systems. Ice accretion on the rotor blades of a wind turbine leads, among other things, to added loads, safety issues and diminished aerodynamic performance of the airfoil. Presently, the capabilities of existing ice detection techniques are limited to determining whether or not ice is present on the blades. This paper presents a feasibility investigation of the implementation of a recent scenario-based modal-driven damage detection, localization and quantification technique for ice detection on a wind turbine blade. The investigation is experimentally founded and consists of a series of full-scale modal tests on a modern wind turbine blade mounted in a fixed test rig. Throughout the test campaign the modal parameters are extracted by means of an automated Operational Modal Analysis algorithm. The vibrational data are extracted in the original state of the blade as well as various ice build-up scenario states. In the perturbation tests sand bags are used to simulate the presence of ice. The output of the detection algorithm is an estimate of location, within 4 discrete areas on the blade, along with an estimate of the size of the additional mass.
Application of Low-Cost UASs and Digital Photogrammetry for High-Resolution Snow Depth Mapping in the Arctic

The repeat acquisition of high-resolution snow depth measurements has important research and civil applications in the Arctic. Currently, the surveying methods for capturing the high spatial and temporal variability of the snowpack are expensive, in particular for small areal extents. An alternative methodology based on Unmanned Aerial Systems (UASs) and digital photogrammetry was tested over varying surveying conditions in the Arctic employing two diverse and low-cost UAS-camera combinations (500 and 1700 USD, respectively). Six areas, two in Svalbard and four in Greenland, were mapped covering from 1386 to 38,410 m². The sites presented diverse snow surface types, underlying topography and light conditions in order to test the method under potentially limiting conditions. The resulting snow depth maps achieved spatial resolutions between 0.06 and 0.09 m. The average difference between UAS-estimated and measured snow depth, checked with conventional snow probing, ranged from 0.015 to 0.16 m. The impact of image pre-processing was explored, improving point cloud density and accuracy for different image qualities and snow/light conditions. Our UAS photogrammetry results are expected to be scalable to larger areal extents. While further validation is needed, with the inclusion of extra validation points, the study showcases the potential of this cost-effective methodology for high-resolution monitoring of snow dynamics in the Arctic and beyond.

Application of Low-Cost UASs and Digital Photogrammetry for High-Resolution Snow Depth Mapping in the Arctic

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Applying LCA in decision making - the need and the future perspective

General information
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Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, Department of Civil Engineering, Centre for oil and gas – DTU, Transport DTU, Transport Modelling, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Department of Environmental Engineering, Urban Water Systems, National Food Institute, Research Group for Genomic Epidemiology, Section for Structural Engineering
Authors: Dong, Y. (Intern), Miraglia, S. (Intern), Manzo, S. (Intern), Georgiadis, S. (Intern), Sørup, H. J. D. (Intern), Boriani, E. (Intern), Hald, T. (Intern), Thöns, S. (Intern), Hauschild, M. Z. (Intern)
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Are building users prepared for energy flexible buildings - A large-scale survey in the Netherlands

Building energy flexibility might play a crucial role in demand side management for integrating intermittent renewables into smart grids. The potential of building energy flexibility depends not only on the physical characteristics of a building but also on occupant behaviour in the building. Building users will have to adopt smart technologies and to change their daily energy use behaviours or routines, if energy flexibility is to be achieved. The willingness of users to make changes will determine how much demand flexibility can be achieved in buildings and whether energy flexible buildings can be realized. This will have a considerable impact on the transition to smart grids. This study is thus to access the perception of smart grids and energy flexible buildings by building users, and their readiness for them on a large scale. We attempted to identify the key characteristics of the ideal user of flexible buildings. A questionnaire was designed and administered as an online survey in the Netherlands. The questionnaire consisted of questions about the sociodemographic characteristics of the current users, house type, household composition, current energy use behaviour, willingness to use smart technologies, and willingness to change energy use behaviour. The survey was completed by 835 respondents, of which 785 (94%) were considered to have provided a genuine response. Our analysis showed that the concept of smart grids is an unfamiliar one, as more than 60% of the respondents had never heard of smart grids. However, unfamiliarity with smart grids increased with age, and half of the respondents aged 20–29 years old were aware of the concept. Monetary incentives were identified as the biggest motivating factor for adoption of smart grid technologies. It was also found that people would be most in favour of acquiring smart dishwashers (65% of the respondents) and refrigerator/freezers (60%). Statistical analysis shows that people who are willing to use smart technologies are also willing to change their behaviour, and can thus be categorised as potentially flexible building users. Given certain assumptions, 11% of the respondents were found to be potentially flexible building users. To encourage people to be prepared for energy flexible buildings, awareness of smart grids will have to be increased, and the adoption of smart technologies may have to be promoted by providing incentives such as financial rewards.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Eindhoven University of Technology
Authors: Li, R. (Intern), Dane, G. (Ekstern), Finck, C. (Ekstern), Zeiler, W. (Ekstern)
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Scopus rating (2015): SJR 2.912 SNIP 2.61 CiteScore 6.4
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.254 SNIP 3.28 CiteScore 6.93
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 3.164 SNIP 3.377 CiteScore 6.59
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.516 SNIP 2.25
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.003 SNIP 1.781
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.974 SNIP 1.215
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.179 SNIP 1.709
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.979 SNIP 1.293
Scopus rating (2005): SJR 1.043 SNIP 0.996
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.643 SNIP 0.839
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.778 SNIP 0.797
Scopus rating (2002): SJR 0.577 SNIP 0.775
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.376 SNIP 0.578
Scopus rating (2000): SJR 0.352 SNIP 0.515
Scopus rating (1999): SJR 0.182 SNIP 0.45
A Science Cloud for Smart Cities Research

Cities are densely populated and heavily equipped areas with a high level of service provision. Smart cities can use these conditions to achieve the goals of a smart society for their citizens. To facilitate such developments, the necessary IT-infrastructure has to be in place for supporting, amongst many other things, the whole lifecycle of big data management and analytics for research activities. At the Centre for IT-Intelligent Smart Energy for Cities, we have therefore been developing a flexible infrastructure, based on open sourcetechnologies. This paper presents this solution and its application in a city and building research.
A simple model for fatigue crack growth in concrete applied to a hinge beam model

In concrete structures, fatigue is one of the major causes of material deterioration. Repeated loads result in formation of cracks. Propagation of these cracks cause internal progressive damage within the concrete material which ultimately leads to failure. This paper presents a simplified general concept for non-linear analysis of concrete subjected to cyclic loading. The model is based on the fracture mechanics concepts of the fictitious crack model, considering a fiber of concrete material, and a simple energy based approach for estimating the bridging stress under cyclic loading. Further, the uni-axial fiber response is incorporated in a numerical hinge model for beam analysis. Finally, the hinge model is implemented into a finite element beam element on a constitutive level. The proposed model is compared to experimental results on both fiber-and beam level. The proposed model shows good performance and seems well suited for the description of fatigue crack growth in concrete. (C) 2017 Elsevier Ltd. All rights reserved.

General information
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Authors: Skar, A. (Intern), Poulsen, P. N. (Intern), Olesen, J. F. (Intern)
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Web of Science (2016): Indexed yes
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Assessing and managing multiple risks in a changing world — The Roskilde recommendations

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Department of Civil Engineering, Section for Structural Engineering, Roskilde University, Stockholm University, University of Michigan, DHI Denmark, Simon Fraser University, Delft University of Technology, Enviresearch, Newcastle-upon-Tyne, Halmstad University, Aarhus University, Norwegian Institute for Water Research, University of Aveiro, U.S. Environmental Protection Agency, Norwegian Geotechnical Institute, Polish Academy of Sciences, Chapema Environmental Strategies, University of Gothenburg
Assessing climate impact on reinforced concrete durability with a multi-physics model

A framework for performance-based durability engineering can incorporate climate impacts in its assessment of the lifetime sustainability of built infrastructure. Most performance-based durability and climate impact assessments have used simplified deterioration models, which are insensitive to shorter-term fluctuations in boundary conditions and therefore may underestimate climate change impacts. A highly sensitive fully-coupled, validated, multi-physics model for heat, moisture and ion transport and corrosion was used to assess a reinforced concrete structure located in coastal Norfolk, Virginia. Deterioration was predicted using tidal exposure conditions obtained from statistically downscaled global climate model output under two emissions scenarios. Deterioration, repair, and decision metrics under the emissions scenarios were compared using the performance-based framework to assess the influence of climate change.

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Authors: Michel, A. (Intern), Flint, M. M. (Ekstern)
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Assessing dermal exposure to nicotine - an interdisciplinary approach.

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Authors: Salthammer, T. (Ekstern), Bekö, G. (Intern), Clausen, G. (Intern), Koch, H. (Ekstern), Morrison, G. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Weschler, C. J. (Intern)
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A-indoor environment, B-VOCs, C-air, A-biomonitoring, A-exposure models
Electronic versions:
Assessment of RC walls with cut-out openings strengthened by FRP composites using a rigid-plastic approach

Building refurbishment works frequently require the cutting of new openings in concrete walls. Cutting new openings weakens the overall response of such elements, so they usually require strengthening. However, current design codes offer little guidance on strengthening walls with openings, and less still on the use of non-metallic reinforcements such as FRP (Fibre Reinforced Polymers) to ensure sufficient load bearing capacity. This paper proposes a new procedure based on limit analysis theory for evaluating the ultimate load of walls with cut-out openings that have been strengthened with carbon-FRP (CFRP). First, the approach is verified against transverse (out-of-plane) and axial (in-plane) loading for unstrengthened specimens. These loading types result in different failure mechanisms: transverse loading leads to failure due to yielding/rupture of the steel reinforcement while axial loading leads to failure by concrete crushing. Second, the proposed method is further developed for CFRP-strengthened specimens under axial loading. It accounts for the contribution of CFRP indirectly, by updating the concrete model with an enhanced compressive strength as a result of confining the piers. Predictions made using the new method agree closely with experimental results. (C) 2017 Elsevier Ltd. All rights reserved.

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Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, Lulea University of Technology, NORUT Narvik
Authors: Popescu, C. (Ekstern), Schmidt, J. W. (Intern), Goltermann, P. (Intern), Sas, G. (Ekstern)
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Publication information
Journal: Engineering Structures
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.93 SJR 1.578 SNIP 2.048
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.696 SNIP 2.195 CiteScore 2.59
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.756 SNIP 2.56 CiteScore 2.4
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.049 SNIP 2.853 CiteScore 2.69
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.855 SNIP 2.627 CiteScore 2.23
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.7 SNIP 2.735 CiteScore 2.26
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
A study on burning behavior and convective flows in Methanol pool fires bound by ice

An experimental study on methanol pool fires bound by ice was carried to research the burning behavior and flow field (within the liquid-phase) of methanol. The experiments were conducted in two parts: 1- in a cylindrical ice cavity/pan (10.2 cm diameter and 6 cm depth) at three different conditions to analyze burning parameters of methanol, 2- in a square glass tray with outside dimensions of 10 × 10 cm and a depth of 5 cm to obtain flow field of methanol pool with a two-dimensional PIV (Particle Image Velocimetry) system. The results of the experiments of the first part show the cold boundaries of the ice cavity/pan act as a heat sink causing considerable heat losses. Thus, burning rates and burning efficiencies are found to be lower with cold boundaries. However, the burning rate values in ice cavity are found to be the highest because of the melting of the ice and expansion of the cavity. The analysis of the results obtained by the PIV system showed the velocity magnitudes and flow patterns in the liquid-phase of icy methanol fire significantly change over the course of burning. In the instants after ignition a horizontal flow induced by Marangoni near the surface was observed. Later on, mixing of melt-water with methanol and sinking of this mixture caused a cycle in the tray that resulted in a vortex appearing in the middle of the pool. Magnitudes of velocity were also observed to increase after ignition. The increase in the velocity magnitudes is expected to significantly impact the melting and size of the lateral cavity.
Asymptotically Matched Layer (AML) for transient wave propagation in a moving frame of reference

The paper presents an Asymptotically Matched Layer (AML) formulation in a moving frame of reference for transient dynamic response of a multi-layer 2D half-space. A displacement based finite element formulation of the convected domain problem is presented together with the AML formulation in which the original convolution integrals are represented via two auxiliary displacement-like state-space variables. A parametric study of the AML parameters is conducted for optimizing the absorbing properties. The performance is demonstrated on a single- and a two-layered half-space for various velocities of an impulse Ricker load. Excellent absorbing properties are demonstrated in both half spaces.

General information

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Department of Mechanical Engineering, Solid Mechanics
Authors: Madsen, S. S. (Intern), Krenk, S. (Intern)
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): SJR 2.012 SNIP 2.371 CiteScore 3.11
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.959 SNIP 2.157 CiteScore 2.65
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.025 SNIP 2.649 CiteScore 2.83
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.158 SNIP 2.959 CiteScore 2.51
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.149 SNIP 2.974 CiteScore 1.99
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.751 SNIP 3.384 CiteScore 2.2
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.691 SNIP 2.522
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.167 SNIP 2.07
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.935 SNIP 1.659
Availability of high quality weather data measurements
In the period 2016-2017 the project “Availability of high quality weather data measurements” is carried out at Department of Civil Engineering at the Technical University of Denmark. The aim of the project is to establish measured high quality weather data which will be easily available for the building energy branch and the solar energy branch in their efforts to achieve energy savings and for researchers and students carrying out projects where measured high quality weather data are needed.

Bayesian estimation of $P(X > x)$ from a small sample of Gaussian data
The classical statistical uncertainty problem of estimation of upper tail probabilities on the basis of a small sample of observations of a Gaussian random variable is considered. Predictive posterior estimation is discussed, adopting the standard statistical model with diffuse priors of the two normal distribution parameters. Rarely the uncertainty of the predictive estimate itself is quantified in practice. By considering the exceedance probability as a random variable over the posterior probability distribution of the parameters, an explicit expression for the distribution of this random variable is obtained. It is shown that the usual elementary estimate based on the normal distribution is very close to the median of this distribution. For increasing exceedance level the distribution skewness increases so that the predictive estimate, which is equal to the mean of the distribution, comes further and further out in the upper tail of the distribution. The dual frequentist's confidence interval approach is shown to have difficulties not present for the Bayesian approach. (C) 2017 Elsevier Ltd. All rights reserved.
Gaussian Bayesian statistics, Estimation uncertainty, Exceedance probability estimation, Noncentral t-distribution
Biomaterials reaction to fire

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark, Teknologisk Institut
Authors: Risco, G. (Ekstern), Markert, F. (Intern), Steenkær Hastrup, A. C. (Ekstern)
Number of pages: 1
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Article number: M-19
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Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Electronic versions:
SustainAbstracts2017c.compressed_129.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Brillouin optical correlation domain analysis in composite material beams
Structural health monitoring is a critical requirement in many composites. Numerous monitoring strategies rely on measurements of temperature or strain (or both), however these are often restricted to point-sensing or to the coverage of small areas. Spatially-continuous data can be obtained with optical fiber sensors. In this work, we report high-resolution distributed Brillouin sensing over standard fibers that are embedded in composite structures. A phase-coded, Brillouin optical correlation domain analysis (B-OCDA) protocol was employed, with spatial resolution of 2 cm and sensitivity of 1 °K or 20 micro-strain. A portable measurement setup was designed and assembled on the premises of a composite structures manufacturer. The setup was successfully utilized in several structural health monitoring scenarios: (a) monitoring the production and curing of a composite beam over 60 h; (b) estimating the stiffness and Young’s modulus of a composite beam; and (c) distributed strain measurements across the surfaces of a model wing of an unmanned aerial vehicle. The measurements are supported by the predictions of structural analysis calculations. The results illustrate the potential added values of high-resolution, distributed Brillouin sensing in the structural health monitoring of composites.

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Bar-Ilan University, Doron Shalev Engineering Ltd., Xenom Ltd
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.78 SJR 0.576 SNIP 1.393
Calculation of dynamic stresses in viscoelastic sandwich beams using oma

The mechanical response of sandwich elements with viscoelastic core is time and temperature dependent. Laminated glass is a sandwich element where the mechanical behavior of the glass layers is usually considered linear-elastic material whereas the core is made of an amorphous thermoplastic which is modelled as linear-viscoelastic. Dynamic displacements and stresses can be estimated in structural elements combining the experimental responses measured in a reduced set of DOF’s with standard sensors and the mode shapes of a finite element model which has to be correlated and updated using experimental data. In simple structures, analytical mode shapes can be used alternatively to the numerical ones. In this paper, the dynamic stresses on the glass layers of a laminated glass beam have estimated using the experimental acceleration responses measured at 7 points of the beam, and the experimental mode shapes estimated with operational modal analysis which were expanded using an analytical model. The predicted stresses are validated with the experimental strains provided by two strain gages attached to the beam.
Can crawl space temperature and moisture conditions be calculated with a whole-building hygrothermal simulation tool?

The hygrothermal behaviour of an outdoor ventilated crawl space with two different designs of the floor structure was investigated. The first design had 250 mm insulation and visible wooden beams towards the crawl space. The second design had 300 mm insulation and no visible wooden beams. One year of measurements was compared with simulations of temperature and moisture condition in the floor structure and crawl space. The measurements showed that the extra 50 mm insulation placed below the beams reduced moisture content in the beams below 20 weight% all year. A reasonable agreement between the measurements and simulations was found; however, the evaporation from the soil was a dominant parameter affecting the hygrothermal response in the crawl space and floor structure.
Cases of Lightweight Structures for Polar Areas
The paper focuses on what the authors call ‘Polar Lightweight Structures’. The first part presents a collection of lightweight structures (LWS) designed and built for Antarctic conditions, with the aim of demonstrating the diversity of approaches attempted by designers. The second part of the paper presents two studies where different computational methods were applied for the design of generic LWS based on the local conditions of two particular Polar locations; namely, the Arctic region and Glacier Union in the Antarctic plateau. Both studies were conducted independently with the aim of demonstrating the feasibility of employing LWS of larger dimensions/scale than currently seen in Polar settings.

Challenges of Implementing Renewable Energy Policies at Community Scale: The Case of Strategic Energy Plans in Denmark
The implementation of national energy efficiency targets requires policies at the local scale. It is widely acknowledged that local communities play an important role to implement these policies: as arena where renewable energy technologies can be combined with socio-economic interests of local stakeholders. Although a vast amount of demo projects are well-documented, insufficient attention has been given to the average performing municipalities and their challenges in linking technical energy scenarios with their socio-economic realities in practice. This paper analyses the Strategic Energy Plans (SEP) of 17 Danish municipalities on their development, inclusion of local communities, affected stakeholders, and on their impact on the municipalities’ working procedures.

The main technical, physical, organisational and socio-economic challenges for local energy policy implementation are illustrated by means of the SEPs. Findings indicate lacking capacity in municipalities; in both resources and technical knowledge. This explains partly the technology-focused strategies developed by private sector technocrats, leading to a negligence of socio-technical realities of the local communities, which in combination with lacking capacity makes it difficult for municipalities to implement these energy strategies. Conclusive, an implementation-oriented taxonomy of implementation challenges for communities to optimize the development and scope of SEPs is proposed. This approach might help improving local anchoring of energy strategies in communities, and raise awareness for external challenges to facilitate the strategy production and implementation process.
Challenging the limits for beam bending designs
The traditional design limits of beams in bending have been challenged by testing from very under-reinforced design to over-reinforced and strengthened over-reinforced designs in order to investigate if the current limits could be abolished. The ductility of normally reinforced beam depends significantly on the amount of reinforcement and an over-reinforced design can be modified to behave as a normally reinforced design, but with extreme ductile behaviours, but may requires stirrups beyond the codes requirements for columns. The ductility of under-reinforced beams may exceed that of some normally reinforced designs.

Characterizing Aggregated Exposure to Primary Particulate Matter: Recommended Intake Fractions for Indoor and Outdoor Sources
Exposure to fine particulate matter (PM$_{(2.5)}$) from indoor and outdoor sources is a leading environmental contributor to global disease burden. In response, we established under the auspices of the UNEP/SETAC Life Cycle Initiative a coupled indoor-outdoor emission-to-exposure framework to provide a set of consistent primary PM$_{(2.5)}$ aggregated exposure factors. We followed a matrix-based mass balance approach for quantifying exposure from indoor and ground-level urban and rural outdoor sources using an effective indoor-outdoor population intake fraction and a system of archetypes to represent different levels of spatial detail. Emission-to-exposure archetypes range from global indoor and outdoor averages, via archetypal urban and indoor settings, to 3646 real-world cities in 16 parameterized sub-continental regions. Population intake fractions from urban and rural outdoor sources are lowest in Northern regions and Oceania and highest in Southeast Asia with population-weighted means across 3646 cities and 16 sub-continental regions of, respectively, 39 ppm (95% confidence interval: 4.3–160 ppm) and 2 ppm (95% confidence interval: 0.2–6.3 ppm). Intake fractions from residential and occupational indoor sources range from 470 ppm to 62,000 ppm, mainly as function of air exchange rate and occupancy. Indoor exposure typically contributes 80–90% to overall exposure from outdoor sources. Our framework facilitates improvements in air pollution reduction strategies and life cycle impact assessments.
Circular Ocean. Environmental challenges related to waste fishing nets and innovative use as resource in fiber-reinforced concrete

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, North Highland College UHI, University for the Creative Arts
Authors: Ottosen, L. M. (Intern), Bertelsen, I. M. G. (Intern), Charter, M. (Ekstern), James, N. (Ekstern)
Number of pages: 1
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Electronic versions:
SustainAbstracts2017c.compressed_8.pdf
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CITIESData: a smart city data management framework
Smart city data come from heterogeneous sources including various types of the Internet of Things such as traffic, weather, pollution, noise, and portable devices. They are characterized with diverse quality issues and with different types of sensitive information. This makes data processing and publishing challenging. In this paper, we propose a framework to streamline smart city data management, including data collection, cleansing, anonymization, and publishing. The paper classifies smart city data in sensitive, quasi-sensitive, and open/public levels and then suggests different strategies to process and publish the data within these categories. The paper evaluates the framework using a real-world smart city data set, and the results verify its effectiveness and efficiency. The framework can be a generic solution to manage smart city data.

General information
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Organisations: Department of Management Engineering, Systems Analysis, Department of Civil Engineering, Section for Building Energy, Centre for IT-Intelligent Energy Systems in Cities
Authors: Liu, X. (Intern), Heller, A. (Intern), Nielsen, P. S. (Intern)
Pages: 699-722
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Publication information
Journal: Knowledge and Information Systems
Volume: 53
Issue number: 3
Clay squirt: Local flow dispersion in shale-bearing sandstones

Dispersion of elastic-wave velocity is common in sandstone and larger in shaly sandstone than in clean sandstone. Dispersion in fluid-saturated shaly sandstone often exceeds the level expected from the stress-dependent elastic moduli of dry sandstone. The large dispersion has been coined clay squirt and is proposed to originate from a pressure gradient between the clay microporosity and the effective porosity. We have formulated a simple model that quantifies the clay-squirt effect on bulk moduli of sandstone with homogeneously distributed shale laminae or dispersed shale. The model predictions were compared with the literature data. For sandstones with dispersed shale, agreement was found, whereas other sandstones have larger fluid-saturated bulk modulus, possibly due to partially load-bearing shales or heterogeneous shale distribution. The data that agree with the clay-squirt model indicated nonuniform pore pressure in the high-frequency regime and uniform pore pressure in the low-frequency regime. Therefore, our model showed that clay-squirt dispersion can attain a sufficient magnitude to explain much of the large dispersion observed in shaly sandstone.
Cohesive cracked-hinge model for simulation of fracture in one-way slabs on grade

Numerical analysis of slab on grade structures subjected to mechanical loads is a complex matter often requiring computationally expensive models. In order to develop a simplified and general concept for non-linear analysis of slab on grade structures, this paper presents a cohesive cracked-hinge model aimed at the analysis of the bending fracture of the cemented material. The model is based on the fracture mechanics concepts of the fictitious crack model with a linear stress-crack opening relationship. Moreover, the paper presents a two-parameter spring foundation model applied to realistically capture the continuity in the supporting medium. The functionality of the proposed model is compared to numerical analysis with application of the more conventional cohesive zone model. The results obtained show that the methodology is an attractive and powerful one well-suited for practical use and further development.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Skar, A. (Intern), Poulsen, P. N. (Intern), Olesen, J. F. (Intern)
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Main Research Area: Technical/natural sciences

Publication Information
Journal: The International Journal of Pavement Engineering
ISSN (Print): 1029-8436
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.36 SJR 0.76 SNIP 1.491
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.534 SNIP 1.038 CiteScore 1.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.666 SNIP 1.317 CiteScore 1.01
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.017 SNIP 1.694 CiteScore 1.13
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.729 SNIP 1.622 CiteScore 0.88
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.516 SNIP 1.093 CiteScore 0.61
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.51 SNIP 0.917
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.66 SNIP 1.546
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.539 SNIP 1.665
Scopus rating (2007): SJR 0.614 SNIP 1.01
Scopus rating (2006): SJR 0.318 SNIP 0.71
Scopus rating (2005): SJR 0.248 SNIP 0.651
Scopus rating (2004): SJR 0.272 SNIP 0.944
Scopus rating (2003): SJR 0.121 SNIP 0
Scopus rating (2002): SJR 0.121 SNIP 0
Original language: English
Cohesive crack, Non-linear FEM, Slab on grade, Cemented materials, Pavement analysis, Two-parameter foundation model
Electronic versions:
Cracked_hinge_slab_on_grade.pdf. Embargo ended: 02/03/2018
Colour, compressive strength and workability of mortars with an iron rich sewage sludge ash
This paper reports a study of the colour, compressive strength and workability of mortar when cement is partly replaced by sewage sludge ash (SSA). In the study, an iron rich SSA was dry milled into six different fractions. The results showed that the colour, compressive strength and workability parallel to one another gradually changed when the particle sizes of the SSA decreased. The milling of the SSA altered the performance of mortars to the extent that the compressive strength and workability were comparable to the performance of ordinary mortar. At the same time, the colour also changed from grey to a reddish colour. As the change in colour may be of importance for application, it is suggested to include colour as experimental parameter in future work.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Kappel, A. (Intern), Ottosen, L. M. (Intern), Kirkelund, G. M. (Intern)
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Publication date: 2017
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Journal: Construction and Building Materials
Volume: 157
ISSN (Print): 0950-0618
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.77 SJR 1.49 SNIP 2.339
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.54 SNIP 2.299 CiteScore 3.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.554 SNIP 2.594 CiteScore 2.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.88 SNIP 3.043 CiteScore 3.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.706 SNIP 3.37 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.493 SNIP 3.537 CiteScore 2.74
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.362 SNIP 1.969
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.08 SNIP 1.848
Comparison of different MSWI fly ash treatment processes on the thermal behavior of As, Cr, Pb and Zn in the ash

To reduce heavy metal leaching and stabilize municipal solid waste incineration (MSWI) fly ash, different methods and combination of methods were tested: water washing, electrodialytic separation and thermal treatment at 1000°C. A comparison of heavy metal concentration and leaching levels of As, Cr, Pb and Zn for the different untreated and treated ashes was made. The results showed that minimizing leaching to meet the limiting values of the all the studied heavy metals can be obtained at the same time by combining water washing, electrodialytic separation and thermal treatment. The ash subjected to this combination had lower Cr than the ash solely subjected to thermal treatment or subjected to water washing prior to thermal treatment. The electrodialytic separation (EDS) of the washed ash lowered pH from alkaline to acidic, which resulted in elevated leaching of Cd and Zn, while the Cr leaching was reduced. Up to 58.6% of Zn and 5.5% of Pb were extracted by EDS compared to less than 0.6% extraction by water washing. During thermal treatment of the EDS treated ash, the ash was re-alkalized. Due to solidification and possibly evaporation, most heavy elements left in the thermally treated ash were stabilized and immobilized. However, leaching of As and/or Cr was still problematic and did not meet the limit value for the thermally treated ash being recycled in construction work. The removal of Ca and decomposition of Ca oxides and minerals during EDS was linked to the leaching patterns of As and Cr after thermal treatment.

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Ratings:
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.354 SNIP 2.044
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.739 SNIP 2.256 CiteScore 4.33
District heating (DH) systems are important components in an energy efficient heat supply. With increasing amounts of renewable energy, the foundation for DH is changing and the approach to its planning will have to change. Reduced temperatures of DH are proposed as a solution to adapt to future renewable energy systems. This study compares three alternative concepts for DH temperature level: Low temperature (55/25 °C), Ultra-low temperature with electric boosting (45/25 °C), and Ultra-low temperature with heat pump boosting (35/20 °C) taking into account the grid losses, production efficiencies and building requirements. The scenarios are modelled and analysed in the analysis tool EnergyPLAN and compared on primary energy supply and socioeconomic costs. The results show that the low temperature solution (55/25°C) has the lowest costs, reducing the total costs by about 100 M€/year in 2050.
Comparison of luminance based metrics in different lighting conditions

In this study, we evaluate established and newly developed metrics for predicting glare using data from three different research studies. The evaluation covers two different targets: 1. How well the user’s perception of glare magnitude correlates to the prediction of the glare metrics? 2. How well do the glare metrics describe the subjects’ disturbance by glare? We applied Spearman correlations, logistic regressions and an accuracy evaluation, based on an ROC-analysis. The results show that five of the twelve investigated metrics are failing at least one of the statistical tests. The other seven metrics CGI, modified DGI, DGP, Ev, average Luminance of the image Lavg, UGP and UGR are passing all statistical tests. DGP, CGI, DGI_mod and UGP have largest AUC and might be slightly more robust. The accuracy of the predictions of afore mentioned seven metrics for the disturbance by glare lies in the range of 75-83% and does not confirm findings from other studies stating a poor performance of existing glare metrics.

Comparison of phosphorus recovery from incineration and gasification sewage sludge ash

Incineration of sewage sludge is a common practice in many western countries. Gasification is an attractive option because of its high energy efficiency and flexibility in the usage of the produced gas. However, they both unavoidably produce sewage sludge ash (SSA), a material which is rich in phosphorus (P), but that it is commonly landfilled or used in construction materials. With current uncertainty in phosphate rock (PR) supply, P recovery from SSA has become
interesting. In the present work, ashes from incineration and gasification of the same sewage sludge were compared in terms of P extractability using electrodialytic (ED) methods. The results show that comparable recovery rates of P were achieved with a single ED step for incineration SSA and a sequential combination of two ED steps for gasification SSA, which was due to a higher influence of Fe and/or Al in P solubility for the latter. A product with lower level of metallic impurities and comparable to wet process phosphoric acid (WPA) was eventually obtained from gasification SSA. Thus, gasification becomes an interesting alternative to incineration also in terms of P separation.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Chemical and Biochemical Engineering, CHEC Research Centre, Roskilde University
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.3 SJR 0.394 SNIP 0.621
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.466 SNIP 0.599 CiteScore 1.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.587 SNIP 0.685 CiteScore 1.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.568 SNIP 0.7 CiteScore 1.3
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.601 SNIP 0.669 CiteScore 1.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.591 SNIP 0.626 CiteScore 1.25
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.522 SNIP 0.602
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.589 SNIP 0.686
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.579 SNIP 0.697
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.749 SNIP 0.781
Comparison of two- and three-compartment cells for electrodialytic removal of heavy metals from contaminated material suspensions

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Akvaplan-niva AS
Authors: Kirkelund, G. M. (Intern), Jensen, P. E. (Intern), Pedersen, K. B. (Ekstern), Ottosen, L. M. (Intern)
Publication date: 2017
Event: Abstract from 15th International Symposium on Electrokinetic Remediation, Montreal, Canada.
Main Research Area: Technical/natural sciences
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Untitled.pdf
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Complex conductivity of soils
The complex conductivity of soil remains poorly known despite the growing importance of this method in hyrogeophysics. In order to fill this gap of knowledge, we investigate the complex conductivity of 71 soils samples (including 4 peat samples) and one clean sand in the frequency range 0.1 Hertz to 45 kHz. The soil samples are saturated with 6 different NaCl brines with conductivities (0.031, 0.53, 1.15, 5.7, 14.7, and 22 S m\(^{-1}\), NaCl, 25°C) in order to determine their intrinsic formation factor and surface conductivity. This dataset is used to test the predictions of the dynamic Stern polarization model of porous media in terms of relationship between the quadrature conductivity and the surface conductivity. We also investigate the relationship between the normalized chargeability (the difference of in phase conductivity between two frequencies) and the quadrature conductivity at the geometric mean frequency. This dataset confirms the relationships between the surface conductivity, the quadrature conductivity, and the normalized chargeability. The normalized chargeability depends linearly on the cation exchange capacity and specific surface area while the chargeability shows no dependence on these parameters. These new data and the dynamic Stern layer polarization model are observed to be mutually consistent. Traditionally, in hydrogeophysics, surface conductivity is neglected in the analysis of resistivity data. The relationships we have developed can be used in field conditions to avoid neglecting surface conductivity in the interpretation of DC resistivity tomograms. We also investigate the effects of temperature and saturation and, here again, the dynamic Stern layer predictions and the experimental observations are mutually consistent.

General information
State: Published
Computational fluid dynamics simulation of wind-driven inter-unit dispersion around multi-storey buildings: Upstream building effect

Previous studies on inter-unit dispersion around multi-storey buildings focused mostly on an isolated building. Considering that the presence of an upstream building(s) would significantly modify the airflow pattern around a downstream building, this study intends to investigate the influence of such changed airflow patterns on inter-unit dispersion characteristics around a multi-storey building due to wind effect. Computational fluid dynamics (CFD) method in the framework of Reynolds-averaged Navier-Stokes modelling was employed to predict the coupled outdoor and indoor airflow field, and the tracer gas technique was used to simulate the dispersion of infectious agents between units. Based on the predicted concentration field, a mass conservation based parameter, namely re-entry ratio, was used to evaluate quantitatively the inter-unit dispersion possibilities and thus assess risks along different routes. The presence of upstream building(s) could disrupt the strong impingement of approaching flows but brings a more complex and irregular airflow pattern around the downstream multi-storey buildings, leading to a more scattered distribution of re-entry ratio values among different units and uncertain dispersion routes. Generally, the tracer gas concentration in most units was lower than those in an isolated building, although very high concentrations were found in some specific areas.
Conditions for mould growth on typical interior surfaces

Prediction of the risk for mould growth is an important parameter for the analysis and design of the hygrothermal performance of building constructions. However, in practice the mould growth does not always follow the predicted behavior described by the mould growth models. This is often explained by uncertainty in the real conditions of exposure.

In this study, laboratory experiments were designed to determine mould growth at controlled transient climate compared to growth at constant climate. The experiment included three building materials with four different surface treatments. The samples were inoculated with 8 common indoor moulds. Even after 40 weeks no growth was observed on any sample. The paper describes different hypotheses for the missing growth, and how these have been tested.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Department of Biotechnology and Biomedicine, Fungal Degradation, Aalborg University
Authors: Møller, E. B. (Ekstern), Andersen, B. (Intern), Rode, C. (Intern), Peuhkuri, R. (Ekstern)
Pages: 171-176
Publication date: 2017
Conference: 11th Nordic Symposium on Building Physics, Trondheim, Norway, 11/06/2017 - 11/06/2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Procedia
Volume: 132
Contribution of copy number variants to schizophrenia from a genome-wide study of 41,321 subjects

Copy number variants (CNVs) have been strongly implicated in the genetic etiology of schizophrenia (SCZ). However, genome-wide investigation of the contribution of CNV to risk has been hampered by limited sample sizes. We sought to address this obstacle by applying a centralized analysis pipeline to a SCZ cohort of 21,094 cases and 20,227 controls. A global enrichment of CNV burden was observed in cases (odds ratio (OR) = 1.11, $P = 5.7 \times 10^{-15}$), which persisted after excluding loci implicated in previous studies (OR = 1.07, $P = 1.7 \times 10^{-6}$). CNV burden was enriched for genes associated with synaptic function (OR = 1.68, $P = 2.8 \times 10^{-11}$) and neurobehavioral phenotypes in mouse (OR = 1.18, $P = 7.3 \times 10^{-5}$). Genome-wide significant evidence was obtained for eight loci, including 1q21.1, 2p16.3 (NRXN1), 3q29, 7q11.2, 15q13.3, distal 16p11.2, proximal 16p11.2 and 22q11.2. Suggestive support was found for eight additional candidate susceptibility and protective loci, which consisted predominantly of CNVs mediated by nonallelic homologous recombination.

General information

State: Published
Organisations: Department of Civil Engineering, Center for Bachelor of Engineering Studies, Afdelingen for Byggeri og Infrastruktur, Department of Systems Biology, Center for Biological Sequence Analysis, Behavioral Phenomics, Aarhus University, University of Copenhagen


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Scopus rating (2016): CiteScore 20.83 SJR 20.899 SNIP 6.62
Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 23.808 SNIP 6.61 CiteScore 23.17
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Control of Indoor Airflows for Reduction of Human Exposure to Aerosol Contaminants

Air distribution in indoor environments is a critical factor of occupants’ exposure to airborne contaminants. There is a wide range of gaseous and biological contaminants which deteriorate the indoor air quality and thus affect negatively occupants’ health and performance. Increasing attention is being paid to analysing indoor airflow patterns and on understanding indoor pollution transmission to the breathing zone of occupants. However, studies rarely take into account the complex airflow interaction in the breathing zone, which may lead to inaccurate exposure prediction. Therefore, there is still a need for improved understanding of the air movement in the vicinity of the occupants. Tracer gas measurements are often used to study exposure to both indoor generated gases and airborne particles (aerosols). The tracer gas,
however, cannot be used as a common substitute for aerosols of all sizes due to the different physical forces acting on them. Determining to what extent tracer gas can be used as substitute for aerosols when assessing occupants’ exposure to indoor aerosols is needed and can be used for appropriate ventilation systems design. A properly developed ventilation method achieves the maximum efficiency with the minimum airflow rate, avoiding excessive installation and maintenance costs and more importantly, excessive energy use can be avoided. It is well-known that the most efficient method to prevent the risk of exposure is to control the contaminants directly or close to their source. A person, particularly his/her body, may be the primary source of unpleasant and even contagious contaminants in spaces. Dilution of the contaminated room air by supply of clean air, known as ventilation by dilution, is a recognised method for improving indoor air quality. The current method for ventilating an entire room based on total volume air distribution principles is often not efficient in providing high quality environment and satisfying every occupant. Hence, local exhaust ventilation applied in the vicinity of the occupants, i.e. close to the pollution source can offer a better solution. The main objectives of the present thesis are: 1) to study the effect of typical airflows interactions around the human body (convective boundary layer, respiratory flow, and flow of local ventilation flow) on transport mechanisms of airborne contaminants and the resulting occupants’ exposure; 2) to verify the use of tracer gas as a measure of exposure to indoor aerosols; 3) to develop and study local exhaust ventilation methods for exposure reduction to body-emitted contaminants in indoor environments.

The most important findings of the research performed in this thesis are summarized in the following:

In ventilated rooms with low air mixing, the interaction of the exhaled flow with the convective boundary layer (CBL) around a seated person increases the exposure to own body released pollution, especially when the pollution is generated close to the breathing zone. Breathing does not affect exposure to gaseous pollutants emitted from the lower part of the body. Local airflow from personalised ventilation directed against the face with mean air speed of 0.4 m/s can reduce substantially the exposure regardless of the pollution source location. However, when the personalised airflow is combined with local source control, i.e. local exhaust of pollution, the exposure may increase depending on the airflow interaction at the breathing zone and the source location. Exposure assessment based on tracer gas concentration measurement can be incorrect if the measuring instrument has long response time and the complex airflow interaction in the breathing zone is not correctly simulated. Results showed that in the breathing zone of a seated occupant, the tracer gas emerged as a reliable predictor for the exposure to aerosols with aerodynamic diameter 0.07, 0.7, and 3.5 μm in a room with mixing air distribution. An increase of the air change rate did not affect the comparable normalized concentration distribution of the tracer gas and the larger particles, namely 0.7μm and 3.5μm. However, the ventilation rate was important for comparing the behaviour of the ultrafine particles (0.07 μm) and the tracer gas in the breathing zone. A moderate change of the room surface area did not influence the resemblance in the dispersion of the aerosols and the tracer gas. The results also showed that tracer gas can be used to indicate the exposure of a person lying in bed to 0.7 μm aerosols.

Furniture-integrated exhaust methods can be used as a pollution source control strategy in facilities where people are seated or bed-bound for considerable amounts of time. The current study examined ventilated mattress and ventilated seat cushion as local pollution exhaust methods. It was found that at reduced background ventilation rate, the use of the ventilated mattress and the ventilated seat cushion improved the air quality substantially when the pollution source was located near the exhaust openings. The pollution was removed from the room through the ventilated mattress or seat cushion’s connection with the exhaust system before it was mixed with the room air. An alternate approach was to install a filter inside the mattress in order to clean the exhausted air of body effluents and recirculated it back into the room. This provides flexibility of bed location (the bed with own ventilation can be moved to ventilated or non-ventilated rooms) and avoids installation of additional ducting. This technique can also be applied in the case of the ventilated seat cushion. The ventilated mattress and seat cushion in conjunction with background ventilation at low supply flow rate are effective methods for reducing room pollution and exposure to the level that can be achieved with background ventilation alone at much higher supply flow rate. These findings suggest that the implementation of such user-centred ventilation methods can allow the ventilation rate requirements in buildings to be significantly reduced. The results also showed that the integrated exhaust methods provided body cooling to the parts in contact with their surface. The most affected body parts were the back, back side, pelvis, and thighs. It is expected that the local cooling will have a positive effect on thermal comfort in summer seasons and in regions with subtropical or tropical climate conditions. This positive effect must be verified with human subject experiments.

The results from the performed energy simulations showed that the use of the ventilated mattress and the ventilated seat cushion offers potential for energy savings. The ventilated mattress in conjunction with background ventilation at 3 air change per hour (ACH) can decrease the annual energy use by 24% to 52% for a double patient room located in a cold climate or hot and humid climate in comparison with conventional mixing ventilation at 4 - 6 ACH. It was found that combining the ventilated seat cushion with mixing ventilation and a chilled ceiling in a call-centre with 14 employees, each using a ventilated seat cushion, reduced the annual energy use by 7 % compared to a system with only mixing ventilation.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Bivolarova, M. P. (Intern), Melikov, A. K. (Intern), Bolashikov, Z. D. (Intern)
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Publication date: 2017

**Publication information**

Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Print): 97887778774705
Controls on Cementation in a Chalk Reservoir

In this study, we identify different controls on cementation in a chalk reservoir. Biot's coefficient, a measure of cementation, stiffness and strength in porous rocks, is calculated from logging data (bulk density and sonic P-wave velocity). We show that Biot's coefficient is correlated to the water saturation of the Kraka reservoir and is partly controlled by its stratigraphic sub-units. While the direct causal relationship between Biot's coefficient and water saturation cannot be extended for Biot's coefficient and porosity, a correlation is also identified between the two, implying that some degree of pore filling cementation occurred in Kraka (Alam, 2010). Lack of correlation between Biot's coefficient and Gamma Ray (GR) indicates that the small amount of clay present is generally located in the pore space, thus not contributing to frame stiffness. While there was no compositional control on cementation via clay, we could infer that stratigraphy impacts on the diagenetic process.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources, Schlumberger Norge AS, Danish Hydrocarbon Research and Technology Centre
Authors: Meireles, L. T. P. (Intern), Hussein, A. (Ekstern), Welch, M. (Ekstern), Fabricius, I. L. (Intern)
Number of pages: 5
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
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Source: PublicationPreSubmission
Source-ID: 140684875
Publication: Research - peer-review › Paper – Annual report year: 2017

Convection-driven melting in an n-octane pool fire bounded by an ice wall

An experimental study on an n-octane pool fire bound on one side by an ice wall was carried out to investigate the effects on ice melting by convection within the liquid part of the fuel. Experiments were conducted in a square glass tray (9.6cm ×9.6cm ×5cm) with a 3cm thick ice wall (9.6cm ×6.5cm ×3cm) placed on one side of the tray. The melting front velocity, as an indicator of the melting rate of the ice, increased from 0.04cm/min to 1cm/min. The measurement of the burning rates and flame heights showed two distinctive behaviors; an induction period from the initial self-sustained flame to the peak mass loss rate followed by a steady phase from the peak of mass loss rate until the manual extinguishment. Similarly, the flow field measurements by a 2-dimensional PIV system indicated the existence of two different flow regimes. In the moments before ignition of the fuel, coupling of surface tension and buoyancy forces led to a combined one roll structure in the fuel. After ignition the flow field began transitioning toward an unstable flow regime (separated) with an increase in number of vortices around the ice wall. The separated regime started with presence of a multi-roll structure separating from a primary horizontal flow on the top driven by Marangoni convection. As the burning rate/flame height increased the velocity and evolving flow patterns enhanced the melting rate of the ice wall. Experimentally determined temperature contours, using an array of finely spaced thermocouples in the liquid fuel, were used to further investigate the two layer temperature structure; an upper layer (≈8mm thick) with steep temperature gradient in the vertical direction and a layer of low temperature in deeper regions. A hot zone with thickness of ≈3mm was present below the free surface corresponding to the multi-roll location. The multi-roll structure could be the main reason for the transport of the heat received from the flame toward the ice wall which causes the melting.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Worcester Polytechnic Institute
Authors: Farahani, H. F. (Ekstern), Alva, W. U. R. (Intern), Rangwala, A. S. (Ekstern), Jomaas, G. (Intern)
Number of pages: 9
Convection-driven melting in an n-octane pool fire bounded by an ice wall

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Worcester Polytechnic Institute, University of Edinburgh
Authors: Farahani, H. F. (Ekstern), Alva, U. (Ekstern), Rangwala, A. S. (Ekstern), Jomaas, G. (Intern)
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Electronic versions:
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Cooling load calculations of radiant and all-air systems for commercial buildings
The authors simulated in TRNSYS three radiant systems coupled with a 50% sized variable air volume (VAV) system and a 50% sized all-air VAV system with night ventilation. The objective of this study was to identify the differences in the cooling load profiles of the examined systems when they are sized based on different levels of the maximum cooling demand. The authors concluded that for high thermal mass radiant system nocturnal operation was adequate for providing an acceptable thermal environment even when the radiant system was sized based on the 50% of the maximum cooling demand. The 50% all-air system alone was able to provide comfort if night cooling was implemented. On the other hand, radiant cooling panels (low thermal mass) should be operating during the occupancy period. When sizing a high thermal mass radiant cooling system, the effect of thermal inertia and the response time should always be taken into account.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of California at Berkeley
Authors: Bourdakis, E. (Intern), Bauman, F. (Ekstern), Schiavon, S. (Ekstern), Raftery, P. (Ekstern), Olesen, B. W. (Intern)
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Main Research Area: Technical/natural sciences
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Core Flooding Experiments and Reactive Transport Modeling of Seasonal Heat Storage in the Hot Deep Gassum Sandstone Formation
Seasonal storage of excess heat in hot deep aquifers is considered to optimize the usage of commonly available energy sources. The chemical effects of heating the Gassum Sandstone Formation to up to 150 degrees C is investigated by combining laboratory core flooding experiments with petrographic analysis and geochemical modeling. Synthetic formation water is injected into two sets of Gassum Formation samples at 25, 50 (reservoir temperature), 100, and 150 degrees C with a velocity of 0.05 and 0.1 PV/h, respectively. Results show a significant increase in the aqueous concentration of silicium and iron with increasing temperature due to dissolution of silica and siderite. Increasing the reservoir temperature from 50 to 100 degrees C enhanced the naturally occurring weathering of Na-rich feldspar to kaolinite. Dissolution of quartz increased sharply above 100 degrees C and was the dominating process at 150 degrees C, resulting in a significant increase in the aqueous silicium concentration. At temperatures, 100 degrees C, the silicium concentration was controlled by a quasi-stationary state between feldspar dissolution and kaolinite precipitation whereas the concentration
was kinetically controlled by quartz dissolution at 150 degrees C. Furthermore, a strong coupling between dissolution, precipitation, and flow velocity was observed. The results of this study show that the effects of heat storage of up to 150 degrees C in the Gassum Formation in the Stenlille area is expected to have only minor effects on the properties of the reservoir and that storage of excess heat in the Gassum Formation in the Stenlille area may be possible provided operational precautions are taken.

Corrosion resistance of steel fibre reinforced concrete - A literature review
Steel fibre reinforced concrete (SFRC) is increasingly being used in the construction of civil infrastructure. However, there are inconsistencies among international standards and guidelines regarding the consideration of carbon-steel fibres for the structural verification of SFRC exposed to corrosive environments. This paper presents a review of the published research regarding carbonation- and chloride-induced corrosion of SFRC, and proposes a deterioration theory for cracked SFRC exposed to chlorides and carbonation, based on the damage at the fibre-matrix interface. The review confirms an overall agreement among academics and regulators regarding the durability of uncracked SFRC exposed to chlorides and carbonation. Contrariwise, the durability of cracked SFRC is under discussion at the technical and scientific level, as there is a large dispersion on the experimental results and some of the mechanisms governing the corrosion of carbon-steel fibres in cracks and its effects on the fracture behaviour of SFRC are not fully understood.
Cyclic cohesive model for fatigue crack growth in concrete

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Section for Structural Engineering
Damage Detection and Deteriorating Structural Systems

This paper addresses the quantification of the value of damage detection system and algorithm information on the basis of Value of Information (VoI) analysis to enhance the benefit of damage detection information by providing the basis for its optimization before it is performed and implemented. The approach of the quantification the value of damage detection information builds upon the Bayesian decision theory facilitating the utilization of damage detection performance models, which describe the information and its precision on structural system level, facilitating actions to ensure the structural integrity and facilitating to describe the structural system performance and its functionality throughout the service life. The structural system performance is described with its functionality, its deterioration and its behavior under extreme loading. The structural system reliability given the damage detection information is determined utilizing Bayesian updating. The damage detection performance is described with the probability of indication for different component and system damage states taking into account type 1 and type 2 errors. The value of damage detection information is then calculated as the difference between the expected benefits and risks utilizing the damage detection information or not. With an application example of the developed approach based on a deteriorating Pratt truss system, the value of damage detection information is determined, demonstrating the potential of risk reduction and expected cost reduction.

Data driven quantification of the temporal scope of building LCAs

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Structural Engineering, Department of Management Engineering, Quantitative Sustainability Assessment, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Aalborg University
Authors: Østergaard, N. (Ekstern), Thorsted, L. (Ekstern), Miraglia, S. (Intern), Birkved, M. (Intern), Rasmussen, F. N. (Ekstern), Birgisdottir, H. (Ekstern), Kalbar, P. (Intern), Georgiadis, S. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

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Scopus rating (2015): SJR 0.572 SNIP 1.012
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Data for occupancy internal heat gain calculation in main building categories

Heat losses from occupant body by means of convection, radiation, vapor, and sweat are essential data for indoor climate and energy simulations. Heat losses depend on the metabolic activity and body surface area. Higher variations of body surface area of occupants are observed in day care centers, kinder gardens and schools compared to other building categories (Tables 2 and 3) and these variations need to be accounted, otherwise in these building categories heat gains, CO₂ and humidity generation are overestimated. Indoor temperature, humidity level, air velocity, and clothing insulation have significant influences on dry and total heat losses from occupant body leading to typical values for summer and winter. The data presented in this article are related to the research article entitled Occupancy schedules for energy simulation in new prEN16798-1 and ISO/FDIS 17772-1 standards (Ahmed et al., 2017) [1].

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Aalto University
Authors: Ahmed, K. (Ekstern), Kurnitski, J. (Ekstern), Olesen, B. W. (Intern)
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Electronic versions: 1_s2.0_S2352340917305565_main.pdf
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Der er fortsat problemer med Landsplanredgørelsen for 2017

General information
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Authors: Hendriksen, K. (Intern), Poppel, B. (Ekstern), Jørgensen, U. (Ekstern)
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Newspaper: Sermitsiaq
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Dermal uptake of benzophenone-3 from clothing
Benzophenone-3 (aka BP-3, oxybenzone) is added to sunscreens, plastics, and some coatings to filter UV radiation. A suspected endocrine disruptor, BP-3 has been widely detected and only in summertime, where a more intended use of sunscreen might be expected in the urine of Danish children (Frederiksen et al., 2016; Krause et al., 2016) and other populations. BP-3 has been found in the air and settled dust of homes (Wan et al., 2015) and is expected to redistribute from its original sources to other indoor compartments, including clothing. As has been previously observed for phthalates (Morrison et al., 2016), we hypothesized that dermal uptake from clothing would occur and could contribute to the body burden of this compound.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Copenhagen University Hospital
Authors: Morrison, G. (Ekstern), Bekö, G. (Intern), Weschler, C. J. (Intern), Schripp, T. (Ekstern), Salthammer, T. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern), Frederiksen, H. (Ekstern)
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Benzophenone-3, Clothing, Dermal uptake, Exposure, Biomonitoring
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Dermal Uptake of Benzophenone-3 from Clothing
Benzophenone-3 (also known as BP-3 or oxybenzone) is added to sunscreens, plastics, and some coatings to filter UV radiation. The suspected endocrine disruptor, BP-3 has been detected in the air and settled dust of homes and is expected to redistribute from its original sources to other indoor compartments, including clothing. Given its physical and chemical properties, we hypothesized that dermal uptake from clothing could contribute to the body burden of this compound. First, cotton shirts were exposed to air at an elevated concentration of BP-3 for 32 days; the final air concentration was 4.4 μg/m³. Next, three participants wore the exposed shirts for 3 h. After 3 h of exposure, participants wore their usual clothing during the collection of urine samples for the next 48 h. Urine was analyzed for BP-3, a metabolite (BP-1), and six other UV filters. The rate of urinary excretion of the sum of BP-1 and BP-3 increased for all participants during and following the 3 h of exposure. The summed mass of BP-1 and BP-3 excreted during the first 24 h attributable to wearing exposed t-shirts were 12, 9.9, and 82 μg for participants 1, 2, and 3, respectively. Analysis of these results, coupled with predictions of steady-state models, suggest that dermal uptake of BP-3 from clothing could meaningfully contribute to overall body burden.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology, Fraunhofer Wilhelm-Klauditz-Institut (WKI), University of Copenhagen
Authors: Morrison, G. C. (Ekstern), Bekö, G. (Intern), Weschler, C. J. (Intern), Schripp, T. (Ekstern), Salthammer, T. (Ekstern), Hill, J. (Ekstern), Andersson, A. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern), Frederiksen, H. (Ekstern)
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Volume: 51
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.26 SJR 2.538 SNIP 1.889
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.584 SNIP 1.828 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.777 SNIP 2.017 CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.103 CiteScore 5.52
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.146 SNIP 2.056 CiteScore 5.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.178 SNIP 1.953 CiteScore 5.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.964 SNIP 1.729
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.835 SNIP 1.803
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.943 SNIP 1.942
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.8 SNIP 1.927
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.541 SNIP 1.901
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.604 SNIP 2.014
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.863 SNIP 2.046
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.545 SNIP 2.071
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.353 SNIP 1.953
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.419 SNIP 1.977
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 2.474 SNIP 2.334
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 3.466 SNIP 2.359
Dermal uptake of nicotine from air and clothing: Experimental verification
This study aims to elucidate in greater detail the dermal uptake of nicotine from air or from nicotine-exposed clothes, which was demonstrated recently in a preliminary study. Six non-smoking participants were exposed to gaseous nicotine (between 236 and 304 μg/m³) over 5 hours while breathing clean air through a hood. Four of the participants wore only shorts and 2 wore a set of clean clothes. One week later, 2 of the bare-skinned participants were again exposed in the chamber, but they showered immediately after exposure instead of the following morning. The 2 participants who wore clean clothes on week 1 were now exposed wearing a set of clothes that had been exposed to nicotine. All urine was collected for 84 hours after exposure and analyzed for nicotine and its metabolites, cotinine and 3OH-cotinine. All participants except those wearing fresh clothes excreted substantial amounts of biomarkers, comparable to levels expected from inhalation intake. Uptake for 1 participant wearing exposed clothes exceeded estimated intake via inhalation by >50%. Biomarker excretion continued during the entire urine collection period, indicating that nicotine accumulates in the skin and is released over several days. Absorbed nicotine was significantly lower after showering in 1 subject but not the other. Differences in the normalized uptakes and in the excretion patterns were observed among the participants. The observed cotinine half-lives suggest that non-smokers exposed to airborne nicotine may receive a substantial fraction through the dermal pathway. Washing skin and clothes exposed to nicotine may meaningfully decrease exposure.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI)
Authors: Bekö, G. (Intern), Morrison, G. (Ekstern), Weschler, C. J. (Intern), Koch, H. (Ekstern), Pälmke, C. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Eftekhari, A. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
Number of pages: 11
Publication date: 2017
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Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 3.55
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 3.88
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 4.57
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 3.63
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 2.72
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): CiteScore 2.42
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Web of Science (2010): Indexed yes
Web of Science (2009): Indexed yes
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Dermal uptake of nicotine from air and clothing: Experimental verification.

Studies suggest that dermal uptake of certain semivolatile organic compounds (SVOC) directly from air can be a significant exposure pathway. This has been experimentally confirmed for two phthalates (Weschler et al., 2015). Morrison et al. (2016) showed that clean clothing can impede, while clothing that has previously absorbed/adsorbed indoor air pollutants can increase dermal uptake. A recent experiment demonstrated that dermal uptake of airborne nicotine directly from air or from clothing can occur (Bekö et al., 2017). The current study aims to expand our knowledge on the dermal uptake of nicotine, by conducting more extensive experiments.

Dermal uptake of phthalates from clothing: Comparison of model to human participant results

In this research, we extend a model of transdermal uptake of phthalates to include a layer of clothing. When compared with experimental results, this model better estimates dermal uptake of diethylphthalate and di-n-butylphthalate (DnBP) than a previous model. The model predictions are consistent with the observation that previously exposed clothing can increase dermal uptake over that observed in bare-skin participants for the same exposure air concentrations. The model predicts that dermal uptake from clothing of DnBP is a substantial fraction of total uptake from all sources of exposure. For compounds that have high dermal permeability coefficients, dermal uptake is increased for (i) thinner clothing, (ii) a narrower gap between clothing and skin, and (iii) longer time intervals between laundering and wearing. Enhanced dermal uptake is most pronounced for compounds with clothing-air partition coefficients between $10^4$ and $10^7$. In the absence of direct measurements of cotton cloth-air partition coefficients, dermal exposure may be predicted using equilibrium data for compounds in equilibrium with cellulose and water, in combination with computational methods of predicting partition coefficients.
Design and operation of ventilation in low energy residences – A survey on code requirements and building reality from six European countries and China

One of the key objectives of the IEA Annex 68 research programme entitled “Indoor Air Quality Design and Control in Low Energy Residential Buildings” is to provide a generic guideline for the design and operation of ventilation in residential buildings. Modern and refurbished domestic buildings need to have minimal energy consumption, and at the same time maintain a high level of Indoor Air Quality. The paper reports on preliminary results of an interview survey conducted among different stakeholders involved in design, installation and operation of residential ventilation in countries involved in the Annex. There were two main objectives, firstly, to describe and analyse a transition between actual requirements (national building codes and standards) and current practice. Secondly, to investigate current barriers and challenges regarding installation of mechanical ventilation in residences. In total, 35 interviews from six European countries and China have been analysed, certainly not enough for a representative sample. However, the results provide a valuable snapshot of current practices
and insights into potential barriers. The results show that mechanical ventilation with heat recovery is becoming the dominating ventilation system installed in new residences in Europe. However, there are countries, where, due to tradition, national legislation and/or cost reasons, other types of ventilation like mechanical exhaust or manual window ventilation are applied. Demand Controlled Ventilation is often allowed or even recommended in standards, but rarely implemented in practice, except for humidity controlled trickle vents in France. The main barriers against mechanical ventilation with heat recovery seem to be high capital cost, space requirements and duct routing as well as problems resulting from poor construction, lack of commissioning and/or maintenance.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, University of Strathclyde, Lawrence Berkeley National Laboratory, UCL Institute for Environmental Design and Engineering, Norwegian University of Science and Technology
Authors: del Carmen Bocanegra-Yanez, M. (Ekstern), Rojas, G. (Ekstern), Zukowska-Tejsen, D. (Intern), Burman, E. (Ekstern), Cao, G. (Ekstern), Hamon, M. P. Y. (Ekstern), Kolarik, J. (Intern)
Number of pages: 10
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Main Research Area: Technical/natural sciences
Indoor air quality, Residential ventilation, Mechanical ventilation with heat recovery, Low-energy housing
Source: PublicationPreSubmission
Source-ID: 13739815
Publication: Research - peer-review › Paper – Annual report year: 2017

Design of the GDSI Open-Platform and GDSI: Factsheets

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Department of Management Engineering, Quantitative Sustainability Assessment
Authors: Miraglia, S. (Intern), Melero, C. M. M. (Intern), Thöns, S. (Intern)
Number of pages: 24
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Publication information
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Main Research Area: Technical/natural sciences
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Source-ID: 133700748
Publication: Research › Report – Annual report year: 2017

Desorption of SVOCs from Heated Surfaces in the Form of Ultrafine Particles
Ultrafine particles (UFP) produced by electric heating of stoves and metal cooking pans, absent food, have been hypothesized to be created from a surface film of semivolatile organic compounds (SVOCs) sorbed from the surrounding air. This study tests that hypothesis by size-resolved measurements extending the lower range of the UFP studied from 10 to 2.3 nm, and including other surfaces (glass, aluminum, and porcelain). Heating glass Petri dishes or squares of aluminum foil to about 350-400 degrees C for 4-6 min removed all sorbed organic substances completely. Subsequent exposure of these "clean" Petri dishes and foil squares to indoor air in two different residences for successively longer periods (1 h to 281 days), followed by heating the materials for 4-6 min, indicated a strong relationship of the number, size distribution, and mass of the UFP to the time exposed. Estimates of the accumulation rate of SVOCs on surfaces were similar to those in studies of organic film buildup on indoor windows. Transfer of skin oils by touching the glass or foil surfaces, or after washing the glass surface with detergent and bare hands, was also observed, with measured particle production comparable with that produced by long-term exposure to indoor air.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Stanford University, City University of Hong Kong

Ports and industries require special types of pavements to resist the heavy static load from containers and continuous loads from operation vehicles. To reduce the risk of rutting and settlements over time concrete or composite pavement systems are typically applied. The structural design of such pavements are today based on Mechanistic-Empirical (M-E) methods. The M-E method is appropriate for many situations, in other situations it may lead to overdesign, or maybe worse, underdesign. The method has limited capabilities and cannot account for significant factors affecting the pavement response, such as geometry, realistic material behavior and arbitrary loading conditions in a unified manner.

In recent years we have seen significant growth in the capabilities of computer hardware and software that has allowed numerical modeling and analysis of structural problems for an increasing variety of applications. Such models allow use of constitutive models that have the potential to replicate a wide range of material behavior under arbitrary loading conditions. However, successful application of numerical models in engineering design is often prevented by complex implementation, unstable simulations and a large number of model parameters.

In order to move a step towards more generalised structural design methods for analysis of heavy duty pavements, this study aims at developing a mechanistic approach based on constitutive models. A simple framework for engineering application is sought; creating a rational link between laboratory tests, design and field applications.

First, a realistic 3-D cohesive finite element model for structural analysis of composite block pavement systems is developed. This model is used for verification and compared to experimental results. Secondly, a simplified two-dimensional engineering model is developed incorporating a cohesive hinge and a two-parameter foundation model into a beam element. This model includes the most significant parameters that influence the structural response, i.e. soil-structure interaction and cyclic damage of the cemented material.

It is found that both the conventional cohesive zone model and the cohesive hinge model is suitable for the description of the fracture behaviour of cemented materials in concrete and composite pavement systems. The engineering model is efficient, resulting in computationally fast and stable simulations, and a simple calibration method for estimating foundation model parameters is developed. The consistent format applied enables straightforward implementation of different unloading and reloading schemes. The presented damage model accounts for the material behavior in all the cracked phases, linking the development of the fracture process zone and damage of the existing fracture process zone to the monotonic material characteristics in a unified manner.

The obtained results show that the methodology is attractive and well-suited for further developments and practical use. The real-scale model can be used directly in design, whereas the engineering model can be used in special design cases, for sensitivity analysis and simple studies. The engineering model, can when extended to three-dimensional applications, replace many of the more complex real-scale cohesive zone models. The engineering model can then be used for structural analysis enabling a full mechanistic analysis of concrete and composite pavement structures, something which is not possible today.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Section for Structural Engineering, COWI AS
Authors: Skar, A. (Intern), Poulsen, P. N. (Intern), Zania, V. (Intern), Holst, M. L. (Ekstern)
Number of pages: 232
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Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Print): 9788778779991
Original language: English
Development and evaluation of a building integrated aquifer thermal storage model

An aquifer thermal energy storage (ATES) in combination with a heat pump is an excellent way to reduce the net energy usage of buildings. The use of ATES has been demonstrated to have the potential to provide a reduction of between 20 and 40% in the cooling and heating energy use of buildings. ATES systems are however a complex system to analyse as a number of ground conditions influence heat losses within the aquifer. ATES is also not confined from the sides and is therefore vulnerable to heat losses through conduction, advection and dispersion. The analyses of ATES system is even further complicated when the dynamic of a building is considered. When connected to a building, the temperature in the aquifer is influenced by the amount of heat exchange with the varying building load. Given the energy saving potentials of ATES systems in building operation, detailed understanding of the influence of buildings on the ATES systems and vice versa would facilitate improved operation and efficiency of ATES and building coupled systems. Therefore, taking into account the variations in the building and below ground conditions, there is the need for the development of a model that can potentially handle the dynamics on both sides. Finite element and finite volume methods are frequently used in the development of ATES models and proven as adequate tools for modelling complex ground conditions, however, most developed ATES models are often analysed independent of the building. Therefore, in this study, an ATES model that also integrates building dynamics is developed using the finite element method (FEM). The developed model was validated using data from an ATES and building in the Netherlands. The developed model was shown to have an absolute mean error of 0.17 C and 0.12 C for the cold and warm wells respectively.
Development and validation of a detailed TRNSYS-Matlab model for large solar collector fields for district heating applications

This study describes the development of a detailed TRNSYS-Matlab model to simulate the behavior of a large solar collector field for district heating application. The model includes and investigates aspects which are not always considered by simpler models, such as flow distribution in the different rows, effect of the flow regime on the collector efficiency, thermal capacity of the components and effect of shadows from row to row. The model was compared with measurements from a solar collector field and the impact of each aspect was evaluated. A good agreement between model and measurements was found. The results showed that a better agreement was achieved, when a flow regime-dependent efficiency of the collector was used. Also the precise flow distribution in the collector field improved the model accuracy, but it must be assessed if the aimed level of accuracy justifies the much longer programming and computing time. Thermal capacity was worth being considered only for the bulkier components, such as the longer distribution and transmission pipes. The actual control strategy, which regulates the flow rates in the solar heating plant, was accurately reproduced in the model, as proved by the good agreement with the measurements.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Bava, F. (Intern), Furbo, S. (Intern)
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Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.17 SJR 1.999 SNIP 1.798
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.276 SNIP 2.046 CiteScore 5.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.647 SNIP 2.63 CiteScore 5.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.54 SNIP 2.593 CiteScore 5.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.998 SNIP 2.25 CiteScore 4.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.609 SNIP 2.043 CiteScore 4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.814 SNIP 2.725
Development of a generalized integral jet model

Integral type models to describe stationary plumes and jets in cross-flows (wind) have been developed since about 1970. These models are widely used for risk analysis, to describe the consequences of many different scenarios. Alternatively, CFD codes are being applied, but computational requirements still limit the number of scenarios that can be dealt with using CFD only. The integral models, however, are not suited to handle transient releases, such as releases from pressurized equipment, where the initially high release rate decreases rapidly with time. Further, on gas ignition, a second model is needed to describe the rapid combustion of the flammable part of the plume (flash fire) and a third model has to be applied for the remaining jet fire. The objective of this paper is to describe the first steps of the development of an integral-type model describing the transient development and decay of a jet of flammable gas after a release from a pressure container. The intention is to transfer the stationary models to a fully transient model, capable to predict the maximum extension of short-duration, high pressure jets. The model development is supported by conducting a set of transient ignited and unignited spontaneous releases at initial pressures between 25bar and 400bar. These data forms the basis for the presented model development approach.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Department of Management Engineering, Engineering Systems, Fraunhofer Institute for Chemical Technology ICT
Authors: Duijm, N. J. (Intern), Kessler, A. (Ekstern), Markert, F. (Intern)
Number of pages: 12
Publication date: 2017

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Main Research Area: Technical/natural sciences
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Source: PublicationPreSubmission
Source-ID: 139059701
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017
Development of a joint Nordic master in cold climate engineering within the Nordic five tech alliance

Developments in the Arctic regions are intensifying and the industry now demands engineers who have Arctic competencies. Working as an engineer in the Arctic requires special skills, but yet no full Master's programme in cold climate engineering has been offered in Europe. A joint Nordic master programme in Cold Climate Engineering was therefore established in collaboration between three Nordic technical universities; Aalto University in Finland, Norwegian University of Science and Technology (NTNU) and the Technical University of Denmark (DTU). These universities are part of a strategic alliance, Nordic Five Tech, which was established in 2006 with the goal of utilizing the shared and complementary strengths of the universities and creating synergies, also within education in the form of joint master programmes.

The Cold Climate Engineering students study for one year at two of the universities, having to pass 60 ECTS at each university. The programme is structured in three overall tracks: Sea (Aalto/NTNU), Land (DTU/NTNU) and Space (Aalto/DTU) using already existing courses offered by different departments at the universities. In Year 1, the students follow general competence and technological specialisation courses at University 1 and in Year 2, the students take one semester of technological specialisation courses and write their final Master thesis, which is co-supervised by University 1. This construction allows the students to achieve a double master's degree.

The three universities have their own unique teaching profiles, but individually offer a limited number of cold climate and Arctic related master courses. For the Sea and Land tracks, one or two semesters can be taken at the University Centre of Svalbard (UNIS) and for the Land track a semester at the DTU campus in Sisimiut, Greenland is compulsory. Thus, the significant strength of this programme is that the universities are joining the use of their cold climate courses, creating an MSc programme that stands out from the regular MSc programmes at the universities, as well as offering courses at Svalbard and in Greenland. The students have access to laboratory and testing facilities at the universities as well as they can conduct field work in the Baltic Sea, Svalbard and Greenland. By actually going to the Arctic and applying their skills, the students get valuable first-hand insight into working as an engineer in one of the most challenging areas of the world and being attractive candidates to companies and research institutions working in extreme climates and different cultures.

The first students started in the autumn semester 2016, with students coming from the NST universities, European and international universities. The students are highly motivated when starting in the MSc programme and are eager to develop their competences within Cold climate and Arctic Engineering.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalto University, Norwegian University of Science and Technology
Authors: Kirkelund, G. M. (Intern), Tuhkuri, J. (Ekstern), Høyland, K. V. (Ekstern)
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Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Digitalization as Driver for Standardized Specification and Design of Buildings: In Search of an Efficient Building Design Management Methodology

The architectural, engineering and construction industry is suffering from low productivity and the integration of project information, design solutions, design processes and project organization is believed to be a solution to produce high performing buildings more efficiently. Utilization of contractual frameworks to support such integration is still relatively new to the industry, but when successfully implemented it can foster collaboration and considerably increase possibilities for achieving project success related to buildings which are buildable, operable, usable, and sustainable. Digitalization is a driver in such a framework to support an efficient way of working, but multiple barriers exist for its expansion. This thesis focuses on solutions to improve digitalization and integration in the building design process.

The often unique, fragmented and interdependent nature of building design makes it difficult to adopt methodologies from other industries – such as manufacturing – where digitalization and integration seems better established. Solutions to integrate the different elements in building design processes into a coherent methodology are far less explored, and the goal of this research is, therefore, to increase the understanding of the relation between information needs, standardisation and efficient design management. The research draws on findings from previous research on information management, design management and socio-technical science and focuses in particular on an improved foundation for efficient planning and decision making processes.

The research concludes that high variability exists in current building design processes. This could be acceptable if the
goal is to increase the understanding of the design problems to solve, but there is a risk that non-value adding design iterations will occur too frequently if the variability is not carefully managed. Building a strong community within the design team is found to be critical to reduce variability as it allows project managers to entrust the team to find solutions and coordinate activities more efficiently. Based on several case studies it is identified that applying an agile project management method adds a needed structure to the design development process and increase collaboration and shared understanding. Only when such applicable management practices are in place, digitalization can add proper value. For digitalization to add value, efficient information management is also found to be critical, which requires that information can be captured, structured and exchanges in a standardized way.

To achieve efficient standardization, proposals for modularisation and expansion of current industry information exchange standards were developed in the current research. An IDM package framework is proposed to make the current IDM methodology from buildingSMART more modular and easier to reuse and utilize on projects. A generic LOD framework is proposed to make the agreement on geometry information exchange more pragmatic. Furthermore, an expanded schema architecture is proposed for the BCF format from buildingSMART to support an increased use of process information exchange within task management. The proposals were evaluated in several different ways and found to match a range of industry needs, making the proposals of interest for further research and development.

Based on the findings, operational principles of how building design can be produced efficiently are described with specific considerations to information flow and value generation. The operational principles are, furthermore, combined with socio-technical and reflective theory to propose a methodology of how information in building design can be managed to also support a collaborative and learning building design process. A methodology is proposed and contains information models for the mission, function, product, and process (MFPP) for building projects to summarize the findings in this research in a combined contribution to further research and development. The methodology is a pragmatic approach to more extensive PLM systems used in the manufacturing industry and incorporates an agile design development process. The modular yet structured approach in the MFPP methodology allows for automation of information requirements, flow optimization and automatic identification of relations between information models, which is believed to lower the barriers for implementation of digitalization and integration in the AEC industry.

The research makes use of a range of different theories and methods which have previously been evaluated individually in the AEC industry and found useful. Based on the findings in this thesis it seems clear that these theories and methods should not be considered as alternatives to each other but as elements in an integrated approach. A key challenge ahead for the AEC industry is to find ways to integrate these theories and methods as opposed to executing them in parallel and thereby not achieving the required level of improvement. The MFPP methodology can serve as contribution to how several perspectives can be integrated in a common approach for efficient building design management.

General information
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Authors: Treldal, N. (Intern)
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Digitalization as Driver for Standardized Specification and Design of Buildings: In Search of an Efficient Building Design Management Methodology
Publication: Research › Ph.D. thesis – Annual report year: 2018

Displacement ventilation
The aim of this Guidebook is to give the state-of-the-art knowledge of the displacement ventilation technology, and to simplify and improve the practical design procedure. The Guidebook discusses methods of total volume ventilation by mixing ventilation and displacement ventilation and it gives insights of the performance of the displacement ventilation. It also shows practical case studies in some typical applications and the latest research findings to create good local micro-climatic conditions.

General information
Durability of vertically cast mortar joints in Pearl-Chain Bridges

General information
State: Submitted
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Lund, M. S. M. (Intern), Hansen, K. K. (Intern), Arvidsson, M. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.77 SJR 1.49 SNIP 2.339
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.54 SNIP 2.299 CiteScore 3.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.554 SNIP 2.594 CiteScore 2.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.88 SNIP 3.043 CiteScore 3.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.706 SNIP 3.37 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.493 SNIP 3.537 CiteScore 2.74
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.362 SNIP 1.969
Web of Science (2010): Indexed yes
Dynamic backcalculation with different load-time histories

This paper focused attention to the falling weight deflectometer (FWD) load-time history. For a commonly used device, it studied the pulse generation mechanism and the influence of different load histories on backcalculation results. In this connection, a semi-analytic impact theory was first introduced for realistically simulating FWD pulse generation. Then a newly developed finite-element code was presented for FWD interpretation; the code is capable of addressing dynamics, time-dependent layer properties, and quasi-nonlinear behaviour. Both new developments were demonstrated for an experimental dataset that resulted from operating an FWD with different loading configurations. It was found that backcalculated parameters are sensitive to the FWD pulse features. Consequently, it is recommended that, whenever advanced pavement characterisation is sought, experimental attention should be placed on generating diverse FWD pulse histories. Collectively, the resulting deflection histories will contain pertinent constitutive information for supporting the calibration of more complex pavement models.

General information
State: Accepted/In press
Organisations: Department of Mechanical Engineering, Solid Mechanics, Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Madsen, S. S. (Intern), Levenberg, E. (Intern)
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.59 SJR 0.821 SNIP 1.279
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.991 SNIP 1.279 CiteScore 1.7
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.653 SNIP 1.076 CiteScore 1.27
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.773 SNIP 0.915 CiteScore 1.1
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.495 SNIP 0.574 CiteScore 0.76
Dynamic lateral response of suction caissons

Deeper water installations of offshore wind turbines may be supported by jacket structures. This study investigates the dynamic response of suction caissons for jackets by analysing 3D finite element models in the frequency domain. The numerical modelling was firstly validated by analytical solutions for pile foundations. Groups of crucial dimensionless parameters related to the soil profile and the foundation geometry are identified and their effects on the response of suction caissons are studied. Static stiffness coefficients are presented in a form of mathematical formulas obtained by fitting the numerical results, pertaining foundations with different slenderness ratios and embedded in different soil profiles. Sensitivity of the dynamic impedances of suction caissons on the skirt length was showed in this study. Moreover, the results for the suction caissons indicated that the overall dynamic response is profoundly affected by the relative thickness of the soil layer and by the variation of soil stiffness with depth.

Dynamic backcalculation, Falling weight deflectometer, Finite-element method, Load-time history

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Final_Version_After_Feedback_full_author_details_and_affiliations_.pdf. Embargo ended: 04/04/2018

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Source: FindIt
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Dynamic lateral response of suction caissons

Deeper water installations of offshore wind turbines may be supported by jacket structures. This study investigates the dynamic response of suction caissons for jackets by analysing 3D finite element models in the frequency domain. The numerical modelling was firstly validated by analytical solutions for pile foundations. Groups of crucial dimensionless parameters related to the soil profile and the foundation geometry are identified and their effects on the response of suction caissons are studied. Static stiffness coefficients are presented in a form of mathematical formulas obtained by fitting the numerical results, pertaining foundations with different slenderness ratios and embedded in different soil profiles. Sensitivity of the dynamic impedances of suction caissons on the skirt length was showed in this study. Moreover, the results for the suction caissons indicated that the overall dynamic response is profoundly affected by the relative thickness of the soil layer and by the variation of soil stiffness with depth.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Latini, C. (Intern), Zania, V. (Intern)
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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.03 SJR 1.485 SNIP 1.798
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.395 SNIP 1.884 CiteScore 2.05
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.344 SNIP 1.959 CiteScore 1.88
Early age fracture properties of microstructurally-designed mortars

This paper compares the fracture properties as well as crack initiation and propagation of real and equivalent mortars. The development of the elastic modulus, tensile strength, and fracture energy at different hydration stages were determined by inverse analysis of load-displacement curves obtained by the compact tension test (CTT). Further, the impact of the moisture content on the aforementioned material properties was also tested on oven-dried equivalent mortars. Digital image correlation (DIC) was used to follow the crack initiation and propagation. The elastic modulus, tensile strength, and fracture energy support the validity of the equivalent mortars approach. The load-displacement curves obtained by the CTT were also compared to those simulated by finite element method showing excellent correlations. DIC revealed the formation of similar crack patterns at comparable load levels between the two mortars. At early age, the moisture content has a considerable influence on the tensile strength and the fracture energy.
Economic Model Predictive Control for Hot Water Based Heating Systems in Smart Buildings
This paper presents a study to optimize the heating energy costs in a residential building with varying electricity price signals based on an Economic Model Predictive Controller (EMPC). The investigated heating system consists of an air source heat pump (ASHP) incorporated with a hot water tank as active Thermal Energy Storage (TES), where two optimization problems are integrated together to optimize both the ASHP electricity consumption and the building heating consumption utilizing a heat dynamic model of the building. The results show that the proposed EMPC can save the energy cost by load shifting compared with some reference cases.

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy resources, services and control, Department of Civil Engineering, University of Oldenburg
Authors: Awadelrahman, M. A. A. (Ekstern), Zong, Y. (Intern), Li, H. (Intern), Agert, C. (Ekstern)
Pages: 112-119
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Main Research Area: Technical/natural sciences
Publication information
Journal: Energy and Power Engineering
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ISSN (Print): 1949-243X
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ISI indexed (2013): ISI indexed no
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Source-ID: 131629455
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Effectiveness of a chemical herder in association with in-situ burning of oil spills in ice-infested water
The average herded slick thickness, surface distribution and burning efficiency of a light crude oil were studied in ice-infested water to determine the effectiveness of a chemical herder in facilitating the in-situ burning of oil. Experiments were performed in a small scale (1.0m2) and an intermediate scale (19m2) setup with open water and 3/10, 5/10 and 7/10 brash ice coverages. The herded slick thicknesses (3-8mm) were ignitable in each experiment. The presence of ice caused fracturing of the oil during the herding process, which reduced the size of the herded slicks and, as a consequence, their ignitability, which in turn decreased the burning efficiency. Burning efficiencies relative to the ignited fraction of the oil were in the expected range (42-86%). This shows that the herder will be an effective tool for in-situ burning of oil when the ignitability issues due to fracturing of the oil are resolved.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Aarhus University
Authors: van Gelderen, L. (Intern), Fritt-Rasmussen, J. (Ekstern), Jomaas, G. (Intern)
Pages: 345-351
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Marine Pollution Bulletin
Volume: 115
ISSN (Print): 0025-326X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
Effective stresses and shear failure pressure from in situ Biot's coefficient, Hejre Field, North Sea: Stresses and shear failure pressure

We propose a combination of Biot's equations for effective stress and the expression for shear failure in a rock to obtain an expression for minimum pore pressure in a stable vertical well bore. We show that a Biot's coefficient calculated from logging data in the Hejre Field, North Sea, is significantly different from 1. The log-derived Biot's coefficient is above 0.8 in the Shetland Chalk Group and in the Tyne Group, and 0.6-0.8 in the Heno Sandstone Formation. We show that the effective vertical and horizontal stresses obtained using the log-derived Biot's coefficient result in a drilling window for a vertical well larger than if approximating Biot's coefficient by 1. The estimation of the Biot's coefficient is straightforward in
formations with a stiff frame, whereas in formations such as shales, caution has to be taken. We discuss the consequence
of assumptions made on the mineral composition of shales as unphysical results could be obtained when choosing
inappropriate mineral moduli.

**General information**

*State:* Published

*Organisations:* Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, DONG Energy AS

*Authors:* Regel, J. B. (Intern), Orozova-Bekkevold, I. (Intern), Andreassen, K. A. (Intern), van Gilse, N. C. H. (Ekstern), Fabricius, I. L. (Intern)

*Number of pages:* 15

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*Main Research Area:* Technical/natural sciences

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*Journal:* Geophysical Prospecting

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*BFI (2018):* BFI-level 1

*Web of Science (2018):* Indexed yes

*BFI (2017):* BFI-level 1

*Web of Science (2017):* Indexed Yes

*BFI (2016):* BFI-level 1

*Scopus rating (2016):* CiteScore 1.84 SJR 1.286 SNIP 1.347

*BFI (2015):* BFI-level 1

*Scopus rating (2015):* SJR 1.299 SNIP 1.695 CiteScore 1.97

*BFI (2014):* BFI-level 1

*Scopus rating (2014):* SJR 1.631 SNIP 1.304 CiteScore 1.7

*Web of Science (2014):* Indexed yes

*BFI (2013):* BFI-level 1

*Scopus rating (2013):* SJR 1.434 SNIP 1.557 CiteScore 1.5

*ISI indexed (2013):* ISI indexed yes

*BFI (2012):* BFI-level 1

*Scopus rating (2012):* SJR 1.147 SNIP 1.312 CiteScore 1.39

*ISI indexed (2012):* ISI indexed yes

*Web of Science (2012):* Indexed yes

*BFI (2011):* BFI-level 1

*Scopus rating (2011):* SJR 1.823 SNIP 1.347 CiteScore 1.92

*ISI indexed (2011):* ISI indexed yes

*BFI (2010):* BFI-level 1

*Scopus rating (2010):* SJR 1.171 SNIP 1.075

*BFI (2009):* BFI-level 1

*Scopus rating (2009):* SJR 1.544 SNIP 1.693

*Web of Science (2009):* Indexed yes

*BFI (2008):* BFI-level 2

*Scopus rating (2008):* SJR 0.642 SNIP 0.983

*Scopus rating (2007):* SJR 0.704 SNIP 1.208

*Web of Science (2007):* Indexed yes

*Scopus rating (2006):* SJR 0.808 SNIP 1.523

*Web of Science (2006):* Indexed yes

*Scopus rating (2005):* SJR 0.665 SNIP 0.805

*Web of Science (2005):* Indexed yes

*Scopus rating (2004):* SJR 0.732 SNIP 1.858

*Scopus rating (2003):* SJR 0.836 SNIP 1.763
Effect of airflow interaction in the breathing zone on exposure to bio-effluents

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark, Silesian University of Technology
Authors: Bivolarova, M. P. (Intern), Kierat, W. (Ekstern), Zavrl, E. (Ekstern), Popiolek, Z. (Ekstern), Melikov, A. K. (Intern)
Number of pages: 11
Pages: 216-226
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Main Research Area: Technical/natural sciences

Publication information
Journal: Building and Environment
Volume: 125
ISSN (Print): 0360-1323
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Effect of energy renovation on indoor air quality in multifamily residential buildings in Slovakia

Buildings are responsible for a substantial portion of the global energy consumption. Most of the multifamily residential buildings built in the 20th century in Central and Eastern Europe do not satisfy the current requirements on energy efficiency. Nationwide measures taken to improve the energy efficiency of these buildings rarely consider their impact on the indoor air quality (IAQ). The objective of the present study was to evaluate the impact of simple energy renovation on IAQ, air exchange rates (AER) and occupant satisfaction in Slovak residential buildings. Three pairs of identical naturally ventilated multifamily residential buildings were examined. One building in each pair was newly renovated, the other was in its original condition. Temperature, relative humidity (RH) and the concentration of carbon dioxide (CO2) were measured in 94 apartments (57%) during one week in the winter. A questionnaire related to perceived air quality, sick building syndrome symptoms and airing habits was filled by the occupants. In a companion experiment, the IAQ was investigated in 20 apartments (50%) of a single residential building before and after its renovation. In this experiment, concentrations of nitrogen dioxide (NO2), formaldehyde and total and individual volatile organic compounds (VOC) were also measured. CO2 concentrations were significantly higher and AERs were lower in the renovated buildings. Formaldehyde concentrations increased after renovation and were positively correlated with CO2 and RH. Energy renovation was associated with lower occupant satisfaction with IAQ. Energy retrofitting efforts should be complemented with improved ventilation in order to avoid adverse effects on IAQ.
Effect of Flow Direction on the Extinction Limit for Flame Spread over Wire Insulation in Microgravity

Experiments to determine the Limiting Oxygen Concentration (LOC) of a flame spread over electric wire insulation were carried out in microgravity provided by parabolic flights. The difference between the LOC in opposed and concurrent flows was evidenced. Polyethylene insulated Copper (Cu) wires and polyethylene insulated Nickel-Chrome (NiCr) wires with inner core diameter of 0.50 mm and insulation thickness of 0.30 mm were examined with external flow velocities ranging from 50 mm/s to 200 mm/s. The results for the Copper wires show that with increasing external flow velocity, the LOC monotonically decreased for the concurrent flow conditions and the LOC first decreased and then increased ("U" trend) for the opposed flow conditions. Similar trends were found in the experiments with NiCr wires. Also, in terms of the minimum LOC value, the minimum LOC was comparable for both wire types in both flow conditions. However, for the concurrent flow, the minimum LOC was about 1-2% lower (in oxygen concentration) than for opposed flow for both wire types. A heat balance model for the electric wire with flame propagation was established to estimate the LOC under opposed and concurrent flow conditions in microgravity. In this model, it was suggested that the LOC can be estimated using the normalized radiative heat loss from the sample surface. Result of the calculation qualitatively matched the LOC profile extracted from the experiments.

Effect of long-term electrodialytic soil remediation on Pb removal and soil weathering

Weathering of soil minerals during long-term electrochemical soil remediation was evaluated for two different soils: an industrially Pb contaminated soil with high carbonate content and an unpolluted soil with low carbonate content. A constant current of 5 mA was applied for 842 days, and sampling was made 22 times during the treatment. The overall qualitative mineral composition was unaffected by electrodialysis, except for calcite removal which was complete. However, dissolution and removal of Al, Fe, Si, Mg, Ca and Pb from the soil during the treatment exceeded the fraction extractable by digestion in 7 M HNO₃, and provided evidence of enhanced mineral dissolution induced by the current. Nevertheless, the total dissolved Si and Al only constituted 0.2-0.3 % and 1.1-3.5 % of the total content, while the Pb overall removal from the contaminated soil was only 8.1 %. An observed reduction in the dry matter of 4.5 % and 13.5% from the two soils, respectively was mainly due to dissolution of CaCO₃ and organic matter, but also included a minor dissolution of other soil minerals.

Effect of supply air temperature on air distribution in a room with radiant heating and mechanical ventilation

The present study focused on the effect of supply air temperature on air distribution in a room with floor heating (FH) or ceiling heating (CH) and mixing ventilation (MV) or displacement ventilation (DV). The vertical distribution of air temperature and velocity in the occupied zone and the horizontal distribution of containment concentration in the breathing
zone were measured as the supply air temperature ranged from 15.0°C (59°F) to 19.0°C (66.2°F). The results showed that the vertical air temperature differences were less than 0.3°C (32.5°F) with FH+MV or CH+MV and between 1.9°C (35.4°F) and 4.2°C (39.6°F) with FH+DV or CH+DV. The turbulence intensity varied from 12.5% to 15.5% with FH+MV or CH+MV and from 6.0% to 10.8% with FH+DV or CH+DV. The air-distribution effectiveness was close to 1.0 with FH+MV or CH+MV and between 1.06 and 1.16 with FH+DV or CH+DV. The results in this paper are relevant to the design and control of the hybrid systems with radiant heating systems and mechanical ventilation systems.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Xi'an Jiaotong University, Harbin Institute of Technology
Authors: Wu, X. (Ekstern), Zhao, J. (Ekstern), Fang, L. (Intern), Wang, F. (Ekstern), Olesen, B. W. (Intern)
Pages: 120-128
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: A S H R A E Transactions
Volume: 123
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BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.42 SJR 0.329 SNIP 0.613
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.408 SNIP 0.583 CiteScore 0.36
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.359 SNIP 0.408 CiteScore 0.32
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.417 SNIP 0.44 CiteScore 0.32
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.413 SNIP 0.73 CiteScore 0.29
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.391 SNIP 0.881 CiteScore 0.35
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.48 SNIP 0.661
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.663 SNIP 0.728
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.528 SNIP 0.562
Scopus rating (2007): SJR 0.551 SNIP 0.793
Scopus rating (2006): SJR 0.406 SNIP 0.702
Scopus rating (2005): SJR 0.472 SNIP 0.822
Scopus rating (2004): SJR 0.419 SNIP 0.753
Scopus rating (2003): SJR 0.456 SNIP 0.678
Scopus rating (2002): SJR 0.439 SNIP 0.672
Scopus rating (2001): SJR 0.516
Scopus rating (2000): SJR 0.353
Scopus rating (1999): SJR 0.213
Original language: English
Source: PublicationPreSubmission
Source-ID: 138915303
Publication: Research - peer-review › Journal article – Annual report year: 2017
Effect of the Ignition Method on the Extinction Limit for a Flame Spreading over Electric Wire Insulation

Flame spread experiments with wire insulation were conducted in microgravity (parabolic flights) and in normal gravity to understand the effect of the ignition condition on the Limiting Oxygen Concentration (LOC) for an opposed air flow condition of 100 mm/s (typical flow velocity on ISS). Both the ignition power (50-110 W) and the igniter heating time (5-15 s) were varied. Polyethylene-coated Nickel-Chrome or copper wires with inner core diameter of 0.50 mm and insulation thickness of 0.30 mm were used as sample wires, and a 0.50 mm diameter coiled Kanthal wire was used as the igniter. The experimental results show that the LOC of NiCr core wires assume an almost constant value under normal gravity conditions once ignition occurred, whereas under microgravity conditions, the LOC gradually decreases as the ignition power or heating time increases and eventually it reaches an almost constant value. Thus, the effect of ignition condition on LOC is more evident in microgravity than in normal gravity. The variation in LOC value is about 2% within the tested range of ignition conditions. Finally, the results suggest that there exists a minimum ignition power and heating time to obtain the correct LOC values for electric wire combustion, especially in microgravity. In Cu core wire cases, the LOC monotonically decreases as the heating time increases because of preheating by the igniter. This preheating helps to sustain spreading during microgravity period. Future study is required to find the proper ignition condition for a high-conductivity wire. The results have the potential to improve safety aspects associated with the development of a fire safety standard for spacecraft.

Effects of acoustic ceiling units on the cooling performance of thermally activated building systems (TABS)

Europe, with a building stock responsible for about 40% of the total energy use, needs to reduce the primary energy use in buildings in order to meet the 2020 energy targets of the European Union. High temperature cooling and low temperature heating systems, and as an example, Thermally Activated Building Systems (TABS), have proven to be an energy efficient solution to provide buildings with an optimal indoor thermal environment. This solution uses the structure of the building to store heat and decrease the primary energy use. TABS require the active (heated or cooled) surfaces to be as exposed as possible to the room, but exposing bare concrete surfaces will have a diminishing effect on the acoustic qualities of indoor spaces. Acoustic solutions capable of providing optimal acoustic comfort while allowing the heat exchange between the TABS and the room are desirable. This study quantifies the effects of two types of free hanging ceiling absorbers (horizontal and vertical) on the cooling performance of the TABS and the implications this has on the occupant thermal comfort. The measurements were carried out in a full-scale TABS test facility. The results show a reduction of 11% of the heat removed by the TABS when 43% of the ceiling area was covered with free hanging horizontal sound absorbers at 300 mm (0.98 ft) from the active surface. This reduction was 23% for a ceiling coverage ratio of 60%. The decrease in heat absorbed by the TABS is less pronounced in the case of vertical sound absorbers for equivalent levels of sound absorption. A reduction of 12% of the heat removed by the TABS has been measured for vertical sound absorbers (equivalent sound absorption levels to 60% coverage ratio with horizontal sound absorbers). This reduction was of 13% for vertical sound absorbers (equivalent sound absorption levels to 80% coverage ratio with horizontal sound absorbers).
Effects of Exposure to Carbon Dioxide and Bioeffluents on Perceived Air Quality, Self-assessed Acute Health Symptoms and Cognitive Performance

The purpose of this study was to examine the effects on humans of exposure to carbon dioxide (CO2) and bioeffluents. In three of the five exposures, the outdoor air supply rate was high enough to remove bioeffluents, resulting in a CO2 level of 500 ppm. Chemically pure CO2 was added to this reference condition to create exposure conditions with CO2 at 1,000 ppm or 3,000 ppm. In two further conditions, the outdoor air supply rate was restricted so that the bioeffluent CO2 reached 1,000 ppm or 3,000 ppm. The same twenty-five subjects were exposed for 255 minutes to each condition. Subjective ratings, physiological responses and cognitive performance were measured. No statistically significant effects on perceived air quality, acute health symptoms or cognitive performance were seen during exposures when CO2 was added. Exposures to bioeffluents with CO2 at 3,000 ppm reduced perceived air quality, increased the intensity of reported headache, fatigue, sleepiness and difficulty in thinking clearly, and reduced speed of addition, the response time in a redirection task and the number of correct links made in the cue-utilisation test. This suggests that moderate concentrations of bioeffluents, but not pure CO2, will result in deleterious effects on occupants during typical indoor exposures.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Shanghai Jiao Tong University
Authors: Zhang, X. (Ekstern), Wargocki, P. (Intern), Lian, Z. (Ekstern), Thyregod, C. (Intern)
Pages: 47-64
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.55
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.88
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 4.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.63
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.42
Effects of Free-Hanging Horizontal Sound Absorbers on the Cooling Performance of Thermally Activated Building Systems

Thermally Activated Building Systems (TABS) have proven to be an energy-efficient solution to provide buildings with an optimal indoor thermal environment. This solution uses the structure of the building to store heat, reduce the peak loads, and decrease the primary energy demand. TABS require the heated or cooled surfaces to be as exposed as possible to the indoor space, but exposing the bare concrete surfaces has a diminishing effect on the acoustic qualities of the spaces in a building. Acoustic solutions capable of providing optimal acoustic comfort and allowing the heat exchange between the TABS and the room are desirable. In this study, the effects of free-hanging units on the cooling performance of TABS and the occupants’ thermal comfort was measured in a full-scale TABS laboratory. Investigations demonstrate that the use of freehanging sound absorbers are compatible with the performance of TABS and the occupant’s thermal comfort, but an appropriate acoustic design is needed to find the most suitable solution for each case. The results show a reduction of 11% of the cooling performance of the TABS when 43% of the ceiling area is covered with free-hanging horizontal sound absorbers, of 23% for 60% ceiling coverage ratio and of 36% for 80% coverage. Measurements in actual buildings showed an increase of the room operative temperature of 0.3 K when 50% of the ceiling surface is covered with horizontal panels and of 0.8 to 1 K for a 70% coverage ratio. According to numerical simulations using a new TRNSYS Type, the use of comfort ventilation has a considerable influence on the thermal conditions in the room; if the ventilation is removed, then the operative temperature increases by 1.8 K for a 60%-covered ceiling.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Lacarte, L. M. D. (Ekstern), Rage, N. (Intern), Kazanci, O. B. (Intern), Olesen, B. W. (Intern)
Pages: 59-63
Publication date: 2017
Conference: 19th International Conference on People, Ecosystems and Built Environment, Barcelona, Spain, 26/02/2017 - 26/02/2017
Main Research Area: Technical/natural sciences
Elasticity and Density of Paleozoic Shales from Bornholm

The Paleozoic shales exposed on the island of Bornholm contain intervals with more than 10% organic matter which is post mature with respect to the formation of hydrocarbons. Four shallow bore holes have been drilled through the 250 m thick shale interval and partly cored and logged with geophysical probes. We studied how the organic content and mineralogical composition influence mass density and elastic properties as measured from core analysis and logging data. The shales have porosity in the range of 1%-10% and modelled permeability (from porosity and BET) of generally less than 0.1 μDarcy. We found that solid density and elastic stiffness parameters only vary insignificantly with solid composition, when TOC is lower than 5%, but that mass density and TOC are correlated when TOC is higher than 5%. A similar correlation was not seen for TOC and Sonic logging data. A reason can be that the content of low-density kerogen and high-density pyrite is correlated. According to our data, the shales have weak to medium degree anisotropy of stiffness and compare well with other studied shales.
making process and at the same time to have a high material quality of the bricks. Two Danish bioashes from co-combustion of straw and wood were studied. They were collected from Enstedværket and Vordingborg Kraftvarme A/S, both combined heat and power plants. The bioashes had Cd concentrations of 9.0-9.7 mg/kg TS, which exceeds the limiting value of 5 mg/kg TS for the ash for agriculture purposes. The use of the ashes directly in brick production results in a loss of plant nutrients, mainly potassium. Potassium is generally present in the water-soluble fraction, which is in practice already being recovered from e.g. straw ash for use as fertilizer by water leaching and other chemical treatments to precipitate dissolved heavy metals prior to use. The scope of this PhD work is on using the water washed ash as resource. The water washed bioashes had a Cd concentration varying between 20 and 67 mg/kg TS. The enrichment of other heavy metals, such as As, Cr, Ni, Pb and Zn, was also observed due to the high ash dissolution ranging from 75% to 88% of the initial mass. Considering the enrichment effect of water washing on heavy metals, recycling of the washed bioashes is problematic from an environmental point of view. Removal of heavy metals from the washed ashes was carried out by electrodialytic remediation (EDR). The results showed that the Cd bound in the two studied bioashes was EDR extractable. After 10-14 days electrodialytic extraction, the Cd concentration in both the raw and the washed ashes originating from Enstedværket CHP was reduced to below 2 mg/kg (with removal rate >95%); and, after 7 days EDR, the Cd concentration in the washed bioash originating from Vordingborg CHP was reduced from 63.7 to 21.4 mg/kg TS. Pb had a removal rate ranging between 12% and 67% from the Enstedværket CHP ash, which shows that Pb in the bioashes was harder to remove than Cd. A two-compartment electrodialytic cell with anode placed in the ash suspension was tested and facilitated the extraction of Pb by creating a faster acidification process. The results showed that prewash with water before EDR stabilized the ash properties, and the removal of Cl resulted in good separation of e.g. Cd, Pb and Ni by hindering the formation of chlorine complexes. The XRD analysis showed that the ashes from Enstedværket CHP underwent dramatic changes in the main mineral compositions: from KCl and K2SO4 in the raw ashes, to quartz and carbonates and sulfates after water washing, and finally to mainly quartz in the ashes after EDR treatment. In relation to the use of the treated bioashes in the production of bricks at sintering temperature 1000 °C, substituting 25% clay in the small brick pellets (~2 g) with the washing-EDR treated bioashes resulted in pellets with higher porosity, higher water absorption, and less total shrinkage compared to the pure clay pellets. The water absorption of the pellets increased with increasing ash content, but decreased with increasing sintering temperature. Increasing sintering temperature also led to the decrease in porosity and the increase in bulk density. In addition, by increasing sintering temperature the leaching of heavy metals from the fired pellets containing bioash, in particular As and Cr, could also be minimized to a level that allows the clay pellets to be reused or landfilled as nonhazardous waste at the end of service life. The bricks also had good material qualities. For instance, when fired at 1100 °C for 1 h, the pellets with 25% treated fly ash from Enstedværket CHP met the water absorption requirement for building bricks in accordance with ASTM C62-13a. When fired at 1100 °C, the pellets with 20% treated ash from Vordingborg CHP showed acceptable leaching of heavy metals such as As, Cd, Cr, Ni, Pb and Zn, allowing the bricks to be used in construction work. The use of the bioashes in the production of clay bricks is technically possible, after being treated first by water washing to extract plant nutrients, and then by EDR to extract easily mobilized Cd and the mobile fraction of other heavy metals to lower the leaching to acceptable low levels. The recycling of MSWI fly ash faces challenges from technical, legislative, environmental and economical aspects. Thus, identifying options allowing use of the resources retained in the ash is necessary. Direct use of MSWI fly ash in the production of bricks leads to air pollution (e.g. the emission of volatile heavy metals) and the loss of metal resources (e.g. Zn), and also causes heavy metal leaching from the bricks themselves. Zn was the metal with the highest concentration in the MSWI fly ash studied, followed by Pb. Water washing was also applied to remove the soluble salts in the MSWI fly ash in the present work. Approximately 19% of the ash was dissolved in water. It was found that Pb and Zn had relatively higher concentrations in the leachate after washing than the other heavy metals, probably due to the presence of chlorine complexes of Pb and Zn in the ash. The raw MSWI fly ash and the washed ash were alkaline; whereas EDR could lower pH to the acidic range, resulting in elevated leaching of Cd and Zn after EDR. At same time, the Cr leaching could be reduced, which was related to the pH and redox potential of the treated ash. Up to 59% of Zn and 6% of Pb were extracted by EDR for 7-12 days compared to less than 0.6% extraction by water washing. However, the extraction of Cr was generally low, because Cr was strongly bound in the ash. The major fraction of Cr remained bound in the ash even after different EDR treatments including one, two and three step treatments, involving ash suspension alkalization by the cathode reaction and acidification by the anode reaction and/or water splitting. The Cr extraction rate was improved by combining different electrodialytic cells to achieve first acidification (especially to pH below 4) and then alkalization generation. The improvement was mainly due to the combined extraction of Cr(III) at low/oxidizing condition (e.g. anode reaction taking place in the ash suspension) and extraction of Cr(VI) at high pH/reducing condition (e.g. cathode reaction taking place in the ash suspension). Thermal treatment was conducted on the pure EDR-treated ash at 1000 °C for 1 h. The results showed that during thermal treatment the slightly acidic to neutral ashes (pH 5-6.5) were realkalized. The thermal treatment reduced the leaching of most heavy metals by solidification, and possibly also by evaporation; however, the leaching of As and Cr were still problematic and did not meet the limiting values for the ash being reused in construction work. It was found that the removal of Ca by EDR resulted in a decrease in the leaching of Cr after thermal treatment, but an increase in As leaching. However, minimizing leaching from the thermally treated ash (especially of Cr) could be obtained when optimizing the combined water washing and EDR prior to the thermal treatment. In addition, the evaporation of especially Pb during thermal treatment was significantly reduced by water washing and EDR pre-treatment. Handmade bricks (50 mm × 50 mm × 50 mm) incorporating the MSWI fly ash treated after water washing and EDR, had higher porosity, lower compressive strength and higher soluble salts content compared to the 100% clay brick when sintered at 1000 °C for 6 h. Still the washing-EDR treatment significantly improved the properties of the fired fly ash-clay bricks compared to the properties of the bricks incorporating the untreated ash. The results indicated that the MSWI fly ash could be fit for the studied clay replacement at low substitution ratio i.e. 5%, as the bricks with this substitution met the technical requirements for bricks (properties: weight loss during firing 11.3%; density 1.63 g/cm3; apparent porosity 41%; water absorption 25.5%; and compressive strength 8 N/mm2). The leaching of heavy metals from all the bricks with ash
content up to 20% sintered at 1000 °C for 6 h met the requirement for landfills as mineral waste. Even better was that the fly ash-clay brick with 5% ash content might be reused in construction work at the end of service life as the heavy metal leaching was low enough to allow this, and thus these bricks could be reused directly. Even though washing-EDR treatment reduced the Cr leaching from the fired bricks compared to that from the bricks with the untreated ash, the fine fraction in the ash was shown to significantly contribute to the leaching of Cr. Thus, fractionation of the treated MSWI fly ash was beneficial to its recycling in particular of the less toxic fraction.

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Electrochemical upgrading of different ashes for use in production of bricks
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Electrode placement during electro-desalination of Carved stone sculptures and ornaments can be severely damaged by salt induced decay. Often the irregular surfaces are decomposed, and the artwork is lost. The present paper is an experimental investigation on the possibility for using electro-desalination for treatment of stone with irregular shape with only two electrodes. The used Gotland sandstones were contaminated by NaCl in the laboratory. Due to the relatively good homogeneity in initial salt concentration obtained in this way, interpretation of the ED process were direct. Stones with an up-side-down T-shape formed the core of the investigation. Electro-desalination experiments were made with different duration to follow the progress. Successful desalination of the whole stone piece was obtained, showing that also parts not being placed directly between the electrodes were desalinated. This is important in case of salt damaged carved stones, where the most fragile parts thus can be desalinated without physically placing electrodes on them. The Cl removal rate was higher in the areas closest to the electrodes and slowest in the part, which was not placed directly between the electrodes. This is important to incorporate in the monitoring program to decide when a desalination action is finished.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Ottosen, L. M. (Intern), Andersson, L. C. H. (Ekstern)
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Source: PublicationPreSubmission
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Publication: Research › peer-review › Article in proceedings – Annual report year: 2017
Electrodialytic remediation of municipal solid waste incineration residues using different membranes

In the present work, three different commercial membrane brands were used in an identical electrodialytic cell setup and operating conditions, in order to reduce the leaching of metals and salt anions of two types of municipal solid waste incineration residues: air pollution control residues of a semi-dry flue-gas cleaning system and fly ashes from a plant with wet flue-gas cleaning system. The results showed a general reduction of the leaching in both residues after ED remediation. For the following elements, the leaching was found to be different after ED treatment depending on the membrane used, with statistical significance:

- Air pollution control residues of the semi-dry flue-gas cleaning system: Cr, Cu, Ni, Pb, Zn;
- Fly ashes from a plant with wet flue-gas cleaning system: Al, Ba, Cu, Ni, Zn, Cl, SO4. Final leaching values for some elements and membranes, but not the majority, were below than those of certified coal fly ash (e.g. Al or Cr), a material which is commonly used in construction materials; at the same time, some of these values were reduced to below the Danish law thresholds on the use of contaminated soil in constructions. These results show the potential of ED as a technology to upgrade municipal solid waste incineration residues.

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Organisations: Department of Civil Engineering
Authors: Parés Viader, R. (Intern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern)
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BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.593 SNIP 1.651 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.724 SNIP 1.767 CiteScore 3.92
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.818 SNIP 1.623 CiteScore 3.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.961 SNIP 1.515 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.867 SNIP 1.421
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Electrokinetic desalination of protruded areas of stone avoiding the direct contact with electrodes

Soluble salts are considered one of the main deterioration factors of porous building materials such as rocks, bricks or granites. The desalination treatments currently used in order to mitigate this alteration process are usually applied directly on the affected areas, which have often a low degree of cohesion precisely due to the deteriorating effect of the salts. The present study aimed to investigate the evaluation of a new approach based on electrokinetic techniques to desalinate rocks in monuments, specifically to desalinate carved reliefs. The procedure avoids the direct contact with the areas highly affected by salts, which usually show loss of cohesion due to salt crystallization processes, by placing the electrodes on adjacent areas less contaminated with salts. This fact represents another difficulty in the desalination process because the electric field must be adapted to the shape of the sculptural motif. An ashlar of sandstone highly contaminated with salts in a protruded area located in its central part was used for this purpose. The results showed that the electrokinetic setup proposed allowed to achieve high percentages of salt content reduction (above 80%) in the protruded area of the sandstone highly contaminated with salts. Therefore, these results confirmed that it was possible to desalinate the sandstone using electrokinetic methods without the need to put in contact the affected areas with the equipment, reducing the possibility of altering it by manipulation.
Energirenovering af større bygninger - metode og proces
SBi-anvisning 269 omhandler metode og proces for gennemførelse af energirenoveringsprojekter for større bygninger fra idefase til driftsfase. Større bygninger omfatter etageboliger, bygninger til privat handel- og service samt offentlige institutioner.

Anvisningen giver vejledning for de involverede parter i et renoveringsprojekt om, hvordan energirenoveringsprojekter gennemføres i alle faser.

SBi-anvisning 269 kan bruges som styringsredskab for bygherrer og kravgrundlag for rådgivere, entreprenører og andre parter, der leverer ydelser til bygherren. For institutioner, der stiller kapital til rådighed for energirenoveringsprojekter, kan anvisningen udgøre et grundlag til vurdering af kvaliteten af konkrete projektforslag.

Til anvisningen er knyttet en webside med links til specifikke værktøjer, dokumenter, tjeklister, beregningsprogrammer m.m., der kan anvendes ved energirenovering af bygninger.
Environmental Electrokinetics for a sustainable subsurface

Soil and groundwater are key components in the sustainable management of the subsurface environment. Source contamination is one of its main threats and is commonly addressed using established remediation techniques such as in-situ chemical oxidation (ISCO), in-situ chemical reduction (ISCR; most notably using zero-valent iron [ZVI]), enhanced in-situ bioremediation (EISB), phyto remediation, soil-washing, pump-and-treat, soil vapour extraction (SVE), thermal treatment, and excavation and disposal. Decades of field applications have shown that these techniques can successfully treat or control contaminants in higher permeability subsurface materials such as sands, but achieve only limited success at sites where low permeability soils, such as silts and clays, prevail. Electrokinetics (EK), a soil remediation technique mostly recognized in in-situ treatment of low permeability soils, has, for the last decade, been combined with more conventional techniques and can significantly enhance the performance of several of these remediation technologies, including ISCO, ISCR, EISB and phyto remediation. Herein, we discuss the use of emerging EK techniques in tandem with conventional remediation techniques, to achieve improved remediation performance. Furthermore, we highlight new EK applications that may come to play a role in the sustainable treatment of the contaminated subsurface.
European column buckling curves and finite element modelling including high strength steels

Eurocode allows for finite element modelling of plated steel structures, however the information in the code on how to perform the analysis or what assumptions to make is quite sparse. The present paper investigates the deterministic modelling of flexural column buckling using plane shell elements in advanced non-linear finite element analysis (GMNIA) with the goal of being able to reestablish the European buckling curves. A short comprehensive historical review is given on the development of the European buckling curves and the related assumptions made with respect to deterministic modelling of column buckling. The European buckling curves allowing deterministic analytical engineering analysis of members are based on large experimental and parametric measurement programs as well as analytical, numerical and probabilistic investigations. It is of enormous practical value that modern numerical deterministic analysis can be performed based on given magnitudes of characteristic yield stress, material stress–strain relationship, and given characteristic values for imperfections and residual stresses. The magnitude of imperfections and residual stresses are discussed as well as how the use of equivalent imperfections may be very conservative if considered by finite element analysis as described in the current Eurocode code. A suggestion is given for a slightly modified imperfection formula within the Ayrton-Perry formulation leading to adequate inclusion of modern high grade steels within the original four buckling curves. It is also suggested that finite element or frame analysis may be performed with equivalent column bow imperfections extracted directly from the Ayrton-Perry formulation.

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Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Jönsson, J. (Intern), Stan, T. (Intern)
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Scopus rating (2013): SJR 1.874 SNIP 2.552 CiteScore 2.1
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.852 SNIP 2.896 CiteScore 2.09
ISI indexed (2012): ISI indexed yes
Evaluating economic and environmental aspects of using solar panels on multi-angled facades of office buildings

This paper is concerned with using solar panels as high-tech cladding materials on multi-angled facades for office buildings. The energy produced by the solar panels will be consumed inside the office rooms by cooling compressors, ventilation, lighting and office equipment. Each multi-angled facade unit is directed into two different orientations on a vertical axis (right and left), but not tilted up and down. The different facade orientations will optimize the use of solar radiation to produce the needed energy from the solar panels when placing them on the parapets of these facades. In this regard, four scenarios with different facade configurations and orientations are evaluated and discussed. The method for the simulations and calculations depends on two main programs: first, IDA ICE program to calculate the energy consumption and evaluate the indoor climate of the building; and second, PVBAT to calculate the cost of the electricity produced by the solar panels and evaluate the total amount of energy produced from these panels along with the ratio to the energy bought directly from the electricity grid. There is also an environmental evaluation for the system by calculating the CO₂ emissions in the different scenarios.
Evaluating potentials for waste sorting in the Arctic: waste separation studies from Greenland

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark, Rambøll Danmark A/S
Authors: Kirkelund, G. M. (Intern), Diez, L. (Ekstern), Scheutz, C. (Intern), Eisted, R. (Ekstern)
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Evaluating the Integration of Architectural Solutions such as Multi-Angled Facades in Specific Urban Contexts

General information
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Organisations: Department of Civil Engineering, Section for Building Energy , Aalborg University
Authors: Hannoudi, L. A. (Ekstern), Lauring, M. (Ekstern), Christensen, J. E. (Intern)
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Evaluation of computational domain on CFD simulation of flow in a long street canyon under a perpendicular wind direction

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Hong Kong Polytechnic University, University of Hong Kong
Authors: Ai, Z. (Intern), Mak, C. M. (Ekstern), Wong, H. M. (Ekstern)
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Evaluation of the renovation of a Danish single-family house based on measurements
Building renovation is too often carried out with only one objective: necessary maintenance, updating design and functions, or reducing energy consumption. But, if a necessary maintenance is exploited as an opportunity for renovation, energy improvements can be implemented, house functions can be updated, and indoor climate improved with minimal nuisance and expense. This paper illustrates this approach by documenting the renovation of a single-family house in Denmark, and monitoring its energy consumption and indoor climate before and after the renovation. Building elements were replaced where necessary, and the total energy consumption was reduced by 23%, giving the house owners a saving of about DKK 8400 per year. The energy consumption for heating was reduced by 53%, close to the 58% found using dynamic simulations. The temperatures reached a more comfortable level, and the house owners were satisfied with the result. The increased value of the house was estimated to cover about 77% of the investment.

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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Grøn Bjørneboe, M. (Intern), Svendsen, S. (Intern), Heller, A. (Intern)
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Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
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Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
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Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
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Experimental analysis of indoor air quality improvement achieved by using a Clean-Air Heat Pump (CAHP) air-cleaner in a ventilation system

This study investigated the air purification effect of a Clean-Air Heat Pump (CAHP) air-cleaner which combined a silica gel rotor with a heat pump to achieve air cleaning, heating and ventilation in buildings. The experiments were conducted in a field laboratory and compared a low outdoor air supply rate with CAHP air purification of recirculated air with three different outdoor air supply rates without recirculation or air cleaning. Sensory assessments of perceived air quality and chemical measurements of TVOC concentration were used to evaluate the air-cleaning performance of the CAHP. The results of the experiment showed that the operation of the CAHP significantly improved the perceived air quality in a room polluted by both human bio-effluents and building materials. At the outdoor airflow rate of 2 L/s per person, the indoor air quality with CAHP was equivalent to what was achieved in the same room with 10 L/s per person of outdoor air ventilation without air cleaning. The percentage dissatisfied was as low as 5.2% with the CAHP in operation, based on adapted perception assessment. The outdoor air supply rate can be reduced by 76% by using CAHP, as the Clean Air Delivery Rate (CADR) was over three times the outdoor air supply rate when the CAHP was in operation. The chemical measurements indicated a single-pass efficiency of over 92% for the removal of indoor air pollutants when the regeneration temperature was 60 °C. No VOC accumulation on the desiccant wheel was observed.

General information
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Experimental and numerical analyses on thermal performance of different typologies of PCMs integrated in the roof space

The study investigates the thermal performances of Phase Change Materials (PCM) integrated in a roof space to be used as a residential attic in Torino, Italy. Three different solutions were applied to a roof continuously monitored under summer climatic conditions. The roof was divided into three portions, one, the bare roof, representing the reference case without PCMs, the other two integrating two PCM's typologies with different melting/solidification temperatures range. A numerical model was furthermore developed implementing the equivalent capacitance numerical method to describe the substance phase transition and the measured data set were used for its validation. The study demonstrates that PCM-enhanced components are a promising solution toward a higher thermal performance efficiency in roof attic spaces during the summer season. Experimental results showed a reduction of the ongoing heat peak load between 13% and 59% depending on the PCM typology, highlighting that to reach the expected performance the proper PCM type should be carefully selected.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Politecnico di Torino, University of Padua
Authors: Elarga, H. (Intern), Fantucci, S. (Ekstern), Serra, V. (Ekstern), Zecchin, R. (Ekstern), Benini, E. (Ekstern)
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BFI (2013): BFI-level 2
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ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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Experimental and Numerical Studies of Solar Chimney for Ventilation in Low Energy Buildings

As an effective way to protect environment and save energy in buildings, passive ventilation method has generated intense interest for improving indoor thermal environment in recent years. Among these passive ventilation solutions, design of solar chimney in buildings is a promising approach for guiding natural ventilation orderly. Many studies about solar chimneys have mainly focused on achieving a better ventilation performance both experimentally and theoretically in ideal condition, whereas experimental studies are mainly focused on small-sized equipment. This research examines the performance of a full-scale solar chimney in a real building in Eastern China. The measured performance is compared with theoretical calculation and numerical simulation. In a solar chimney of 6.2m length, 2.8m width and 0.35m air gap, the experimental results show that air flow rate of 70.6 m³/h~1887.6 m³/h can be achieved during the daytime in the testing day. Comparing measured value with theoretical value, the flow rate is generally lower than the theoretical value. By data analysis, the suggested discharge coefficient Cd of solar energy in real engineering project is 0.51. With the use of this suggested value, the simulation results show that during the transition seasons (from April to October), solar chimney can be used for saving energy with an energy saving rate around 14.5% in Shanghai. It is shown solar chimney is an effective approach to save energy for residential buildings in transition seasons in hot summer and cold winter area in China.

General information

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Nanjing University
Authors: Zha, X. (Ekstern), Zhang, J. (Ekstern), Qin, M. (Intern)
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Experimental and Numerical Study of the Effects of Acoustic Sound Absorbers on the Cooling Performance of Thermally Active Building Systems

Free-hanging horizontal and vertical sound absorbers are commonly used in buildings for room acoustic control; however, when these sound absorbers are used in combination with Thermally Active Building Systems, they will decrease the cooling performance of Thermally Active Building Systems and this will affect the thermal indoor environment in that space. Therefore, it is crucial to be able to quantify and model these effects in the design phase.

This study quantifies experimentally the effects of horizontal and vertical free-hanging sound absorbers on the cooling performance of Thermally Active Building Systems and on the thermal indoor environment. The experiments were carried out in a climate chamber configured as a two-person office room. Different ceiling coverage ratios were tested. In addition, a commercially available dynamic building simulation software was used with a recently developed plug-in for acoustic elements, which allows modeling free-hanging horizontal sound absorbers that partially cover the ceiling.

With horizontal sound absorbers, the cooling performance of the Thermally Active Building System decreased by 11%, 23% and 36% for ceiling coverage ratios of 43%, 60% and 80%, respectively. With vertical sound absorbers, the decrease in cooling performance was 8%, 12%, and 14% for the corresponding cases, respectively. The numerical model predicted closely the cooling performance reduction, air temperatures and ceiling surface temperatures in most cases, while there were differences in mean radiant temperatures and cooling capacity coefficients, indicating that the model can be improved in certain aspects.
Experimental and theoretic investigations of thermal behavior of a seasonal water pit heat storage

Seasonal heat storages are considered essential for district heating systems because they offer flexibility for the system to integrate different fluctuating renewable energy sources. Water pit thermal storages (PTES) have been successfully implemented in solar district heating plants in Denmark. Thermal behavior of a 75,000 m³ water pit heat storage in Marstal solar heating plant was investigated experimentally and numerically. Temperatures at different levels of the water pit storage and temperatures at different depths of the ground around the storage were monitored and analyzed. A simulation model of the water pit storage is built to investigate development of temperatures in and around the storage. The calculated temperatures are compared to the monitored temperatures with an aim to validate the simulation model. Thermal stratification in the water pit heat storage and its interaction with the ground are elucidated by calculations using the validated CFD model.

General information
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Authors: Fan, J. (Intern), Huang, J. (Intern), Chatzidiakos, A. (Ekstern), Furbo, S. (Intern)
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Experimental investigations on solar heating/heat pump systems for single family houses

In the period 2013-2017 the project “Experimental investigations on solar heat pump systems for single family houses” is carried out at Department of Civil Engineering, Technical University of Denmark. The aim of this project is to increase the knowledge of the heat and mass transfer in the combined solar heating/heat pump system type when the heat pump makes use of a horizontal ground source heat exchanger. The knowledge is gained by experimental investigations on a solar heating/heat pump system and forms the basis for improved marketed combined solar heating/heat pump systems.

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State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Andersen, E. (Intern), Perers, B. (Intern)
Number of pages: 64
Publication date: 2017

Publication information
Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Electronic): 97887778774804
Original language: English
Main Research Area: Technical/natural sciences

Electronic versions:
Untitled.pdf

Bibliographical note
Report R-385
Source: PublicationPreSubmission
Source-ID: 142081470
Publication: Research › Report – Annual report year: 2017

Experimental study on air cleaning effect of clean air heat pump and its impact on ventilation requirement

This study investigated air purification effect of a Clean-Air Heat Pump (CAHP) which combined a desiccant wheel with a heat pump for both air cleaning and HVAC of buildings. The experiment was conducted in a field lab at four different outdoor air supply rates with and without air cleaning by CAHP. Both sensory assessments of perceived air quality and chemical measurements of TVOC concentrations were conducted for evaluating the air cleaning performance of the CAHP. The results of experiment showed that running the CAHP improved significantly perceived air quality. At 2 L/s per person of outdoor air supply rate with operating the CAHP, the air quality was equivalent to the value at the higher outdoor air supply rate of 10 L/s per person without running CAHP. The TVOC measurements observed over 92% of efficiency on removal of indoor air VOCs
and no VOCs accumulation on the desiccant wheel was observed.

### General Information

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, Tianjin University, Beijing University of Civil Engineering and Architecture  
**Authors:** Fang, L. (Intern), Sheng, Y. (Ekstern), Nie, J. (Ekstern)  
**Publication date:** 2017

**Host publication information**  
**Title of host publication:** Proceedings of Healthy Buildings Europe 2017  
**Article number:** 0047  
**ISBN (Electronic):** 978-83-7947-232-1  
**Main Research Area:** Technical/natural sciences  
**Conference:** Healthy Buildings Europe 2017, Lublin, Poland, 02/07/2017 - 02/07/2017  
**Air purification, Adsorption, Silica gel wheel, VOCs**  
**Source:** PublicationPreSubmission  
**Source-ID:** 138915082  
**Publication:** Research - peer-review › Article in proceedings – Annual report year: 2017

**Experimental study on the influence of different thermal insulation materials on the fire dynamics in a reduced-scale enclosure**

Four scaled (1:5) fire experiments with two identically classified types of commercially available sandwich panels incorporating either stone wool (SW) or poly-isocyanurate (PIR) foam as cores were conducted using a modified version of the ISO 13784-1 (Reaction to fire tests for sandwich panel building systems — Part 1: Small room test) standard. This was to assess the suitability of scaled experiments for assessing sandwich panel fire behavior. In the modified version of the test standard (scaled and full experiments), the fire severity was increased to simulate fires that could occur in commercial premises. This was achieved by prolonging and doubling the heat release rate output of the gas burner at the end of the experiments. Furthermore, non-structural damages such as screw-hole damages were applied to the enclosures to reflect real life observations.

The results showed differences in the fire behavior, depending on whether the enclosures were constructed of panels filled with SW or PIR insulation material. The mass losses of the insulation materials showed significant contribution from the PIR cores, regardless of fire load and the non-structural damage.

The qualitative behavior with respect to the “flashover” failure criterion, as stated in the ISO 13784-1, was successfully obtained in all of the scaled experiments. As such, the scaled experiments mimicked the behavior of the full scale SW experiments to a satisfactory degree. However, the PIR compartments failed considerably earlier in the full scale tests than in the scaled experiments. Therefore, it can be concluded that when the energy contribution from the core material remained negligible compared to the gas burner, the measured parameters matched quite well. Therefore, if the insulating core material does not dominate the fire dynamics of the compartment and the energy from the gas burner dictates the fire scenario then the scaled set-up will predict the temperature in the full scale compartment. Based on this and with further development with respect to, especially, time, this kind of scaled experiments could be a valuable testing method for assessment of the behavior of sandwich panel, and therefore merit further studies and eventually increased use.

### General Information

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Building Design, Technical University of Denmark  
**Authors:** Leisted, R. R. (Intern), Sørensen, M. X. (Ekstern), Jomaas, G. (Intern)  
**Pages:** 114-125  
**Publication date:** 2017  
**Main Research Area:** Technical/natural sciences

**Publication information**  
**Journal:** Fire Safety Journal  
**Volume:** 93  
**ISSN (Print):** 0379-7112  
**Ratings:**  
**BFI (2018):** BFI-level 1  
**Web of Science (2018):** Indexed yes  
**BFI (2017):** BFI-level 1  
**Web of Science (2017):** Indexed yes  
**BFI (2016):** BFI-level 1  
**Scopus rating (2016):** CiteScore 2.03 SJR 0.932 SNIP 1.627  
**BFI (2015):** BFI-level 1  
**Scopus rating (2015):** SJR 0.887 SNIP 1.518 CiteScore 1.69
Exploratory studies of substitutions in the tetrahedrite/tennantite-goldfieldite solid solution

Phases on the Fe-tetrahedrite-goldfieldite and Fe-tennantite-goldfieldite joins were synthesized from high purity elements in evacuated silica glass tubes at 450 °C and analyzed using electron microprobe analysis and X-ray powder diffraction. The synthetic studies confirm that the compositions on these joins are determined by a (formal) interplay of the $\text{Fe}^{3+} + \text{Cu}^{+} \rightarrow 2\text{Fe}^{2+}$, $\text{Cu}^{++}\text{Te}^{4+} \rightarrow \text{Fe}^{2+} + (\text{Sb,As})_{3}^{+}$, $\text{Cu}^{++}2\text{Te}^{4+} \rightarrow \text{Fe}^{3+} + 2(\text{Sb,As})_{3}^{+}$, and $\text{Cu}^{++}\text{Te}^{4+} \rightarrow \text{Cu}^{2+} + (\text{Sb,As})_{3}^{+}$ substitutions, and also for the region close to Te = 2 apfu by $\text{A} + \text{Te}^{4+} \rightarrow \text{Cu}^{++} \text{Sb}^{3+}$. The latter exchange determines the Te-tennantite/tetrahedrite-goldfieldite join. For the region of goldfieldite just above and below 2 Te atoms pfu, the latter exchange is modified by the $\text{Fe}^{n+} \rightarrow n\text{Cu}^{+}$ exchange. The $2\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{Cu}^{+}$ exchange causes an arc-like retreat of the composition field away from the linear $\text{Cu}^{++} + \text{Te}^{4+} \rightarrow \text{Fe}^{2+} + (\text{Sb,As})_{3}^{+}$ boundary. Incomplete elimination of Fe, compensated by early onset of Cu vacancies, results in a gradual transition between the region of tellurian td/tn and goldfieldite sensu stricto. This variety of substitution and omission mechanisms determines the proportions of alternative endmembers and intermediate members: $\text{Cu}_{10}\text{Fe}^{2+}_{2}(\text{Sb,As})_{13}$, $\text{Cu}_{11}\text{Fe}^{3+}(\text{Sb,As})_{13}$, $\text{Cu}_{12}\text{Te}_{2}(\text{Sb,As})_{13}$, and $\text{Cu}_{10}\text{Te}_{2}\text{S}_{13}$, plus a measure of the $\text{Fe}^{n+} \rightarrow n\text{Cu}^{+}$ exchange. Natural goldfieldite conforms with the synthesis results in its compositional extent. The natural data are mostly not good or complete enough to examine the compositional details suggested here because the calculations described above are very sensitive to the quality of the analyses.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, University of Copenhagen
Exploratory studies of the Cu–Pd–Se system at 650 °C, 550 °C, 400 °C, and 300 °C

The condensed-phase system Cu–Pd–Se was investigated by means of dry syntheses from elements in evacuated silica glass tubes at 650 °C, 550 °C, 400 °C, and 300 °C. Synthesized phases were analysed by electron microprobe and textural studies in polished sections. At 650 °C an extensive selenide liquid field covers central portions of the system, coexisting with a limited choice of Pd selenides, Cu$_{2-x}$Se, alloys, and a (Cu,Pd)Se$_2$ solid solution. The selenide melt recedes to the Pd side of the system at 550 °C and its remnants persist at 400 °C. At the lower temperature, the gamut of Pd selenides becomes richer, and especially Pd$_4$Se and Pd$_{17}$Se$_{15}$ display significant solubility of Cu. The composition range of (Cu,Pd)Se$_2$ broadens and moves towards Cu-richer compositions as temperature decreases; CuSe and CuSe$_2$ appear at 300 °C. The synthetic analogue of jaguéite, Cu$_{2}$Pd$_3$Se$_4$, is present at 400 °C and 300 °C, at Se concentrations above the Cu$_{2-x}$Se–Pd$_{17}$Se$_{15}$ line. At all examined temperatures, the individualized CuPd alloy dissolves Se, up to ~5 at% at low temperatures.
Faecal bacteria on seaweeds in Greenland

General information
State: Published
Organisations: National Food Institute, Research Group for Bioactives – Analysis and Application, Research Group for Analytical and Predictive Microbiology, Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Kreissig, K. J. (Intern), Hansen, L. T. (Intern), Jensen, P. E. (Intern)
Number of pages: 1
Publication date: 2017
Event: Poster session presented at 7th Nordic seaweed conference, Grenaa, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Nordic_Seaweed_Conference_KJKR_poster_final.pdf
Source: PublicationPreSubmission
Source-ID: 140631782
Publication: Research - peer-review › Poster – Annual report year: 2017

Fatigue Model for the Structural Integrity Evaluation Applied to a Wind Turbine Concrete Shaft, Considering Corrosion and Freeze and Thaw Degradation

Fatigue is one of the principal damage mechanisms in a slender concrete structure under cyclic loads. And needs to be calculated locally through all the structure, considering the lading conditions and the particularities of concrete. The model presented here is capable to account for the fatigue damage in a probabilistic way, relating the annual loading conditions for each point and the degradation processes with a probability of failure. The methodology is as well capable to model the effect of a repair and control the structural integrity using the monitored data.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, CSIC
Authors: Saucedo-Mora, L. (Ekstern), Thöns, S. (Intern)
Pages: 2144-2151
Publication date: 2017
Host publication information
Publisher: Springer
Main Research Area: Technical/natural sciences
Conference: fib Symposium 2017, Maastricht, Netherlands, 12/06/2017 - 12/06/2017
Fatigue, Degradation, Concrete, Probability of failure
DOIs:
10.1007/978-3-319-59471-2_245
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

FEM Modelling of Lateral-Torsional Buckling Using Shell and Solid Elements

The paper describes two methods of FEM modelling of I-section beams loaded by bending moments. Series of random realizations with initial imperfections following the first eigenmode of lateral-torsional buckling were created. Two independent FEM software products were used for analyses of resistance. At the end the difference and correlation

Scopus rating (2004): SJR 1.011 SNIP 1.09
Scopus rating (2003): SJR 0.985 SNIP 0.86
Scopus rating (2002): SJR 1.114 SNIP 1.211
Scopus rating (2001): SJR 1.32 SNIP 1.356
Scopus rating (2000): SJR 1.475 SNIP 1.619
Scopus rating (1999): SJR 1.26 SNIP 1.343
Original language: English
Cu–Pd–Se system, Cu–Pd selenides, Cu–Pd alloys, Selenide melt, Jaguéite, Oosterboschite, Phase relations, Synthesis, Copper, Palladium, Selenium
DOIs:
10.1127/ejm/2017/0029-2651
Source: FindIt
Source-ID: 2390539289
Publication: Research - peer-review › Journal article – Annual report year: 2017
between the results as well as advantages and disadvantages of both methods are discussed.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Brno University of Technology
Authors: Valeš, J. (Ekstern), Stan, T. (Intern)
Pages: 464-471
Publication date: 2017
Main Research Area: Technical/natural sciences

Publications information
Journal: Procedia Engineering
Volume: 190
ISSN (Print): 1877-7058
Ratings:
- Web of Science (2017): Indexed yes
- Scopus rating (2016): CiteScore 0.74
- Scopus rating (2015): CiteScore 0.56
- Scopus rating (2014): CiteScore 0.53
- Scopus rating (2013): CiteScore 0.4
- ISI indexed (2013): ISI indexed no
- Scopus rating (2012): CiteScore 0.28
- ISI indexed (2012): ISI indexed no
- Scopus rating (2011): CiteScore 0.45
- ISI indexed (2011): ISI indexed no
- Web of Science (2010): Indexed yes
Original language: English
Imperfection, Beam, Steel, Lateral-torsional buckling, FE modelling, Stability
Electronic versions:
- filestore_12_.pdf
DOIs:
- 10.1016/j.proeng.2017.05.365

Bibliographical note
Under a Creative Commons license
Source: FindIt
Source-ID: 2371026816
Publication: Research - peer-review » Journal article – Annual report year: 2017

Firefighter nozzle reaction
Nozzle reaction and hose tension are analyzed using conservation of fluid momentum and assuming steady, inviscid flow and a flexible hose in frictionless contact with the ground. An expression that is independent of the bend angle is derived for the hose tension. If this tension is exceeded owing to anchor forces, the hose becomes straight. The nozzle reaction is found to equal the jet momentum flow rate, and it does not change when an elbow connects the hose to the nozzle. A forward force must be exerted by a firefighter or another anchor that matches the forward force that the jet would exert on a perpendicular wall. Three reaction expressions are derived, allowing it to be determined in terms of hose diameter, jet diameter, flow rate, and static pressure upstream of the nozzle. The nozzle reaction predictions used by the fire service are 56% to 90% of those obtained here for typical firefighting hand lines. Sharing these findings with the fire protection community can improve the safety of firefighters.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, University of Maryland
Authors: Chin, S. K. (Ekstern), Sunderland, P. B. (Ekstern), Jomaas, G. (Intern)
Number of pages: 11
Pages: 1907-1917
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Fire Technology
Volume: 53
Issue number: 5
Fire-induced re-radiation underneath photovoltaic arrays on flat roofs

The impact of the reflection of fire-induced heat from a gas burner was studied experimentally to gain knowledge on the interaction between photovoltaic (PV) panels and a fire. The heat flux was measured in a total of eight points at the same level as the top of the gas burner. The gas burner was placed underneath the centre of a PV panel and the eight points were measured in symmetrical pairs of two at four different distances from the burner. The heat release rate from the gas burner was increased stepwise every four minutes. The measurements were made underneath a PV panel installed in a
geometry similar to a commercial East-West orientated mounting system and was compared to a baseline test without the re-reflection from the PV panel. A significant increase of the received heat flux was noticed and the trend indicated an ascending percentage-wise difference as a function of an increased heat release rate. Contrary to the basic view factor theory, the received heat flux was higher underneath the most elevated part of the PV panel, and this occurred due to two important flame related reasons: 1) the deflection of the flame towards the most elevated part of the panel, resulting in an increased amount of radiation from the flame towards the surface; 2) A non-homogeneous distribution of the temperature on the PV panel surface, due to the deflected flame, and thereby a non-homogeneous emission from the heated PV panel. Finally, it was seen that two similar tests conducted with respectively a brand new PV panel and a PV panel tested for the fourth time, showed very comparable results, except during the period when the thin combustible film underneath the new PV panel was burning. This resulted in a higher heat flux during that period and implies that the results presented herein are conservative in that they are lower than what can be expected in case of a real fire hazard, where the PV panel is by definition involved in the fire for the first time. It can be concluded that PV panels can have a significant contribution in roof fires, as they stimulate fire spread over the roof on which they have been mounted. These findings emphasise that the risk related to the installation of PV panels is not only associated with the increased fire load and possibility of ignition, but largely also with the changed fire dynamic surroundings of the roof construction.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark, Ghent University
Authors: Steemann Kristensen, J. (Ekstern), Merci, B. (Ekstern), Jomaas, G. (Intern)
Number of pages: 13
Pages: 34-43
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the Fire and Materials 2017 Conference
Place of publication: San Francisco, USA
Publisher: Interscience Communications
Main Research Area: Technical/natural sciences
Conference: 15th International Conference Fire and Materials 2017, San Francisco, United States, 06/02/2017 - 06/02/2017
Electronic versions:
FAM_Kristensen_Merci_Jomaas_accepted_by_FAM.pdf
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Fire resistance of extruded hollow-core slabs
Purpose – Prefabricated extruded hollow-core slabs are preferred building components for floor structures in several countries. It is therefore important to be able to document the fire resistance of these slabs proving fulfilment of standard fire resistance requirements of 60 and 120 min found in most national building regulations. The paper aims to present a detailed analysis of the mechanisms responsible for the loss of loadbearing capacity of hollow-core slabs when exposed to fire.

Design/methodology/approach – Furthermore, it compares theoretica calculation and assessment according to the structural codes with data derived from a standard fire test and from a thorough examination of the comprehensive test documentation available on fire exposed hollow-core slabs.

Findings – Mechanisms for loss of load-bearing capacity are clarified, and evidence of the fire resistance is found.

Originality value – For the first time, the mechanisms responsible for loss of load-bearing capacity are identified, and test results and calculation approach are for the first time applied in accordance with each other for assessment of fire resistance of the structure.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Aalborg University
Authors: Hertz, K. D. (Intern), Sørensen, L. S. (Intern), Giuliani, L. (Intern)
Number of pages: 13
Pages: 324-336
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Structural Fire Engineering
Volume: 8
Issue number: 3
ISSN (Print): 2040-2317
Ratings:
Dette notat er udarbejdet som del af InnoBYG spireprojektet: Fleretagers Træhuse i Danmark – Er det muligt og hvad mangler?

Det overordnede mål med projektet er, at skabe et langsigtet fundament for større anvendelse af træ i fleretagers byggeri i Danmark og gøre træ til et mere naturligt valg for byggeriets parter i forhold til fleretagers byggerier, end det er i dag. Projektdeltagerne har gennem egen erfaring, litteratur, workshops, interviews, nationale og internationale studieture samlet viden om mulighederne og udfordringerne ved at anvende træ i fleretagers byggeri. Resultaterne af dette arbejde er samlet i notater forfattet af forskellige aktører deltagende i InnoBYG spireprojektet. Projektet er udført i et samarbejde mellem Teknologisk Institut (DTI - projektleder), Danmarks Tekniske Universitet (DTU), Dansk Brand- og Sikringsteknisk Institut (DBI) samt en række virksomheder og brancheorganisationer med relation til byggebranchen. Projektet er forløbet i perioden januar 2016 – december 2016.

Flooding of North Sea chalk and greensand cores with specific brines

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, CERE – Center for Energy Resources Engineering, Department of Chemical and Biochemical Engineering, Department of Chemistry
FOMO, LOL, BSc og MSc

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern)
Pages: 6-6
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: H V A C Magasinet
Volume: 53
Issue number: 12
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
Leder_Studerendes_engagement.pdf
Source: PublicationPreSubmission
Source-ID: 140016219
Publication: Research › Editorial – Annual report year: 2017

Food production and exports in the Arctic island operated society - Qaanaaq an example

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
Publication date: 2017
Event: Abstract from 9th International Congress of Arctic Social Sciences, Umeå, Sweden.
Main Research Area: Technical/natural sciences

Publication information
Journal: H V A C Magasinet
Volume: 53
Issue number: 12
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
Leder_Studerendes_engagement.pdf
Source: PublicationPreSubmission
Source-ID: 139562304
Publication: Research › Conference abstract for conference – Annual report year: 2017

Formation evaluation

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Fabricius, I. L. (Intern), Engstrøm, F. (Ekstern)
Pages: 175-191
Publication date: 2017

Host publication information
Title of host publication: North Sea Chalk
Publisher: Joint Chalk Research
ISBN (Electronic): 978-82-7644-733-0
Chapter: 12
**Full-scale load tests of Pearl-Chain arches**

A full-scale load test is made of two Pearl-Chain (PC) concrete arches in order to evaluate the structural response and assess the design safety. Pearl-Chain structures and Pearl-Chain arches are invented and patented at the Technical University of Denmark. PC-Arches consist of specially designed, pre-fabricated, composite, lightweight, concrete deck elements (SL-Decks), that are post-tensioned together into an arch shape. The two Pearl-Chain arches, each with a span of 13m and a rise of 1m, were placed on a post tensioned bearing plate prepared in advance. The arches are tested with load control by applying a gravity load to a quarter point of the span since a single load in the quarter point is found to be the decisive load case for an analytical design of such relatively short bridges. The test is completed in two tempi in order to determine the behavior of an arch formed with SL-Decks: First an investigation of the system’s elastic response (maximum load of 648kN), and second a demonstration of its collapse mechanism and ultimate capacity (maximum load of 970kN). The full-scale test showed formation of plastic hinges and clear warning signs are observed at 84% of the failure load. The ultimate, experimental load capacity is 14% higher than the calculated mainly due to the assumed static system used for the calculation. In addition to the full-scale test bridge the first ever permanent PC-Bridge is erected in Denmark in 2015.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, University of Washington
Authors: Halding, P. S. (Intern), Hertz, K. D. (Intern), Schmidt, J. W. (Intern), Kennedy, B. J. (Ekstern)
Number of pages: 14
Pages: 101-114
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Engineering Structures
Volume: 131
ISSN (Print): 0141-0296
Ratings:

- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 2.93 SJR 1.578 SNIP 2.048
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 1.696 SNIP 2.195 CiteScore 2.59
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 1.756 SNIP 2.56 CiteScore 2.4
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 2.049 SNIP 2.853 CiteScore 2.69
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 1.855 SNIP 2.627 CiteScore 2.23
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 1.7 SNIP 2.735 CiteScore 2.26
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
Full Scale Measurements and CFD Investigations of a Wall Radiant Cooling System Based on Plastic Capillary Tubes in Thin Concrete Walls

Densely occupied spaces such as classrooms can very often have problems with overheating. It can be difficult to cool such spaces by means of a ventilation system without creating draughts and causing discomfort for occupants. The use of a wall radiant cooling system is a suitable option for spaces with a high occupant density. Radiant systems can remove most sensible heat loads resulting in a relatively small requirement for supply air for ventilation.

Full-scale, Pearl-Chain arches, Ultimate capacity, Arch bridge, Concrete, Post-tensioning, Structural behavior, Plastic hinges, Super-Light Deck elements, Testing to failure

Original language: English

Source: FindIt
Source-ID: 2348617570
Publication: Research - peer-review › Journal article – Annual report year: 2017

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Danfoss A/S, Aalto University, VTT - Technical Research Centre of Finland, University of Stuttgart, Hochschule fur Technik Stuttgart - University of Applied Sciences Stuttgart, AQVF - Energy Efficiency Association for heating, cooling and CHP, Fraunhofer Institute for Wind Energy and Energy System Technology (IWES), Norwegian University of Science and Technology, Korea Institute of Energy Research, Uponor AB, Building Research Establishment Ltd.
General cracked-hinge model for simulation of low-cycle damage in cemented beams on soil

The need for mechanistic constitutive models to evaluate the complex interaction between concrete crack propagation, geometry and soil foundation in concrete- and composite pavement systems has been recognized. Several models developed are either too complex or designed to solve relatively simple problems, e.g. limited to one type of load configuration or test set-up. In order to develop a general and mechanistic modeling framework for non-linear analysis of low-cycle damage in cemented materials, this paper presents a cracked-hinge model aimed at the analysis of the bending fracture of the cemented material. The model is based on the fracture mechanics concepts of the fictitious crack model. The proposed hinge is described in a general and consistent format, allowing for any type of stress-crack opening relationship and unloading-reloading formulation. The functionality of the proposed hinge model is compared to numerical- and experimental results. The proposed hinge shows good performance and seems promising for the description of low-cycle fracture behavior in cemented materials.
Geotechnical challenges for establishing an Aquifer Thermal Energy Storage (ATES) in the greater Copenhagen area (Zealand, Denmark).

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Enopsol ApS
Authors: Paci, L. (Intern), Rocchi, I. (Intern), Sørensen, S. (Ekstern), Fabricius, I. L. (Intern)
Number of pages: 1
Publication date: 2017

Host publication information
Title of host publication: Book of Abstracts, Sustain 2017
Publisher: Technical University of Denmark (DTU)
Article number: E-15
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Greenland - far from reaching The United Nations Millennium Development Goal - Why?

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
Publication date: 2017
Event: Abstract from Water Innovations for Healthy Arctic Homes, Anchorage, United States.
Main Research Area: Technical/natural sciences
Electronic versions:
Source: PublicationPreSubmission
Source-ID: 139562616
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Greenlandic water and sanitation—a context oriented analysis of system challenges towards local sustainable development

Today, as Greenland focuses on more economic and cultural autonomy, the continued development of societal infrastructure systems is vital. At the same time, pressure is put on the systems by a lack of financial resources and locally based professional competences as well as new market-based forms of organization. Against this background, the article discusses the challenges facing Greenland's self-rule in relation to further develop the existing water and wastewater systems so that they can contribute to the sustainable development of Greenland. The article reviews the historical development of the water supply and wastewater system. This leads to an analysis of the sectorisation, which in recent decades has reorganized the Greenlandic infrastructures, and of how this process is influencing local sustainable development. The article discusses the socio-economic and human impacts and points to the need for developing the water and sanitation system to support not only hygiene and health, but also local sustainable development.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalborg University
Authors: Hendriksen, K. (Intern), Hoffmann, B. (Ekstern)
Number of pages: 11
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Environmental Science and Pollution Research
ISSN (Print): 0944-1344
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.66 SJR 0.813 SNIP 1.048
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.879 SNIP 1.02 CiteScore 2.5
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.949 SNIP 1.178 CiteScore 2.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.879 SNIP 1.163 CiteScore 2.34
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Greenlandic water and sanitation systems-identifying system constellation and challenges

A good water supply and wastewater management is essential for a local sustainable community development. This is emphasized in the new global goals of the UN Sustainable Development, where the sixth objective is to: "Ensure availability and sustainable management of water and sanitation for all" (United Nations 2015). This obviously raises the question of how this can be achieved considering the very different conditions and cultures around the globe. This article presents the Greenlandic context and elucidates the current Greenland water supply system and wastewater management system from a socio-technical approach, focusing on the geographic, climatic and cultural challenges. The article identifies a diverse set of system constellations in different parts of Greenland and concludes with a discussion of health and quality of life implications.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalborg University
Authors: Hendriksen, K. (Intern), Hoffmann, B. (Ekstern)
Number of pages: 11
Publication date: 2017
Main Research Area: Technical/natural sciences
Growth of organic films on indoor surfaces
We present a model for the growth of organic films on impermeable indoor surfaces. The model couples transport through a gas-side boundary layer adjacent to the surface with equilibrium partitioning of semivolatile organic compounds (SVOCs) between the gas phase and the surface film. Model predictions indicate that film growth would primarily be influenced by the gas-phase concentration of SVOCs with octanol-air partitioning (Koa) values in the approximate range $10 \leq \log K_{oa} \leq 13$. Within the relevant range, SVOCs with lower values will equilibrate with the surface film more rapidly. Over time, the film becomes relatively enriched in species with higher log Koa values, while the proportion of gas-phase SVOCs not in equilibrium with the film decreases. Given stable airborne SVOC concentrations, films grow at faster rates initially and then subsequently diminish to an almost steady growth rate. Once an SVOC is equilibrated with the film, its mass per unit film volume remains constant, while its mass per unit area increases in proportion to overall film thickness. The predictions of the conceptual model and its mathematical embodiment are generally consistent with results reported in the peer-reviewed literature.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of California at Berkeley
Authors: Weschler, C. J. (Intern), Nazaroff, W. W. (Ekstern)
Number of pages: 12
Pages: 1101-1112
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Indoor Air
Volume: 27
Issue number: 6
ISSN (Print): 0905-6947
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.55
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.88
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 4.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.63
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.42
ISI indexed (2011): ISI indexed yes
Heating of indoor swimming pools by solar thermal collectors in summerhouses in Denmark

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Department of Applied Mathematics and Computer Science, Dynamical Systems, Centre for IT-Intelligent Energy Systems in Cities, Eurisco Aps.
Authors: Dannemand, M. (Intern), Furbo, S. (Intern), Andersen, C. A. (Ekstern), Heller, A. (Intern), Madsen, H. (Intern)
Number of pages: 38
Publication date: 2017

Publication information
Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Print): 97887778774606
Original language: English

Series: DTU Byg Sagsrapport
Number: R-366
Main Research Area: Technical/natural sciences
Electronic versions: Untitled_32.pdf
Source: PublicationPreSubmission
Source-ID: 128931966
Publication: Research › Report – Annual report year: 2017

High Temperature Energy Storage – HTES project: Geotechnics and Geology section.
This research is part of the EUDP funded project HTES that aims at demonstrating the successful employment of Underground Thermal Energy Storage (UTES) in the subsurface of Copenhagen with a focus on the Chalk Group. The study investigates the geotechnical and petrophysical properties (i.e. stiffness and porosity) of the medium depth (800mbgl) Chalk Group. The majority of the geotechnical data available covers shallow depth, while deep well log data are fewer and of variable quality. In order to overcome the lack of information, this work evaluates the possibility to use Dan field in the central North Sea as an analogue for the chalk in Zealand comparing the effective stress and elastic moduli at the two locations. The maximum experienced effective stress for the formation is the same at the two geographical locations, which currently have different effective stress due to uplift and erosion of Zealand during the Neogene. The
results shown were obtained calculating the maximum effective stress based on the burial anomaly as studied by Japsen (1998). In addition, the elastic moduli were calculated using the bulk density and the elastic P-wave velocity log data by means of the iso-frame model proposed by Fabricius (2003). The model allows us to estimate the elastic moduli by comparing the elastic modulus obtained by elastic P-wave measurements with the theoretical one obtained under the assumptions of either particles in suspension or cemented particles constituting a frame.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Paci, L. (Intern), Rocchi, I. (Intern), Fabricius, I. L. (Intern)
Number of pages: 25
Publication date: 2017

Publication information
Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Electronic): 9788778774842
Original language: English
Series: DTU Civil Engineering Reports
Number: R-389
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 142993957
Publication: Research › Report – Annual report year: 2018

How accurate are estimates of glacier ice thickness? Results from ITMIX, the Ice Thickness Models Intercomparison eXperiment
Knowledge of the ice thickness distribution of glaciers and ice caps is an important prerequisite for many glaciological and hydrological investigations. A wealth of approaches has recently been presented for inferring ice thickness from characteristics of the surface. With the Ice Thickness Models Intercomparison eXperiment (ITMIX) we performed the first coordinated assessment quantifying individual model performance. A set of 17 different models showed that individual ice thickness estimates can differ considerably - locally by a spread comparable to the observed thickness. Averaging the results of multiple models, however, significantly improved the results: on average over the 21 considered test cases, comparison against direct ice thickness measurements revealed deviations on the order of 10 +/- 24% of the mean ice thickness (1 sigma estimate). Models relying on multiple data sets - such as surface ice velocity fields, surface mass balance, or rates of ice thickness change - showed high sensitivity to input data quality. Together with the requirement of being able to handle large regions in an automated fashion, the capacity of better accounting for uncertainties in the input data will be a key for an improved next generation of ice thickness estimation approaches.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Swiss Federal Institute of Technology, Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), University of Alaska Fairbanks, University of British Columbia, Friedrich-Alexander University Erlangen-Nuremberg, University of Zurich, Indian Institute of Science, Universite Grenoble Alpes, University of California at Irvine, University of Oslo, Natural Environmental Research Council, University of Innsbruck, Indian Institute of Technology, Bombay, Utrecht University, Uppsala University, Victoria University of Wellington, University of Cambridge, Zentralanstalt für Meteorologie und Geodämiik, Austrian Academy of Sciences, Russian Academy of Sciences, Chinese Academy of Sciences, Norwegian Water Resources and Energy Directorate
Number of pages: 22
Pages: 949-970
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
How does sustainability certification affect the design process? Mapping final design projects at an architectural office

The context of the study is the very strict regulation of energy consumption for operating buildings in Denmark. It is difficult to meet the requirements by system optimisation in the final design phase, so recent research has focused on ways of meeting the target by adapting the whole design process and informing the industry of them. This has led to optimised design processes such as Integrated Energy Design, in which many decisions related to energy consumption and indoor climate are made in the early design stages. The current tendency is to use an expanded notion of sustainability, derived from the sustainability certification system itself, and to apply it even in the early design process. This perspective emphasises all phases of the life cycle of a building. The goal of the present study was to map how a Danish architectural office approached sustainability in the projects they undertook in the course of a year. All the projects concerned were intended to conform to the German Sustainability Certification System DGNB. We developed a mapping tool to document these case projects and found that different sets of certification criteria were used in each project. This demonstrates the complexity of using them as design parameters in practice, but also that it was successfully achieved.

General information
How Pore Filling Shale Affects Elastic Wave Velocities in Fully and Partially Saturated Sandstone: Characterization, Measurement, and Modelling

The elastic bulk modulus of a sandstone is affected by the fluid saturation as compression induces a pressure in the fluid thus increasing the bulk modulus of the sandstone as a whole. Assuming a uniform induced pressure and no interaction between the saturating fluid and the solid rock the fluid contribution to the elastic bulk modulus is quantified by Gassmann's equations. Experimental measurements of the fluid contribution to the elastic moduli are, however often much larger than predicted within the assumptions of Gassmann. Clay-rich low-mobility sandstones are especially prone to having elastic moduli highly sensitive to the fluid saturation. The presence of clay in a sandstone can affect two of the underlying assumptions to Gassmann's equations: decreased fluid mobility can cause pressure gradients and fluid-clay interactions are common. The elastic and petrophysical properties of clay are not well defined and the consequent parameter fitting makes both effects viable when modelling elastic moduli measured on fully saturated sandstones. To address this question, we conduct a thorough characterization of a suite of sandstones and measure their elastic moduli at different saturations. We supplement the data with low field NMR spectra at each saturation step to determine if any anomalous effects are associated with the fluid mobility and distribution in the pore-space. We find anomalous fluid contributions to the elastic moduli in sandstones with high clay contents. We also find that the anomalous fluid contributions are closely linked to the fluid distribution in the pore-space, meaning that pressure gradients associated with the presence of clay is more significant than fluid-clay interactions.
Hybrid Simulation of Composite Structures

Hybrid simulation is a substructural method combining a numerical simulation with a physical experiment. A structure is thereby simulated under the assumption that a substructure’s response is well known and easily modelled while a given substructure is studied more accurately in a physical experiment. The technique has primarily been used within earthquake engineering but many other fields of engineering have utilized the method with benefit. However, these previous efforts have focused on structures with a simple boundary between the numerical and physical substructure i.e. few degrees of freedom. In this dissertation the main focus is to develop hybrid simulation for composite structures e.g.
wind turbine blades where the boundary between the numerical model and the physical experiment is continues i.e. in principal infinite amount of degrees of freedom. This highly complicates the transfer system and the control and monitoring techniques in the shared boundary is therefore a key issue in this type of hybrid simulation. During the research, hybrid simulation platforms have been programmed capable of running on different time scales with advanced control and monitoring techniques at the shared boundary. The hybrid simulation programs have been tested on different simple composite structures and they have proven able to increase the accuracy in tests with a complex transfer system.

**General information**

State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics, Department of Wind Energy, Wind Turbine Structures and Component Design, Department of Civil Engineering, Section for Building Design, Section for Structural Engineering
Authors: Høgh, J. H. (Intern), Berggreen, C. (Intern), Branner, K. (Intern), Schmidt, J. W. (Intern), Stang, H. (Intern)
Number of pages: 136
Publication date: 2017

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Series: DCAMM Special Report
Number: S220
ISSN: 0903-1685
Main Research Area: Technical/natural sciences
Electronic versions:
S220_Jacob_Herold_H_gh_PhD_Thesis.pdf

**Relations**

Projects:

Hybrid Simulation of Composite Structures
Publication: Research › Ph.D. thesis – Annual report year: 2017

**Ice & Fire: the Burning Question**

With the Arctic opening up to new shipping routes and increased oil exploration and production due to climate change, the risk of an Arctic oil spill is increasing. Of the classic oil spill response methods (mechanical recovery, dispersants and in-situ burning), in-situ burning is considered to be particularly a suitable response method in the Arctic. In-situ burning aims to remove the oil from the marine environment by burning it from the water surface. A recent Ph.D. thesis from the Technical University of Denmark has provided some new insights with respect to the fire science behind this response method.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: van Gelderen, L. (Intern), Jomaas, G. (Intern)
Pages: 26-27
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Frontier Energy
Issue number: Spring 2017
ISSN (Print): 2047-3702
Original language: English
Links:
https://issuu.com/frontierenergy/docs/fe_17spring_17_lr
Source: PublicationPreSubmission
Source-ID: 132516285
Publication: Communication › Journal article – Annual report year: 2017

**Ice-margin and meltwater dynamics during the mid-Holocene in the Kangerlussuaq area of west Greenland**

Land-terminating parts of the west Greenland ice sheet have exhibited highly dynamic meltwater regimes over the last few decades including episodes of extremely intense runoff driven by ice surface ablation, ponding of meltwater in an increasing number and size of lakes, and sudden outburst floods, or jokulhlaups’, from these lakes. However, whether this
meltwater runoff regime is unusual in a Holocene context has not been questioned. This study assembled high-resolution topographical data, geological and landcover data, and produced a glacial geomorphological map covering similar to 1200km². Digital analysis of the landforms reveals a mid-Holocene land-terminating ice margin that was predominantly cold-based. This ice margin underwent sustained active retreat but with multiple minor advances. Over c.1000 years meltwater runoff became impounded within numerous and extensive proglacial lakes and there were temporary connections between some of these lakes via spillways. The ice-dams of some of these lakes had several quasi-stable thicknesses. Meltwater was apparently predominantly from supraglacial sources although some distributary palaeochannel networks and some larger bedrock palaeochannels most likely relate to mid-Holocene subglacial hydrology. In comparison to the geomorphological record at other Northern Hemisphere ice-sheet margins the depositional landforms in this study area are few in number and variety and small in scale, most likely due to a restricted sediment supply. They include perched fans and deltas and perched braidplain terraces. Overall, meltwater sourcing, routing and the proglacial runoff regime during the mid-Holocene in this land-terminating part of the ice sheet was spatiotemporally variable, but in a manner very similar to that of the present day.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Leeds, Sogn og Fjordane University College, Newcastle University
Authors: Carrivick, J. L. (Ekstern), Yde, J. (Ekstern), Russell, A. J. (Ekstern), Quincey, D. J. (Ekstern), Ingeman-Nielsen, T. (Intern), Mallalieu, J. (Ekstern)
Number of pages: 19
Pages: 369-387
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Boreas
Volume: 46
Issue number: 3
ISSN (Print): 0300-9483
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.45 SJR 1.042 SNIP 1.09
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.606 SNIP 1.178 CiteScore 2.79
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.32 SNIP 1.284 CiteScore 2.27
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.509 SNIP 1.099 CiteScore 2.6
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.864 SNIP 1.268 CiteScore 2.61
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.738 SNIP 1.32 CiteScore 2.83
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.445 SNIP 1.263
BFI (2009): BFI-level 1
Impact of Building Design Parameters on Thermal Energy Flexibility in a Low-Energy Building

This work focuses on demand-side management potential for the heating grid in residential buildings. The possibility to increase the flexibility provided to the heat network through specific building design is investigated. The role of different parts of the building structure on thermal flexibility is assessed through a parameter variation on a building model. Different building designs are subjected to heat cut-offs, and flexibility is evaluated with respect to comfort preservation and heating power peak creation.

Under the conditions of this study, the thermal transmittance of the envelope appears to have the largest impact on thermal flexibility. The importance of window design, namely the size, U-value and orientation, is underlined due to its critical influence on solar gains and heat losses. It is eventually observed that thermal mass has a secondary influence on the evaluated indicators; its variation only affects thermal flexibility if the thermal resistance of the envelope is sufficient.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Sarran, L. (Ekstern), Foteinaki, K. (Intern), Gianniou, P. (Intern), Rode, C. (Intern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 138750381
Publication: Research - peer-review › Paper – Annual report year: 2017

Impact of Prosumers and their Clusters on the Energy System

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Department of Energy Conversion and Storage, Centre for IT-Intelligent Energy Systems in Cities
Authors: Larma, M. (Intern), Heller, A. (Intern), Pedersen, A. S. (Intern)
Number of pages: 1
Publication date: 2017
Event: Poster session presented at Fourth General CITIES Consortium Meeting, Aarhus, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 132795158
Impact of Weather and Occupancy on Energy Flexibility Potential of a Low-energy Building

The introduction of renewable energy sources in the energy market leads to instability of the energy system itself; therefore, new solutions to increase its flexibility will become more common in the coming years. In this context the implementation of energy flexibility in buildings is evaluated, using heat storage in the building mass. This study focuses on the influence of weather conditions and internal gains on the energy flexibility potential of a nearly-zero-energy building in Denmark. A specific six hours heating program is used to reach the scope. The main findings showed that the direct solar radiation and the outdoor temperature appeared to have the larger impact on the thermal flexibility of the building. Specifically, the energy flexibility potential of the examined apartment can ensure its thermal autonomy up to 200 h in a typical sunny winter day.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Zilio, E. (Ekstern), Foteinaki, K. (Intern), Gianniou, P. (Intern), Rode, C. (Intern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf

Implementation of Energy Strategies in Communities (Annex 63) Volume 1: Inventory of measures

This report describes the existing national political framework conditions, energy and land-use planning processes, strategies for energy planning and existing national measures in the field of urban and energy planning. In this research, the term measure refers to any action, program, policy or other activity that can demonstrate or influence a change in process. Amongst other background information, 22 planning processes and 89 measures from 11 countries are described in detail in this report.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Energy, Aalborg University, Norwegian University of Science and Technology, Osaka University, RWTH Aachen University, University of Minnesota
Number of pages: 107
Publication date: 2017

Publication information
Publisher: International Energy Agency
Volume: 1
Original language: English
Main Research Area: Technical/natural sciences
Links:
https://www.annex63.org/app/download/13561884934/Annex63_Volume1_September+2017.pdf?t=1511422950

Bibliographical note
Citation:<br/>K. Church, V. Aagesen, I. Andresen, R. Buggie, J. Freudenberg, D. Kellenberger, J. Kimman, A. Koch, M. Kornmann, Å. Lekang-Serensten, U. Lynar, J.P. Petersen, M.B. Quitzau, A. Roser, C. Schively-Slotterback, Y. Shimoda, H. Strasser, R. Streibl, G. Styri-Hipp (2017). Annex 63: implementation of energy strategies in communities - Volume 1: inventory of measures, IEA project annex 63, salzburg institute for regional planning and housing, Salzburg.<br/>Abstract:<br/>This report describes the existing national political framework conditions, energy and land-use planning processes, strategies for energy planning and existing national measures in the field of urban and energy planning. In this research, the term measure refers to any action, program, policy or other activity that can demonstrate or influence a change in process. Amongst other background information, 22 planning processes and 89
Implementation of Energy Strategies in Communities (Annex 63) Volume 2: Development of strategic measures

This report describes the further development of the analysed measures from Volume 1 into strategic measures. As with the term measure, a strategic measure refers to an essential measure in concept that can be used to develop individual implementation strategies on a local level for part or the whole life cycle of a project (from the first vision to monitoring of the implemented solution). The developed strategic measures deal with the following topics: Setting Vision and Targets Developing Renewable Energy Strategies Making Full use of Legal Frameworks Designing an Urban Competition Processes Making use of Tools Supporting the Decision Making Process Implementing Monitoring of Energy Consumption and GHG Emission practices Enhancing Stakeholder Engagement & Involvement Including Socio Economic Criteria Implementing Effective and Efficient Organisational Processes

The report includes both a summary of each strategic measure supported by nine appendices, each a detailed description of each strategic measure.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Energy, Aalborg University, Norwegian University of Science and Technology, Osaka University, RWTH Aachen University, University of Minnesota
Number of pages: 253
Publication date: 2017

Implementation of Energy Strategies in Communities – Results within the Context of IEA Annex 63
Cities are responsible for more than 70 % of global greenhouse gas emissions. Thus, cities can play a major part within the CO₂ emission reduction goals of the Paris agreement. Lack of technical knowledge and solutions has often been seen as major challenge for energy efficiency implementation. However, findings of the International Energy Agency (IEA) Annex 51 – Case Studies & Guidelines for Energy Efficient Communities – showed that the primary challenges result from inefficient organizational processes and unsupportive framework for implementation. Thus, solutions have to be found how the energy and urban planning can act more efficiently to successfully support the implementation of energy strategies within urban areas. Within the IEA Energy in Buildings and Communities (EBC) Program, the Annex 63 – Implementation of Energy Strategies in Communities – aims at giving recommendations for an optimized energy and urban planning process to support decision makers as well as planners. Therefore, existing legal frameworks, processes and case studies within energy planning in communities were analysed. This paper shows first results of the Annex 63 to serve as orientation for decision makers and other interested persons in the field of urban energy planning.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, RWTH Aachen University, University of Minnesota, Karlsruhe Institute of Technology KIT, Salzburg Institute for Regional Planning and Housing, Hogeschool Zuyd, Natural Resources Canada, Deutscher Verband für Wohnungswesen, Städtebau und Raumordnung e.V
Authors: Schiefelbein, J. (Ekstern), Slotterback, C. S. (Ekstern), Petersen, J. (Intern), Koch, A. (Ekstern), Strasser, H. (Ekstern), Mair am Tinkhof, O. (Ekstern), Kimman, J. (Ekstern), Church, K. (Ekstern), Freudenberg, J. (Ekstern)
Number of pages: 10
Implementing energy efficient pavements: A socio-economic analysis of the development and implementation of energy efficient pavements with low rolling resistance

The demand for the implementation of more energy efficient means to reduce carbon and particle emissions is increasing. Within the transportation sector, lowering carbon emissions is a high priority for the European Commission which is required to meet specific targets. A key driver for the transportation sector is to make road networks more energy efficient by implementing pavements with low rolling resistance, leading to lower fuel consumption. Through a series of projects focusing on reducing rolling resistance conducted since 2010, the Danish Road Directorate (DRD) has developed a durable, energy-efficient asphalt pavement. Socio-economic analyses conducted to quantify the benefit to society associated with implementing these asphalt pavements have demonstrated very high benefits. The demonstrated results in terms of durability, energy efficiency and socio-economics have resulted in substantial government funding being provided for demonstration trials on 50 kilometers of energy-efficient pavement in 2018. The implementation of energy-efficient pavements will enable Denmark to contribute to the out-of-quota 2030-emission cuts in line with EU regulations.

Implementing Occupant Behaviour in the Simulation of Building Energy Performance and Energy Flexibility: Development of Co-Simulation Framework and Case Study

Occupant behaviour has a substantial impact on the prediction of building energy performance. To capture this impact, co-simulation is considered an effective approach. It is still a new method in need of more development. In this study, a co-simulation framework is established to couple EnergyPlus with Java via Functional Mock-up Interface (FMI) using the EnergyPlusToFMU software package. This method is applied to a case study of a single occupant office with control of lighting, plug load and thermostat. Two control scenarios are studied. These are occupancy and occupant behaviour based control (OC), and sensor based control (SBC) triggered by dynamic electricity price under demand side management (DSM) program. The building energy performance in the OC scenario is then used as reference to evaluate the building energy (cost) saving and energy flexibility. This is an improvement of current studies on DSM and building energy flexibility, in which predefined user schedules are commonly used.
Incentives and barriers for wind power expansion and system integration in Denmark

In Denmark expansion of on-shore, near-shore and off-shore wind power is planned to increase the wind power share to 50% of electricity consumption by 2020. In this situation a continuation of past policies will not suffice, and a dual-track incentive system that both establishes incentives for investing in wind power and integration infrastructure with integration between the electricity, heating and transportation sectors, is required. The current Danish taxation system discourages electricity use and works against this integration. Likewise, the current day-ahead electricity spot market is not appropriate for a high-wind future as wind reduces price levels, but integration across sectors can partly assist in increasing demand and prices. The European Emission Trading System does not suffice in providing a level playing field for wind power and thus needs a revision. Another barrier for on-shore and near-shore wind power expansion is a growing citizens’ resistance due to an unequal distribution of benefits and burdens. Ownership should be open for more types of investors especially local investors in order to ensure public support and local acceptance of wind power projects. The Danish political system needs to address these issues in order to promote further expansion of wind power in Denmark.
Mechanical ventilation has become a mandatory requirement in multiple European standards addressing indoor air quality (IAQ) and ventilation in residential dwellings (single family houses and low-rise apartment buildings). This article presents the state of the art study through a review of the existing literature, to establish a link between ventilation rate and key indoor air pollutants. Design characteristics of a mechanical ventilation system such as supply/exhaust airflow, system and design of supply and exhaust outlets were considered. The performance of various ventilation solutions was assessed by comparing reported ventilation rates, concentrations of CO₂ and total volatile organic compounds (TVOC) to minimum requirements defined by the latest version of the European Standard EN 15251:2007. Based on the literature review of these parameters, the authors noted that whenever the whole-house ventilation rate was reported below 0.5 h⁻¹ or 14 l/s-person in bedrooms, the concentrations of the pollutants elevated above minimum threshold limits (CO₂ > 1350 ppm; TVOC > 3000 μg/m³) defined by the standard. Insufficient or non-existent supply of air was related to significantly higher pollutant concentrations. The authors additionally noted that the literature frequently reported the role of improper maintenance and use on deterioration of IAQ in residential dwellings. The summarized data and comments may provide useful information for future guidelines related to ventilation strategies designed for high IAQ in residential dwellings.

**General information**

State: Published

Organisations: Department of Civil Engineering, Section for Building Energy, Norwegian University of Science and Technology, Technical University of Denmark

Authors: Aganovic, A. (Ekstern), Hamon, M. (Ekstern), Kolarik, J. (Intern), Cao, G. (Ekstern)
Induced Shear Failure by Temperature Reduction at Uni-axial Strain Conditions

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, University of Stavanger
Authors: Voake, T. (Ekstern), Nermoen, A. (Ekstern), Korsnes, R. (Ekstern), Fabricius, I. L. (Intern)
Number of pages: 11
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 140684882
Publication: Research - peer-review › Paper – Annual report year: 2017

Induration and Biot's Coefficient of Palaeogene Limestone
In engineering geology and classification of rock masses for civil engineering purposes, the degree of induration for a rock serves as a useful classification parameter. Induration is a measure of how well the grains of a sedimentary rock are cemented together - from loosely cemented/soft rock to very competent/slightly metamorphic rock. The Biot coefficient links to the degree of cementation in the capacity of how it relates the elastic deformations with the change in pore pressure. A hypothesis is that the degree of induration could be correlated to the magnitude of the Biot coefficient. This is tested on 11 Copenhagen Limestone specimens of varying porosity and densities obtained from one borehole with a limestone interval of 30 m. Their induration varies from H2 to H5. Elastic wave propagation measurements are used to establish the Biot coefficient and determination of the mineralogy for H5 specimens aids in performing fluid substitution with Gassmann’s equation. For the soft H2 specimens the shear wave could not be obtained and isoframe modelling is applied. A correlation is found; although, the Biot coefficient for the intermediate indurations H3 and H4 overlap. The dry density is found to adequately correlate with the Biot coefficient.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Andreassen, K. A. (Intern), Ghabezloo, S. (ed.) (Ekstern)
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Publication date: 2017
Main Research Area: Technical/natural sciences
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Source-ID: 2372717277
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Inferring pavement layer properties from a moving measurement platform
This work offered a new method for accessing the mechanical properties of pavement layers based on data obtained by a moving measurement platform. The method has the following features: (i) calculations are based on tracking distances to a point on the pavement surface, (ii) measurements are not required outside the zone of load influence, and (iii) possibility to access absolute pavement deflections. First, the envisioned platform-design and required readings were presented;
The external supply of saturated NaCl solution from the upper slab surfaces was found to be crucial to develop ASR concrete. These findings had a significant influence on the development and orientation of the ASR cracks inside the slabs. This PhD study also contributed to a better understanding of the time-dependent effect of ASR on the physical and extent of ASR cracks in the beams or to the compressive strengths. The measured tensile strains were not proportional to the carrying capacities. Most of the beams tested in the three-point setup suffered ductile rotational failure in diagonal cracks. Additionally, the test setups had different influence on the failure mechanism and measured load-carrying capacities. The ASR cracks had a significant influence on the propagation of load-induced cracks in the beams. The residual load-carrying capacity was determined on 18 beams cut from six reinforced slab segments from a severely ASR-damaged flat slab bridge. Nine beams were tested in a three-point bending setup and nine beams were tested in an asymmetrical four-point bending setup. The ASR cracks had a significant influence on the propagation of load-induced cracks in the beams. Additionally, the test setups had different influence on the failure mechanism and measured load-carrying capacities. Most of the beams tested in the three-point setup suffered ductile rotational failure in diagonal cracks and most of the beams tested in the four-point setup suffered ductile shear failure. It was found that the measured load-carrying capacities were at least equivalent to the calculated load-carrying capacities based on the compressive strength of vertically and horizontally drilled cores. It was measured that the ASR-induced expansions resulted in significant tensile strains and stresses (pre-stress effect) in the reinforcing bars. The measured tensile strains were not proportional to the carrying capacities. Most of the beams tested in the three-point setup suffered ductile rotational failure in diagonal cracks.

**General information**

State: Published  
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Section for Structural Engineering, Dynatest A/S  
Authors: Andersen, S. (Intern), Levenberg, E. (Intern), Andersen, M. (Ekstern)  
Pages: 675-682  
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**Influence of alkali-silica reaction on the physical, mechanical, and structural behaviour of reinforced concrete**

Alkali-silica reaction (ASR) is one of the major concrete deterioration mechanisms in the world. Cracking in concrete structures due to ASR has been observed worldwide. In Denmark, numerous concrete structures have been built with a critical amount of ASR-reactive aggregate, mostly a porous opaline and porous calcareous opaline flint in the fine aggregate fraction. During the last few decades, an increasing number of bridges in Denmark have been severely damaged due to ASR. In the most severe cases, the ASR-damaged bridges have been demolished and reconstructed due to uncertainty about their residual load-carrying capacity. The decisions to demolish and reconstruct these bridges have been based on visible appearance of drilled concrete cores and rough estimates of their residual load-carrying capacity. Research into the mechanical properties of drilled cores and the residual load-carrying capacity of ASR-damaged flat slab bridges in service is very limited. This PhD thesis contributes to the documentation and better understanding of the influence of ASR on the physical and mechanical properties of ASR-damaged concrete, and on the residual load-carrying capacity of an actual ASR-damaged flat slab bridge. The ASR-damaged concrete originated from ASR-damaged flat slab bridges in service and from laboratory-casted and laboratory-accelerated reinforced slabs. In this study, slab segments from three ASR-damaged slab bridges without shear reinforcement were examined. All the examined slabs had following features in common: a) significant amount of ASR cracks were observed on and inside the slabs, b) the ASR cracks were oriented parallel to the plane of the slabs, and c) ASR occurred in the fine aggregate fraction. In this PhD study, both the compressive strength and tensile strength of drilled cores, from all slabs, were found to be negatively influenced by ASR. However, the compressive and tensile strength depended on the orientation of the ASR cracks inside the cores. It was found that the compressive strength in the direction perpendicular to ASR cracks can be significantly smaller than the strength in the direction parallel to ASR cracks. Consequently, evaluation of compressive strength based on vertically drilled cores (ASR cracks oriented perpendicular to the load direction) can be rather conservative. It is argued that the difference in compressive strength for the two crack orientations (perpendicular or parallel to the load direction) will decrease as the amount of ASR cracks in the concrete increases. An explanation of the effect of ASR cracks and their orientation on the compressive strength is proposed. The tensile strength of concrete specimens depended on the test method applied. Both direct and indirect tensile strength test methods showed shortcomings when testing ASR-damaged specimens.

The residual load-carrying capacity was determined on 18 beams cut from six reinforced slab segments from a severely ASR-damaged flat slab bridge. Nine beams were tested in a three-point bending setup and nine beams were tested in an asymmetrical four-point bending setup. The ASR cracks had a significant influence on the propagation of load-induced cracks in the beams. Additionally, the test setups had different influence on the failure mechanism and measured load-carrying capacities. Most of the beams tested in the three-point setup suffered ductile rotational failure in diagonal cracks and most of the beams tested in the four-point setup suffered ductile shear failure. It was found that the measured load-carrying capacities were at least equivalent to the calculated load-carrying capacities based on the compressive strength of vertically and horizontally drilled cores. It was measured that the ASR-induced expansions resulted in significant tensile strains and stresses (pre-stress effect) in the reinforcing bars. The measured tensile strains were not proportional to the extent of ASR cracks in the beams or to the compressive strengths. This PhD study also contributes to better understanding of the time-dependent effect of ASR on the physical and mechanical properties of laboratory-casted and laboratory-accelerated reinforced slabs. The sources of alkali to the concrete were found to have a significant influence on the development and orientation of the ASR cracks inside the slabs. The external supply of saturated NaCl solution from the upper slab surfaces was found to be crucial to develop ASR cracks.
cracks with orientations comparable to those observed on actual bridge slabs, while the slabs with high initial Na₂O eq. content developed random map-cracks. The development of ASR cracks inside the slabs exposed to NaCl solution had a negative and rapid influence on the compressive strength of vertically drilled cores. Although accelerated at high temperature and high RH, it was found that the rate of the downwards penetration and development of ASR cracks inside the slabs was very fast. In this study it is argued that the correlation between vertical expansion and surface expansion of the slabs can be divided into three phases, which may lead to challenges in the interpretation of internal ASR cracking based on the surface expansion measurements.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, Danish Road Directorate
Authors: Barbosa, R. A. (Intern), Hansen, K. K. (Intern), Grelk, B. (Intern), Hoang, L. C. (Intern), Larsen, E. S. (Ekstern)
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Innovative bridge cables for the reduction of ice-shedding risk

General information
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Organisations: Department of Civil Engineering, Aarhus University, VSL International Ltd
Authors: Matejicka, L. (Intern), Georgakis, C. T. (Ekstern), Schwarz, A. (Ekstern), Egger, P. (Ekstern)
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In situ afbrænding af emulsion

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Nørre Gymnasium
Authors: Afzelius, E. (Ekstern), Fink-Jensen, I. (Ekstern), Groth, L. (Ekstern), Mannstaedt, O. (Ekstern), van Gelderen, L. (Intern)
Publication date: 2017
Event: Poster session presented at Præsentation - Forskerpraktik 2017, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
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Source: PublicationPreSubmission
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In-Situ Burning of Crude Oil on Water: A study on the fire dynamics and fire chemistry in an Arctic context

The fire dynamics and fire chemistry of in-situ burning of crude oil on water was studied in order to improve predictions on the suitability of this oil spill response method. For this purpose, several operational parameters were studied to determine the factors that control the burning efficiency of in-situ burning, i.e. the amount of oil (in wt%) removed from the water surface by the burning process. The burning efficiency is the main parameter for expressing the oil removal effectiveness of in-situ burning as response method and is thus relevant for suitability predictions of in-situ burning as oil spill response method. The parameters studied were the initial slick thickness of the oil, the vaporization order of burning crude oil, the ignition of fresh and weathered crude oils on water, the influence of the burning area, the effect of the water layer below the burning oil and the use of chemical herders in ice-infested water to thicken spread oil slicks.

All the experimental work, except for the crude oil herding studies in ice-infested water, was conducted in several small and intermediate scale setups with oil pool diameters between 0.1 m and 1.1 m. The main apparatus used in this study featured a water basin (water volume of 1.0 x 1.0 x 0.50 m3) in which a 0.34 m high Pyrex glass cylinder with a diameter of 0.16 m was placed to contain the oil samples. Several fresh crude oils, refined oils, and pure oils, which were used as reference fuels, were burned in this setup to study the surface temperature, burning rate, flame height, burning efficiency and chemical composition of the burn residue as a function of the oil type, the initial slick thickness and other experimental conditions.

The results showed that crude oils burned distinctively different from pure oils and refined fuel oils, as no steady state burning behavior was observed for the crude oils. Whereas the pure reference oils burned with relatively constant surface temperatures, burning rates and flame heights, the surface temperature increased and the burning rate and flame height decreased over time for the crude oils. Through a comparison with predictions of these parameters from vaporization order models for multicomponent fuels, it was shown that the components in a crude oil vaporize in the order of decreasing volatility. This volatility controlled vaporization order was confirmed by a principal component analysis of the chemical composition of the residues as a function of the burning efficiency. The differences in chemical composition between the 85 m/z ion chromatographs, which include the n-alkanes (C9-C31), clearly showed that the abundance of light components decreased with increasing burning efficiency.

A mathematical analysis of the heat transfer mechanics of oil pool fires on water showed that the net heat feedback to the fuel surface depends on the pool diameter due to the heat losses to the water layer. Due to the fact that burning crude oils follow a volatility controlled vaporization order, these heat losses furthermore increase as a function of the burning time. By supporting this mathematical analysis with experimental results, it was shown that the burning area is the most important parameter of the burning efficiency for crude oil burning on water, with larger pool areas leading to higher burning efficiencies. This size dependency of the burning efficiency was attributed to the increased heat feedback to the fuel surface for large scale pool fires, as compared with small scale fires, that could cancel out the heat losses to the water. Small scale burning experiments subjected to an incident heat flux from a conical heater confirmed that an increased incident heat flux increased the burning efficiency of both fresh and weathered crude oils. At incident heat fluxes representative of large scale fires (diameter ≥ 2 m), however, the burning efficiency did not reach the high efficiencies (≥ 90%) reported for large scale in-situ burning operations. It was therefore deduced that the high burning efficiencies observed in large scale crude oil fires on water are not only caused by an increased heat feedback, but by other factors inherent to large scale fires as well. Further studies on the fire dynamics of large scale crude oil fires on water should be conducted to identify the factors associated with a large pool diameter that are responsible for the high burning efficiencies.

The initial slick thickness was primarily of importance to the ignition of oil slicks in the small scale experiments. Once a minimum ignitable thickness that accommodated for the heat losses to the water layer was reached, the results suggested that further increasing the slick thickness has little influence on the burning behavior of crude oil on water. The thickening of simulated crude oil spills in ice-infested water with a chemical herder, a surfactant that rapidly spreads over a water surface, also indicated that the slick thickness is only a minimum requirement for ignition. Crude oil spread on water with 2/10-7/10 ice coverages in small (1 m2 water surface) and intermediate (19 m2 water surface) scale experiments was successfully thickened from non-ignitable oil spill thicknesses of 0.1-2 mm to ignitable herded thicknesses of 3-7 mm.

In the herding process, however, the crude oil slicks were observed to fracture as a function of the ice coverage. This fracturing process complicated and inhibited ignition of small slicks, even though the herded oil slicks theoretically had an ignitable slick thickness. The resulting burning efficiencies were therefore lower than expected based on the burning areas. Herders thus successfully facilitated in-situ burning of oil in ice-infested waters, but ignitability issues of fractured oil slicks should be addressed to improve burning efficiencies of herded oil slicks.

Ignition studies of fresh and weathered crude oils and a fresh heavy refined oil under a conical heater showed that the critical heat flux for weathered oils and heavy oils with little volatile components was 5-10 kW/m2. At higher incident heat fluxes (≥ 20 kW/m2), ignition was very rapid for fresh and weathered oils and the weathering state (evaporated or emulsified) did not significantly affect the ignition or burning efficiency. These results correspond well with the reported need for large ignition sources to ignite and spread flames on weathered oils on water. Once ignited, however, the weathering state is not expected to influence the burning efficiency for large scale fires, which is in accordance with the postulated theory on the size dependency of the burning efficiency.

The boilover phenomenon, i.e. the explosive burning of crude oil, was shown to be a function both of the superheating of the water and the chemical composition of the burning oil. Cooling of the water layer below the burning oil, by introducing a current in the water body, prevented boilover from occurring for oil burned in the small scale water basin. Boilovers were also observed during the burning of a heavy crude oil with a substantial light fraction without a water layer, however, which suggests that water is not essential for boilover occurrence. Further studies are required to determine the conditions under which these boilovers without a water layer can occur.
Overall, the results showed that the studied operational parameters, apart from the pool diameter, only have a limited effect on the efficiency of in-situ burning as oil spill response method. This strongly suggests that high burning efficiencies are inherent to operational scale crude oil fires on water. Operational and environmental conditions such as the weathering state of the oil and the initial slick thickness only influence the ignitability of the oil. Once ignition and flame spread on a large oil slick are successful, high burning efficiencies are expected simply due to the scale of the fire. As such, the main parameter that determines the suitability of in-situ burning as oil spill response method becomes the ignitability of the oil. This ignitability parameter is depending on complex fire dynamics aspects, but can be expressed in terms of the heat flux that the ignition source needs to be able to provide to the oil surface to ignite the oil. From an operational point of view, predicting the suitability of in-situ burning can thus be reduced to answering the question whether the strength of the required ignition source to ignite the spilled oil is practically feasible.
period for different weather cases. The results show that the optimal scheduling of the system is successful in terms of reducing the peak load during times when electricity prices are high, thus achieving cost savings as well as maintaining good thermal comfort conditions. The proposed methodology bridges dynamic building modelling with optimization of real-time operation of HVAC systems offering a detailed model for building physics, especially regarding thermal mass and a stochastic price-based control.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Energy
Authors: Giannou, P. (Intern), Foteinaki, K. (Intern), Heller, A. (Intern), Rode, C. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

IoT i bygninger

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern)
Pages: 6-6
Publication date: 2017
Main Research Area: Technical/natural sciences

Kan man forudsige brugernes adfærd?

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Andersen, R. K. (Intern), Kirstein, M. L. (Ekstern)
Pages: 22-28
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Main Research Area: Technical/natural sciences
Kinetics of dermal uptake of nicotine from air

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Missouri University of Science and Technology
Authors: Morrison, G. (Ekstern), Bekö, G. (Intern), Clausen, G. (Intern), Koch, H. (Ekstern), Paelmke, C. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Weschler, C. J. (Intern)
Publication date: 2017

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A-indoor environment, A-biomonitoring, A-second-hand smoke, B-VOCs, C-air
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- Untitled.pdf
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Klimavenlig beton

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Indoor Climate and Building Physics, Section for Building Design, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Goltermann, P. (Intern), Wargocki, P. (Intern), Hertz, K. D. (Intern), Ottosen, L. M. (Intern), Jensen, P. E. (Intern), Rode, C. (Intern)
Number of pages: 54
Publication date: 2017

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Publisher: DTU Byg, Danmarks Tekniske Universitet
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Publication: Research › Report – Annual report year: 2017

Laboratory study of subjective perceptions to low temperature heating systems with exhaust ventilation in Nordic countries

Given the global trends of rising energy demand and the increasing utilization of low-grade renewable energy, low-temperature heating systems can play key roles in improving building energy efficiency while providing a comfortable indoor environment. To meet the need to retrofit existing buildings in Nordic countries for greater energy efficiency, this study focused on human subjects’ thermal sensation, thermal comfort, thermal acceptability, draft acceptability, and perceived air quality when three low-temperature heating systems were used: conventional radiator, ventilation radiator, or floor heating with exhaust ventilation. Human subject tests were carried out in the climate chamber at the Technical University of Denmark. In total, 24 human subjects, 12 females and 12 males, participated in the tests during the winter
season. The results show that no significant differences in thermal sensation and thermal comfort between the three heating systems. Ventilation radiator promised a comfortable indoor environment with a decreased water supply temperature and floor heating with exhaust ventilation can provide a basic thermal comfort level. Thermal acceptability and draft acceptability show variations in different heating systems. Gender has significant influences on thermal sensation, draft acceptability, and preference of clo values. Personal thermal preference is observed between males and females. The males prefer to dress lighter than the females, but both can get the same thermal comfort level. It is concluded that low-temperature heating systems using exhaust air ventilation are a potentially solution when buildings are being retrofitted for improved energy efficiency and comfort of the occupants.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Chalmers University of Technology, KTH - Royal Institute of Technology
Authors: Jin, Q. (Ekstern), Simone, A. (Intern), Olesen, B. W. (Intern), Holmberg, S. K. (Ekstern), Bourdakis, E. (Intern)
Number of pages: 12
Pages: 457-468
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Main Research Area: Technical/natural sciences

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Scopus rating (2016): CiteScore 1.01
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.514 SNIP 0.731
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.561 SNIP 0.891
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.544 SNIP 1.104
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.498 SNIP 0.742
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.93 SNIP 0.956
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.614 SNIP 1.187
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.791 SNIP 0.903
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.677 SNIP 1.639
Web of Science (2007): Indexed yes
Landsplanlægning - en nødvendighed

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
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Publication date: 2017

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Newspaper: Sermitsiaq
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Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
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Landsplanlægning - hvordan

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Section for Building Design
Authors: Hendriksen, K. (Intern)
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Publication date: 2017

Publication information
Pages (from-to): 41-43
Newspaper: Sermitsiaq
Volume: 2017
No.: 50
Ratings:
Linking a dermal permeation and an inhalation model to a simple pharmacokinetic model to study airborne exposure to di(n-butyl) phthalate

Six males clad only in shorts were exposed to high levels of airborne di(n-butyl) phthalate (DnBP) and diethyl phthalate (DEP) in chamber experiments conducted in 2014. In two 6 h sessions, the subjects were exposed only dermally while breathing clean air from a hood, and both dermally and via inhalation when exposed without a hood. Full urine samples were taken before, during, and for 48 h after leaving the chamber and measured for key DnBP and DEP metabolites. The data clearly demonstrated high levels of DnBP and DEP metabolite excretions while in the chamber and during the first 24 h once leaving the chamber under both conditions. The data for DnBP were used in a modeling exercise linking dose models for inhalation and transdermal permeation with a simple pharmacokinetic model that predicted timing and mass of metabolite excretions. These models were developed and calibrated independent of these experiments. Tests included modeling of the "hood-on" (transdermal penetration only), "hood-off" (both inhalation and transdermal) scenarios, and a derived "inhalation-only" scenario. Results showed that the linked model tended to duplicate the pattern of excretion with regard to timing of peaks, decline of concentrations over time, and the ratio of DnBP metabolites. However, the transdermal model tended to overpredict penetration of DnBP such that predictions of metabolite excretions were between 1.1 and 4.5 times higher than the cumulative excretion of DnBP metabolites over the 54 h of the simulation. A similar overprediction was not seen for the "inhalation-only" simulations. Possible explanations and model refinements for these overpredictions are discussed. In a demonstration of the linked model designed to characterize general population exposures to typical airborne indoor concentrations of DnBP in the United States, it was estimated that up to one-quarter of total exposures could be due to inhalation and dermal uptake.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, U.S. Environmental Protection Agency, Missouri University of Science and Technology, National Institute of Standards and Technology, Ruhr-Universitat Bochum, Fraunhofer Wilhelm-Klauditz-Institut (WKI)
Authors: Lorber, M. (Ekstern), Weschler, C. J. (Intern), Morrison, G. (Ekstern), Beko, G. (Intern), Gong, M. (Ekstern), Koch, H. M. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.338 SNIP 1.162 CiteScore 2.66
Liquid Water Flow and Retention on the Greenland Ice Sheet in the Regional Climate Model HIRHAM5: Local and Large-Scale Impacts

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Authors: Langen, P. L. (Ekstern), Fausto, R. S. (Ekstern), Vandecruix, B. R. M. (Intern), Mottram, R. H. (Ekstern), Box, J. E. (Ekstern)
Number of pages: 18
Publication date: 2017
Main Research Area: Technical/natural sciences

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DOIs:
Long-term dispersion and availability of metals from submarine mine tailing disposal in a fjord in Arctic Norway

Mining of Cu took place in Kvalsund in the Arctic part of Norway in the 1970s, and mine tailings were discharged to the inner part of the fjord, Repparfjorden. Metal speciation analysis was used to assess the historical dispersion of metals as well as their potential bioavailability from the area of the mine tailing disposal. It was revealed that the dispersion of Ba, Cr, Ni, Pb and Zn from the mine tailings has been limited. Dispersion of Cu to the outer fjord has, however, occurred; the amounts released and dispersed from the mine tailing disposal area quantified to be 2.5-10 t, less than 5% of Cu in the original mine tailings. An estimated 80-390 t of Cu still remains in the disposal area from the surface to a depth of 16 cm. Metal partitioning showed that 56-95% of the Cu is bound in the potential bioavailable fractions (exchangeable, reducible and oxidisable) of the sediments, totalling approximately 70-340 t, with potential for continuous release to the pore water and re-precipitation in over- and underlying sediments. Surface sediments in the deposit area were affected by elevated Cu concentrations just above the probable effect level according to the Norwegian sediment quality criteria, with 50-80% Cu bound in the exchangeable, reducible and oxidisable fractions, potentially available for release to the water column and/or for uptake in benthic organisms.
Lower bound equilibrium element and submodel for shear joints in precast concrete structures

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, ALECTIA A/S
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Ekstern)
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BFI (2018): BFI-level 2
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BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.93 SJR 1.578 SNIP 2.048
Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 1.696 SNIP 2.195 CiteScore 2.59
Web of Science (2015): Indexed yes
Lower bound plane stress element for modelling 3D structures

In-plane action is often the primary load-carrying mechanism of reinforced concrete structures. The plate bending action will be secondary, and the behaviour of the structure can be modelled with a reasonable accuracy using a generalised three-dimensional plane stress element. In this paper, the formulation of such an element is given and the Mohr-Coulomb and von Mises criteria are presented for second-order cone programming. Three examples of increasing complexity are used to analyse the performance of the element and the convergence rate and to demonstrate the potential of the proposed element.

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State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, NIRAS A/S
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Ekstern)
Number of pages: 11
Pages: 107-117
Publication date: 2017
Main Research Area: Technical/natural sciences
Low-Field NMR Spectrometry of Chalk and Argillaceous Sandstones: Rock-Fluid Affinity Assessed from T-1/T-2 Ratio

Nuclear magnetic resonance (NMR) procedure typically minimizes the effects of external magnetic field gradients on the transverse relaxation. Thus, longitudinal, and transverse, T-2, relaxation times should in principle be similar. However, internal magnetic field gradients related to minerals can shorten T-2, as compared to provided the saturating fluid has high affinity to the solid. Consequently, the T-1/T-2 ratio should quantify the affinity between the mineral and wetting pore fluid, so we estimate wettability from logging data by comparing the T-1/T-2 ratio of oil and water peaks in the reservoir zone to the T-1/T-2 ratio in the water zone. We tested the hypothesis on core samples and used the predicted wettability to successfully determining the elastic bulk modulus of samples containing oil and water. In order to investigate the T-2-shortening, we performed 1D and 2D NMR experiments on samples of chalk, kaolinitic sandstone, and chloritic greensand, saturated either with water, oil or oil/water at irreducible water saturation. The 1D NMR experiment involved determination of T-2 spectrum, whereas the 2D NMR experiments included determination of T-1-T-2 and D-T-2 maps, where D is the intrinsic diffusion coefficient. T-2 spectra show that in all water-saturated samples, surface relaxation dominates; in oil-saturated chalk and kaolinitic sandstone, bulk relaxation dominates; whereas T-2 of oil-saturated greensand shows surface relaxation in the part of the spectrum representing chlorite. In all samples with irreducible water saturation, water shows surface relaxation, whereas oil shows bulk relaxation. In line with this observation D-T-2 maps of these samples show field gradient effects in the oil, but not in the water indicating that the water is trapped between solid and oil due to restricted diffusion. A T-2 shortening will increase the T-1/T-2 ratio, so we use the T-1/T-2 ratio obtained from T-1-T-2 maps as a measure of fluid-mineral affinity. By this measure, the chalk shows high affinity for water, the kaolinitic sandstone has no clear preference for oil or water, whereas chloritic greensand shows different behavior for small and large pores. Small pores (fast-relaxing components) have T-1/T-2 = 2.0 when water saturated, but T-1/T-2 = 3.8 when oil saturated, indicating oil-affinity of chlorite. By contrast, large pores (slow-relaxing components) have significant preference for water (T-1/T-2 = 2.2) as compared to oil (T-1/T-2 = 1.2 to 1.4). Overall, this paper provides an insight into the preference of a mineral to a fluid and ultimately into determining the wettability and correct pore-fluid distribution of a reservoir rock.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, Colorado School of Mines
Authors: Katika, K. (Intern), Saidian, M. (Ekstern), Prasad, M. (Ekstern), Fabricius, I. L. (Intern)
Number of pages: 15
Pages: 126-140
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Petrophysics
Volume: 58
Issue number: 2
ISSN (Print): 1529-9074
Ratings:
Low field NMR surface relaxivity studies of chalk and argillaceous sandstones
This paper addresses how the surface relaxivity, \( \rho \), of rock forming minerals as assessed from low field Nuclear Magnetic Resonance (NMR) spectrometry, is affected by temperature and Larmor frequency. This is relevant for connecting laboratory data and reservoir logging data while increasing the accuracy of predictions of petrophysical properties of various rocks with the use of NMR spectrometry. We perform laboratory transverse relaxation \( (T_2) \) measurements on water saturated Gorm field chalk, Stevns Klint chalk, Solsort field greensand and Berea sandstone. These rocks are of particular interest in studies related to the North Sea oil and gas reservoirs, since they cover a wide range of formations, ranging from homogeneous to inhomogeneous chalk, chloritic and quartz mineralogy. Comparison of \( T_2 \) distributions at Larmor frequency of 2 and 20 MHz at 40 °C shows that paramagnetic minerals in the Gorm field chalk and Solsort field greensand have higher \( \rho \) at higher Larmor frequency. By contrast, \( \rho \) of the purely calcitic Stevns chalk and quartzitic Berea sandstone proved not to be affected by the changes in frequency. \( T_2 \) distributions at temperatures ranging from 10 °C to 60 °C provided comparison between lab and field \( T_2 \) measurements: \( \rho \) for calcite decreases with temperature; whereas \( \rho \) for quartz increases with temperature. These findings illustrate differences in the porosity and pore size distribution obtained in the lab, compared to those from logs using NMR tools.

General information
State: Accepted/In press
Organisations: Section for Structural Engineering, Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, Haldor Topsoe AS
Nuclear magnetic resonance, Surface relaxivity, Larmor frequency, Temperature

Authors: Katika, K. (Intern), Fordsmand, H. (Ekstern), Fabricius, I. L. (Intern)
Number of pages: 3
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Microporous and Mesoporous Materials
ISSN (Print): 1387-1811
Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.6 SJR 1.086 SNIP 1.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.205 SNIP 1.183 CiteScore 3.55
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.244 SNIP 1.294 CiteScore 3.55
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.229 SNIP 1.358 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.489 SNIP 1.563 CiteScore 3.53
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.524 SNIP 1.46 CiteScore 3.53
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.536 SNIP 1.399
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.236 SNIP 1.308
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.365 SNIP 1.427
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.358 SNIP 1.416
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.498 SNIP 1.329
Scopus rating (2005): SJR 1.38 SNIP 1.605
Scopus rating (2004): SJR 1.324 SNIP 1.417
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.346 SNIP 1.433
Scopus rating (2002): SJR 1.85 SNIP 1.547
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.515 SNIP 1.463
Scopus rating (2000): SJR 0.988 SNIP 1.409
Scopus rating (1999): SJR 0.582 SNIP 1.133

Original language: English

DOIs:
Low Temperature District Heating for Future Energy Systems

The building sector is responsible for more than one third of the final energy consumption of societies and produces the largest amount of greenhouse gas emissions of all sectors. This is due to the utilisation of combustion processes of mainly fossil fuels to satisfy the heating demand of the building stock. Low temperature district heating (LTDH) can contribute significantly to a more efficient use of energy resources as well as better integration of renewable energy (e.g. geothermal or solar heat), and surplus heat (e.g. industrial waste heat) into the heating sector. LTDH offers prospects for both the demand side (community building structure) and the supply side (network properties or energy sources). Especially in connection with buildings that demand only low temperatures for space heating. The utilisation of lower temperatures reduces losses in pipelines and can increase the overall efficiency of the total energy chains used in district heating. To optimise the exergy efficiency of community supply systems the LowEx approach can be utilised, which entails matching the quality levels of energy supply and demand in order to optimise the utilisation of high-value resources, such as combustible fuels, and minimising energy losses and irreversible dissipation. The paper presents the international co-operative work in the framework of the International Energy Agency (IEA), the Technology Cooperation Programme on District Heating and Cooling including Combined Heat and Power (DHC|CHP) Annex TS1.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Fraunhofer Institute for Wind Energy and Energy System Technology (IWES), University of Stuttgart, Norwegian University of Science and Technology, VTT - Technical Research Centre of Finland
Authors: Schmidt, D. (Ekstern), Kallert, A. (Ekstern), Blesl, M. (Ekstern), Svendsen, S. (Intern), Li, H. (Intern), Nord, N. (Ekstern), Sipilä, K. (Ekstern)
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Publication information
Journal: Energy Procedia
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
Web of Science (2009): Indexed yes
Original language: English
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Mapping the communication of engineering knowledge using visuals to improve interdisciplinary design team performance for sustainable building design

General information
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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Landgren, M. (Intern), Jensen, L. B. (Intern)
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Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
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Original language: English
Source: PublicationPreSubmission
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Material characterization models and test methods for historic building materials
Predictions of long term hygrothermal performance can be assessed by dynamic hygrothermal simulations, in which material parameters are crucial input. Material parameters for especially historic materials are often unknown; therefore, there is a need to determine important parameters, and simple ways for estimation of these. A case study of a brick wall was used to create and validate a hygrothermal simulation model; a parameter study with five different parameters was performed on this model to determine decisive parameters. Furthermore, a clustering technique has been proposed to estimate decisive parameters through simple testing of interrelated parameters that are easier to determine.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Aalborg University
Authors: Hansen, T. K. (Intern), Peuhkuri, R. H. (Ekstern), Møller, E. B. (Ekstern), Bjarløv, S. P. (Intern), Odgaard, T. (Intern)
Pages: 315-320
Publication date: 2017
In this preliminary study, we have investigated whether dermal uptake of nicotine directly from air or indirectly from clothing can be a meaningful exposure pathway. Two participants wearing only shorts and a third participant wearing clean cotton clothes were exposed to environmental tobacco smoke (ETS), generated by mechanically "smoking" cigarettes, for three hours in a chamber while breathing clean air from head-enveloping hoods. The average nicotine concentration (420 μg/m³) was comparable to the highest levels reported for smoking sections of pubs. Urine samples were collected immediately before exposure and 60 hour post-exposure for bare-skinned participants. For the clothed participant, post-exposure urine samples were collected for 24 hour. This participant then entered the chamber for another three-hour exposure wearing a hood and clothes, including a shirt that had been exposed for five days to elevated nicotine levels. The urine samples were analyzed for nicotine and two metabolites-cotinine and 3OH-cotinine. Peak urinary cotinine and 3OH-cotinine concentrations for the bare-skinned participants were comparable to levels measured among non-smokers in hospitality environments before smoking bans. The amount of dermally absorbed nicotine for each bare-skinned participant was conservatively estimated at 570 μg, but may have been larger. For the participant wearing clean clothes, uptake was similar to 20 μg, and while wearing a shirt previously exposed to nicotine, uptake was similar to 80 μg. This study demonstrates meaningful dermal uptake of nicotine directly from air or from nicotine-exposed clothes. The findings are especially relevant for children in homes with smoking or vaping.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI)
Authors: Beko, G. (Intern), Morrison, G. (Ekstern), Weschler, C. J. (Intern), Koch, H. M. (Ekstern), Paelmke, C. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
Metal speciation of historic and new copper mine tailings from Repparfjorden, Northern Norway, before and after acid, base and electrodialytic extraction

In Kvalsund, Northern Norway, a permit for submarine mine tailings disposal in Repparfjorden was recently issued for a copper mine with expected operation from 2019. A copper mine was active in the same area in the 1970s and also deposited mine tailings in the fjord. Investigations of the metal binding in the historic and new mine tailings (produced from bedrock in the area) have been undertaken in this study. Acid and base extraction experiments provided desorption curves of mine tailing suspensions as a function of pH (0.5-12.7), and showed that Cu was more easily desorbed in the historic mine tailings. Substantial desorption (>40%) for both historic and new mine tailings occurred at pH values below 3 and above 12. These results combined with metal speciation, showing that the binding of Cu in the sediment changes around pH values 3 and 10, indicate potential for extraction of more Cu from the new mine tailings. Electrolysis, based
on applying an electric field of low intensity to extract metals from polluted soils/sediments, was designed for acidic and alkaline extraction, and in both cases more Cu was extracted than in the pure acid/base extractions, while maintaining low mobilisation of other metals. Electrodialysis can hence be designed to target extraction of Cu while limiting the mobilisation of other metals.

**General information**
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Akvaplan-niva AS, UiT The Arctic University of Norway
Authors: Pedersen, K. B. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern), Evenset, A. (Ekstern), Christensen, G. N. (Ekstern), Frantzen, M. (Ekstern)
Pages: 100-111
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Scopus rating (2016): SJR 1.133 SNIP 1.766 CiteScore 2.48
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.114 SNIP 1.865 CiteScore 2.31
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.063 SNIP 1.876 CiteScore 1.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.342 SNIP 2.267 CiteScore 2.09
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.109 SNIP 1.864 CiteScore 1.66
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.909 SNIP 1.826 CiteScore 1.64
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.945 SNIP 1.644
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.966 SNIP 1.655
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.805 SNIP 1.222
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.009 SNIP 1.401
Scopus rating (2006): SJR 0.882 SNIP 1.372
Scopus rating (2005): SJR 0.843 SNIP 1.198
Scopus rating (2004): SJR 0.564 SNIP 0.969
Scopus rating (2003): SJR 0.59 SNIP 0.993
Scopus rating (2002): SJR 0.664 SNIP 1.044
Scopus rating (2001): SJR 0.446 SNIP 0.86
Scopus rating (2000): SJR 0.502 SNIP 0.972
Method for achieving hydraulic balance in typical Chinese building heating systems by managing differential pressure and flow

Hydraulic unbalance is a common problem in Chinese district heating (DH) systems. Hydraulic unbalance has resulted in poor flow distribution among heating branches and overheating of apartments. Studies show that nearly 30% of the total heat supply is being wasted in Chinese DH systems due to a lack of pressure and flow control. This study investigated using pre-set radiator valves combined with differential pressure (DP) controllers to achieve hydraulic balance in building distribution systems, and consequently save energy and reduce the emissions. We considered a multi-storey building modelled in the IDA-ICE software, along with a self-developed mathematical hydraulic model to simulate its heat performance and hydraulic performance with various control scenarios. In contrast to the situation with no pressure or flow control, this solution achieves the required flow distribution and close-to-design room temperatures, as well as 16% heat savings, 74% pump electricity savings, and proper cooling of supply water. The energy consumption savings would therefore have positive environmental impacts, and be reflected in seasonal reductions of 2.1 kg/m² CO₂, 0.02 kg/m² SO₂, and 0.01 kg/m² NOₓ for 3rd step energy efficiency buildings in Beijing.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Tsinghua University, Danfoss AS
Authors: Zhang, L. (Intern), Xia, J. (Ekstern), Thorsen, J. E. (Ekstern), Gudmundsson, O. (Ekstern), Li, H. (Intern), Svendsen, S. (Intern)
Number of pages: 13
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Main Research Area: Technical/natural sciences

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Scopus rating (2016): CiteScore 1.56 SJR 0.784 SNIP 0.936
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.016 SNIP 1.154 CiteScore 1.74
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.827 SNIP 1.264 CiteScore 1.41
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.45 SNIP 0.649 CiteScore 0.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.444 SNIP 0.751 CiteScore 0.72
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 0.373 SNIP 0.858 CiteScore 0.95
Method for planning extensive energy renovation of detached single-family houses

It has long been a political aim to reduce the emissions caused by energy consumption, and in Denmark politicians aim to make Denmark a society independent of fossil fuels by 2050. To achieve this, it is necessary to increase sustainable energy production and reduce energy consumption. This will take time, so both areas must be considered already now, but it will be beneficial to work on reducing the consumption before the sustainable energy supply is fully developed, so that we can avoid expensive over-production.

Some 30% of the total energy consumption in Denmark takes place in households, and 22% occurs in single-family houses, making this the largest single contributor to the total consumption after road transport (DEA, 2015a). There is a large potential for achieving energy savings in this sector, especially among the large number of single-family houses built in the 1960s and 1970s. Many of these were built before the introduction of actual regulations for energy consumption in buildings, and many will soon need considerable renovation due to their age.

However, despite the potential for achieving savings and updating these houses built about 40-60 years ago, the renovation of the building stock is proceeding very slowly. This is partly due to problems with the process, in which the initiative rests very much with the house owners, and partly due to barriers to renovation that are currently unaddressed by policy makers.

One of the problems addressed in this thesis is the process. In the hope that this could be improved, the use of a One-Stop-Shop (OSS) was investigated and tested. With an OSS, one contact person guides the house owners through all five phases of renovation: initial planning, thorough analysis, deciding on specific solutions, implementation, and verification through measurements. Although the case study suffered from a very high dropout rate, one renovation was successfully completed, and a second followed the project until the start of the fourth phase. While the study did not find evidence that the use of an OSS concept would motivate people to renovate, it did find that the use of this approach produced a better renovation with a larger energy saving. The initial evaluation helped the house owners identify a maintenance backlog, and the use of an independent advisor helped ensure quality throughout the process.

Renovations are too often carried out for just one purpose: maintenance, to update functions or to reduce energy consumption. But a lot can be gained by combining these efforts, which can reduce expenses for planning and execution and avoid doing things twice. Research for this thesis demonstrated this approach by carrying out a renovation based on maintenance, but including the owners' wishes for functional improvements and better than mandatory energy improvements. The renovation resulted in increased comfort, a reduction of 53% for heating, and an increase in the value of the house corresponding to 77% of the investment.

There are a lot of barriers that discourage people from embarking on a renovation, and one way to deal with these barriers is through targeted policy. The research created an overview of current policy in this field in Denmark and compared it with the known barriers and motivations, which were collected in a framework to make it possible to identify the areas where current policy falls short. Four points in need of improvement and attention were identified: focus, finance, plans and regulation. The focus must be moved to improving comfort instead of energy renovation as an investment, because this is doing the field a serious disservice. There is a need for more financial support in the form of cheap loans and non-symbolic subsidies, which can overcome the barrier of lack of finance and motivate more extensive renovations. House owners should receive long-term renovation plans for their house, which inform them of their maintenance backlog and inspire energy improvements. And finally, it will be necessary to use regulation to reach those who are not planning to renovate. This could be done for example by setting a maximum allowed energy consumption per m² in houses, though this would have to be backed up by subsidies to avoid creating major social imbalance.
General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, University of Missouri at Kansas City, Iowa State University
Authors: Lund, M. S. M. (Intern), Kevern, J. T. (Ekstern), Schaefer, V. R. (Ekstern), Hansen, K. K. (Intern)
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Main Research Area: Technical/natural sciences
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Journal: Materials and Structures
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Mix design for improved strength and freeze-thaw durability of pervious concrete fill in Pearl-Chain Bridges
Pearl-Chain Bridges are an innovative precast arch bridge technology which can utilize pervious concrete as fill material. The present study investigates how the mix design of the pervious concrete fill can be influenced by use of an air-entraining admixture, a high-range water reducing admixture, fibers, and by internal curing using lightweight aggregate to best possibly meet the requirements for a fill material in Pearl-Chain Bridges. The 28-day compressive strength, splitting tensile strength, shear strength, permeability, and freeze-thaw durability were determined and compared for eight different mixture proportions using two different sizes of granite coarse aggregate and at two different water-to-cement ratios. The specimens had an average void content of 24-28 %. Specimens containing air entraining and high-range water reducing admixtures were most workable, as determined by fresh density, and thus the easiest to place. The addition of a high-range water reducing admixture and lightweight sand (expanded shale) for internal curing improved the 28-day compressive strength and splitting tensile strength. The coarse aggregate gradation had a large influence on permeability; however, all tested permeabilities were high enough to drain the rain from a 100-year rain event in Denmark. The air entraining agent dosage used was not sufficiently high to create the necessary protective air content in the cement paste, and the freeze-thaw durability of the specimens were generally poor for the utilized test procedure; however, the mix design containing lightweight sand showed improved freeze-thaw durability compared to the other mix designs.

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Organisations: Department of Civil Engineering, Section for Building Design, University of Missouri at Kansas City, Iowa State University
Authors: Lund, M. S. M. (Intern), Kevern, J. T. (Ekstern), Schaefer, V. R. (Ekstern), Hansen, K. K. (Intern)
Number of pages: 14
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Volume: 50
Modal participation in multiple input Ibrahim time domain identification

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Structural Engineering, Centre for oil and gas – DTU, Aarhus University, University College Dublin, Semnan University
Authors: Brincker, R. (Intern), Olsen, P. (Ekstern), Amador, S. (Intern), Juul, M. (Ekstern), Malekjafarian, A. (Ekstern), Ashory, M. (Ekstern)
Publication date: 2017
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Scopus rating (2016): CiteScore 1.6 SJR 0.998 SNIP 1.036
Scopus rating (2015): CiteScore 1.03 SNIP 0.912 SJR 0.619
Scopus rating (2014): CiteScore 0.87 SNIP 0.785 SJR 0.662
Scopus rating (2013): CiteScore 0.81 SNIP 0.732 SJR 0.514
Scopus rating (2012): CiteScore 0.99 SNIP 1.2 SJR 0.825
Scopus rating (2011): CiteScore 1 SNIP 1.305 SJR 0.849
Scopus rating (2010): SNIP 1.022 SJR 0.778
Scopus rating (2009): SNIP 0.825 SJR 0.631
Scopus rating (2008): SNIP 0.638 SJR 0.5
Scopus rating (2007): SNIP 0.845 SJR 0.68
Scopus rating (2006): SNIP 0.741 SJR 0.617
Scopus rating (2005): SNIP 1.316 SJR 1.762
Scopus rating (2004): SNIP 0.765 SJR 0.652
Scopus rating (2003): SNIP 0.712 SJR 0.639
Scopus rating (2002): SNIP 0.645 SJR 0.821
Scopus rating (2001): SNIP 1.113 SJR 0.492
Scopus rating (2000): SNIP 0.989 SJR 0.563
Scopus rating (1999): SNIP 0.878 SJR 0.838
Original language: English
Modal participation, Ibrahim time domain, Multiple-input formulation, Operational modal analysis, Closely spaced modes

Modeling in-situ hysteretic variation of unfrozen water content in high-latitude fine-grained permafrost

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Tomaskovicova, S. (Intern), Ingeman-Nielsen, T. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Unfrozen water content, Freeze-thaw hysteresis, Thermal modeling, Fine-grained permafrost

Electronic versions:
**Modeling of solar collector fields for solar heating plants in district heating systems**

**General information**
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Arcon Solvarme A/S
Authors: Bava, F. (Intern), Furbo, S. (Intern), Fan, J. (Intern), Tange, J. (Ekstern)
Number of pages: 178
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**Publication information**
Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Print): 9788778774590
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Series: B Y G D T U. Rapport
Number: R-365
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Electronic versions:
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**Relations**
Projects:
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Publication: Research › Ph.D. thesis – Annual report year: 2017

**Modeling the ground resistivity from unfrozen water content in fine-grained high-latituide permafrost**

**General information**
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Tomaskovicova, S. (Intern), Ingeman-Nielsen, T. (Intern)
Number of pages: 22
Publication date: 2017

**Publication information**
Media of output: Powerpoint presentation
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf

**Modelling of a thermally activated building system (TABS) combined with free-hanging acoustic ceiling units using computational fluid dynamics (CFD)**
Thermally Activated Building Systems (TABS) have proven to be an energy-efficient solution to achieve optimal indoor thermal environment in buildings. This solution uses the building mass to store heat and by means of water pipes embedded in the concrete slabs adjust the temperature in the premises. The active surfaces of TABS need to be as exposed as possible, but exposing bare concrete surfaces has a negative impact on the acoustic quality in the premises. Acoustic solutions capable of providing optimal acoustic comfort while allowing the heat exchange between the TABS and the room are desirable. This study focuses on the influence of two types of free-hanging ceiling absorbers (horizontal and vertical) on the cooling performance of the TABS. Different scenarios are investigated for each type of sound absorber. Computational Fluid Dynamics (CFD) simulations are used to illuminate the nature of the heat exchange between the TABS and the room and
the occupants. The simulations are validated by comparison with full scale measurements in laboratory conditions. The study shows that for equivalent sound absorption levels, free-hanging vertical sound absorbers have a lower impact on the heat exchange between the room and the TABS compared to free-hanging horizontal sound absorbers. Cold air stagnation between the sound absorber units and the TABS has been identified as the major cause of the cooling performance decrease of the TABS.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Building Energy, Technical University of Denmark
Authors: Lacorte, L. M. D. (Ekstern), Fan, J. (Intern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Building Simulation
ISSN (Print): 1996-3599
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.56 SJR 0.784 SNIP 0.936
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.016 SNIP 1.154 CiteScore 1.74
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.827 SNIP 1.264 CiteScore 1.41
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.45 SNIP 0.649 CiteScore 0.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.444 SNIP 0.751 CiteScore 0.72
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 0.373 SNIP 0.858 CiteScore 0.95
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.364 SNIP 0.699
BFI (2009): BFI-level 2
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Original language: English
TABS, Thermal environment, Sound absorption, Cooling capacity, Full-scale measurements, Building simulations, Computational fluid dynamics
DOIs: 10.1007/s12273-017-0392-x
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Publication: Research - peer-review › Journal article – Annual report year: 2017

Modelling of constitutive behavior of sand in the low stress regime: an implementation of SANISAND
The paper provides background information for the modification of SANISAND (2004) constitutive model in order to capture the mechanical behavior of sand in the low stress regime. In the implementation of this model in finite element programs, computational difficulties arise due to the gradient discontinuity which occurs at the apex of the yield surface when it deals with soil deposits subjected to low initial confining pressure. This singularity often causes the stress-point integration algorithm to perform inefficiently or even fail. In this study a hyperbolic yield surface was introduced to eliminate the singular tip from the original yield surface, by adjusting only one parameter. Undrained triaxial compression tests on
Toyoura sand are performed to show the performance of the proposed formulation.

**General information**

State: Published  
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, University of Perugia  
Authors: Latini, C. (Intern), Zania, V. (Intern), Tamagnini, C. (Ext)  
Number of pages: 4  
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Conference: 19th International Conference on Soil Mechanics and Geotechnical Engineering, Seoul, Korea, Republic of, 17/09/2017 - 17/09/2017  
**Anisotropy, Sand, Constitutive relations, Plasticity, Critical state, Hyperbolic approximation**

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19th_ICSMGE_paper_Chiara_Latini_final_OK.pdf  
Source: PublicationPreSubmission  
Source-ID: 137539998  
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Moisture Buffer Effect and its Impact on Indoor Environment

The moisture buffer effect of building materials may have great influence on indoor hygrothermal environment. In order to characterize the moisture buffering ability of materials, the basic concept of moisture buffer value (MBV) is adopted. Firstly, a theoretical correction factor is introduced in this paper. The moisture uptake/release by hygroscopic materials can be calculated with the factor and the basic MBV. Furthermore, the validation of the correction factor is carried out. The impact of moisture buffering on indoor environment is assessed by using numerical simulations. The results show that the application of hygroscopic materials with large MBV values could reduce the fluctuation of indoor relative humidity, thus decreasing the energy demand for dehumification. The potential energy saving rate of the test building in temperate climates and semi-arid climates could be up to 25-30%. Finally, the relationship between MBV and potential energy saving rate is discussed.

**General information**

State: Published  
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Nanjing University  
Authors: Zhang, M. (Ext), Qin, M. (Intern), Chen, Z. (Ext)  
Pages: 1123-1129  
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Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes  
Scopus rating (2016): CiteScore 0.74  
Scopus rating (2015): CiteScore 0.56  
Scopus rating (2014): CiteScore 0.53  
Scopus rating (2013): CiteScore 0.4  
ISI indexed (2013): ISI indexed no  
Scopus rating (2012): CiteScore 0.28  
ISI indexed (2012): ISI indexed no  
Scopus rating (2011): CiteScore 0.45  
ISI indexed (2011): ISI indexed no  
Web of Science (2010): Indexed yes  
Original language: English  
Building energy conservation, Hygroscopic material, Indoor humidity condition, Moisture Buffer Effect, Test method  
Electronic versions:  
pesei_1_s2.0_S1877705817350920_main_oa.pdf
Moisture buffering phenomenon and its impact on building energy consumption

Moisture buffering is the ability of surface materials in the indoor environment to moderate the indoor humidity variations through adsorption or desorption. Materials with high moisture buffering capacity could be used to passively control the indoor moisture condition and consequently improve the indoor environmental quality and reduce the latent heat load of buildings. In order to characterize the moisture buffering ability of materials, the basic concept of moisture buffer value (MBV) is adopted. The paper first proposes a new mathematical expression of basic MBV, and then introduces a theoretical correction factor that could be used together with the MBV to calculate the moisture uptake/release by hygroscopic materials exposed to different types of humidity variations. Secondly, a simplified two-bottle test method is proposed to measure the MBV in the present study. The impact of moisture buffering on building energy consumption in different climate conditions is assessed by using numerical simulations. The results show that the potential energy saving rate could be up to 25–30% when using proper hygroscopic materials in the test building in temperate climates and semi-arid climates. Finally, the relationship between MBV and potential energy saving rate is also discussed.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Nanjing University
Authors: Zhang, M. (Ekstern), Qin, M. (Intern), Rode, C. (Intern), Chen, Z. (Ekstern)
Number of pages: 9
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.78 SJR 1.462 SNIP 1.828
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.734 SNIP 1.898 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.576 SNIP 2.206 CiteScore 3.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.516 SNIP 2.5 CiteScore 3.31
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.54 SNIP 2.432 CiteScore 2.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.389 SNIP 2.186 CiteScore 2.83
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Moisture damage with magnesium oxide boards in Danish facade structures

Magnesium oxide boards have been widely used on facades in Denmark during 2010-2015. However, the magnesium salts absorb humidity from the ambient, and they begin to leak salty water, which is highly corrosive, and leads to moisture and mould problems in wooden members of the structures. MgO-boards were not tested for their hygrothermal function before being used on exterior wall structures, which has had detrimental consequences, such as an expected cost of repair of around 2 billion DKK. Properties for moisture transport and retention properties have been determined and will be shown together with some examples of damaged structures.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Design, Bunch Bygningsfysik ApS
Authors: Rode, C. (Intern), Bunch-Nielsen, T. (Ekstern), Hansen, K. K. (Intern), Grek, B. (Intern)
Pages: 765-770
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Moving on dangerous grounds – wind power and earthquake exposures in China

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Kübler, O. (Ekstern), Thöns, S. (Intern), Katsanos, E. (Intern)
Number of pages: 16
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Publisher: Swiss Re Institute
Original language: English
Main Research Area: Technical/natural sciences
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Source-ID: 142685731
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Multi-hazard response analysis of a 5MW offshore wind turbine

Wind energy has already significant role on the scene of the clean energy production. Well-promising markets, like China, India, Korea and Latin America are the fields of expansion for new wind turbines mainly installed in offshore environment, where wind, wave and earthquake loads threat the structural integrity and reliability of these energy infrastructures. Along these lines, a multi-hazard environment was considered herein and the structural performance of a 5 MW offshore wind turbine was assessed through time domain analysis. A fully integrated model of the offshore structure consisting of the blades, the nacelle, the tower and the monopile was developed with the use of an aeroelastic code considering the interaction between the elastic and inertial forces, developed in the structure, as well as the generated aerodynamic and hydrodynamic forces. Based on the analysis results, the dynamic response of the turbine’s tower was found to be severely affected by the earthquake excitations. Moreover, fragility analysis based on acceleration capacity thresholds for the nacelle’s equipment corroborated that the earthquake excitations may adversely affect the reliability and availability of wind turbines.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, COWI AS, Aarhus University
Authors: Katsanos, E. (Intern), Sanz, A. A. (Ekstern), Georgakis, C. T. (Ekstern), Thöns, S. (Intern)
Pages: 3206-3211
Publication date: 2017
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Main Research Area: Technical/natural sciences

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Journal: Procedia Engineering
Volume: 199
ISSN (Print): 1877-7058
The choice of proper wind comfort criterion is considered to be crucial to reliable assessment of pedestrian level wind comfort. This paper aims to propose a wind comfort criterion that can be applied to Hong Kong, in which the wind comfort is seriously deteriorated by the moderated airflow, particularly in the hot and humid summer. By thoroughly reviewing and comparing exiting wind comfort criteria, the parameters in Lawson (1978) criterion are adopted for acceptable, tolerable and intolerable category and the parameters in NEN8100 (2006) criterion are adopted for danger category in the proposed criteria. Besides, a low wind parameter suggested by AVA scheme (2005) is adopted for unfavourable category in summer criterion. The adopted parameters provide scientific foundations and they are carefully chosen to adapt the weak wind conditions. The prominent features of the criteria are proposed seasonally (summer and winter, respectively) and the overall mean wind velocity ratio (OMVR) is used as threshold wind velocity parameter. The wind tunnel tests of Hong Kong Polytechnic University (HKPolyU) campus model were used as a case study. The results show that the proposed criteria can reasonably represent the weak wind condition and provide suitable assessments of the wind comfort in Hong Kong. Moreover, the findings in this study provide scientific basis for future policy-making and the proposed criteria can also help city planners to improve the pedestrian level wind comfort.
**Numerical analysis of the potential of using light radiant ceilings in combination with diffuse ventilation to achieve thermal comfort in NZEB buildings**

Renewable energy resources for heating and cooling of buildings have temperatures close to room temperature and therefore a limited convertibility potential, i.e. they are of low value. To exploit low-valued energy sources Low Temperature Heating and High Temperature Cooling (LTH-HTC) systems must be developed.

Hydronic radiant ceiling systems with large surfaces for heat transfer are well suited for the usage of LTH-HTC. In this paper, the aim is to create a system that can be flexible and include ventilation. The system analysed are a suspended capillary tube ceiling placed on top of perforated gypsum ceiling panels. These panels make it possible to combine the heating/cooling ceiling with the diffuse ventilation method. The diffuse ventilation method or leak ventilation use larger surfaces to provide air into the room instead of diffusers.

An office building is investigated and analysed on an annual basis in the dynamic building simulation tool IDA Indoor Climate and Energy (IDA ICE). The office building contains both offices and meeting rooms. Worst-case scenarios are investigated in the office building considering heat gains, solar gains and the temperature offset between supply water temperature and room air temperature. The studies a carried out to identify the potential of reducing the temperature offset in near-zero energy buildings (NZEB) to the level where temperatures between ±2-4 °C becomes possible. The reduction should not compromise on the thermal comfort of the building occupants and comprise energy savings.

The investigations showed that with a NZEB building it was possible to create an adequate thermal comfort with a minimum use of energy. The studies showed that an energy saving of 36-41 % from a fan coil system running with the same temperatures was possible.

**General information**

State: Published

Organisations: Department of Civil Engineering, Section for Building Energy

Authors: Krusaa, M. R. (Intern), Hviid, C. A. (Intern), Kolarik, J. (Intern)

Number of pages: 9

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Main Research Area: Technical/natural sciences

Diffuse ventilation, Energy saving, Radiant ceilings, Heating, Cooling

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Publication: Research - peer-review › Paper – Annual report year: 2017

**Numerical Limit Analysis of Precast Concrete Structures: A framework for efficient design and analysis**

Precast concrete elements are widely used in the construction industry as they provide a number of advantages over the conventional in-situ cast concrete structures. Joints cast on the construction site are needed to connect the precast elements, which poses several challenges. Moreover, the current practice is to design the joints as the weakest part of the structure, which makes analysis of the ultimate limit state behaviour by general purpose software difficult and inaccurate. Manual methods of analysis based on limit analysis have been used for several decades. The methods provide excellent tools for engineers, however, the results are very dependent on the skill and intuition of the design engineer. Increasingly complex structures and the extensive use of computer-aided design on other aspects of civil engineering push for more accurate and efficient tools for the analysis of the ultimate limit state behaviour. This thesis introduces a framework based on finite element limit analysis, a numerical method based on the same extremum principles as the manual limit analysis. The framework allows for efficient analysis and design in a rigorous manner by use of mathematical optimisation. The scope is to be able to model entire precast concrete structures while accounting for the local behaviour of the joints.

The in-situ cast joints are crucial to the capacity of precast concrete structures, however, the behaviour of joints is in practice assessed by simple, empirical design formulas. A detailed study of in-situ cast joints in two-dimensions is conducted using finite element limit analysis, and the findings are used in the development of a two-dimensional multiscale joint finite element, which can represent the complex behaviour of the joints to a satisfactory degree.

Analysis of three-dimensional structures is rather difficult, especially by manual methods, however, considering three-dimensional nature of structures will generally increase the capacity. The two-dimensional joint element is therefore generalised to three-dimensions in order to be able to account for the influence of the joints.

The strength and efficiency of the presented framework are demonstrated by two real size examples, a two-dimensional precast shear wall and a three-dimensional precast concrete stairwell. The analysis shows that the framework is capable...
of modelling complex precast concrete structures efficiently. Moreover, the influence and local behaviour of the joints are accounted for in the global model.

The results of the two examples demonstrate the potential of a framework based on finite element limit analysis for practical design. The use of mathematical optimisation ensures an optimised design, and the optimisation problems are solved efficiently using state-of-the-art solvers. It is concluded that the framework and developed joint models have the potential to enable efficient design of precast concrete structures in the near future.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Intern)
Number of pages: 250
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Series: B Y G D T U. Rapport
Number: R-383
ISSN: 1601-2917
Main Research Area: Technical/natural sciences

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Numerical Limit Analysis of Precast Concrete Structures
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Publication: Research › Ph.D. thesis – Annual report year: 2017

Occupancy schedules for energy simulation in new prEN16798-1 and ISO/FDIS 17772-1 standards
This study reports the development of occupancy, lighting and appliance hourly schedules for new energy calculation input data standards. Developed schedules apply for 10 building categories which are described by one to three space categories, and include the separation between weekdays and weekends if needed. The approach used allowed to keep the full set of schedules compact and easy to implement in building energy simulation tools. The average values cab be used in monthly calculation tools. Occupant density values have local nature and occupancy patterns also depend on culture. The structure of the schedules, i.e. the way how the occupancy patterns are described, may be seen as an original result and its application has no geographical limitations. The main focus of the study was in the occupancy heat emission modeling and schedule development for prEN16798-1 and ISO/FDIS 17772-1 standards, supported by appliances and lighting schedules which are similarly needed as energy calculation input data. Hourly schedules allow to model occupant behaviour effects, for instance the peak cooling load in an office room was increased by factor of 1.1–1.3 compared to the use of constant average value. Single office schedule increased the delivered cooling energy by 8% compared to an open plan office schedule. The findings emphasize the importance of realistic schedules for specific categories of buildings.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Aalto University, Helsinki Metropolia University of Applied Sciences
Authors: Ahmed, K. (Ekstern), Akhondzada, A. (Ekstern), Kurnitski, J. (Ekstern), Olesen, B. W. (Intern)
Number of pages: 11
Pages: 134-144
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Oma modal indication by sensitivity to added artificial noise

This paper presents a modal indicator for use in OMA identification techniques relying on the correlation function for extraction of parameters. We propose to add small amounts of artificial white Gaussian noise to the correlation function and measuring the sensitivity of the identified modes to this noise. The idea is to identify system parameters many times, each time adding a tiny amount of uncorrelated white Gaussian noise to the correlation function. Since the noise modes are more affected by the adding of tiny amounts of additional noise, than the physical modes, the variance of the estimated parameters gives an effective modal indicator.

General information
State: Published
Organisations: Centre for oil and gas – DTU, Department of Civil Engineering, Section for Structural Engineering, Aarhus University
Authors: Juul, M. O. (Ekstern), Olsen, P. (Ekstern), Tarpø, M. (Intern), Brincker, R. (Intern)
Pages: 92-95
Publication date: 2017

On decision analysis about proof loading with inference to untested components

In this paper, a model is presented that applies proof load testing to separate components of structural systems before construction in order to update their component and system reliability. This model may be beneficial if the structure itself is difficult to proof load test and only its components can be tested. We discuss how the information of only one or a few tested components is inferred to further components. For this, a new approach is developed which facilitates to take the correlation of the components’ performance into account through the method of Bayesian updating using series and Daniels systems as models. With the proof loading information, the expected life-cycle benefits are computed within the framework of the Bayesian decision. The described framework is applied to offshore wind turbines. The life cycle economy is calculated based on a detailed cost and benefit analysis with consideration of the direct risks due to component deterioration, indirect risks due to system failure and the expected costs and direct risks of the proof loading procedure in a (pre-) posterior decision analysis. Based on this case study, it is demonstrated how the optimal decision can be determined and which effect the system behaviour of structural systems has.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Brüske, H. (Intern), Thöns, S. (Intern)
On minimizing the influence of the noise tail of correlation functions in operational modal analysis

In operational modal analysis (OMA) correlation functions are used by all classical time-domain modal identification techniques that uses the impulse response function (free decays) as primary data. However, the main difference between the impulse response and the correlation functions estimated from the operational responses is that the latter present a higher noise level. This is due to statistical errors in the estimation of the correlation function and it causes random noise in the end of the function and this is called the noise tail. This noise might have significant influence on the identification results (random errors) when the noise tail is included in the identification. On the other hand, if the correlation function is truncated too much, then important information is lost. In other to minimize this error, a suitable truncation based on manual inspection of the correlation function is normally used. However, in automated OMA, an automated procedure is needed for the truncation. Based on known theoretical solutions from the literature, a model is proposed in this paper to automatically truncate the correlation function at the point where it starts to get dominated by the noise tail. The accuracy of the proposed truncation procedure is studied using a three degree of freedom simulation case.

Ongoing Research on Herding Agents for In Situ Burning in Arctic Waters: Studies on Fate and Effects

Research on the fate and effects of herding agents used to contain and thicken oil slicks for in situ burning in Arctic waters continues under the auspices of the International Association of Oil and Gas Producers Arctic Oil Spill Response Technology – Joint Industry Program (JIP). In 2014/2015 laboratory studies were conducted on the fate and effects of herders. The purpose of the studies was to improve the knowledge base used to evaluate the environmental risk of using herders in connection with in situ burning for oil spill response in Arctic seas. Two herding agents were studied (OP 40 and ThickSlick 6535).

Laboratory-scale herding and burning experiments were carried out for investigating the physical fate of the two herders during combustion of Alaska North Slope and Grane crude oils (fresh and emulsified). The results showed that after burning, the herder was mainly found on the water surface, and only small concentrations of herders were found in the water column (0.2-22.8 mg/L).

The inherent properties of herders in relation to toxicity and bioaccumulation on the high Arctic copepods (Calanus hyperboreus), as well as the biodegradability of herders were studied under arctic conditions. The results indicated that a distinct mortality was seen at the highest test concentrations of the herders. However, the concentration of herders required to produce acute toxicity in the laboratory was approximately three orders of magnitude higher than the concentrations measured in the water column when herders were used to conduct an in situ burn in the laboratory. OP-40 might bio-accumulate whereas TS6535 might not. TS6535 was mostly degraded within 7 days, whereas the degradation of OP-40 was insignificant over 28 days.

Since herders are mainly considered as a surface active chemical compound, the potential impacts of herders on Arctic seabird feathers (from legally hunted Thick-Billed Murre and Common Eider) were investigated. Different dosages of herders were tested; high dosages that might be present just after the application of the herder and low dosages (approximately monolayers) likely to occur for a significant time and distance from the operations. Low dosages corresponding to approximately monolayers of OP-40 and TS6535 did not cause feathers to sink; however they did absorb more water than the controls. The high dosages caused measured damages to the feather microstructure.

Finally, laboratory burning experiments were carried out to determine if there was a difference in the composition of smoke plumes from mechanically contained burns versus herded oil burns. Herder was not measured in the smoke plumes, and there were no other noticeable differences in combustion between the two methods of containment (herder vs. metal ring).
On the application of correlation function matrices in OMA

In this paper the theoretical solution for the correlation function matrix of the random response of a structural system is revisited. It is shown that using the classical definition of the correlation functions, the row space is defined by the mode shapes of the system, whereas the column space is defined by the modal participation vectors. This means that only the rows can be used for unbiased modal identification in operational modal analysis and if the columns are used for identification, then bias will be introduced on the mode shape estimates. It is pointed out that the mode shape bias is strongly dependent on the frequency distance between the modes, i.e. bias will significantly increase in case of closely spaced modes. The identification errors on the estimated biased and unbiased mode shapes are studied in a simulation example.
On the different derivatives of the half spectral density

The half spectral density is normally used as primary data by frequency-domain output-only identification techniques. It is defined as the Fourier transform of the half (positive part) of the correlation function. The classical way of computing the half spectral density consists of disregarding the negative part of the correlation function. It turns out, however, that when the negative part is neglected, a discontinuity is created around zero. It is well known that this discontinuity introduces increasing constant noise levels in the frequency domain, which is normally reduced by dividing the initial value of the correlation function by a factor of two. In this paper, different ways of reducing the discontinuity are considered, and the effect of these modifications on the increased noise in the frequency domain is studied.
On the Probabilistic Characterization of Robustness and Resilience

Over the last decade significant research efforts have been devoted to the probabilistic modeling and analysis of system characteristics. Especially performance characteristics of systems subjected to random disturbances, such as robustness and resilience have been in the focus of these efforts and significant insights have been gained. However, as much of the undertaken research and developments aim to fulfill the particular needs of specific application areas and/or societal sectors somewhat diverging perspectives and approaches have emerged. In the present paper we take basis in recent developments in the modeling of robustness and resilience in the research areas of natural disaster risk management, socio-ecological systems and social systems and we propose a generic decision analysis framework for the modeling and analysis of systems across application areas. The proposed framework extends the concept of direct and indirect consequences and associated risks in probabilistic systems modeling formulated by the Joint Committee on Structural Safety (JCSS) to facilitate the modeling and analysis of resilience in addition to robustness and vulnerability. Moreover, based on recent insights in the modeling of robustness, a quantification of resilience is formulated utilizing a scenario based systems benefit modeling where resilience failure is associated with exhaustion of the capital accumulated by the system of time. The proposed framework and modeling concepts are illustrated with basis in a simple interlinked system comprised by an infrastructure system, a governance system, a regulatory system and a geohazards system. It is shown how the robustness and the resilience of the interlinked system may be modeled and quantified, how robustness and resilience are influenced by the stochastic dependency structure of the disturbance events and corresponding resistances, how robustness and resilience depends on the capacity of the social system to plan for and respond to disturbances over time and how robustness and resilience interrelate.
On the Value of Structural Health Monitoring Information for the Operation of Wind Parks

In the present paper, an approach for the quantification of the Value of Structural Health Monitoring (SHM) Information building upon a framework for infrastructure system utility and decision analysis is developed and applied to the operation of wind parks. The quantification of the value of SHM facilitates a benefit and risk informed assessment and optimization of SHM strategies and encompasses models for the infrastructure functionality, the structural constituent and system risks and its management as well as the performance of SHM strategies. A wind park system model incorporating the structural wind turbine systems and its components is developed accounting for the wind park functionality, i.e. power production, its operation and its cascading damage and failure scenarios. This system model facilitates to quantify the expected benefits and risks throughout the service life accounting for the propagation of SHM information and uncertainties from components to the different system levels and vice versa. The decision to extend the service life and the operation of a wind park is investigated without SHM information and by quantifying the value of several SHM strategies.

Operational modal analysis based prediction of actual stress in an offshore structural model

In this paper the accuracy of predicting stresses directly from the operational responses is investigated. The basic approach to the stress prediction is to perform an operational modal analysis (OMA) and then applying a modal filtering to the operating response, so that the modal coordinates of all significant modes are known. Next, the experimental mode shapes are expanded using a finite element (FE) model together with the local correspondence principle to estimate the displacements in all degrees of freedom of the FE model, and strain is predicted using the strain mode shapes. The accuracy of the approach is assessed by comparing the predicted and measured strains.

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Optimal scheduling for electric heat booster under day-ahead electricity and heat pricing

Multi-energy system (MES) operation calls for active management of flexible resources across energy sectors to improve efficiency and meet challenging environmental targets. Electric heat booster, a solution for Domestic Hot Water (DHW) preparation under Low-Temperature-District-Heating (LTDH) context, is identified as one of aforementioned flexible resources for electricity and heat sectors. This paper extends the concept of optimal load scheduling under day-ahead pricing from electricity sector only to both electricity and heat sectors. A case study constructing day-ahead energy prices to shift energy consumption to low carbon content energy is provided. Results show that 0.5 DKK/kWh add-ons on top of electricity spot price makes electricity and heat price not comparable such that electricity price variation will have no impact on load scheduling. This result suggests aforementioned concept is not feasible with current Danish electricity taxation.

General information
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Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy System Management, Department of Civil Engineering, Section for Building Energy, Section for Indoor Climate and Building Physics
Authors: Cai, H. (Intern), You, S. (Intern), Bindner, H. W. (Intern), Klyapovskiy, S. (Intern), Yang, X. (Intern), Li, R. (Intern)
Number of pages: 4
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Parametric analysis of the operation of nocturnal radiative cooling panels coupled with in room PCM ceiling panels

The scope of this parametric simulation study was to identify the optimal combination of set-points for different parameters of a radiant PCM ceiling panels cooling system that will result in the best indoor thermal environment with the least possible energy use. The results showed that for each parameter examined, a different set-point value was optimal for the thermal environment than the value that was optimal for the reduction of energy use. Therefore, two additional simulations were run, one with the combination of set-point values that resulted in the improvement of the thermal environment and one with the set-point values resulting in the reduction of energy use. In the first case, the temperature was within the range of Category III of EN 15251 (23 – 26°C, 73.4 – 78.8°F) for 83.5% of the occupancy time, while in the second case it was within Category III for 39.4%. In the first simulation, the energy usage of the pumps and the heat pump was 178 kWh, 608 kBtu, while for the second one it was 36 kWh, 121 kBtu. It was concluded that the optimal combination of set-point values to provide the most comfortable thermal environment was to activate the pump circulating water to the PCM no earlier than 03:00 and get activated when the temperature in the storage tank was below 21°C, 69.8°F, activate the heat pump no earlier than 05:00 and get activated when the temperature in the storage tank was below 15°C, 59°F, and lastly have a temperature difference between the output of the solar panels and the temperature in the middle of the storage tanks of 5 K, 9°F.
Parametric study on cavity formation during in-situ burning of oils in ice

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, University of Science and Technology of China, Worcester Polytechnic Institute
Authors: Fu, Y. (Ekstern), Farahani, H. F. (Ekstern), Jomaas, G. (Intern), Rangwala, A. S. (Ekstern)
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Performance, acute health symptoms and physiological responses during exposure to high air temperature and carbon dioxide concentration

Human subjects were exposed for 3 h in a climate chamber to the air temperature of 35 °C that is an action level, at which the working time needs to be diminished in China. The purpose was to put this action level to test by measuring physiological responses, subjective ratings and cognitive performance, and compare them with responses at temperature of 26 °C (reference exposure). Moreover, CO₂ was increased to 3000 ppm (CO₂ exposure) at 35 °C to further examine, whether this change will have any effect on the measured responses. Compared with the reference exposure, exposure to 35 °C caused subjects to report feeling uncomfortably warm, to rate the air quality as worse, to report increased sleepiness and higher intensity of several acute health symptoms. Eardrum temperature, skin temperature, heart rate and body weight loss all increased significantly at this exposure, arterial oxygen saturation decreased significantly, while the percentage of adjacent inter-beat cardiac intervals differing by > 50 m (pNN50) decreased significantly, indicating elevated stress. The performance of addition and subtraction tasks decreased significantly during this exposure, as well. Increasing CO₂ to 3000 ppm at 35 °C caused no significant changes in responses. Present results reaffirm the selection of 35 °C as an action level, and show that concurrently occurring high CO₂ levels should not exacerbate the hazards.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Central South University
Number of pages: 10
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Performance evaluation of radiant and convective cooling/heating systems & Survey on HVAC related potential research themes for office buildings - Final Report

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Kazanci, O. B. (Intern), Khovalyg, D. (Intern), Olesen, B. W. (Intern)
Number of pages: 135
Publication date: 2017

Performance maps for the control of thermal energy storage
Predictive control in building energy systems requires the integration of the building, building system, and component dynamics. The prediction accuracy of these dynamics is crucial for practical applications. This paper introduces performance maps for the control of water tanks, phase change material tanks, and thermochemical material tanks. The results show that these performance maps can fully account for the dynamics of thermal energy storage tanks.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Eindhoven University of Technology
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Pages: 1387-1393
Publication date: 2017

Performance of a Solar Heating System with Photovoltaic Thermal Hybrid Collectors and Heat Pump
The energy consumption in buildings accounts for a large part of the World’s CO2 emissions. Much energy is used for appliances, domestic hot water preparation and space heating.
In solar heating systems, heat is captured by solar collectors when the sun is shining and used for heating purposes. When the solar collectors are unable to supply the heat demand an auxiliary heat source is used. Heat pumps can generate this heat. Liquid/water heat pumps have better performance than air/water heat pumps in cold climates but requires installation of a tubing system for the cold side of the heat pump. The tubes are typically placed in the ground, requires a significant land area and increase the installation cost.
A new system design of a solar heating system with two storage tanks and a liquid/water heat pump is presented. The system consists of PVT collectors that generate both heat and electricity. Heat from the collectors is transferred to a domestic hot water storage tank or to a cold storage tank, which is used as the source for the heat pump. When the heat pump charges the warm storage tank, heat is extracted from the cold storage tank, which then can be reheated by the PVT collectors. In this system, it is possible to have the high performance of the liquid/water heat pump but without the need to install tubes in the ground. The performance of the system with automated energy discharge over several months is evaluated.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, RACELL Power Systems A/S, COWI AS
Authors: Dannemand, M. (Intern), Furbo, S. (Intern), Perers, B. (Intern), Kadim, K. (Ekstern), Mikkelsen, S. E. (Ekstern)
Permeability Estimation in Chalk Using NMR and a Modified Kozeny Equation
An NMR logging-based permeability estimator was implemented for chalk. Several authors have identified the inability of accurate prediction of permeability from NMR logs in carbonates. Current models (namely Coates and SDR) may yield unreliable permeability data and require extensive calibration of parameters. Also, calibration requires data from core analysis, which undermines one of the key advantages of the technology: minimizing the need of expensive coring runs. A modified Kozeny method is used for permeability estimation from NMR logs. Unlike the model of Coates and SDR, does not require calibration. To translate the T2 relaxation distribution into pore size, an analogy is made between the NMR T2 data and the MICP output. Specific surface data acquired by the Brunauer Emmett Teller method (BET) was used to aid the interpretation of the surface relaxivity. The model was tested in a chalk reservoir borehole in the North Sea, for which NMR logs and permeability data for 4 core plugs are available. Results achieved using the modified Kozeny equation are in better agreement with the Klinkenberg permeability of core plugs than both the SDR and Coates methods. They are also superior to the results found by the application of Kozeny's equation when used without input from NMR data.

Permeability in deep North Sea sandstones as predicted from NMR
General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Meireles, L. T. P. (Intern), Alam, M. M. (Intern), Fabricius, I. L. (Intern)
Number of pages: 8
Pages: 1208-1215
Publication date: 2017
Phase Change Humidity Control Material and its Application in Buildings

The synthesis of novel phase change humidity control material (PCHCM) was achieved by using composite microencapsulated phase change material (MPCM) and hygroscopic material. The PCHCM composite can moderate indoor hygrothermal fluctuations by absorbing or releasing both heat and moisture. The MPCM was synthesized by the microencapsulated phase change material (PCM) with SiO$_2$ shell. The diatomite was used as hygroscopic material. The morphology of MPCM and PCHCM were measured by scanning electron microscopy (SEM). The thermal properties of the new composites were analyzed with differential scanning calorimetry (DSC). The thermal gravimetric analysis (TGA) was used to study the thermal stability. Both the moisture transfer coefficient and moisture buffer value (MBV) of the PCHCM were measured by two bottle method. The DSC results show that the super-cooling degrees of microcapsule and PCHCM are lower than pure PCM. Both the moisture transfer coefficients and the MBV of PCHCM are higher than pure hygroscopic materials. The influence of PCHCM on indoor hygrothermal environment and building energy consumption was also studied. The results show that the PCHCM can effectively regulate the indoor temperature and relative humidity, thus own a potential energy saving rate of 18% for the test building in research. The overall hygrothermal performance of PCHCM is better than the simple combination of two separate layers of PCM and hygroscopic materials. The PCHCM could be used as an innovative passive material to improve the building energy efficiency.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Nanjing University
Authors: Wu, Z. (Ekstern), Qin, M. (Intern), Chen, Z. (Ekstern)
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Physiological responses during exposure to carbon dioxide and bioeffluents at levels typically occurring indoors

Twenty-five subjects were exposed to different levels of carbon dioxide (CO$_2$) and bioeffluents. The ventilation rate was set high enough to create a reference condition of 500 ppm CO$_2$ with subjects present; additional CO$_2$ was then added to supply air to reach levels of 1000 or 3000 ppm, or the ventilation rate was reduced to allow metabolically generated CO$_2$ to reach the same two levels (bioeffluents increased as well). Heart rate, blood pressure, end-tidal CO$_2$ (ETCO$_2$), oxygen saturation of blood (SPO$_2$), respiration rate, nasal peak flow, and forced expiration were monitored, and the levels of salivary α-amylase and cortisol were analyzed. The subjects performed a number of mental tasks during exposures and assessed their levels of comfort and the intensity of their acute health symptoms. During exposure to CO$_2$ at 3000 ppm,
when CO₂ was added or ventilation was restricted, ETCO₂ increased more and heart rate decreased less than the changes that occurred in the reference condition. Exposure to bioeffluents, when metabolically generated CO₂ was at 3000 ppm, significantly increased diastolic blood pressure and salivary α-amylase level compared with pre-exposure levels, and reduced the performance of a cue-utilization test. These effects may suggest higher arousal/stress. A model is proposed describing how mental performance is affected by exposure to bioeffluents.

**General information**

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**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark, Shanghai Jiao Tong University

**Authors:** Zhang, X. (Ekstern), Wargocki, P. (Intern), Lian, Z. (Ekstern)

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Porosity in Chalk

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Authors: Fabricius, I. L. (Intern)
Publication date: 2017
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Main Research Area: Technical/natural sciences

Post-earthquake fire resistance of steel buildings

Current design procedures do not account for the concomitant or subsequent occurrence of earthquakes and fires, which has so far been justified by the low probability of occurrence of accidental actions. Nevertheless, fires are often triggered as a consequence of damage caused by the earthquake and are responsible for casualties and major additional damage to buildings and other constructions. Despite a number of research studies on the topic, it is at present unclear as to what extent the occurrence of a previous earthquake could affect the response of a structure to fire.

The response of a moment-resistant steel frame to post-earthquake fires (PEFs) is investigated and compared with the response of the undamaged frame exposed to fire only, by means of numerical analyses performed using a commercial finite element software. The frame considered as a case study is not insulated against fire, but it is designed to comply with the service damage limitation prescribed in EN1998-1 (2004). The nonlinear seismic response to 7 different earthquakes, scaled at the same peak ground acceleration (PGA), is analyzed; then two of these earthquakes are selected for the post-earthquake fire (PEF) computations and a number of critical fire scenarios are identified, based on the vicinity of the fire to the highest permanent deformation induced by the earthquakes. The structural elements involved in each fire scenario are considered to be exposed to a standard fire and the collapse mode and time are determined by means of large deformation analysis.

The comparison of the mode and time of the frame collapse for all the investigated scenarios shows a minor influence of the effect of the two considered earthquakes on the fire resistance of the frame. The current study shows that nonlinear geometric effects do not have a significant effect in the behavior of the building during fire, when the structure is designed to comply with the service damage limit states prescribed in EN1998-1 (2004).
The presence of the fungal genus *Chaetomium* and its secondary metabolites in indoor environments is suspected to have a negative impact on human health and wellbeing. About 200 metabolites have been currently described from *Chaetomium* spp., but only the bioactive compound group, chaetoglobosins, have been screened for, and thus detected in buildings. In this study, we used a liquid chromatography-high resolution mass spectrometry approach to screen both artificially and naturally infected building materials for all the *Chaetomium* metabolites described in the literature. Pure agar cultures were also investigated in order to establish differences between metabolite production *in vitro* and on building materials as well as comparison to non-indoor reference strains. On building materials six different chaetoglobosins were detected in total concentrations of up to 950 mg/m² from *C. globosum* along with three different chaetoviridins/chaetomugilins in concentrations up to 200 mg/m². *Indoor Chaetomium* spp. preferred wood-based
materials over gypsum, both in terms of growth rate and metabolite production. Cochliodones were detected for the first time on all building materials infected by both C. globosum and C. elatum, and are thus candidates as Chaetomium biomarkers. No sterigmatocystin was produced by Chaetomium spp. from indoor environment.

General information
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Organisations: Department of Systems Biology, Metabolomics Platform, Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Dosen, I. (Intern), Nielsen, K. F. (Intern), Clausen, G. (Intern), Andersen, B. (Intern)
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Scopus rating (2007): SJR 0.933 SNIP 3.724
Web of Science (2007): Indexed yes
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Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.347 SNIP 1.283
Web of Science (2005): Indexed yes
Probabilistic disaggregation of a spatial portfolio of exposure for natural hazard risk assessment

In natural hazard risk assessment situations are encountered where information on the portfolio of exposure is only available in a spatially aggregated form, hindering a precise risk assessment. Recourse might be found in the spatial disaggregation of the portfolio of exposure to the resolution of the hazard model. Given the uncertainty inherent to any disaggregation, it is argued that the disaggregation should be performed probabilistically. In this paper, a methodology for probabilistic disaggregation of spatially aggregated values is presented. The methodology is exemplified with the disaggregation of a portfolio of buildings in two communes in Switzerland and the results are compared to sample observations. The relevance of probabilistic disaggregation uncertainty in natural hazard risk assessment is illustrated with the example of a simple flood risk assessment.

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Authors: Custer, R. (Intern), Nishijima, K. (Ekstern)
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Scopus rating (2013): SJR 1.026 SNIP 0.656 CiteScore 0.65
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ISI indexed (2012): ISI indexed no
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ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.218 SNIP 0.485
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Process optimization on ambitious sustainability goals through the framework of DGNB

The need for designing buildings with a sustainable approach is higher than ever before, but using building sustainability assessment tools, such as DGNB, is a comprehensive and complex activity. This has led to attempts to optimize the tangibility for usage of sustainability assessment tools in the design process. A holistic qualitative approach is used in this paper with the aim of mapping the structure of DGNB Office Building finding and prioritizing topics to address during a design process. Four experts from the Danish building sector were interviewed and their responses analyzed through the use of Grounded Theory. The findings expose that the project brief must define a healthy framework for both collaboration and project management, and a specific two-step approach to obtain the certification goal should be performed. The size of the criteria determined how it should be addressed in the project. DGNB was also found to have an impact on the architectural quality leading to certain architectural traits. An important finding was that it is paramount that all stakeholders take an integrated holistic approach when applying DGNB.

Progressive collapse of steel moment frame subjected to post-earthquake fire

Progress of the COST Action TU1402 on the Quantification of the Value of Structural Health Monitoring

This paper summarizes the development of Value of Structural Health Monitoring (SHM) information analyses and introduces the development, objectives and approaches of the COST Action TU1402 on this topic. SHM research and engineering has been focused on the extraction of loading, degradation and structural features for damage detection and condition assessment, system identification and model updating. However, there is an actual challenge to establish a better understanding of the value of SHM before its implementation in terms of its utility in conjunction with practically applicable methods for its quantification. This challenge can be met with Value of SHM.
Information analyses facilitating that the SHM contribution to substantial benefits for life safety, economy and beyond can be may be quantified, demonstrated and utilized. However, Value of SHM Information analyses involve complex models encompassing the infrastructure and the SHM systems, their functionality and thus require the interaction of several research disciplines. For progressing on these points, a scientific networking and dissemination project namely the COST Action TU1402 has been initiated.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, IFSTTAR - French institute of science and technology for transport, development and networks, Politecnico di Milano, University of Zagreb, Heriot-Watt University, University of Surrey, KU Leuven, Technical University of Munich, ETH Zurich, Norwegian University of Science and Technology, University of Natural Resources and Life Sciences, Aalborg University
Authors: Thöns, S. (Intern), Limongelli, M. P. (Ekstern), Ivanovic, A. M. (Ekstern), Val, D. (Ekstern), Chryssanthopoulos, M. (Ekstern), Lombaert, G. (Ekstern), Döhler, M. (Ekstern), Straub, D. (Ekstern), Chatzi, E. (Ekstern), Köhler, J. (Ekstern), Wenzel, H. (Ekstern), Sørensen, J. D. (Ekstern)
Pages: 1314-1323
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ISBN (Electronic): 978-1-60595-330-4
Main Research Area: Technical/natural sciences
Conference: 11th International Workshop on Structural Health Monitoring, Stanford, United States, 12/09/2017 - 12/09/2017
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Project families: A new concept for student thesis activities
The students’ activities during their final thesis work have been organised in project families, i.e. a group of individual student project organized in a shared learning environment. The aim is more efficient supervision and support, simultaneously to improved learning. DTU Byg have now tested this concept for 100+ students with experimental activities and found a major improvement in their learning, grades, interaction and behaviour in the laboratories, just as they now provides a strong support for the supervisors’ research. The use of resources for the supervision and the support in the laboratories has also been significantly reduced.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Section for Building Design
Authors: Goltermann, P. (Intern), Ottosen, L. M. (Intern), Schmidt, J. W. (Intern), Nielsen, J. H. (Intern)
Pages: 4
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the XXIII Nordic Concrete Research Symposium
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Conference: XXIII Nordic Concrete Research Symposium, Aalborg, Denmark, 20/08/2017 - 20/08/2017
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Proposing a Central AEC Ontology That Allows for Domain Specific Extensions
In the last years, several ontologies focused on structuring domain specific information within the scope of Architecture, Engineering and Construction (AEC) have emerged. Several of these individual ontologies redefine core concepts of a building already specified in the publicly available ontology version of the ISO standardised Industry Foundation Classes (IFC) schema, thereby violating the W3C best practice rule of minimum redundancy. The voluminous IFC schema with origins in a closed world assumption is likewise violating this rule by redefining concepts about time, location, units etc. already available from other sources, and it is furthermore violating the rule of keeping ontologies simple for easy maintenance. Based on all the available ontologies, we propose a simple Building Topology Ontology (BOT) only covering the core concepts of a building, and three methods for extending this with domain specific ontologies. This approach makes it (1) possible to work with a limited set of core building classes, and (2) extend those as needed towards specific domain ontologies that are in hands of business professionals or domain-specific standardisation bodies, such as the
European Telecommunications Standards Institute (ETSI), buildingSMART, the Open Geospatial Consortium (OGC), and so forth.

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, Section for Building Design, Section for Building Energy, Ghent University

**Authors:** Rasmussen, M. H. (Intern), Pauwels, P. (Ekstern), Hviid, C. A. (Intern), Karlshøj, J. (Intern)

**Pages:** 237-244

**Publication date:** 2017

**Host publication Information**

**Title of host publication:** LC3 2017: Proceedings of the Joint Conference on Computing in Construction

**Volume:** 1

**ISBN (Print):** 978-0-9565951-6-4

**Main Research Area:** Technical/natural sciences

**Conference:** 2017 Lean and Computing in Construction Congress, Heraklion, Greece, 04/07/2017 - 04/07/2017

**Linked data, Building information modelling, Web of data, Building topology ontology**

**Electronic versions:** Untitled.pdf

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**Source-ID:** 134307721

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**Prøvehus i Nuuk. Ny Arktisk Byggeskik: Midtvejsevaluering**

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalborg University

**Authors:** Lading, T. (Intern), Bunch-Nielsen, T. (Ekstern), Møller, E. B. (Ekstern)

**Publication date:** 2017

**Publication Information**

**Publisher:** Technical University of Denmark, Department of Civil Engineering

**ISBN (Electronic):** 9788778774699

**Original language:** English

**Series:** DTU Byg Rapport

**Number:** R-375 (DK)

**Main Research Area:** Technical/natural sciences

**Electronic versions:**

Tove_Lading_R_375_samlet_2_.pdf

**Publication:** Research › Report – Annual report year: 2017

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**PV-PCM integration in glazed building. Co-simulation and genetic optimization study**

The study describes a multi-objective optimization algorithm for an innovative integration of forced ventilated PV-PCM modules in glazed façade buildings: the aim is to identify and optimize the parameters that most affect thermal and energy performances. 1-D model, finite difference method FDM, thermal resistances technique and enthalpy method were applied to describe different façade solutions and transient thermal performance of PCM. The coupling between the PV-PCM façade code implemented in MATLAB and the TRNSYS software was developed to estimate the dynamic thermal energy profiles. An exploratory step has also been considered prior to the optimization algorithm: it evaluates the energy profiles before and after the application of PCM to PV module integrated in glazed building. The optimization analysis investigate parameters such as ventilation flow rates and time schedule to obtain the best combination suiting the PCM performance and external-internal loads. A group of solution were identified on the Pareto front. Savings in thermal loads for the best individual reached 26.4% while the best in temperature increment in operating temperatures was recorded as 6.8% comparing to the design set temperature.

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Padua

**Authors:** Elarga, H. (Intern), Dal Monte, A. (Ekstern), Andersen, R. K. (Intern), Benini, E. (Ekstern)
Quantification of Residual Stresses in External Attachment Welding Applications

It is uncertain whether postweld heat treatment (PWHT) should be required for external attachment welds in petrochemical industry applications where stress corrosion cracking (SCC) is a possibility. An industrial criterion established by NACE SP0472 indicates that PWHT is not required if residual stresses don't extend through the entire thickness. To investigate this problem, a finite-element analysis (FEA) software, Sysweld™, was utilized to analyze the extent and level of residual stresses of such welds through the thickness of the pressure vessel shell. The study also used the gas metal arc welding (GMAW) process to deposit single beadonplate welds with ER70S6 wire on ASTM516 grade 70 pressure vessel steel plates of 6.3, 12.7, and 19 mm thicknesses.

Microstructural analysis, temperature, and distortion measurements of weldments were performed to qualify the FEA modeling results. In addition, the holedrilling method was used for residual stress measurement on the bottom surfaces. Following the through-thickness direction, the maximum tensile residual stresses were invariably observed in the subcritical and intercritical heat-affected zones (HAZ). Maximum tensile stresses at 86 to 104% of the yield strength existed in the bottom surface of the 6.3mm-thick plates, whereas the maximum tensile stresses only reached 26 to 35% of the yield strength in the 19mm-thick plates. This conclusion indicates that, for single-pass welding, the 6.3-mm-thickness application demands PWHT. The 19-mm-thick plates were found with safe conditions where PWHT can either be optional or waived, depending on loading conditions.
Quantitative risk assessment of continuous liquid spill fires based on spread and burning behaviours

Spill fires usually occur during the storage and transportation of hazardous materials, posing a threat to the people and environment in their immediate proximity. In this paper, a classical Quantitative Risk Assessment (QRA) method is used to assess the risk of spill fires. In this method, the maximum spread area and the steady burning area are introduced as parameters to clearly assess the range of influence of the spill fire. In the calculations, a modified spread model that takes into consideration the burning rate variation is established to calculate the maximum spread area. Furthermore, the steady burning area is calculated based on volume conservation between the leakage rate and the fuel consumption rate due to burning. Combining these two parameters with leakage frequency, flame model, and vulnerability model, the dynamic individual risk can be calculated quantitatively. Subsequently, large-scale experiments of spill fires on water and a glass sheet were conducted to verify the accuracy and application of the model. The results show that the procedure we developed can be used to quantitatively calculate the risk associated with a continuous spill fire.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Tsinghua University, China University of Petroleum - Beijing, China University of Mining And Technology
Authors: Zhao, J. (Ekstern), Huang, H. (Ekstern), Li, Y. (Ekstern), Jomaas, G. (Intern), Wang, H. (Ekstern), Zhong, M. (Ekstern)
Number of pages: 7
Pages: 500-506
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Main Research Area: Technical/natural sciences

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ISSN (Print): 1359-4311
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.78 SJR 1.462 SNIP 1.828
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.734 SNIP 1.898 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Random fields of initial out of straightness leading to column buckling

The elastic load-carrying capacity and buckling trajectory of steel columns under compression with open and hollow cross-sections, whose axis is curved by spatial random fields, are studied in the article. As a result of the spatial curvature of the axis the cross-sections are subjected to compression, bending and torsion from the onset of loading. Numerical simulations are performed using the geometrically non-linear model created using the ANSYS software package. Each simulation run has input random realizations of yield strength and the random field generated using the Latin Hypercube Sampling method. In the plane perpendicular to a perfectly straight column axis, the random observations of deformation trajectories of a node in the middle of the column height are studied. The increasing compression load moves the node along the curve path (open sections) or along the linear path (hollow sections). Large discrepancies in the deformation trajectories of open sections (curvilinear paths) and hollow sections (linear paths) were observed from the comparison of simulation runs. The average and design load-carrying capacities of compressed columns with open cross-sections are lower in comparison to columns with hollow cross-sections due to the lower efficiency of open cross-sections in torsion.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Brno University of Technology
Authors: Kala, Z. (Ekstern), Valeš, J. (Ekstern), Jönsson, J. (Intern)
Reaction to fire of glass/ hemp/ furan composites

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Markert, F. (Intern)
Number of pages: 11
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Original language: English
Main Research Area: Technical/natural sciences
Electronic versions: Untitled_2.pdf
Source: PublicationPreSubmission
Source-ID: 139059934
Publication: Communication › Sound/Visual production (digital) – Annual report year: 2017

Recent changes in the Building Topology Ontology
The Building Topology Ontology (BOT) was in early 2017 suggested to the W3C community group for Linked Building Data as a simple ontology covering the core concepts of a building. Since it was first announced it has been extended to cover a building site, elements hosted by other elements, zones as a super-class of spaces, storeys, buildings and sites, interfaces between adjacent zones/elements, a transitive property to infer implicit relationships between building zone siblings among other refinements. In this paper, we describe in detail the changes and the reasons for implementing them.

General information
Recycling of MSWI fly ash in clay bricks—effect of washing and electrodialytic treatment

Fly ash generated from municipal solid waste incineration (MSWI) is a hazardous waste due to presence and leachability of heavy metals and organic pollutants (e.g. dioxins and polycyclic aromatic hydrocarbons). In 2000, approximately 25 Mt/year of fly ash was generated in USA, Japan and EU (Reijnders 2005). Electrodialytic remediation (EDR) is one technique for MSWI fly ash treatment (Ferreira et al. 2005), where an electric DC field is applied to an ash-water suspension to extract and separate heavy metal by migration towards anode or cathode through ion exchange membranes. Ferreira et al. (2008) observed that in MSWI ash treated by water washing and EDR, metals were mainly in the strongly bonded and residual phases, indicating a reduction in the ash's environmental risk. Belmonte et al. (2016) made Greenlandic bricks (∼2 g discs) containing 20% and 40% of EDR treated MSWI fly ash, and found that bricks had a low durability and high leaching of As and Cr. In the present study, fired fly ash-clay bricks with a larger size and with lower EDR-treated ash (water-washed before EDR) contents (5%, 10% and 20%) were made and characterized. These bricks were compared with 100% clay bricks and with bricks made from original MSWI fly ash at 20% substitution rate. The feasibility of incorporation of MSWI fly ash treated by combined washing and EDR in production of sintered clay bricks was investigated.

Reducing the computational requirements for simulating tunnel fires by combining multiscale modelling and multiple processor calculation

Multiscale modelling of tunnel fires that uses a coupled 3D (fire area) and 1D (the rest of the tunnel) model is seen as the solution to the numerical problem of the large domains associated with long tunnels. The present study demonstrates the feasibility of the implementation of this method in FDS version 6.0, a widely used fire-specific, open source CFD software. Furthermore, it compares the reduction in simulation time given by multiscale modelling with the one given by the use of multiple processor calculation. This was done using a 1200m long tunnel with a rectangular cross-section as a demonstration case. The multiscale implementation consisted of placing a 30MW fire in the centre of a 400m long 3D domain, along with two 400m long 1D ducts on each side of it, that were again bounded by two nodes each. A fixed volume flow was defined in the upstream duct and the two models were coupled directly. The feasibility analysis showed a difference of only 2% in temperature results from the published reference work that was performed with Ansys Fluent (Colella et al., 2010). The reduction in simulation time was significantly larger when using multiscale modelling than when performing multiple processor calculation (97% faster when using a single mesh and multiscale modelling; only 46% faster when using the full tunnel and multiple meshes). In summary, it was found that multiscale modelling with FDS v.6.0 is feasible, and the combination of multiple meshes and multiscale modelling was established as the most efficient method for reduction of the calculation times while still maintaining accurate results. Still, some unphysical flow oscillations were predicted by FDS v.6.0 and such results must be treated carefully.
Reliability analysis and updating of deteriorating systems with subset simulation

An efficient approach to reliability analysis of deteriorating structural systems is presented, which considers stochastic dependence among element deterioration. Information on a deteriorating structure obtained through inspection or monitoring is included in the reliability assessment through Bayesian updating of the system deterioration model. The updated system reliability is then obtained through coupling the updated deterioration model with a probabilistic structural model. The underlying high-dimensional structural reliability problems are solved using subset simulation, which is an
efficient and robust sampling-based algorithm suitable for such analyses. The approach is demonstrated in two case studies considering a steel frame structure and a Daniels system subjected to high-cycle fatigue.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Technical University of Munich, Bundesanstalt für Materialforschung und Prüfung
Authors: Schneider, R. (Ekstern), Thöns, S. (Intern), Straub, D. (Ekstern)
Number of pages: 17
Pages: 20-36
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

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Ratings:
BFI (2018): BFI-level 2
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.15 SJR 1.615 SNIP 2.367
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.462 SNIP 2.249 CiteScore 2.7
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.607 SNIP 2.809 CiteScore 2.89
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.585 SNIP 3.359 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.741 SNIP 3.533 CiteScore 3.13
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.07 SNIP 3.365 CiteScore 3.22
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.15 SNIP 2.722
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.256 SNIP 2.964
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.414 SNIP 2.507
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.261 SNIP 2.743
Scopus rating (2006): SJR 1.179 SNIP 3.275
Scopus rating (2005): SJR 1.309 SNIP 2.582
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.11 SNIP 2.13
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.546 SNIP 1.766
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.56 SNIP 1.037
Reliability analysis of offshore structures using OMA based fatigue stresses

Today, many offshore structures in the North Sea already reached their predicted lifetime. Since it is still required a huge demand of oil, it results in an important need to keep those structures in operation. The great attention concerning the lifetime of offshore platforms has triggered a need for monitoring these structures in order to gain information about their actual state and hence reduce the uncertainty and allow for more optimal decision planning regarding maintenance, repair and future inspection actions.

Throughout the lifetime, the performance of the structure can be evaluated by analyzing the deterioration process of the structure. In the offshore environment, one of the most common deterioration mechanisms is the fatigue of structural steel induced by wave loading. The deterioration formulation of a structural system subjected to fatigue is nowadays well known. However, many uncertainties may affect the accuracy of the performance evaluation. It can be mentioned mainly the uncertainties related to the materials, the uncertainty on Miner’s rule and the uncertainty on the SN curve but most importantly is the uncertainty on the stress ranges induced by the wave loading.

In this paper, the main focus is on the uncertainty observed on the different stresses used to predict the damage. This uncertainty can be reduced by Modal Based Fatigue Monitoring which is a technique based on continuously measuring of the accelerations in few points of the structure with the use of accelerometers known as reliable for long time measurements. An Operational Modal Analysis (OMA) is performed and then a modal filtering of the operating response is considered, so that the modal coordinates of all significant modes are known. Next, the experimental mode shapes are expanded using a Finite Element (FE) model together with the Local Correspondence (LC) principle and the displacements can be estimated in all degrees of freedom of the FE model, allowing the stresses and strains to be obtained from the element equations. It is important to emphasize that even though the accelerations are measured in only a few points of the structure, the stress history can be calculated in any arbitrary point of the structure. The accuracy of the estimated actual stress is analyzed by experimental tests on a scale model where the obtained stresses are compared to strain gauges measurements. After evaluating the fatigue stresses directly from the operational response of the structure, a reliability analysis is performed in order to estimate the reliability of using Modal Based Fatigue Monitoring for long term fatigue studies.
Renovering af skoleventilation - indeklima og energiforbrug

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern), Wargocki, P. (Intern)
Pages: 24-28
Publication date: 2017
Main Research Area: Technical/natural sciences

Residential fire solutions in the building sector

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Building Energy
Authors: Shaukat, F. S. (Intern), Markert, F. (Intern)
Publication date: 2017
Event: Abstract from Nordic Fire and Safety Days 2017, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Fire retardants, Biomaterials, Residential fires
Electronic versions:

Residential fire solutions in the building sector
Resilience of Networked Infrastructure with Evolving Component Conditions: Pavement Network Application

This paper deals with quantifying the resilience of a network of pavements. Calculations were carried out by modeling network performance under a set of possible damage-meteorological scenarios with known probability of occurrence. Resilience evaluation was performed a priori while accounting for optimal preparedness decisions and additional response actions that can be taken under each of the scenarios. Unlike the common assumption that the pre-event condition of all system components is uniform, fixed, and pristine, component condition evolution was incorporated herein. For this purpose, the health of the individual system components immediately prior to hazard event impact, under all considered scenarios, was associated with a serviceability rating. This rating was projected to reflect both natural deterioration and any intermittent improvements due to maintenance. The scheme was demonstrated for a hypothetical case study involving LaGuardia Airport. Results show that resilience can be impacted by the condition of the infrastructure elements, their natural deterioration processes, and prevailing maintenance plans. The findings imply that, in general, upper bound values are reported in ordinary resilience work, and that including evolving component conditions is of value. (C) 2016 American Society of Civil Engineers.
Resilience of systems by value of information and SHM

Critical infrastructure systems such as energy provision and distribution systems, transport systems, and the built environment in general are subject to and sensitive to deterioration processes. Structural Health Monitoring (SHM) strategies have been increasingly employed as means to detect deterioration, facilitate timely and efficient interventions, and thereby to enhance resilience of critical infrastructure. However, in specific situations, it is generally not obvious if and to what degree different SHM strategies are efficient and sufficient for enhancing the resilience of critical infrastructure systems. In response to this challenge, the present contribution puts forward a novel approach, taking basis in the concept of value of information analysis from Bayesian pre-posterior decision analysis. Utilizing a principal model framework, we show how the proposed approach is implemented with due consideration of the resilience governing characteristics and interdependencies between infrastructure systems, social/organisational systems, regulatory systems, ecological systems, as well as anthropological and geological hazard systems.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Centre for Oil and Gas - DTU, Aalborg University, University of Newcastle
Authors: Miraglia, S. (Intern), Faber, M. H. (Ekstern), Thöns, S. (Intern), Stewart, M. (Ekstern)
Pages: 2998-3007
Publication date: 2017

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Main Research Area: Technical/natural sciences
Conference: 12th International Conference on Structural Safety and Reliability, Vienna, Austria, 06/08/2017 - 06/08/2017
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Responses to Human Bioeffluents at Levels Recommended by Ventilation Standards

The purpose of this study was to examine whether exposure to human bioeffluents, at the levels recommended by the current ventilation standards, would cause any effects on humans. Ten subjects were exposed in a low-emission stainless-steel climate chamber for 4.25 hours. The outdoor air supply rate was set to 33 or 4 l/s per person, creating two levels of bioeffluents with carbon dioxide (CO2) at 500 or 1600 ppm. Subjective ratings were collected, cognitive performance was examined, and physiological responses were monitored. The results show that exposures to human bioeffluents at ventilation rate of 4 l/s per person caused sensory discomfort of visitors, reduced pNN50 (a domain of ECG measurement), but did not produce negative effects on cognitive performance or health symptoms.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Beijing University of Technology, Shanghai Jiao Tong University
Authors: Zhang, X. (Ekstern), Wargocki, P. (Intern), Lian, Z. (Ekstern), Xie, J. (Ekstern), Liu, J. (Ekstern)
Pages: 609-614
Publication date: 2017
Reuse of polyethylene fibres from discarded fishing nets as reinforcement in gypsum-based materials

In this study, the potential of reusing plastic fibres from discarded waste fishing nets of polyethylene (PE) as fibre reinforcement in gypsum-based building materials is investigated. The fishing nets were not reprocessed, but simply washed and cut to monofilament fibres by an industrial operation. The fibre length was ranging from 1 mm (pulp) to 65 mm, and the diameter from 0.25 mm to 0.35 mm. Gypsum-based prisms and cylinders were cast with these fibres (fibre addition of 0.5 – 2.00 wt%). Mechanical properties such as compressive strength and three-point bending strength of fibre reinforced cylinders and prisms were determined by laboratory-scale testing. A decrease in first-crack strength of the prisms was observed. However, the addition of waste PE fibres resulted in improved post-crack behaviour.

General information

State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Section for Building Design
Authors: Bertelsen, I. M. G. (Intern), Ottosen, L. M. (Intern)
Number of pages: 5
Publication date: 2017
Main Research Area: Technical/natural sciences
Plastic waste, Reuse of fishing nets, Fibre reinforced gypsum, Mechanical properties

Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 140840461
Publication: Research - peer-review › Paper – Annual report year: 2017

Rock Physics

Rock physics is the discipline linking petrophysical properties as derived from borehole data to surface based geophysical exploration data. It can involve interpretation of both elastic wave propagation and electrical conductivity, but in this chapter focus is on elasticity. Rock physics is based on continuum mechanics, and the theory of elasticity developed for statics becomes the key to petrophysical interpretation of velocity of elastic waves. In practice, rock physics involves interpretation of well logs including vertical seismic profiling (VSP) and analysis of core samples. The results of these
procedures are then integrated with reflection seismic data (Japsen, Bruun et al. 2004; Al-Shuhail 2007).

**General information**  
State: Published  
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering  
Authors: Fabricius, I. L. (Intern)  
Pages: 39-46  
Publication date: 2017

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Main Research Area: Technical/natural sciences  
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**Rock Properties**

**General information**  
State: Published  
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering  
Authors: Fabricius, I. L. (Intern)  
Pages: 89-103  
Publication date: 2017

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Chapter: 7  
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Source: PublicationPreSubmission  
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Publication: Research - peer-review › Book chapter – Annual report year: 2017

**Roof windows in low-energy buildings - Analyses of demands and possibilities for future product development**

As part of an ambitious energy policy and strategy for reducing the use of fossil fuels in the European Union, all new buildings are required to consume ‘nearly zero-energy’ by the end of 2020. This creates a strong need for research in cost-effective solutions and technology that can help balance the goal of a very low energy use with good daylighting and a healthy and comfortable indoor environment. Windows play a very large role in both the energy consumption and the indoor environment of buildings. Roof windows are a particularly efficient daylighting source, which certain types of houses depend on to receive sufficient daylighting in all parts. The development of roof windows with an overall improved performance for use in nearly zero-energy houses might therefore help considerably in the achievement of these goals in a cost-effective way.

The main hypothesis of this research was that the current best standard-practice roof windows can be improved in a way that makes it easier and more cost-effective to realise nearly zero-energy houses with sufficient daylighting and thermal comfort throughout.

This hypothesis was tested through a series of simulation-based investigations focusing on the effect of various combinations of glazing size, thermal properties of glazing, frame and junctions, and transmittance of light (LT) and solar energy (g-value) on energy use, daylighting and thermal comfort. The effect of roof and facade window parameters was first studied in rooms with windows of a certain slope and orientation to identify the demands and possibilities in various parts of the building. A glazing diagram was developed which made it possible to map and compare the various options that provide sufficient daylighting and thermal comfort. This showed that well-dimensional facade windows with light transmittances of about 40-70% could provide sufficient daylighting without overheating in the climates of Rome and Copenhagen, as long as they were located in rooms with a reasonable layout for daylighting and appropriate solar-control coating was used on solar exposed glazing. The same was true for sloped and horizontal roof windows with any choice of light transmittance in both climates.

Roof-window thermal properties needed for flexibility were then identified by studying the effect of these options on space-heating demand in rooms representing various parts of a 11/2-storey house with a simplified floor plan and no interaction of air or heat between zones. This showed how improved roof-window frame constructions and heat loss coefficients of the
glazing lower than current standard levels would make it possible to achieve nearly zero-energy consumption with a wider range of options providing sufficient daylighting and thermal comfort, and with increased use of rooms with sloped roof windows oriented north. In Copenhagen, such improvements were found critical for adequate flexibility in building design, while in Rome they were not. Due to the low utilisation of solar gains, such improvements were also generally needed for roof windows in Copenhagen with any orientation to reduce the impact of the choice of window size on space-heating demand.

Comparison of options with and without dynamic shading in a loft room with sloped roof windows facing south in the two climates, showed that dynamic shading made room for considerably more daylighting without overheating than using optimal solar-control coating on its own. However, in both cases, illuminances of 300 lx in 75% of the space could be achieved in 50-63% of the daylight hours, with no more than 40-100 h of excessive temperatures as defined by the Adaptive Thermal Comfort model. Moreover, as an option for reducing the optimum space-heating demand, dynamic shading showed limited potential in Copenhagen, while it could have some potential in Rome.

Finally, the performance and cost-effectiveness of various options for improvement were studied for two large single-family houses in Copenhagen with typical floor plans and sloped (Case A) and horizontal (Case B) roof windows. The scope for investment in improved roof windows was identified on the basis of the cost of the insulation not needed in the houses to meet nearly zero-energy requirements with the improved roof windows installed instead of the options that are current best standard-practice. For the specific improvements investigated, this revealed examples of savings in insulation costs that would allow users to pay EUR 50-320 more per m² improved roof window than for the products that are best standard practice today. Of these amounts EUR 50-60 were due to improvements in the glazed part alone, EUR 100-300 were due to improvements in the frame constructions, while EUR 320 were due to a relatively simple improvement in the horizontal roof windows, where the addition of a 3-pane glazing at the bottom of the light well considerably reduced the overall heat losses. If manufacturers can make such improvements available at prices within these scopes for investment, nearly zero-energy houses with sufficient daylighting and thermal comfort throughout could be realised in an easier and more cost-effective way.
Scan-to-BIM in the pre-design phase
The high demand for energy-efficiency of buildings nowadays has triggered the need for gathering documentation on existing construction conditions. This information is then used to design buildings with high consideration to the site or to allow the renovation of old buildings that can no longer meet the requirements for energy performance or comfortable living. The documentation required for this type of situation is often outdated or missing, and to create an optimal design the existing conditions need to be registered and analysed using advanced technological methods, such as Building Information Modelling (BIM) and 3D laser scanning.

SciCloud: A Scientific Cloud and Management Platform for Smart City Data
The pervasive use of Internet of Things and smart meter technologies in smart cities increases the complexity of managing the data, due to their sizes, diversity, and privacy issues. This requires an innovate solution to process and manage the data effectively. This paper presents an elastic private scientific cloud, SciCloud, to tackle these grand challenges. SciCloud provides on-demand computing resource provisions, a scalable data management platform and an in-place data analytics environment to support the scientific research using smart city data.
Seasonal Deep Aquifer Thermal Energy Storage in the Gassum Sandstone Formation

Seasonal storage of excess heat in hot deep aquifers is considered to optimise the usage of commonly available energy sources. The potential chemical reactions caused by heating the Gassum Sandstone Formation to up to 150°C is investigated by core flooding experiments combined with petrographic analysis and geochemical modelling. Synthetic formation water is injected into two sets of Gassum Formation samples at 25°C, 50°C (reservoir temperature), 100°C and 150°C with a velocity of 0.05 PV/hr and 0.1 PV/hr, respectively. A significant increase in the aqueous concentration of silicium and iron with increasing temperature is observed due to dissolution of silica and siderite. Increasing the reservoir temperature from 50°C to 100°C enhanced the naturally occurring weathering of Na-rich feldspar to kaolinite. Dissolution of quartz increased sharply above 100°C and was the dominating process at 150°C. At temperatures ≤100°C, the silicium concentration was controlled by a dynamic equilibrium between feldspar dissolution and kaolinite precipitation while the concentration was kinetically controlled by quartz dissolution at 150°C. The results imply that storage of excess heat in the Gassum Formation in the Stenlille area may be possible provided operational precautions are taken.

Sensitivity of energy and exergy performances of heating and cooling systems to auxiliary components

Heating and cooling systems in buildings consist of three main subsystems: heating/cooling plant, distribution system, and indoor terminal unit. The choice of indoor terminal unit determines the characteristics of the distribution system and the heating and cooling plants that can be used. Different forms of energy (electricity and heat) are used in heating and cooling systems, and therefore, a holistic approach to system design and analysis is needed. In particular, distribution systems use electricity as a direct input to pumps and fans, and to other components. Therefore, exergy concept should be used in design and analysis of the whole heating and cooling systems, in addition to the energy analysis.

In this study, water-based (floor heating and cooling, and radiator heating) and air-based (air heating and cooling) heating and cooling systems were compared in terms of their energy use and exergy consumption for auxiliary components (pumps and fans). The effects of the auxiliary components on whole system energy and exergy performance were identified.

Water-based heating systems required 68% lower auxiliary exergy input than the warm-air heating system with heat recovery, and floor cooling system required 53% lower auxiliary exergy input than the air cooling system, showing a clear benefit for the water-based systems over the air-based systems.

The auxiliary energy and exergy input to different systems is an important parameter for the whole system performance. Its effects become more pronounced and can be studied better in terms of exergy than energy. The required exergy input to the power plant for space heating and cooling purposes are comparable to the required exergy input for auxiliary components.

The exergy input to auxiliary components should be minimized to fully benefit from the water-based low temperature heating and high temperature cooling systems, and in general in heating and cooling systems, and to integrate effectively the renewable energy resources to building heating and cooling systems.
Sequential electrodialytic recovery of phosphorus from low-temperature gasification ashes of chemically precipitated sewage sludge

Phosphorus recycling from secondary materials like sewage sludge ashes offers an alternative to mining of phosphates from primary resources and a mean to counteract the current phosphorous rock depletion concern. A separation of P from the bulk ash is normally required, due to its low plant availability and the presence of heavy metals. Previously, more than 80% of P was recovered from incineration sewage sludge ashes using a two-compartment electrodialytic cell. In contrast, the recovery was below 30% for ashes from low-temperature gasification using the same setup. The low recovery was due to a high presence of Al- and Fe(III)-P bindings. In the present study, an electrodialytic process combining sequentially a pair of two-compartment cells allowed a recovery of up to 70% of phosphorus from these ashes. The use of a second cell, where the ash was suspended in an alkaline solution, allowed the P solubilisation from aluminium and ferric phosphates. In addition, P was separated from most metals as they became insoluble under the prevailing chemical environment. The obtained ratio of Al, Fe, Mg and most heavy metals to P was comparable to wet process phosphoric acid. Therefore, this sequential process was found to be suitable to recycle P and potentially use it in the production of common fertilizers like diammonium phosphate.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Chemical and Biochemical Engineering, CHEC Research Centre, Roskilde University
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Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4 SJR 1.354 SNIP 2.044
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.739 SNIP 2.256 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.777 SNIP 2.482 CiteScore 3.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.822 SNIP 2.435 CiteScore 3.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.611 SNIP 2.184 CiteScore 2.91
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
A novel method for risk-based optimization of inspection and repair strategies for deteriorating structural systems has recently been proposed. The method defines heuristics at the system level to reduce the number of possible strategies. For each defined strategy, it computes the updated system failure probability conditional on simulated inspection and repair histories, and evaluates the associated costs and risk. The expected total service life costs and risk for a strategy are finally determined using Monte Carlo simulation. The optimal strategy minimizes the expected total service life costs and risk. We intend to adopt this approach to optimize inspection, monitoring and repair activities for offshore wind park support structures. As a first step, we simulate – in analogy to an offshore wind park – the service life performance of an inspected group of jacket-type frames. The performance is quantified in terms of the group's system failure probability conditional on simulated inspection and repair histories. The underlying system model accounts for the structural redundancy of the frames and the interdependence among their failure events due to similar loading conditions. The model also captures stochastic dependence among the deterioration states of the frames. As part of the simulation process the a-priori unknown outcome of any planned inspection is generated conditional on the outcome of all previous inspections.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Bundesanstalt für Materialforschung und Prüfung
Authors: Schneider, R. (Ekstern), Thöns, S. (Intern), Rogge, A. (Ekstern)
Pages: 2738-2747
Publication date: 2017

**Host publication information**

Title of host publication: Safety, Reliability, Risk, Resilience and Sustainability of Structures and Infrastructure : 12th Int. Conf. on Structural Safety and Reliability, Vienna, Austria, 6–10 August 2017
Simultaneous electrodialytic removal of PAH, PCB, TBT and heavy metals from sediments

Contaminated sediments are remediated in order to protect human health and the environment, with the additional benefit of using the treated sediments for other activities. Common for many polluted sediments is the contamination with several different pollutants, making remediation challenging with the need of different remedial actions for each pollutant. In this study, electrodialytic remediation (EDR) of sediments was found effective for simultaneous removal of heavy metals and organic pollutants for sediments from Arctic regions - Sisimiut in Greenland and Hammerfest in Norway. The influence of sediment properties and experimental settings on the remediation process was studied by employing multivariate analysis. The importance of the variables studied varied with the pollutant and based on these results it was possible to assess removal processes for the different pollutants. Desorption was found to be important for the removal of heavy metals and TBT, while photolysis was significant for removal of PAH, PCB and TBT. In addition, dechlorination was found to be important for the removal of PCB. The highest removal efficiencies were found for heavy metals, TBT and PCB (>40%) and lower removal efficiencies for PAH.
In this paper a smeared crack modelling approach is used to simulate corrosion-induced damage in reinforced concrete. The presented modelling approach utilizes a thermal analogy to mimic the expansive nature of solid corrosion products, while taking into account the penetration of corrosion products into the surrounding concrete, non-uniform precipitation of corrosion products, and creep. To demonstrate the applicability of the presented modelling approach, numerical predictions in terms of corrosion-induced deformations as well as formation and propagation of micro- and macrocracks were compared to experimental data obtained by digital image correlation and published in the literature. Excellent agreements between experimentally observed and numerically predicted crack patterns at the micro and macro scale indicate the capability of the modelling approach to accurately capture corrosion-induced damage phenomena in reinforced concrete. Moreover, good agreements were also found between experimental and numerical data for corrosion-induced deformations along the circumference of the reinforcement.
Solar district heating and cooling: A review

Both district heating and solar collector systems have been known and implemented for many years. However, the combination of the two, with solar collectors supplying heat to the district heating network, is relatively new, and no comprehensive review of scientific publications on this topic could be found. Thus, this paper summarizes the literature available on solar district heating and presents the state of the art and real experiences in this field. Given the lack of a generally accepted convention on the classification of solar district heating systems, this paper distinguishes centralized and decentralized solar district heating as well as block heating. For the different technologies, the paper describes commonly adopted control strategies, system configurations, types of installation, and integration. Real-world examples are also given to provide a more detailed insight into how solar thermal technology can be integrated with district heating.

Solar thermal technology combined with thermally driven chillers to provide cooling for cooling networks is also included in this paper. In order for a technology to spread successfully, not only technical but also economic issues need to be tackled. Hence, the paper identifies and describes different types of ownership and financing schemes currently used in this field.
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.06 SNIP 1.35 CiteScore 2.56
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.068 SNIP 1.65 CiteScore 2.71
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.095 SNIP 1.421 CiteScore 2.2
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.03 SNIP 1.361 CiteScore 2.24
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.128 SNIP 1.353
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.063 SNIP 1.206
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.608 SNIP 0.78
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.59 SNIP 1.007
Scopus rating (2006): SJR 0.745 SNIP 0.825
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.054 SNIP 0.849
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.888 SNIP 0.953
Scopus rating (2003): SJR 0.6 SNIP 0.631
Scopus rating (2002): SJR 0.485 SNIP 0.562
Scopus rating (2001): SJR 0.765 SNIP 0.758
Scopus rating (2000): SJR 0.566 SNIP 0.638
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.737 SNIP 0.71
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Solutions for low temperature heating of rooms and domestic hot water in existing

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Svendsen, S. (Intern), Østergaard, D. S. (Intern), Yang, X. (Intern)
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Main Research Area: Technical/natural sciences
Low temperature heating of buildings, Radiators, Domestic Hot Water, Supply and return temperature, District heating
Electronic versions:
Pages_from_Untitled_2.pdf
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Source-ID: 141855507
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017
Space heating with ultra-low-temperature district heating - a case study of four single-family houses from the 1980s

District heating is predicted to play a large role in the future fossil free energy system. Apart from providing energy savings by utilizing surplus heat, the district heating system also provides flexibility to fluctuating electricity generation by bridging the electricity and the heating sector. These benefits can be maximized if district heating temperatures are lowered as much as possible. In this paper we report on a project where 18 Danish single-family houses from the 1980s were supplied by ultra-low temperature district heating with a supply temperature as low as 45 degrees C for the main part of the year. The houses were heated by the existing hydraulic radiator systems, while domestic hot water was prepared by use of district heating and electric boosting. This paper evaluated the heating system temperatures that were necessary in order to maintain thermal comfort in four of the houses. First the four houses were modelled in the building simulation tool IDA ICE. The simulation models included the actual radiator sizes and the models were used to simulate the expected thermal comfort in the houses and resulting district heating return temperatures. Secondly measurements of the actual district heating return temperatures in the houses were analysed for different times of the year. The study found that existing Danish single-family houses from the 1980s can be heated with supply temperatures as low as 45 degrees C for the main part of the year. Both simulation models and test measurements showed that there is a large potential to lower the district heating temperatures. (C) 2017 The Authors. Published by Elsevier Ltd.

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Organisations: Department of Civil Engineering, Section for Building Energy
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Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
Web of Science (2009): Indexed yes
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Source-ID: 2372051676
Publication: Research - peer-review › Journal article – Annual report year: 2017
Spread and burning behavior of continuous spill fires

Spill fire experiments with continuous discharge on a fireproof glass sheet were conducted to improve the understanding of spill fire spread and burning. Ethanol was used as the fuel and the discharge rate was varied from 2.8 mL/s to 7.6 mL/s. Three ignition conditions were used in the experiments; no ignition, instantaneous ignition and delayed ignition. The spread rate, regression rate, penetrated thermal radiation and the temperature of the bottom glass were analyzed. The experiments clearly show the entire spread process for spill fires. Further, the regression rate of spill fires at the quasi-steady burning was lower than that of pool fires and the ratio of the spill fires' regression rate to the pool fires' regression rate was found to be approximately 0.89. With respect to the radiative penetration and the heat conduction between the fuel layer and the glass, a regression rate expression for spill fires was developed based on some modifications on existing expressions for pool fires. In addition, a complete phenomenological model for spill fires was developed by combining the characteristics of spread and burning. The model was verified by the experimental data and found to predict the spread process for spill fires with reasonable accuracy.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Tsinghua University, China University of Petroleum
Authors: Zhao, J. (Ekstern), Huang, H. (Ekstern), Jomaas, G. (Intern), Zhong, M. (Ekstern), Li, Y. (Ekstern)
Number of pages: 8
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.03 SJR 0.932 SNIP 1.627
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.887 SNIP 1.518 CiteScore 1.69
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.904 SNIP 1.937 CiteScore 1.49
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.878 SNIP 2.845 CiteScore 2.05
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.986 SNIP 2.707 CiteScore 2.21
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.224 SNIP 2.712 CiteScore 2.47
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.963 SNIP 1.612
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.806 SNIP 2.137
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.627 SNIP 1.617
Scopus rating (2007): SJR 0.53 SNIP 1.629
Stabilization diagrams using operational modal analysis and sliding filters

This paper presents a filtering technique for doing effective operational modal analysis. The result of the filtering method is construction of stabilization diagram that clearly separates physical poles from spurious noise poles needed for unbiased fitting. A band pass filter is moved slowly over the entire frequency spectrum of the measured data, and poles in the band are identified for each new filter position. In this way all poles are identified many times, making the physical poles stand out to make them immediately identifiable. The technique is illustrated using the Time Domain Poly Reference (TDPR) system identification algorithm on simulated data.

General information
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Organisations: Centre for oil and gas – DTU, Department of Civil Engineering, Section for Structural Engineering, Aarhus University
Authors: Olsen, P. (Ekstern), Juul, M. O. (Ekstern), Tarpø, M. (Intern), Brincker, R. (Intern)
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Status and prospect of solar heat for industrial processes in China

In the past decades, solar heat for industrial processes (SHIP) have been rapidly developed and applied, and also getting more attention in the world. China is still the largest energy consumer with industry accounting for almost 70% of total energy consumption. Low- and medium-temperature heat takes up 45% of process heat, holding 50%-70% of industrial energy consumption, which provides a favorable condition for solar application. China has built some demonstration projects to make industrial processes well integrated with solar heating systems. This paper briefly presents the status of China's energy consumption, integration of SHIP, as well as available solar technologies. 10 typical industrial sectors are selected to specifically describe their potential of SHIP. Moreover, 26 SHIP cases covering the 10 sectors in China are presented by field researches, with their capacity of energy saving and emissions reduction specifically investigated according to their own proportion of SHIP. The potential of SHIP in the selected 10 sectors are further predicted by optimistically and conservatively making their proportion of SHIP 5.5% and 2% respectively during the period of 2016-2020. The prediction shows that at least 39.40 million tons of coal equivalent and 98.22 million tons of CO2 emission can be reduced in 2020 in China's entire industrial sectors although solar supplies different proportions of heat demand in different industrial sectors.

General information
State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Building Energy, Shanghai Jiao Tong University
Strengthening requirement specification in sustainable procurement - an investigation of challenges

To reap the benefits of sustainability in the construction sector, it is crucial that the stakeholders involved can implement it in practice. Investigations have shown that choices made in the early phases of the building process are of very great importance for the outcome and the initiatives and decisions taken by the building owner are crucial. This paper presents research on Danish building practitioners’ ability to make requirements for sustainability in procurement. On the basis of an action research strategy, we asked practitioners to help identify the challenges involved in requiring sustainable solutions through procurement. These included among others a lack of knowledge or experience in sustainable procurement and interdisciplinary challenges. The research showed that practitioners are able to formulate specific requirements for sustainability in procurement. However, the challenges found imply that a sustainable approach in procurement is not fully implemented in a Danish context. This suggests that there is a need for guidance in the area, if the practitioners are to move from good intentions to making more specific requirements for sustainability in procurement.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Design
Authors: Eriksen, M. S. H. (Intern), Bjarløv, S. P. (Intern), Rode, C. (Intern)
Number of pages: 16
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Main Research Area: Technical/natural sciences

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Volume: 12
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ISSN (Print): 1552-6100
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
Scopus rating (2016): SJR 0.195 SNIP 0.352 CiteScore 0.33
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.217 SNIP 0.476 CiteScore 0.34
Scopus rating (2014): SJR 0.27 SNIP 0.272 CiteScore 0.43
Scopus rating (2013): SJR 0.284 SNIP 0.518 CiteScore 0.44
ISI indexed (2013): ISI indexed no
Scopus rating (2012): SJR 0.181 SNIP 0.573 CiteScore 0.3
ISI indexed (2012): ISI indexed no
Scopus rating (2011): SJR 0.167 SNIP 0.217 CiteScore 0.19
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.192 SNIP 0.203
Scopus rating (2009): SJR 0.165 SNIP 0.185
Scopus rating (2008): SJR 0.142 SNIP 0.091
Scopus rating (2007): SJR 0.196 SNIP 0.009
Original language: English
Sustainable procurement, Requirement specification, Procurement challenges, Danish construction industry, Building life cycle
DOIs:
10.3992/1552-6100.12.1.107
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Publication: Research - peer-review › Journal article – Annual report year: 2017

Strength of precast concrete shear joints reinforced with high-strength wire ropes

This paper concerns the in-plane shear strength of connections between precast concrete wall elements reinforced with looped high-strength wire ropes. The looped wire ropes are pre-installed in so-called ‘wire boxes’ which function as shear keys. Although only a small amount of research on the shear strength of such connections can be found in the literature, this type of connection is increasingly being used because wire ropes are much more construction-friendly than traditional U-bars. A rigid plastic upper bound model for the shear strength of wall connections reinforced with looped wire ropes that are pre-installed in wire boxes is presented along with test results on the shear strength of connections with double-wire
boxes. It is shown that the plastic solution agrees well with both the obtained test results and results from previously conducted tests.
Structural Monitoring for Offshore Structures: A challenge needs to be undertaken

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Centre for oil and gas – DTU
Authors: Katsanos, E. (Intern), Diord Rescinho Amador, S. (Intern), Brincker, R. (Intern)
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Event: Abstract from DHRTC Technology Conference 2017, Kolding, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 143097079
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2018

Structural response of full-scale concrete bridges subjected to high load magnitudes
A project concerning full-scale testing of concrete bridges was initiated in September 2016 in Denmark. Four bridges were tested, and the structural response of the bridges evaluated. Two bridges consisted of overturned concrete T-beams (OT-beams), and two bridges were constructed by joining L-shaped concrete elements.
The test method is outlined in the paper, which includes a description of a novel test-rig used to apply a high magnitude loading. It was shown that the test rig could perform controlled testing in only one day, which is an important aspect, since available time (due to traffic disturbance) often is an issue when testing on site. Also, different types of measuring equipment such as lasers, LVDT's and DIC-cameras was investigated, in order to evaluate the deformations during loading of one of the OT-beam bridges. The monitoring equipment was studied to verify if such equipment efficiently could be used for in-situ measurements. The load was applied semi-deformation controlled by a combination of dead load and hydraulic jacks. The novel high magnitude loading-rig worked well. It was also possible to achieve good readings from the monitoring equipment in combination with the applied loading.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, Vejdirektoratet
Authors: Halding, P. S. (Intern), Schmidt, J. W. (Intern), Jensen, T. W. (Intern), Henriksen, A. (Ekstern)
Number of pages: 9
Publication date: 2017
Event: Paper presented at 4th Conference on Smart Monitoring, Assessment and Rehabilitation of Civil Structures, Zürich, Switzerland.
Main Research Area: Technical/natural sciences
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Publication: Research - peer-review › Paper – Annual report year: 2017

Structure-specific selection of earthquake ground motions for the reliable design and assessment of structures
A decision support process is presented to accommodate selecting and scaling of earthquake motions as required for the time domain analysis of structures. Code-compatible suites of seismic motions are provided being, at the same time, prequalified through a multi-criterion approach to induce response parameters with reduced variability. The latter is imperative to increase the reliability of the average response values, normally required for the code-prescribed design verification of structures. Structural attributes like the dynamic characteristics as well as criteria related to variability of seismic motions and their compliance with a target spectrum are quantified through a newly introduced index $\delta_{sv-sc}$, which aims to prioritize motions suites for response history analysis. To demonstrate the applicability of the procedure presented, the structural model of a multi-story building was subjected to numerous suites of motions that were highly ranked according to both the proposed approach ($\delta_{sv-sc}$) and the conventional one ($\delta_{conv}$), that is commonly used for earthquake records selection and scaling. The findings from numerous linear response history analyses reveal the superiority of the proposed multi-criterion approach, as it extensively reduces the intra-suite structural response variability and consequently, increases the reliability of the design values. The relation between the target reliability in assessing structural response and the size of the suite of motions selected was also investigated, further demonstrating the...
efficiency of the proposed selection procedure to achieve higher response reliability levels with smaller samples of ground motion.

**General information**

State: Accepted/In press
Organisations: Department of Civil Engineering, Section for Structural Engineering, Aristotle University of Thessaloniki
Authors: Katsanos, E. I. (Intern), Sextos, A. G. (Ekstern)
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**Publication information**

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Web of Science (2018): Indexed yes
Scopus rating (2016): SJR 1.345 SNIP 1.33
Scopus rating (2015): SNIP 1.725 SJR 1.358
Scopus rating (2014): SNIP 1.856 SJR 1.51
Scopus rating (2013): SNIP 1.677 SJR 1.253
Scopus rating (2012): SNIP 1.606 SJR 1.258
Scopus rating (2011): SNIP 1.376 SJR 1.05
Scopus rating (2010): SNIP 1.143 SJR 1.52
Scopus rating (2009): SNIP 0.977 SJR 1.168
Scopus rating (2008): SNIP 1.898 SJR 2.237
Scopus rating (2007): SNIP 1.282 SJR 0.966
Scopus rating (2006): SNIP 1.186 SJR 1.636
Scopus rating (2005): SNIP 0.522 SJR 1.208
Scopus rating (2004): SNIP 0.71 SJR 0.575
Original language: English
R/C multistory building, Reliable design, Response-history analysis, Selection of earthquake motions, Structural response variability

**Subjective rating and objective evaluation of the acoustic and indoor climate conditions in video conferencing rooms**

Today, face-to-face meetings are frequently replaced by video conferences in order to reduce costs and carbon footprint related to travels and to increase the company efficiency. Yet, complaints about the difficulty of understanding the speech of the participants in both rooms of the video conference occur. The aim of this study is to find out the main causes of difficulties in speech communication. Correlation studies between subjective perceptions were conducted through questionnaires and objective acoustic and indoor climate parameters related to video conferencing. Based on four single-room and three combined-room measurements, it was found that the traditional measure of speech, such as the speech transmission index, was not correlated with the subjective classifications. Thus, a correlation analysis was conducted as an attempt to find the hidden factors behind the subjective perceptions, revealing the speech intelligibility during video conferencing was highly correlated to EDT, D50, and MTI in the 125 Hz frequency band.

**General information**

State: Published
Organisations: Department of Electrical Engineering, Acoustic Technology, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark, Rambøll Danmark A/S
Authors: Hauervig-Jørgensen, C. (Ekstern), Jeong, C. (Intern), Toftum, J. (Intern), Christensen, E. C. (Ekstern)
Number of pages: 7
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Main Research Area: Technical/natural sciences
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Sustainability Gains from combining LCA and Parametric Design in Early Design Phases of Structural Design

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Collin, C. (Ekstern), Jensen, L. B. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Collin_Jensen.pdf

Sustainable Design with Respect to LCA Using Parametric Design and BIM Tools

The Architecture, Engineering and Construction industry has many times been criticized for lack of control and management of its environmental impacts. In an attempt to monitor and minimize these impacts, the method of Life Cycle Assessment is being used more and more often during the design process of construction projects. Nevertheless, the whole process of performing a building’s LCA is considered time consuming which sometimes prevents the design teams from using it more than once in the end of the design as a way to assess the impacts of their final design. The aim of this study is to suggest a method which will render LCA a design tool used during the whole design process. The study focuses not only in creating a tool that will be able to assess a building’s environmental impacts, but will also be an analysis tool which will help the design teams make the right decisions and help them minimize their design’s environmental impacts. To achieve this, this study evaluated the potential of integrating LCA into BIM, developed and proposed an Integrated Dynamic Model using Revit, Dynamo and Excel. The Integrated Dynamic model was used in case studies the results of which were compared with the respective ones from other established LCA software. The results showed that the integrated dynamic model can create results of equal quality and precision with other specialized software while demanding significantly less time. The ease of use of such an integrated dynamic model and the instant creation of results could render it a decision making tool in respect with LCA.

General information
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Organisations: Department of Civil Engineering, Section for Building Design
Authors: Tsikos, M. (Ekstern), Negendahl, K. (Intern)
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Main Research Area: Technical/natural sciences
Life-cycle assessment, Building Information Modelling, Design process
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Synthesis and characteristics of composite phase change humidity control materials

A new kind of phase change humidity control material (PCHCM) was prepared by using PCM microcapsules and different hygroscopic porous materials. The PCHCM composite can regulate the indoor hygrothermal environment by absorbing or releasing both heat and moisture. The PCM microcapsules were synthesized with methyl triethoxysilane by the sol–gel method. The vesuvianite, sepiolite and zeolite were used as hygroscopic materials. The scanning electron microscopy (SEM) was used to measure the morphology profiles of the microcapsules and PCHCM. The differential scanning calorimetry (DSC) and the thermal gravimetric analysis (TGA) were used to determine the thermal properties and thermal stability. Both the moisture transfer coefficient and moisture buffer value (MBV) of different PCHCMs were measured by the improved cup method. The DSC results showed that the SiO2 shell can reduce the super-cooling degree of PCM. The
super-cooling degrees of microcapsules and PCHCM are lower than that of the pure PCM. The onset temperature of thermal degradation of the microcapsules and PCHCMs is higher than that of pure PCM. Both the moisture transfer coefficient and MBV of PCHCMs are higher than that of the pure hygroscopic materials. The results indicated the PCHCMs have better thermal properties and moisture buffer ability.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Nanjing University
Authors: Qin, M. (Intern), Chen, Z. (Ekstern)
Pages: 493-498
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Journal: Energy Procedia
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Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
Web of Science (2009): Indexed yes
Original language: English
Microencapsulated phase change material, Humidity control material, Energy efficiency, Passive hygrothermal design
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 140798249
Publication: Research - peer-review › Conference article – Annual report year: 2017
System reliability of concrete structures subjected to chloride ingress

The parameters relevant for prediction of service lifetime with respect to chloride ingress are associated with large uncertainties. Full-scale measurements are in demand for conditions which are as homogeneous as possible. The present paper first summarizes statistical distributions which are obtained based on measurements from the Gimsøystraumen bridge in Norway. These probability distributions are subsequently employed as input to a prediction model for chloride concentration at the steel reinforcement for a single but arbitrary position along the reinforcement. In order to address chloride attack on the entire bridge, a system model with 90 components is next introduced. This model is employed in order to perform reliability updating based on observations at a number of sites along the bridge. An Enhanced Monte Carlo simulation method (EMC) is applied for this purpose. It is shown that application of this simulation method reduces computation times significantly as compared to crude Monte Carlo methods.

Temperature Effects on Stiffness Moduli of Reservoir Sandstone from the Deep North Sea

We investigate effect of testing temperature on the dynamic frame stiffness of quartz-bearing North Sea sandstone from depths of 5 km. We show that at low stress levels, the rock frame stiffens with increasing temperature and we propose an explanation for the controlling mechanisms. While equilibrating to atmospheric conditions, cooling and stress release of reservoir material can induce tensional forces in the rock frame leading to ruptures of the contact cement in the weakest grain contacts. The frame stiffness hence reduces, as the ruptures are permanent. However, a fraction of the in-situ stiffness can be restored by reestablishment of reservoir stress or temperature, but only as recovery of contact between ruptures and not as re-cementation. In literature, ruptures of contact cement are denoted as micro-cracks, strictly posing a bulk term, without distinguishing effects of stress from temperature. This is unfortunate and hence, we designed a testing program with the intention of separating and quantifying effects of temperature and stress, specifically for the sandstone material subject to this study.

Ten questions about radiant heating and cooling systems

Radiant heating and cooling (RHC) systems are being increasingly applied not only in residential but also in non-residential buildings such as commercial buildings, education facilities, and even large scale buildings such as airport terminals. Furthermore, with the combined ventilation system used to handle latent load, the radiant-cooling system has proven applicable in hot and humid climates. It is well known that the RHC system has advantages of low draught risk, quiet operation, low energy consumption, and ability for design integration with building elements. These merits have
motivated numerous studies on RHC systems in terms of comfort, heat transfer analysis, energy simulation, control strategy, system configurations and so on. Many studies have demonstrated that the RHC system is a good solution to improve indoor environmental quality while reducing building energy consumption for heating and cooling. On the other hand, the RHC system has limitations such as complicated control of Thermally Activated Building System (TABS), acoustical issues, higher capital cost and cooling load than conventional air systems, and so on. For now, the required mitigation of these limitations and the need to extend the applicability of the RHC system are providing the continuous impetus for research on RHC systems. This paper summarizes the important issues involved in the research on RHC system, whereby ten questions and answers concerning the RHC system are discussed, which will help researchers to conduct relevant studies.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Pukyong National University, Seoul National University
Authors: Rhee, K. (Ekstern), Olesen, B. W. (Intern), Kim, K. W. (Ekstern)
Number of pages: 15
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 2.001
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.028 SNIP 1.865
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.924 SNIP 1.38
Ten questions concerning green buildings and indoor air quality
This paper investigates the concern that green buildings may promote energy efficiency and other aspects of sustainability, but not necessarily the health and well-being of occupants through better indoor air quality (IAQ). We ask ten questions to explore IAQ challenges for green buildings as well as opportunities to improve IAQ within green buildings and their programs. Our focus is on IAQ, while recognizing that many factors influence human health and the healthfulness of a building. We begin with an overview of green buildings, IAQ, and whether and how green building certifications address IAQ. Next, we examine evidence on whether green buildings have better IAQ than comparable conventional buildings. Then, we identify so-called green practices and green products that can have unintended and unfavorable effects on IAQ. Looking ahead, we offer both immediate and longer-term actions, and a set of research questions, that can help green buildings to more effectively promote IAQ. This article supports a growing recognition of the importance of IAQ in green buildings, and the opportunities for improvements. As the World Green Building Council [95] and others have emphasized, people are the most valuable asset of organizations, and efforts to improve IAQ can improve health, well-being, productivity, and profitability.
Ten questions concerning thermal and indoor air quality effects on the performance of office work and schoolwork

Energy conservation in buildings as a way to reduce the emission of greenhouse gases is forcing an urgent re-examination of how closely thermal and air quality conditions should be controlled in buildings. Allowing conditions to drift outside the optimum range would conserve very large amounts of energy and would in most cases have only marginal effects on health or subjective comfort. The question that then arises is whether occupant performance would be negatively affected and if so, by how much. This information is required for cost-benefit analyses. The answers in this paper are based on laboratory and field experiments that have been carried out since the massive increase in energy costs that took place in the 1970s. Although only a few of the mechanisms by which indoor environmental effects occur...
have been identified, it is already clear that any economies achieved by energy conservation will be greatly exceeded by the costs incurred due to decreased performance. Reducing emissions by allowing indoor environmental conditions to deteriorate would thus be so expensive that it would justify greatly increased investment in more efficient use of energy in buildings in which conditions are not allowed to deteriorate. Labour costs in buildings exceed energy costs by two orders of magnitude, and as even the thermal and air quality conditions that the majority of building occupants currently accept can be shown to reduce performance by 5e10% for adults and by 15e30% for children, we cannot afford to allow them to deteriorate still further.
This paper presents a study of grout failure in symmetric U-bar loop connections loaded in tension, with focus on the performance of two grouting materials – concrete and mortar. The study contains an experimental investigation as well as a rigid-plastic modelling of the tensile capacity. The test specimens consisted of symmetric ‘2-on-2’ loop connections transversely reinforced with a double T-headed rebar. The amount of transverse reinforcement was varied, including the limiting cases of specimens with no transverse reinforcement, as well as connections with sufficient transverse reinforcement to allow yielding of the U-bars. The experimental work showed that connections grouted with concrete performed better than the connections grouted with mortar. In the theoretical models, the difference in tested capacity is explained by the difference in the internal angle of friction and in the softening behaviour of concrete as compared with mortar.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Sørensen, J. H. (Intern), Hoang, L. C. (Intern), Olesen, J. F. (Intern), Fischer, G. (Intern)
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Main Research Area: Technical/natural sciences

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Journal: Magazine of Concrete Research
Volume: 69
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.18 SJR 0.867 SNIP 0.988
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.893 SNIP 1.059 CiteScore 1.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.939 SNIP 1.051 CiteScore 1.13
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.86 SNIP 1.267 CiteScore 0.96
ISI indexed (2013): ISI indexed yes
Test and Analysis of a New Ductile Shear Connection Design for RC Shear Walls

This paper presents a new and construction-friendly shear connection for assembly of precast reinforced concrete shear wall elements. In the proposed design, the precast elements have indented interfaces and are connected by a narrow zone grouted with mortar and reinforced with overlapping U-bar loops. Contrary to the classical shear connections, the planes of the U-bar loops are here parallel to the plane of the wall elements. This feature enables a construction-friendly installation of the elements without the risk of rebars clashing. The core of mortar inside each U-bar loop is reinforced with a transverse double T-headed bar to ensure transfer of tension between the overlapping U-bars. Push-off tests show that a significantly ductile load-displacement response can be obtained by the new solution as compared to the performance of the conventional keyed shear connection design. The influence of the interface indentation geometry was investigated experimentally and the failure modes in the push-off tests were identified by use of digital image correlation (DIC). For strength prediction, rigid plastic upper bound models have been developed with inspiration from the observed failure mechanisms. Satisfactory agreement between tests and calculations has been obtained.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Sørensen, J. H. (Intern), Hoang, L. C. (Intern), Olesen, J. F. (Intern), Fischer, G. (Intern)
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Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Structural Concrete
Volume: 18
Issue number: 1
Testing and modeling dowel and catenary action in rebars crossing shear joints in RC

This paper presents a detailed study of the shear behavior of two-sided dowel joints, which includes initiation of dowel action at small shear displacements and development of full catenary action in the reinforcement at large displacements. In addition to experimental results, the paper also presents a simple, second order plasticity model to describe the nonlinear regime of the load-displacement relationship. In the model, kinematic relations and the normality condition of plastic theory are utilized to establish a unique link between the imposed shear displacement and combinations of moment and tension that develop in the rebar(s) crossing the joint. Interface friction is included in a consistent manner based on clamping stresses induced by the tension of the rebar(s). Comparison of experimental results with the model predictions shows satisfactory agreement. The model has, due to its simplicity, potential for practical applications related to assessment of structural robustness, where estimation of the available energy (area below load-displacement curve) is
The Arctic in the Twenty-First Century: Changing Biogeochemical Linkages across a Paraglacial Landscape of Greenland

The Kangerlussuaq area of southwest Greenland encompasses diverse ecological, geomorphic, and climate gradients that function over a range of spatial and temporal scales. Ecosystems range from the microbial communities on the ice sheet and moisture-stressed terrestrial vegetation (and their associated herbivores) to freshwater and oligosaline lakes. These ecosystems are linked by a dynamic glacio-fluvial-aolian geomorphic system that transports water, geological material, organic carbon and nutrients from the glacier surface to adjacent terrestrial and aquatic systems. This paraglacial system is now subject to substantial change because of rapid regional warming since 2000. Here, we describe changes in the eco- and geomorphic systems at a range of timescales and explore rapid future change in the links that integrate these systems. We highlight the importance of cross-system subsidies at the landscape scale and, importantly, how these might change in the near future as the Arctic is expected to continue to warm.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Loughborough University, University of Maine, Pennsylvania State University, University of Nottingham, Cardiff University, Queen's University Belfast, Umeå University, University of Leeds, Aarhus University, University of Nebraska, University of Essex, Matthias Belius University, Keele University, Nansen Environmental and Remote Sensing Center, North Carolina State University, Centre de Recerca Ecològica i Aplicacions Forestals, University of California at Davis, University of Bristol, Joint Nature Conservation Committee, Peterborough, Sogn og Fjordane University College
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.9 SJR 2.039 SNIP 1.814
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.358 SNIP 2.331 CiteScore 3.27
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.435 SNIP 2.402 CiteScore 3.12
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.747 SNIP 2.618 CiteScore 3.41
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
The cost efficiency of improved roof windows in two well-lit nearly zero-energy houses in Copenhagen

Roof windows are efficient and flexible daylight sources that are essential in certain types of houses if they are to achieve sufficient daylighting throughout. Previous studies have indicated that, for such buildings to meet nearly zero-energy targets in an easy and robust way without compromising on daylighting and thermal comfort, the thermal properties of roof window glazing, frames and junctions need to be considerably improved. However, the barriers to improving roof windows to levels above the current best standard practice remain great so long as we do not know the economic benefits of such improvements. The aim of this study was to quantify the scope for investing in improved roof window solutions in buildings insulated to consume nearly zero-energy. Based on two single-family houses in Copenhagen with typical roof windows and adequate daylighting, the study identified the prices at which various types of roof window improvements would have to be made available to achieve the same cost efficiency as improved insulation. If the improvements can be made available for less than these prices, the installation of improved roof windows would make it cheaper to construct well-lit and comfortable nearly zero-energy homes.
The effect of dynamic solar shading on energy, daylighting and thermal comfort in a nearly zero-energy loft room in Rome and Copenhagen

Dynamic solar shading is commonly suggested as a means of reducing the problem of overheating in well-insulated residential buildings, while at the same time letting daylight and solar irradiation in when needed. To critically investigate what dynamic shading can and cannot do compared to permanent alternatives in buildings with very low space-heating demand, this study mapped and compared energy, daylighting and thermal comfort for various combinations of window size and glazing properties, with and without dynamic shading. The study considered a loft room with sloped roof windows and moderate venting options in nearly zero-energy homes in Rome and Copenhagen. The more flexible solution space with dynamic shading made it possible to either reduce the time with operative temperatures exceeding the comfort limit by 40–50 h or increase daylighting by 750–1000 h more than could be achieved without shading. However, dynamic shading could not improve the optimum space-heating demand of the loft room in any predictable way, and without using dynamic shading, illuminances of 300 lx in 75% of the space could be achieved in 50–63% of the daylight hours with no more than 40–100 h exceeding the comfort ranges as defined by the Adaptive Thermal Comfort (ATC) model.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Skarning, G. C. J. (Intern), Hviid, C. A. (Intern), Svendsen, S. (Intern)
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
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Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.506 SNIP 2.536 CiteScore 3.23
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
The effects of weathering on the physical and mechanical properties of igneous and metamorphic saprolites

The present paper presents three extensive datasets of laboratory testing on weathered geomaterials, which are emblematic of soil types widely found worldwide. The overall dataset includes soils originating from igneous and metamorphic rocks, either coarse or fine grained and having either felsic or mafic minerals. In particular, the data are interpreted to highlight the effects that weathering has on the physical and mechanical properties of these natural geomaterials comparing them with published data with the aim to provide a general framework of interpretation that takes into account this geological process and links soil mechanics to engineering geology. Generally, weathering induces a reduction in the grain size, both due to physical actions (e.g. opening of grain contacts) and to the chemical decomposition of minerals resulting in the formation of clay minerals. As weathering proceeds and the soil becomes finer, the in situ specific volume and the location of the normal compression and critical state lines move upwards in the volumetric plane. On the other hand, the clay minerals cause its angle of shearing resistance to reduce. When analysing the behaviour of the intact soil, in all cases positive effects of structure, albeit small compared to some sedimentary soils, were observed and these reduced as a consequence of weathering.
The importance of hunting and small-scale fishing in Greenland

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Copenhagen
Authors: Nielsen, M. R. (Ekstern), Meilby, H. (Ekstern), Poppel, B. (Ekstern), Pedersen, P. L. (Ekstern), Andresen, J. G. (Ekstern), Hendriksen, K. (Intern), Snyder, H. T. (Ekstern), Hertz, O. (Ekstern)
Number of pages: 2
Pages: 118-119
Publication date: 2017
The influence of plate thickness on the welding residual stresses from submerged arc welding in offshore steel structures

Welding-induced residual tensile stresses and distortion have become a major concern in relation to the structural integrity of welded structures within the offshore wind industry. The stresses have a negative impact on the integrity of the welded joint, as they promote distortion, reduce fatigue life, and attribute to the corrosion cracking and brittle fracture in the weld components. This study investigates the influence of plate thickness on the welding-induced residual stresses. The residual stresses are investigated through experiments and in accordance with existing production procedures leading to a better understanding of the distribution and development of the welding residual stresses. This can later be used to optimize the fatigue design, providing a more efficient and improved design. In this context, the current research is expected to benefit the offshore industry by leading to an improved design, which consequently may be included in future norms and standards. Submerged Arc Welding (SAW) was used to make a fully penetrated butt weld in 10 mm and 40 mm thick steel plates with the same welding parameters as used in the production procedures. The base material is thermomechanical hot-rolled low-carbon fine-grained S355ML steel in accordance with the European standard DS/EN 10025-4 [1]. The welding temperature profile during welding was recorded by embedded thermocouples and the hole-drilling method was used to measure the near-surface residual stress state.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Colorado School of Mines
Authors: Andreassen, M. J. (Intern), Yu, Z. (Ekstern), Liu, S. (Ekstern), Nielsen, J. H. (Intern)
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Main Research Area: Technical/natural sciences

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Source-ID: 137095774
Publication: Research - peer-review › Conference article – Annual report year: 2017

The influence of sediment properties and experimental variables on the efficiency of electrodialytic removal of metals from sediment

Chemometrics was used to determine the influence of sediment properties and experimental settings for the electrodialytic removal (EDR) of Cu, Pb and Zn from six harbour sediments from Greenland and Norway. A Projection onto latent structures (PLS) model revealed that the most important sediment properties for achieving acidification (lag-phase, pH > 4), necessary for desorbing and mobilising metals in the polluted sediments, were buffer capacity and grain size distribution. Higher stirring rate reduced the acidification time, stressing the importance of thorough mixing of the sediment suspension to achieve a fast and uniform acidification. PLS models were calculated to determine the influence of sediment properties on the removal of metals during EDR, which was observed to vary depending on the targeted metal and the stage of the remediation. In general, buffer capacity, grain size distribution, element composition and metal partitioning were important for remediation efficiency and are important parameters for determining optimal experimental settings. In
the fast removal phase (final pH 2-4), organic matter as well as stirring rate had increasing importance indicating oxidation and release of metals at this stage. Understanding the influence of sediment properties is important for determining experimental settings in accordance with the phase of EDR.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, UiT The Arctic University of Norway
Authors: Pedersen, K. B. (Ekstern), Lejon, T. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern)
Pages: 5312-5321
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Environmental Chemical Engineering
Volume: 5
Issue number: 6
ISSN (Print): 2213-3437
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2016): CiteScore 3.83 SJR 0.844 SNIP 1.355
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.806 SNIP 1.521 CiteScore 3.21
Scopus rating (2014): SJR 0.596 SNIP 1.086 CiteScore 2.21
Original language: English
Chemometrics, EDR, EKR, Heavy metals, PIs, Sediments
DOIs:
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Source: FindIt
Source-ID: 2392133560
Publication: Research - peer-review › Journal article – Annual report year: 2017

The influence of vehicular obstacles on longitudinal ventilation control in tunnel fires
The effect of the vehicular blockage in a tunnel under longitudinal ventilation smoke control was systematically studied using a small-scale tunnel (1:30 of a standard tunnel section) with a helium-air mixture as the buoyant plume. The experimental results showed excellent agreement with full-scale data and reference correlations from former studies. When there are vehicular obstacles in the tunnel, the critical velocity decreased as a function of the blockage ratio. Notwithstanding, it was found that the relative size of the vehicular obstacle and the relative location of the fire source can have a reversed effect, inasmuch as the presence vehicular obstacle exerted an influence on the critical and confinement velocities. Moreover, the backlayering distance was evidently affected by the vehicular blockage. A parallel analysis was carried out for the backlayering distance for lower and upper regimes of the dimensionless heat release rate, where the current data was compared against data from other studies. The method and experimental set-up proved their ability to reproduce several phenomena and thus also their capability to supply relevant and valuable information on the effect of the vehicular blockage on tunnel fire dynamics.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Alva, W. U. R. (Intern), Jomaas, G. (Intern), Dederichs, A. (Intern)
Number of pages: 12
Pages: 25-36
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Fire Safety Journal
Volume: 87
ISSN (Print): 0379-7112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Monohydrocalcite, CaCO$_3$$\cdot$H$_2$O, forms a P3$_1$ structure composed of composite rods in which a spiral arrangement of Ca ions is accompanied by spiral arrangements of CO$_3$ groups and of H$_2$O molecules. The atom arrangement on the surface of the rods has rod symmetry P3$_1$21 whereas in the rod interior the atoms and atom groups have symmetry P3$_1$, which allows for two opposite orientations of a composite rod in respect to the [00.1] direction, connected with minimal change in the inter-rod bonding scheme. The ordered crystal structure contains both rod orientations in a complicated periodic arrangement but various degrees of disorder should occur, generating only small energy penalty.
Theoretical Analysis on Marangoni-driven Cavity Formation in Ice during In-situ Burning of Oil Spills in Ice-infested Waters - Paper Number IN43D-0096

General information
Theoretical modelling and experimental study of air thermal conditioning process of a heat pump assisted solid desiccant cooling system

Taking the integrated gaseous contaminants and moisture adsorption potential of desiccant material, a new heat pump assisted solid desiccant cooling system (HP-SDC) was proposed based on the combination of desiccant rotor with heat pump. The HP-SDC was designed for dehumidification, cooling and air purification aimed at improving indoor air quality and reducing building energy consumption. The heat and moisture transfer in adsorption desiccant rotor was theoretical modelled with one-dimensional partial differential equations. The theoretical model was validated with experimental measurements, and the results showed the model could be used to predict the heat and moisture transfer in desiccant rotor. The air thermal conditioning process and energy consumption of HP-SDC was then experimental measured under varied outdoor thermal environments. Results showed that compared to conventional ventilation system, the energy performance of HP-SDC was more efficient mainly due to high efficient air purification capacity, reduction of cooling load and raised evaporation temperature. The energy performance of HP-SDC was sensitive to outdoor humidity ratio. Further improvements of HP-SDC energy efficiency are suggested to be focused on low regeneration temperature desiccant rotor and more efficient high temperature refrigerant.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Beijing University of Civil Engineering and Architecture
Authors: Nie, J. (Ekstern), Li, Z. (Ekstern), Hu, W. (Ekstern), Fang, L. (Intern), Zhang, Q. (Ekstern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: Energy and Buildings
Volume: 153
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
ISI indexed (2012): ISI indexed yes
The Parameters Controlling the Burning Efficiency of In-Situ Burning of Crude Oil on Water

Parameters that control the burning efficiency of in-situ burning of crude oil on water were identified by studying the influence of the initial slick thickness, vaporization order, oil slick diameter, weathering state of the oil, heat losses to the water layer and heat flux to the fuel surface on the burning efficiency for light and heavy crude oils. These parameters were studied in several small scale and intermediate scale experimental setups. The results showed that the heat losses to the water layer increase with increasing burning time because the components in a crude oil evaporate from volatile to non-volatile. Due to the relatively low heat feedback (reradiation and convection, in kW/m²) to the fuel surface of small scale pool fires, as compared to large scale pool fires, these heat losses were shown to limit the burning efficiency in small scale experiments. By subjecting small scale crude oil pool fires to an incident heat flux, the burning efficiency of a light crude oil could be increased from 48% to 90%. Similarly, increasing the diameter from 0.1 to 1.1 m, which thus increased the heat feedback to the fuel surface, increased the burning efficiency from 41% to 84% for a light crude oil. It can be concluded that the pool fire diameter is the key parameter that determines the burning efficiency of crude oil fires on water, which was partially attributed to the increasing heat flux (in kW/m²) to the fuel surface with increasing diameter. Increasing the heat flux to the fuel surface through external radiation resulted in an increase of the burning efficiency in small scale experiments. The burning efficiencies were, however, still lower than the ≥ 90% burning efficiencies observed in large scale fires of crude oil on water. It is therefore probable that other factors also increase the burning efficiency as the burning diameter increases.
The Potential in the Use of Building Information Modelling and Life-Cycle Assessment for Retrofitting Buildings: A Study Based on Interviews with Experts in Both Fields

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Caceres, A. A. G. (Intern), Karlshoj, J. (Intern), Vik, T. A. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: International Journal of Civil & Environmental Engineering
Volume: 11
Issue number: 7
ISSN (Print): 2077-1258
Original language: English
Source: PublicationPreSubmission
Source-ID: 141915475
Publication: Research - peer-review › Conference abstract in journal – Annual report year: 2017

Thermal conductivity of sedimentary rocks as function of Biot’s coefficient
A theoretical model for prediction of effective thermal conductivity with application to sedimentary rocks is presented. Effective thermal conductivity of sedimentary rocks can be estimated from empirical relations or theoretically modelled. Empirical relations are limited to the empirical conditions and should be applied with caution. Theoretical models are typically porosity-based and unable to capture the complexity of sedimentary rocks. We propose a theoretical model, derived from measurable parameters including both quantity and connectivity of the constituents. Because the thermal conductivity of solids is typically orders of magnitude larger than that of fluids, grain contacts constituting the solid connectivity governs the heat transfer of sedimentary rocks and hence should be the basis for modelling effective thermal conductivity. By introducing Biot’s coefficient, \( \alpha \), we propose \( (1 - \alpha) \) as a measure of the solid connectivity and show how effective thermal conductivity of water saturated and dry sandstones can be modelled.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, Technical University of Denmark, German Research Centre for Geosciences
Authors: Orlander, T. (Intern), Pasquinelli, L. (Intern), Asmussen, J. (Ekstern), Marczyński, A. (Ekstern), Adamopoulou, E. (Ekstern), Milsch, H. (Ekstern)
Number of pages: 8
Publication date: 2017
Thermal environment in a simulated double office room with convective and radiant cooling systems

The thermal environment in a double office room obtained with chilled beam (CB), chilled beam with radiant panel (CBR), chilled ceiling with ceiling installed mixing ventilation (CCMV) and overhead mixing total volume ventilation (MTVV) under summer (cooling) condition was compared. Design (peak) and usual (average) heat load from solar radiation, office equipment, lighting and occupants was simulated, respectively at 62 W/m² and 38 W/m² under four different workstation layouts. Air temperature, globe (operative) temperature, radiant asymmetry, air velocity and turbulent intensity were measured and draught rate was calculated. Manikin-based equivalent temperature (MBET) was determined by using two thermal manikins. CCMV provided slightly more uniform thermal environment and the least sensitive to different workstation layouts than the other systems. CB provided a bit higher draught rate levels than CCMV especially in the design heat load cases. With CBR, the thermal environment was found to be between CB and CCMV. MTVV generated high draught level under the tested design heat load cases. All cooling systems generated similar thermal environment in the usual heat load cases. It would be recommended to include the measurement height of 0.05 m in indoor climate testing standards for obtaining more generic view of the draught risk.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Halton OY, NIRAS A/S, Silesian University of Technology, Technical University of Denmark, Aalto University
Authors: Mustakallio, P. (Ekstern), Bolashikov, Z. D. (Ekstern), Rezgals, L. (Ekstern), Lipczynska, A. (Ekstern), Melikov, A. K. (Intern), Kosonen, R. (Ekstern)
Number of pages: 13
Pages: 88-100
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
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Ratings:
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 2.001
Thermal performance analysis of a solar heating plant

Detailed measurements were carried out on a large scale solar heating plant located in southern Denmark in order to evaluate thermal performances of the plant. Based on the measurements, energy flows of the plant were evaluated. A modified Trnsys model of the Marstal solar heating plant was developed to calculate thermal performances of the plant. In the Trnsys model, three solar collector fields with a total solar collector area of 33,300 m², a seasonal water pit heat storage of 75,000 m³, a simplified CO2 HP, a simplified ORC unit and a simplified wood chip boiler were included. The energy consumption of the district heating net was modeled by volume flow rate and given forward and return temperatures of the district heating net. Weather data from a weather station at the site of the plant were used in the calculations. The Trnsys calculated yearly thermal performance of the solar heating plant was compared to the measurement results. Validity of the Trnsys model was analyzed. Recommendations are given with aim to develop a Trnsys model that can be used to optimize design of a solar heating plant under different scenarios.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Technical University of Denmark
Authors: Fan, J. (Intern), Huang, J. (Intern), Andersen, O. L. (Ekstern), Furbo, S. (Intern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences
Solar heating plant, Thermal performance, Monitoring, Trnsys simulations, Design optimization
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 140731730
Publication: Research - peer-review → Paper – Annual report year: 2017

Thermal properties and burning efficiency of crude oils and refined fuel oil

The thermal properties and burning efficiencies of fresh and weathered crude oils and a refined fuel oil were studied in order to improve the available input data for field ignition systems for the in-situ burning of crude oil on water. The time to ignition, surface temperature upon ignition, heat release rate, burning rate and burning efficiency of two fresh crude oils (DUC, a light crude and Grane, a heavy crude), one fresh refined fuel oil (IFO 180) and weathered DUC (30-40 wt%
evaporated and 40 wt% evaporated with 40 vol% water) were tested. Experiments were conducted in a newly designed water-cooled holder for a cone calorimeter under incident heat fluxes of 0, 5, 10, 20, 30, 40 and 50 kW/m². The results clearly showed that the weathered oils were the hardest to ignite, with increased ignition times and critical heat fluxes of 5-10 kW/m². Evaporation and emulsification were shown to be the determining factors increasing the critical heat flux compared to the physical properties of the oils. Boilover was observed for both emulsified DUC and fresh Grane and dominated the energy released by these oils. These results provided further evidence that the boilover phenomenon is correlated to the superheating of relatively volatile components such as water (DUC emulsion) or light hydrocarbons (Grane). Boilovers can thus occur due to inherent properties of the burning oil and should therefore be taken into account in the safety planning of in-situ burning operations. Maximum burning efficiencies of 85-90% were obtained for heat fluxes of 40-50 kW/m² for the crude oils and 80% at 30 kW/m² for IFO 180. The heat feedback in large scale fires, however, was estimated to be about 17 kW/m², for which the burning efficiencies were < 80%. These results indicate that the increased heat feedback to the fuel surface is not the only factor that increases the burning efficiency for large scale fires compared to laboratory experiments. Additional factors such as feeding of surrounding oil into the fire by buoyancy induced wind flows into the hot smoke plume are probably also contributing to these increased burning efficiencies.

General information
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Organisations: Department of Civil Engineering, Section for Building Design
Publication date: 2017

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Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Thermal stratification built up in hot water tank with different inlet stratifiers
Thermal stratification in a water storage tank can strongly increase the thermal performance of solar heating systems. Thermal stratification can be built up in a storage tank during charge, if the heated water enters through an inlet stratifier. Experiments with a test tank have been carried out in order to elucidate how well thermal stratification is established in the tank with differently designed inlet stratifiers under different controlled laboratory conditions. The investigated inlet stratifiers are from Solvis GmbH & Co KG and EyeCular Technologies ApS. The inlet stratifier from Solvis GmbH is a rigid plastic pipe with holes for each 30 cm. The holes are designed with flaps preventing counter flow into the pipe. The inlet stratifier from EyeCular Technologies ApS is made of a flexible polymer with openings all along the side and in the full length of the stratifier. The flexibility of the stratifier prevents counterflow. The tests have shown that both types of inlet stratifiers had an ability to create stratification in the test tank under the different test conditions. The stratifier from EyeCular Technologies ApS had a better performance at low flows of 1-2 l/min and the stratifier for Solvis GmbH & Co KG had a better performance at 4 l/min. In the intermediate charge test the stratifier from EyeCular Technologies ApS had a better performance in terms of maintaining the thermal stratification in the storage tank while charging with a relative low temperature. [All rights reserved Elsevier].

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Department of Applied Mathematics and Computer Science, Dynamical Systems
Authors: Dragsted, J. (Intern), Furbo, S. (Intern), Dannemand, M. (Intern), Bava, F. (Intern)
Number of pages: 12
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Main Research Area: Technical/natural sciences

Publication information
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Volume: 147
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Ratings:
BFI (2018): BFI-level 1
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.52 SJR 1.547 SNIP 1.748
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.974 SNIP 2.143 CiteScore 4.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.014 SNIP 2.704 CiteScore 4.77
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.058 SNIP 2.92 CiteScore 4.44
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.655 SNIP 2.55 CiteScore 3.65
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.326 SNIP 2.223 CiteScore 3.19
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.419 SNIP 2.161
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.301 SNIP 2.158
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.693 SNIP 2.007
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.708 SNIP 2.101
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.645 SNIP 2.278
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.27 SNIP 1.577
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.535 SNIP 1.675
Scopus rating (2003): SJR 1.184 SNIP 1.421
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.506 SNIP 1.593
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.303 SNIP 1.291
Scopus rating (2000): SJR 1.018 SNIP 1.053
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Scopus rating (1999): SJR 0.677 SNIP 1.275

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Source: FindIt
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Publication: Research - peer-review › Journal article – Annual report year: 2017
The steel–concrete interface

Although the steel–concrete interface (SCI) is widely recognized to influence the durability of reinforced concrete, a systematic overview and detailed documentation of the various aspects of the SCI are lacking. In this paper, we compiled a comprehensive list of possible local characteristics at the SCI and reviewed available information regarding their properties as well as their occurrence in engineering structures and in the laboratory. Given the complexity of the SCI, we suggested a systematic approach to describe it in terms of local characteristics and their physical and chemical properties. It was found that the SCI exhibits significant spatial inhomogeneity along and around as well as perpendicular to the reinforcing steel. The SCI can differ strongly between different engineering structures and also between different members within a structure; particular differences are expected between structures built before and after the 1970/1980s. A single SCI representing all on-site conditions does not exist. Additionally, SCIs in common laboratory-made specimens exhibit significant differences compared to engineering structures. Thus, results from laboratory studies and from practical experience should be applied to engineering structures with caution. Finally, recommendations for further research are made.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, ETH Zurich, Norwegian University of Science and Technology, Technical University of Munich, Imperial College London, Oregon State University, University of Waterloo, Universite de Toulouse, Institute of Construction Science Eduardo Torroja, Laboratorio Nacional de Engenharia Civil, University of Sheffield, University of South Florida
Number of pages: 24
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

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BFI (2016): BFI-level 1
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Scopus rating (2016): CiteScore 2.09 SJR 1.129 SNIP 1.533
Scopus rating (2015): SJR 1.129 SNIP 1.586 CiteScore 1.59
Scopus rating (2014): SJR 1.207 SNIP 1.524 CiteScore 1.55
Scopus rating (2013): SJR 1.49 SNIP 1.758 CiteScore 1.71
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.448 SNIP 1.838 CiteScore 1.63
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.015 SNIP 1.831 CiteScore 1.41
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Three Decades of Volume Change of a Small Greenlandic Glacier Using Ground Penetrating Radar, Structure from Motion, and Aerial Photogrammetry

Glaciers in the Arctic are losing mass at an increasing rate. Here we use surface topography derived from Structure from Motion (SfM) and ice volume from ground penetrating radar (GPR) to describe the 2014 state of Aqqutikitsoq glacier (2.85 km) on Greenland's west coast. A photogrammetrically derived 1985 digital elevation model (DEM) was subtracted from a 2014 DEM obtained using land-based SfM to calculate geodetic glacier mass balance. Furthermore, a detailed 2014 ground penetrating radar survey was performed to assess ice volume. From 1985 to 2014, the glacier has lost 49.8 ± 9.4 10 m of ice, corresponding to roughly a quarter of its 1985 volume (148.6 ± 47.6 10 m) and a thinning rate of 0.60 ± 0.11 m a. The computations are challenged by a relatively large fraction of the 1985 DEM (~50% of the glacier surface) being deemed unreliable owing to low contrast (snow cover) in the 1985 aerial photography. To address this issue, surface elevation in low contrast areas was measured manually at point locations and interpolated using a universal kriging approach. We conclude that ground-based SfM is well suited to establish high-quality DEMs of smaller glaciers. Provided favorable topography, the approach constitutes a viable alternative where the use of drones is not possible. Our investigations constitute the first glacier on Greenland's west coast where ice volume was determined and volume change calculated. The glacier's thinning rate is comparable to, for example, the Swiss Alps and underlines that arctic glaciers are subject to fast changes.

General information
State: Published
Organisations: Department of Environmental Engineering, Department of Civil Engineering, National Space Institute, Geodesy, Section for Geotechnics and Geology, Arctic Technology Centre, Technical University of Denmark, Natural History Museum of Denmark
Authors: Marcer, M. (Ekstern), Stentoft, P. A. (Intern), Bjerre, E. (Intern), Cimoli, E. (Ekstern), Bjørk, A. A. (Ekstern), Stenseng, L. (Intern), Machguth, H. (Intern)
Pages: 411-425
Publication date: 2017
Main Research Area: Technical/natural sciences
Towards the definition of indicators for assessment of indoor air quality and energy performance in low-energy residential buildings

A major obstacle for integrating energy and indoor air quality (IAQ) strategies in the design and optimization of buildings is the non-existence of an agreed measure, which can quantitatively describes the IAQ and will allow the assessment of measures to improve energy performance. A complication to develop such an IAQ index is that hundreds of chemical compounds are present in indoor air, including residential environments, at concentrations much lower than occurring during occupational exposures. There is a lack of clear consensus on which pollutant or group of pollutants should be used to form such an index as well as on how they should be integrated into one index. IEA EBC Annex 68 was formed with the objective to discuss Indoor Air Quality Design and Control in Low Energy Residential Buildings. The objective of Subtask 1 of this Annex described in this paper was to review, discuss and propose methods and approaches to define an IAQ index and to develop such an index so that it can be used as a key performance indicator to examine the methods to control IAQ, which are integral parts of other subtasks in this IEA EBC project. To meet this objective, the pollutants measured in low-energy houses were compared with pollutants measured in traditional houses. Pollutants measured and known to be harmful for health were identified and selected to be represented on a list of pollutants that should be considered when the IAQ index is defined. The selected pollutants were: acetaldehyde, acrolein, α-pinene, benzene, carbon dioxide, formaldehyde, naphthalene, nitrogen dioxide, PM10, PM2.5, radon, styrene, toluene, trichloroethylene, TVOC and mould. Both short-term and long-term effects of these pollutants were considered. The compound with the highest ratio of concentration to its exposure limit value was proposed as the IAQ index for the short term effects so that the existing exposure limits could be referred to and to avoid problems associated with the aggregation of many air quality indices. The same approach was proposed for the IAQ index for the long-term effects together with the calculation of the burden of disease caused by the compounds of concern expressed as the sum of disability-adjusted life years. It is recognized that the proposed IAQ indices are crude, and the list of compounds is incomplete. It should be progressively updated once new data on exposure limits and pollutants of concern become available.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Universite de La Rochelle
Authors: Cony Renaud Salis, L. (Ekstern), Abadie, M. (Ekstern), Wargocki, P. (Intern), Rode, C. (Intern)
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Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
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Transformation Roadmap from High to Low Temperature District Heating Systems: Annex XI final report

General information
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Organisations: Department of Civil Engineering, Section for Building Energy, Halmstad University, Dresden University of Technology, Building Research Establishment Ltd.
Authors: Averfalk, H. (Ekstern), Werner, S. (Ekstern), Felsmann, C. (Ekstern), Rühling, K. (Ekstern), Wiltshire, R. (Ekstern), Svendsen, S. (Intern)
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Treatment of Arctic Wastewater by Chemical Coagulation, UV and Peracetic Acid Disinfection

Conventional wastewater treatment is challenging in the Arctic region due to the cold climate and scattered population. Thus, no wastewater treatment plant exists in Greenland and raw wastewater is discharged directly to nearby waterbodies without treatment. We investigated the efficiency of physico-chemical wastewater treatment, in Kangerlussuaq, Greenland. Raw wastewater from Kangerlussuaq was treated by chemical coagulation and UV disinfection. By applying 7.5 mg Al/L polyaluminium chloride (PAX XL100), 73% of turbidity and 28% phosphate was removed from raw wastewater. E. coli and Enterococcus were removed by 4 and 2.5 log, respectively, when UV irradiation of 0.70 kWh/m3 was applied to coagulated wastewater. Furthermore, coagulated raw wastewater in Denmark, which has a chemical quality similar to Greenlandic wastewater, was disinfected by peracetic acid or UV irradiation. Removal of heterotrophic bacteria by applying 6 mg/L and 12 mg/L peracetic acid was 2.8 and 3.1 log, respectively. Similarly, removal of heterotrophic bacteria by applying 0.21 kWh/m3 and 2.10 kWh/m3 for UV irradiation was 2.1 and greater than 4 log, respectively. Physico-chemical treatment of raw wastewater followed by UV irradiation and/or peracetic acid disinfection showed the potential for treatment of arctic wastewater.

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Organisations: Department of Environmental Engineering, Water Technologies, Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Chhetri, R. K. (Intern), Klupsch, E. (Ekstern), Andersen, H. R. (Intern), Jensen, P. E. (Intern)
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Main Research Area: Technical/natural sciences

Publication information
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.66 SJR 0.813 SNIP 1.048
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.879 SNIP 1.02 CiteScore 2.5
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.949 SNIP 1.178 CiteScore 2.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.879 SNIP 1.163 CiteScore 2.34
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.017 SNIP 1.232 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.13 SNIP 1.1 CiteScore 2.3
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.084 SNIP 1.045
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.022 SNIP 1.014
Web of Science (2009): Indexed yes
Ultrafine particles in inhabited areas in the Arctic - From very low to high concentrations

The Arctic is considered a pristine environment, where pollution mainly originates from global sources. The present study examines particle number concentrations (PNCs) and the main sources of airborne ultrafine particles (UFPs, d < 100 nm) in the town Sisimiut and two nearby settlements, Sarfannguit and Itilleq, in West Greenland. Measurements were carried out during three weeks in April and May 2016. Air temperatures during the measurements ranged from −4.4 to +8.7 °C. A portable condensation particle counter (P-Trak) was used for the measurements. Results showed that the lowest concentrations were found during days with high wind speeds, with the lowest PNC average of 72 ± 11 cm⁻³ (n = 9) (12 m/s). Background concentrations were usually low compared to more densely populated countries, with a couple of exceptions, where there was no clear cause for elevated PNCs in a background area East of Sisimiut. Measured PNCs in the flue gas in the waste incineration plant in Sisimiut showed up to 334,976 cm⁻³ and are expected to be higher in the gas after it is released through the chimney. Average PNCs up to 77,009 ± 43,880 cm⁻³ (n = 26) were measured by a road located by the harbor in Sisimiut, while subsequent measurements at the same location showed much lower PNCs. The presence of heavy machinery elevated PNCs highly during two measurement events, giving PNCs up to 270,993 cm⁻³ but dropping to 1180 cm⁻³ 10 min later, after the vehicle had passed by. A measurement event in Sisimiut Airport while an aircraft landed and departed showed an average PNC of 44,741 ± 85,094 cm⁻³ (n = 21). Two 24-h measurements resulted in average PNCs of 2960 ± 5704 cm⁻³ and 3935 ± 10,016 cm⁻³ respectively.
Understanding the potentials and development dynamics of Arctic island-economies as preconditions for sustainable regional and societal planning

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
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Event: Abstract from 9th International Congress of Arctic Social Sciences, Umeå, Sweden.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Using a One-Stop-Shop Concept to Guide Decisions when Single-Family Houses are renovated

One way of reducing the use of fossil fuels in Denmark is to explore possible energy savings in the building stock, especially the large number of single-family houses built from 1960 through 1980. Energy renovation in this housing segment is progressing slowly. The aim of this project was to determine how a one-stop-shop (OSS) or full-service concept could be used to guide the extensive energy renovation of single-family houses. The purpose was partly to identify the benefits and disadvantages of using the concept and partly to evaluate the potential of the OSS concept for increasing the degree of renovation. The scope of the project was to carry out renovations on up to three houses. The project revealed that the concept on its own was not enough to motivate the house owners to engage in extensive renovation. However, interviews with the house owners indicated that the renovations that took place had probably been expanded and improved with the use of the concept and that the renovations in general benefitted from an independent adviser.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Grøn Bjørneboe, M. (Intern), Svendsen, S. (Intern), Heller, A. (Intern)
Publication date: 2017
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Publication: Journal of Architectural Engineering
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Scopus rating (2016): CiteScore 0.73 SJR 0.255 SNIP 0.454
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 0.398 SNIP 0.754 CiteScore 0.81
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 0.665 SNIP 1.559 CiteScore 1.28
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 0.386 SNIP 0.826 CiteScore 0.8
Utilisation ofelectrodialytictreated sewage sludge ash in cement based materials

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Kappel, A. (Intern), Kirkelund, G. M. (Intern), Ottosen, L. M. (Intern)
Publication date: 2017
Event: Abstract from 5th International Conference on Sustainable Solid Waste Management, Athens, Greece.
Main Research Area: Technical/natural sciences
Mortar, Phosphorous, Heavy metal, Electrokinetic, Fly ash

Utilization of mine tailings as partial cement replacement
Depositing mine tailings entail major economic costs and negative environmental impacts. Thus finding an alternative to depositing is of interest. This study focused on the use of mine tailings as partial cement replacement, thereby preventing depositing the mine tailings. At the same time, such use would reduce the CO₂ emission related to the production of cement. Mine tailings from two different mines Zinkgruvan (Sweden) and Nalunaq (Greenland) were both tested as 5 and 10 % cement replacement. All mortar specimens with mine tailings had lower compressive strength compared to a reference specimen at 7, 14 and 28 days of curing. Both mine tailings showed contributions to the pozzolanic activity. This tendency was more profound for Zinkgruvan. No evidence of either mine tailing containing minerals acting as nucleation sites was, however, seen. The specimens containing mine tailings were compared to a specimen containing a 10 % replacement of cement with coal fly ash, commonly used in Denmark. The compressive strength of specimens containing mine tailings exceeded the compressive strength of the specimen containing coal fly ash, indicating further the amorphous content of volcanic decent contained in the mine tailings to contribute to the pozzolanic activity and thus increase the compressive strength. Mine tailings have a high content of toxic chemical elements, but no significant amount of chemical
elements was seen leaching from neither the pure mine tailings nor the mortar specimens containing mine tailings. Overall, the results show that these mine tailings have potential as a mineral admixture for substitution of cement in concrete.

**General information**
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Sigvardsen, N. M. (Intern), Nielsen, M. (Ekstern), Ottosen, L. M. (Intern), Jensen, P. E. (Intern)
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Mine tailings, Mineral admixtures, Mortar, Compressive strength, Coal fly ash, Sustainability
Source: PublicationPreSubmission
Source-ID: 133423095
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

**Value of information: A roadmap to quantifying the benefit of structural health monitoring**
The concept of value of information (VoI) enables quantification of the benefits provided by structural health monitoring (SHM) systems – in principle. Its implementation is challenging, as it requires an explicit modelling of the structural system's life cycle, in particular of the decisions that are taken based on the SHM information. In this paper, we approach the VoI analysis through an influence diagram (ID), which supports the modelling process. We provide a simple example for illustration and discuss challenges associated with real-life implementation.

**General information**
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aalborg University, Heriot-Watt University, Technical University of Munich, ETH Zurich, TNO Science and Industry, IFSTTAR - French institute of science and technology for transport, development and networks, Norwegian University of Science and Technology, KU Leuven, University of Aberdeen, Carnegie Mellon University, University of Strathclyde
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Main Research Area: Technical/natural sciences
Conference: 12th International Conference on Structural Safety and Reliability, Vienna, Austria, 06/08/2017 - 06/08/2017
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

**Value of information-based inspection planning for offshore structures**
Asset integrity and management is an important part of the oil and gas industry especially for existing offshore structures. With declining oil price, the production rate is an important factor to be maintained that makes integrity of the structures one of the main concerns. Reliability based and risk- based inspection (RRBI) constitutes an efficient method to optimize inspection planning. Basing the inspection planning on pre-posterior Bayesian decision analysis and especially a Value of Information analysis allows to explicitly quantify the expected benefits, costs and risks associated with each inspection strategy. A simplified and generic risk-based inspection planning utilizing pre-posterior Bayesian decision analysis had been proposed by Faber et al. [1] and Straub [2]. This paper provides considerations on the theoretical background and a Value of Information analysis-based inspection planning. The paper will start out with a review of the state-of-art RBI planning procedure based on Bayesian decision theory and its application in offshore structure integrity management. An example of the Value of Information approach is illustrated and it is pointed to further research challenges.

**General information**
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Vaporization order and burning efficiency of crude oils during in-situ burning on water

In order to improve the understanding of the burning efficiency and its observed size dependency of in-situ burning of crude oil on water, the vaporization order of the components in crude oils was studied. The vaporization order of such multicomponent fuels was assessed by studying the surface temperature, flame height, burning rate and burn residues of three alkanes (n-octane, dodecane and hexadecane), a mixture of these alkanes (1:1:1 volumetric ratio) and two crude oils (light and medium-light crudes). The experimental results were compared to four models for the vaporization order of multicomponent fuels. The alkanes were tested as benchmark fuels with a uniform vaporization order, for which all components evaporate simultaneously. As expected, these pure fuels showed a steady state burning with a near-constant surface temperature, flame height and burning rate. The alkane mixture showed similar steady state results but became dominated by the heaviest component towards the end of the burning. These results indicate that the lightest components had been depleted from the mixture. A near-uniform vaporization order in which the lighter components evaporate preferably best matched these results. The crude oils did not show any steady state behavior, but instead had an increasing surface temperature and decreasing burning rate and flame height, indicating a volatility controlled vaporization order. An increasing concentration gradient from the medium to heavy fraction in the burn residues furthermore showed that the vaporization was diffusion-limited. Analysis of the heat transfer balance for the crude oils indicated that the energy available for evaporation decreased over time due to increasing heat losses, which were caused by the volatility controlled vaporization order. Presumably, larger scale fires can overcome these heat losses, as they typically have higher burning rates, which increase the heat feedback to the fuel surface and therefore can result in the higher burning efficiencies.
Vibration Control of Novel Passive Multi-joints Rotational Friction Dampers

This work presents a novel passive friction damper for vibration control of structures. The device is designed to dissipate input energy and protect buildings, especially large and tall buildings from structural and non-structural damage during moderate and severe vibration caused by earthquakes or strong winds. The damper is based on a rotational friction concept that was developed by Mualla, I.H. The devices have a stable energy dissipating behavior. They are flexible in the application, since they only need limited space. The devices can be installed easily. The damping capacity of the devices can be easily increased by adding additional friction layers. The friction damper device proves to be an efficient and economical device for a reduction of dynamic response of structures. The damper has been tested intensively at the Technical University of Denmark and in Osaka, Japan confirming that the damper performance is:
- Independent of forcing frequency within applicable range
- Linearly dependent on displacement amplitudes - Linearly dependent on normal forces
- Very stable over many cycles

Furthermore, a numerical model of the 4-joint damper has been developed based on an analytical derivation of the internal work in the damper. A comparison of results obtained from the experimental work and numerical model showed that the model well represented the behavioral characteristics of the damper, and that the dissipated energy was reliably predicted.
So far several models of the rotational friction dampers that are supplied by Damptech A/S have been installed in many projects in Japan, among them Japan tallest building and in other countries around the world. The paper provides a number of show cases demonstrating versatile application of rotational friction dampers (RFD).

**General information**

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**Organisations:** Department of Civil Engineering, Section for Structural Engineering, Damptech ApS  
**Authors:** Mualla, I. H. (Ekstern), Koss, H. (Intern)  
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10.1002/cepa.190  
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**Source-ID:** 2386057338  
**Publication:** Research - peer-review › Conference article – Annual report year: 2017

**Visual Comfort Evaluation in Residential Buildings: a Simulation-Based Study**

Despite desirability of direct sunlight access in residential buildings, visual discomfort risks for these building types are less known. A simulation-based study was performed on a typical residential building with heritage value in central Copenhagen in order to evaluate its visual comfort characteristics using existing methods. Our results show that, although high relative contrast exist for view-directions not only towards window, these situations are not captured by the existing methods. A new method for quantification of a relative contrast over the 360° span of the space was thus introduced.

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Building Energy, Technical University of Denmark  
**Authors:** Ślipek, M. (Ekstern), Sarey Khanie, M. (Intern), Zukowska-Tejsen, D. (Intern), Kolarik, J. (Intern), Nielsen, T. R. (Intern)  
**Number of pages:** 5  
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Untitled.pdf  
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**Vurdering af behov for byfornyelse i Qaanaaq 2017**

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Building Design, LH Siunnersorti ApS  
**Authors:** Hendriksen, K. (Intern), Johannesen, J. (Ekstern)  
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**Publication information**

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**Main Research Area:** Technical/natural sciences  
**Electronic versions:**  
171229_MASTER_afrapportering.pdf. Embargo ended: 02/02/2018
Web-based topology queries on a BIM model

Building Information Modeling (BIM) is in the industry often confused with 3D-modeling regardless that the potential of modeling information goes far beyond performing clash detections on geometrical objects occupying the same physical space. Lately, several research projects have tried to change that by extending BIM with information using linked data technologies. However, when showing information alone the strong communication benefits of 3D are neglected, and a
A practical way of connecting the two worlds is currently missing. In this paper, we present a prototype of a visual query interface running in a web browser, that enables the user to gain a deeper understanding of what can be extracted from a Building Topology Ontology (BOT) knowledge base. The implementation enables the user to query the graph, and provides visual 3D-feedback along with simple table results. The main purpose of the paper is to establish a baseline for discussion of the general design choices that have been considered, and the developed application further serves as a proof of concept for combining BIM model data with a knowledge graph and potentially other sources of Linked Open Data, in a simple web interface.

Yield Frequency Spectra and seismic design of code-compatible RC structures: an illustrative example

The seismic design of an 8-story reinforced concrete space frame building is undertaken using a Yield Frequency Spectra (YFS) performance-based approach. YFS offer a visual representation of the entire range of a system’s performance in terms of the mean annual frequency (MAF) of exceeding arbitrary global ductility or displacement levels versus the base shear strength. As such, the YFS framework can establish the required base shear and corresponding first-mode period to satisfy arbitrary performance objectives for any structure that may be approximated by a single-degree-of-freedom system with given yield displacement and capacity curve shape. For the 8-story case study building, deformation checking is the governing limit state. A conventional code-based design was performed using seismic intensities tied to the desired MAF for safety checking. Then, the YFS-based approach was employed to redesign the resulting structure working backwards from the desired MAF of response (rather than intensity) to estimate an appropriate value of seismic intensity for use within a typical engineering design process. For this high-seismicity and high-importance midrise building, a stiffer system with higher base shear strength was thus derived. Moreover, performance assessment via incremental dynamic analysis showed that while the code-design did not meet the required performance objective, the YFS-based redesign needed only pushover analysis results to offer a near-optimal design outcome. The rapid convergence of the method in a single design/analysis iteration emphasized its efficiency and practicability as a design aid for practical application.
Yield stress independent column buckling curves

Using GMNIA and shell finite element modelling of steel columns it is ascertained that the buckling curves for given imperfections and residual stresses are not only dependent on the relative slenderness ratio and the cross section shape but also on the magnitude of the yield stress. The influence of the yield stress is to some inadequate degree taken into account in the Eurocode by specifying that steel grades of S460 and higher all belong to a common set of “raised” buckling curves. This is not satisfying as it can be shown theoretically that the current Eurocode formulation misses an epsilon factor in the definition of the normalised imperfection magnitudes. By introducing this factor it seems that the GMNIA analysis and knowledge of the independency of residual stress levels on the yield stress can be brought together and give results showing consistency between numerical modelling and a simple modified Ayrton-Perry formulation. In this paper magnitudes of imperfections and residual stresses in relation to the Eurocode will be discussed. It will be shown that the use of equivalent imperfections may be very conservative if considered by finite element analysis as described in the current Eurocode code. A suggestion is given for a slight modification of the Eurocode formulations of imperfections leading to adequate inclusion of modern high grade steels within the four bucking curves.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Aqvila A/S
A reinforcement system and a method of reinforcing a structure with a tendon

A reinforcement system for anchoring tendons for structural reinforcing a structure such as a concrete structure, said reinforcement system comprises at least one anchor and at least one tendon, said anchor is adapted to fix said tendon in and/or outside said structure, wherein said reinforcement system comprises a ductility element, which is positioned in structural connection between said tendon and said anchor, said ductility element comprising weakened deformation zones being deformable so that the length of the ductility is increased or decreased in an axial direction along the length of said tendon.

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State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Schmidt, J. W. (Intern), Schmidt, J. W. (Intern)
Publication date: 26 May 2016

Publication information
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Patent number: WO2016079214
Date: 26/05/2016
Priority date: 21/11/2014
Priority number: EP20140194291
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WO2016079214A2.pdf
Main Research Area: Technical/natural sciences
Source: espacenet
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Publication: Research › Patent – Annual report year: 2016

A case of peeling

Peeling of paint and plaster from building facades is a well-known phenomenon. This contribution analyses a case of peeling on a villa and its gardens walls, Figure 1. The walls were levelled with cement plaster, before painted with a formally very dense acrylic paint. - The analysis shows that the present layer of acryl paint is not very dense because it is applied on a rough plaster surface. - However, the main reason of the peeling seems to be the difference in thermal expansion between the masonry and the cement plaster. It is shown that the peeling takes place both winter and summer.

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State: Published
Organisations: Department of Civil Engineering
Authors: Nielsen, A. (Intern)
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Title of host publication: International RILEM Conference on Materials, Systems and Structures in Civil Engineering 2016: segment on Moisture in Materials and Structures
Accounting for the uncertainty related to building occupants with regards to visual comfort: A literature survey on drivers and models

The interactions between building occupants and control systems have a high influence on energy consumption and on indoor environmental quality. In the perspective of a future of "nearly-zero" energy buildings, it is crucial to analyse the energy-related interactions deeply to predict realistic energy use during the design stage. Since the reaction to thermal, acoustic, or visual stimuli is not the same for every human being, monitoring the behaviour inside buildings is an essential step to assert differences in energy consumption related to different interactions. Reliable information concerning occupants' behaviours in a building could contribute to a better evaluation of building energy performances and design robustness, as well as supporting the development of occupants’ education to energy awareness. The present literature survey enlarges our understanding of which environmental conditions influence occupants' manual controlling of the system in offices and by consequence the energy consumption. The purpose of this study was to investigate the possible drivers for light-switching to model occupant behaviour in office buildings. The probability of switching lighting systems on or off was related to the occupancy and differentiated for arrival, intermediate, and departure periods. The switching probability has been reported to be higher during the entering or the leaving time in relation to contextual variables. In the analysis of switch-on actions, users were often clustered between those who take daylight level into account and switch on lights only if necessary and people who totally disregard the natural lighting. This underlines the importance of how individuality is at the base of the definition of the different types of users.
A case study involving the cost–benefit analysis of selected packages of measures for reducing the risks posed by different rainfall-induced flow-like phenomena—which include hyperconcentrated flows, debris flows and landslides on open slopes—in the municipality of Nocera Inferiore (located in the Campania region in southern Italy) is then described. As demonstrated through the case study, the approach enables a clear evaluation of the efficiency and acceptability of the risk mitigation packages and provides vital decision support in their prioritisation and optimisation.
Adaptive multi-rate interface: development and experimental verification for real-time hybrid simulation

Real-time hybrid simulation (RTHS) is a powerful cyber-physical technique that is a relatively cost-effective method to perform global/local system evaluation of structural systems. A major factor that determines the ability of an RTHS to represent true system-level behavior is the fidelity of the numerical substructure. While the use of higher-order models increases fidelity of the simulation, it also increases the demand for computational resources. Because RTHS is executed at real-time, in a conventional RTHS configuration, this increase in computational resources may limit the achievable sampling frequencies and/or introduce delays that can degrade its stability and performance. In this study, the Adaptive Multi-rate Interface rate-transitioning and compensation technique is developed to enable the use of more complex numerical models. Such a multi-rate RTHS is strictly executed at real-time, although it employs different time steps in the numerical and the physical substructures while including rate-transitioning to link the components appropriately. Typically, a higher-order numerical substructure model is solved at larger time intervals, and is coupled with a physical substructure that is driven at smaller time intervals for actuator control purposes. Through a series of simulations, the performance of the AMRI and several existing approaches for multi-rate RTHS is compared. It is noted that compared with existing methods, AMRI leads to a smaller error, especially at higher ratios of sampling frequency between the numerical and physical substructures and for input signals with high-frequency content. Further, it does not induce signal chattering at the coupling frequency. The effectiveness of AMRI is also verified experimentally.
Adding Value to Facilities Management with Information Technology

This PhD project investigates implementation and use of Information Systems (IS) and Information Technologies (IT) in the Facilities management (FM) business domain. This investigation is relevant because implementation and use of IS/IT in FM has potentials for improvements which can provide additional value to FM and the organisations which FM supports. The empirical data was collected from more than 16 IS implementation and use cases in FM departments within private and public organisations in Denmark, Sweden, Germany and Australia. Data from 5 of the 16 cases are used as main input to the analysis in this study. The cases have revealed a common structure of the elements constituting the IS and the Business Processes (BP) which the IS are intended to support. Based on this structure an IS-BP framework for analysing the interaction between Business Strategy, BP and the IS supporting the BP is proposed. Specific issues are studied concerning the implementation processes, such as IS project scope, and formal control mechanisms used on the organisational IS level and on the IS project level. Also issues related to the change taking place such as the added value of IS implementation are studied. Finally IS strategy as the strategy of the use of IS to support business strategy (BS) is studied.

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Organisations: Department of Management Engineering, Engineering Systems, Management Science, Implementation and Performance Management, Department of Civil Engineering, Section for Building Design
Authors: Ebbesen, P. (Intern), Bonke, S. (Intern), Jensen, P. A. (Intern), Karlshøj, J. (Intern)
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Part_1_and_2_PhD_Dissertation_Poul_Ebbesen_160129_FINAL_VERSION_SENT_TO_PRINT_161119.pdf
Source: PublicationPreSubmission
Source-ID: 1275117925
Publication: Research › Ph.D. thesis – Annual report year: 2016
Airflow characteristics and pollution distribution around a thermal manikin - Impact of specific personal and indoor environmental factors

This study presents a summary of experimental measurements on the airflow characteristics and pollution distribution around a non-breathing thermal manikin. The two objectives are: (1) to examine the extent to which personal (body posture, clothing insulation, table positioning) and environmental factors (room air temperature and ventilation flow) affect the airflow characteristic (velocity and temperature) around the thermal manikin and (2) to examine the pollution distribution within the convective boundary layer (CBL) around a thermal manikin and personal exposure to two types of airborne pollutants under factors that influence the CBL. The results show that the CBL generated by the thermal manikin influenced the airflow characteristics and pollution distribution in the breathing zone. Parameters such as room air temperature, body posture, clothing insulation, table positioning, and ventilation flow considerably affected airflow characteristics and pollution distribution around the thermal manikin. Under the specific set of conditions studied, the most favorable airflow patterns in preventing the feet pollution from reaching the breathing zone was transverse flow from the front, as it minimized the exposure at the minimum supply air velocity. Certain airflow directions exhibited a nonlinear dependence between the supply airflow rate and personal exposure. This suggests that without a better understanding of the airflow patterns in a room, the ventilation rate may therefore be increased in vain.

A lime based mortar for thermal insulation of medieval church vaults

There are 1700 medieval churches in Denmark, and many of these have brick vaults. The thickness is only 12 – 15 cm, and the heat loss through this building component is large. Thermal insulation has not been permitted until now in respect for the antiquarian values and doubts about the effect on water vapour transport through the vault, and the risk of condensation inside the insulation. A new mortar was developed for thermal insulation of bricks vaults, consisting mainly
of expanded perlite, mixed with slaked lime. These materials are compatible with the fired clay bricks and the lime mortar joints. The insulation mortar is applied to the top side of the vault in a thickness of 10 cm, and covered by 10 mm lime plaster, reinforced with cattle hair. This assembly is resistant to the weight of a person, working with maintenance of the roof. The thermal conductivity of the insulation mortar was measured to 0.08 W/mK, which is twice the value for mineral wool. It has 1/3 of the resistance to water vapour diffusion as brick, and a high capacity for liquid water absorption. This is a benefit in the case of rain leaking from the roof, because the water does not penetrate further down into the bricks.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, National Museum of Denmark, Aalborg University
Authors: Hansen, T. K. (Intern), Larsen, P. K. (Ekstern), Hansen, K. K. (Intern), Bjarløv, S. P. (Intern), Peuhkuri, R. H. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
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Publication: Research - peer-review › Paper – Annual report year: 2016

A lime based mortar for thermal insulation of medieval church vaults
A new mortar for thermal insulation of medieval church vaults was tested in a full scale experiment in Annisse Church, DK. The mortar consists of perlite, a highly porous aggregate, mixed with slaked lime. These materials are compatible with the fired clay bricks and the lime mortar joints. The lambda-value of the insulation mortar is 0.08 W/m K or twice the lambda-value for mineral wool. The water vapour permeability is equal to a medieval clay brick, and it has three times higher capacity for liquid water absorption. The mortar was applied to the top side of the vaults in a thickness of 10 cm, and covered by 10 mm lime plaster, reinforced with cattle hair. This assembly can carry the weight of a person, working with maintenance of the roof. Climate measurements confirmed excellent properties in regards to both moisture transport and thermal insulation. Condensation did not occur at any time, despite a water vapour pressure gradient up to 500 Pa between the nave and attic. There was no reduction in energy consumption the first winter, possibly due to the increased heat loss related to the drying of the mortar.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, National Museum of Denmark
Authors: Larsen, P. (Ekstern), Hansen, T. K. (Intern)
Number of pages: 7
Publication date: 2016
Main Research Area: Technical/natural sciences
Church vault, Thermal insulation, Perlite mortar, Vapour permeability
Electronic versions:
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Publication: Research - peer-review › Paper – Annual report year: 2016

Analysis of occupants' behavior related to the use of windows in German households
Real energy performances of buildings depend not only on deterministic aspects, such as building physics and HVAC systems, but also on stochastic aspects such as weather and occupants' behavior. Typically, occupant behavior is not adequately considered when calculating the expected performance. As a result, field test studies all over Europe have shown discrepancies between real and expected energy performance of buildings. In order to bridge this gap, stochastic occupants' behavior models could be embedded into building energy performance simulation software. In order to make such models, there is a need for a better understanding of occupants' behavior and in particular the reasons of their adjustments of building controls such as window opening, heating set points, etc. The purpose of this paper was to analyze window opening behavior in residential buildings, investigate which drivers lead occupants to interact with windows and how these actions can be modeled. A method to analyze the probability of a state change of the windows, based on logistic regression, was applied to monitored data (measured each minute) from two refurbished demonstration buildings. The weather and the five rooms of the 60 apartments located in the buildings were monitored in terms of air quality and thermal environment (presence of occupants was not monitored) during four years. The most common driver to open a window was the time of the day, followed by the carbon dioxide concentration. The most common driver to close a window was the daily average outdoor temperature, followed by the time of the day. (C) 2016 Elsevier Ltd. All rights
Analysis of the occupants’ behavior related to natural ventilation

The real energy performance of buildings depends both upon deterministic aspects (building's physics and engineering systems) and probabilistic aspects such as weather and occupant behavior. Occupant behavior is usually not directly considered when calculating the expected energy performance of buildings. In fact, field test studies all over the world have shown discrepancies between expectation and real energy performances of buildings. This gap could be bridged, by embedding stochastic occupants’ behavior models within buildings' energy performances simulation software. Within this work, an established method to analyze the probability of a state change of the windows, based on logistic regression, was applied to monitored data (measured each minute) from two refurbished residential buildings. The weather as well as the five rooms of each of the 60 apartments located in the buildings were monitored in terms of indoor environmental quality and window operation for four years. The aim of this work is the investigation of the drivers leading occupants to open and close windows. The evaluation of the 300 windows showed: the two most common drivers leading to the opening action were the time of the day and the carbon dioxide concentration in the room. The two most common drivers leading to the closing action were: the daily average outdoor temperature, and the time of the day.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, RWTH Aachen University
Number of pages: 9
Publication date: 2016
An International Project on Indoor Air Quality Design and Control in Low Energy Residential Buildings

In order to achieve nearly net zero energy use, both new and energy refurbished existing buildings will in the future need to be still more efficient and optimized. Since such buildings can be expected to be already well insulated, airtight, and have heat recovery systems installed, one of the next focal points to limiting energy consumption for thermally conditioning the indoor environment will be to possibly reducing the ventilation rate, or making it in a new way demand controlled. However, this must be done such that it does not have adverse effects on indoor air quality (IAQ).

Annex 68, Indoor Air Quality Design and Control in Low Energy Residential Buildings, is a project under IEA’s Energy Conservation in Buildings and Communities Program (EBC), which will endeavor to investigate how future residential buildings are able to have very high energy performance whilst providing comfortable and healthy indoor environments.

New paradigms for demand control of ventilation will be investigated, which consider the pollution loads and occupancy in buildings. As well, the thermal and moisture conditions of such advanced building shall be considered because of interactions between the hygrothermal parameters, the chemical conditions, ventilation and the wellbeing of occupants.

The project is divided into the five subtasks: 1. Defining the metrics. 2. Pollutant loads in residential buildings. 3. Modeling. 4. Strategies for design and control of buildings. 5. Field measurements and case studies. A flagship outcome of the project will be a guidebook on design and operation of ventilation in residential buildings to achieve high IAQ with least possible energy consumption. The paper illustrates the working program of each of these activities.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Section for Indoor Climate and Building Physics, Universite de La Rochelle, Nanjing University, Technische Universitat Dresden, Ghent University, Syracuse University
Authors: Rode, C. (Intern), Abadie, M. (Ekstern), Qin, M. (Ekstern), Grunewald, J. (Ekstern), Kolarik, J. (Intern), Laverge, J. (Ekstern), Zhang, J. (Ekstern)
Pages: 167-174
Publication date: 2016

An Methodology for Quality Control and Draught Assessment of Room Ventilation Supply Using Laser Light Sheets

A common technique to investigate draught problems in a room is to make spot measurements of air velocity. This might identify where the draught problem is located but it does not necessarily identify the distribution and source of the problem. Usually visual inspections of the location of ventilation inlet and smoke experiments are next step to track the draught source. However, these methods do not provide an understanding of the air flow pattern in the room with sufficient resolution to necessarily identify the source of the draught problem. However, laser light sheets together with smoke seeding for on-site visualization of airflow in rooms might be useful for tracking down draught sources in rooms as part of a commissioning process. This paper reports on the first attempts to use this simple method to visualize and characterize air flow patterns in two different classrooms. The visualizations disclosed the air movements, and it was possible to record the movements using a standard smartphone camera. From the movements it was possible to qualitatively assess the overall airflow patterns of the room. The resolution of the video recording was also sufficient to be processed in particle image velocimetry software to gain overall flow pattern visualization, if not accurate readings. The latter result indicates that there could be a potential for real-time velocimetry processing by smartphones but the method in general needs further investigation and documentation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Hviid, C. A. (Intern), Petersen, S. (Ekstern)
Number of pages: 10
A novel model for interpreting experimental results from sandwich composites exposed to fire conditions

Composite materials offer a large range of advantages for the marine industry such as light weight, reduction of the maintenance costs and the possibility to create complex shapes. However, in order to have the approval of the authorities for building a SOLAS vessel with composite materials, this alternative design has to show an equivalent level of safety as the prescriptive requirement which is based on the use of metals [1]. Several solutions have been proposed to define new methodologies that demonstrate the required fire safety, these can be distinguished into two main ideologies; A) The tradeoff approach, i.e. staying as close as possible to the prescriptive regulations by making conservative equivalences, often in terms of passive protection, compared to an equivalent prescriptive design [2], and B) The performance based approach that looks into the overall performance in a fire situation. [3].

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Department of Mechanical Engineering, Solid Mechanics
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

A numerical model for pressure drop and flow distribution in a solar collector with U-connected absorber pipes

This study presents a numerical model calculating the pressure drop and flow distribution in a solar collector with U-type harp configuration in isothermal conditions. The flow maldistribution in the absorber pipes, caused by the different hydraulic resistances, was considered to evaluate the pressure drop across the collector. The model was developed in Matlab and is based on correlations found in literature for both friction losses and local losses, and was compared in terms of overall pressure drop against experimental measurements carried out on an Arcon Sunmark HT 35/10 solar collector at different flow rates and temperatures for water and water/propylene glycol mixture. For collector pressure drops higher than 1.4 kPa, the relative difference between the model and measurements was within 5% for water and 7% for water/propylene glycol mixture. For lower pressure drops the relative difference increased, but remained within the accuracy of the differential pressure sensor. The flow distribution was mainly affected by the flow regime in the manifolds. Turbulent regime throughout the manifolds entailed a more uniform distribution across the absorber pipes compared to laminar regime. The comparison between calculated flow distributions and results from previous literature showed a good agreement. (c) 2016 Elsevier Ltd. All rights reserved.

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Organisations: Department of Civil Engineering, Section for Building Energy
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Application of behaviour models in BEPS and control

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Authors: Andersen, R. K. (Intern)
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Applications of Polysun at DTU Denmark

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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Andersen, E. (Intern)
Number of pages: 5
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Applying multivariate analysis as decision tool for evaluating sediment-specific remediation strategies
Multivariate methodology was employed for finding optimum remediation conditions for electrodialytic remediation of harbour sediment from an Arctic location in Norway. The parts of the experimental domain in which both sediment- and technology-specific remediation objectives were met were identified. Objectives targeted were removal of the sediment-specific pollutants Cu and Pb, while minimising the effect on the sediment matrix by limiting the removal of naturally occurring metals while maintaining low energy consumption.
Two different cell designs for electrochemical remediation were tested and final concentrations of Cu and Pb were below background levels in large parts of the experimental domain when operating at low current densities (<0.12 mA/cm²). However, energy consumption, remediation times and the effect on naturally occurring metals were different for the 2- and 3-compartment cells.

General information
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Main Research Area: Technical/natural sciences

Publication information
Architectural qualities of Danish office buildings built between 1960 and 1980, seen in a contemporary sustainable perspective

This study is about evaluating the past and present architectural quality of office buildings built between 1960 and 1980 in Denmark. The evaluation will focus on the expression of these buildings in relation to their context, combined with the present sustainable performance of the buildings and their critical problems. The initial method is a historical study to define the originally intended architectural quality of the office buildings and the different aspects related to this quality. The architectural quality is studied in relation to the societal and technological processes that characterized this period, with special focus on industrialization and its impact on the design process, particularly in adopting rational and economic solutions.

When evaluating the buildings in a contemporary, sustainable perspective, the designer faces many problems. These include: economic problems due to high energy consumption; comfort problems due to bad indoor climate; and environmental problems due to the use of construction materials with a negative impact on the environment. Site visits show that these buildings are facing many characteristic constructional and aesthetic problems regarding material durability, mould and fungus, and lack of tightness.

The analysis of the originally intended architectural quality combined with current constructional, sustainable and aesthetic evaluation forms the basis for a discussion on the possibilities of implementing sustainable solutions in the office buildings. This implementation will have an impact on the aesthetic output, and the concepts of possible contemporary architectures are highlighted.

General information
State: Published
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A smart base restraint for wind turbines to mitigate undesired effects due to structural vibrations

Concerns in the last decades of the negative impact of the use of fossil fuels on the environment has lead to a boom in the production of wind turbines. To take advantage of the smoother stronger winds at height, wind turbine heights are progressively increasing. This has led to an increased demand to control tower forces. The application of a semi-active (SA) control system is herein proposed and discussed. Its aim is to limit bending moment demand at the base of a wind turbine by relaxing the base restraint of the turbine's tower, without increasing the top displacement. This is done thanks to the sharp increase of the dissipated energy in selected intervals of time and an adaptive change in tower dynamic
properties. This SA control system reproduces a variable restraint at the base that changes in real time its mechanical properties according to the instantaneous response of the turbine's tower. This smart restraint is made of a central smooth hinge, elastic springs and SA magnetorheological dampers driven by a control algorithm properly designed for the specific application. A commercial 105 m tall wind turbine has been assumed as a case study. Several numerical simulations have been performed with reference to an extreme load, aimed at establishing a procedure for the optimal calibration of the control algorithm according to the specific case, finally proving the actual potential of the proposed control technique in reducing the structural demand with respect to the “fixed base” structure.

General information
State: Published
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Number of pages: 10
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Semi-active control, Wind turbine, Magnetorheological damper
Electronic versions:
11938.pdf
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Source-ID: 2372053161
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Assessment of Severely ASR Damaged Bridges: From Diagnosis to Structural Effects
During the last decade an increasing number of bridges are becoming severely deteriorated due to alkali-silica reaction (ASR) in Denmark. Some bridges have already been demolished due to lack of knowledge on the residual load carrying capacity. The deterioration of concrete by ASR has been widely documented. The majority of the experimental data are based on relatively small scale laboratory specimens accelerated by various exposure conditions. Research on assessment and influence of severely ASR deterioration on the material properties and residual load carrying capacity of real-life structures is unfortunately limited. This paper presents an overview and discussion of the Danish experiences with assessment of the residual load carrying capacity of severely non-shear reinforced ASR damaged bridges. The discussion is supported by experimental data acquired from large scale in-situ tests of three severely ASR deteriorated bridges. The influence of ASR cracking on the mechanical properties of concrete and the pre-stress effect on the reinforcement due to ASR expansion are discussed.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, University of Southern Denmark, Danish Road Directorate
Authors: Barbosa, R. A. (Intern), Hansen, S. G. (Ekstern), Hansen, K. K. (Intern), Hoang, L. C. (Intern), Grelk, B. (Intern), Maag, I. (Ekstern)
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Assessment of kitchen waste compost from Sisimiut for use as plant growth medium or landfill biocover

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Skadborg, M. (Ekstern), Nielsen, M. (Ekstern), Kirkelund, G. M. (Intern), Scheutz, C. (Intern)
Number of pages: 2
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Automated long-term time lapse ERT monitoring of high-latitude permafrost – results of 3 years of monitoring and modeling study

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Tomaskovicova, S. (Intern), Ingeman-Nielsen, T. (Intern)
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Electronic versions: ICOP2016_abstract_TLERT.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Bed-integrated local exhaust ventilation system combined with local air cleaning for improved IAQ in hospital patient rooms
The performance of a ventilated mattress (VM) used as a bed-integrated local exhaust ventilation system combined with air cleaning fabric (acid-treated activated carbon fibre (ACF) fabric) was developed and studied. The separate and combined effect of the VM and the local air cleaning for reducing the exposure to body generated bio-effluents in a hospital room was determined. Full-scale experiments were conducted in a climate chamber furnished as a single-bed patient room. Two heated dummies were used to simulate a patient and a doctor in the room. The patient was lying on a bed equipped with the VM. The patient's body was covered with either a cotton sheet or with the ACF material used as a blanket. Ammonia gas released from the patient's groins simulated the body generated bio-effluents. At the location of the groins the surface area of the VM was perforated through which the contaminated air of the bed micro-environment was exhausted. Two modes of operation were studied: 1) the exhausted polluted air was discharged out of the room and 2) the polluted air was cleaned by the ACF material installed inside the mattress and recirculated back into the room. Both modes of operation efficiently reduced the generated bio-effluents in the room with about 70%. Reduction in the exposure to body-emitted ammonia was up to 96% when the VM was operated at only 1.5 L/s and the ACF was used as a blanket.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Otsuma University, Kyoto Institute of Technology
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Between green growth and degrowth: Decoupling, rebound effects and the politics for long-term sustainability

Taking the simple equation: I(impact) = P(population) A(affluence) T(technology) as the point of departure, this chapter discusses the delusion of decoupling economic activities from environmental impacts by resorting to reduce eco-intensities through technological advancement alone. It is argued that the rebound effect is both a natural consequence of the growth dedicated society and a driver of further economic growth. Through rebound effects, labour productivity and eco-efficiency technologies in the growth society tend to contradict the goal of achieving environmental sustainability. To address the environmental problems, attention should therefore be redirected to the growth ideology and policy in current society. Drawing on the emerging degrowth debates in the affluent countries, the chapter proposes pathways towards a degrowth transformation by, respectively, discussing the role of population, affluence and technology in the attempts at reducing environmental impacts. Overall, it is suggested that from an analysis not confined to monetary terms, but with real cost
and real benefits represented by environmental damage and human satisfaction, respectively, a degrowth in affluent countries can be achieved at no net cost.

Beyond nearly zero-energy buildings: Experimental investigation of the thermal indoor environment and energy performance of a single-family house designed for plus-energy targets

A detached, one-story, single-family house in Denmark was operated with different heating and cooling strategies for 1 year. The strategies compared during the heating season were floor heating without ventilation, floor heating supplemented by warm air heating (ventilation system), and floor heating with heat recovery from exhaust air. During the cooling season, the house was cooled by floor cooling and was ventilated mechanically. Air and globe (operative, when applicable) temperatures at different heights at a central location were recorded. The thermal indoor environment, local thermal discomfort and overheating were evaluated based on EN 15251 (2007), EN ISO 7730 (2005), and DS 469 (2013), respectively. Energy performance was evaluated based on the energy production and HVAC system energy use. The thermal indoor environment during the heating season was satisfactory but it was not possible to reach the intended operative temperature when the outside temperatures were very low. During the cooling season, the cooling demand was high and overheating was a problem. Although the house was designed as a plus-energy house, it did not perform as one under the Danish climate conditions. It would be possible to decrease the heating and cooling demand during the design phase through careful consideration of parameters such as the orientation, glazing area, solar shading, and thermal mass. With a lower demand, plus-energy levels can be achieved even with the minimum contribution from the energy producing components.
Through their biomechanical properties, pedestrians interact with the structures they occupy. Although this interaction has been recognized by researchers, pedestrians’ biomechanical properties have not been fully addressed. In this paper, a spring-mass-damper (SMD) system, with a pair of biomechanical forces, was used to model a pedestrian for application in vertical human-structure interaction (HSI). Tests were undertaken in a gait laboratory, where a three-dimensional motion-capture system was used to record a pedestrian’s walking motions at various frequencies. The motion-capture system produced the pedestrian’s center of mass (COM) trajectories from the captured motion markers. The vertical COM trajectory was approximated to be the pedestrian SMD dynamic responses under the excitation of biomechanical forces.
SMD model parameters of a pedestrian for a specific walking frequency were estimated from a known walking frequency and the pedestrian’s weight, assuming that pedestrians always walk in displacement resonance and retain a constant damping ratio of 0.3. Thus, biomechanical forces were extracted using the measured SMD dynamic responses and the estimated SMD parameters. Extracted biomechanical forces from all test trials were expressed with third-order Fourier series. It was found that the amplitude of the first-order biomechanical forces changed with the pacing frequency and that it fit a linear model. Amplitudes of the second- and third-order biomechanical forces were found to be scattered and not closely related to walking frequency. A generalized extreme value distribution was fit to each of the amplitudes. Phases in the model for biomechanical forces were not related to pacing frequency, and a mean value of the phases is proposed.

General information
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Scopus rating (2016): CiteScore 1.56 SJR 0.933 SNIP 1.659
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BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.038 SNIP 1.934 CiteScore 0.97
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.013 SNIP 1.988 CiteScore 0.98
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.301 SNIP 1.962
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.034 SNIP 1.331
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Scopus rating (2008): SJR 1.054 SNIP 1.508
Scopus rating (2007): SJR 1.183 SNIP 1.606
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Scopus rating (2005): SJR 0.577 SNIP 1.363
Scopus rating (2004): SJR 1.458 SNIP 1.499
Scopus rating (2003): SJR 0.617 SNIP 0.931
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Fabricius, I. L. (Intern)
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Sørensen, M. K. (Intern), Fabricius, I. L. (Intern)
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General information
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Fabricius, I. L. (Intern)
Pages: 258-259
Publication date: 2016
Can superabsorbent polymers mitigate shrinkage in cementitious materials blended with supplementary cementitious materials?

A promising way to mitigate autogenous shrinkage in cementitious materials with a low water-to-binder ratio is internal curing by the use of superabsorbent polymers. Superabsorbent polymers are able to absorb multiple times their weight in water and can be applied as an internal water reservoir to induce internal curing and mitigation of self-desiccation. Their purposefulness has been demonstrated in Portland cement pastes with and without silica fume. Nowadays, fly ash and blast-furnace slag containing binders are also frequently used in the construction industry. The results on autogenous shrinkage in materials blended with fly ash or blast-furnace slag remain scarce, especially after one week of age. This paper focuses on the autogenous shrinkage by performing manual and automated shrinkage measurements up to one month of age. Without superabsorbent polymers, autogenous shrinkage was reduced in cement pastes with the supplementary cementitious materials versus Portland cement pastes. At later ages, the rate of autogenous shrinkage is higher due to the pozzolanic activity of the supplementary cementitious materials. Internal curing by means of superabsorbent polymers is successful, independent of this long-term higher rate of shrinkage in mixtures with supplementary cementitious materials. Superabsorbent polymers proved to be successful in mitigating self-desiccation.
Can the interaction between occupant behaviour and the indoor environment in residences be influenced?
In the context of global climate change it has been broadly recognized that energy use in buildings must be reduced. In many cases this has been achieved by decreasing the natural infiltration rate in buildings by means of a focus on airtightness. Increasing airtightness does decrease energy use, but it also increases the impact of occupant behaviour on energy use and indoor environment.

In Denmark the indoor environment is directly linked to energy use for heating. In most buildings the indoor environment is controlled by the occupant (via thermostat setting, window opening), so any change in the occupants’ control of the indoor environment will influence energy use.

Both older and more recent studies of the influence of occupant behaviour on energy use report that an increased information level and feedback on energy use can be effective in influencing occupant behaviour. The market penetration of smart meters has made it possible to measure and visualize energy use in real-time. Visualizing real-time consumption made it theoretically possible to provide feedback.

Some authors were reluctant to recommend feedback from smart meters and a national roll-out of this approach, as national savings would then depend on the truth of an unproven assumption: that all occupants will act adaptively when provided with more information. Their studies questioned the value of providing feedback to households not motivated to conserve energy and suggested that alternative approaches should be tested.

The purpose of this Ph.D. project was to investigate whether feedback on the indoor environment could be used to adaptively influence occupants’ control of the indoor environment in such a way as to obtain healthy and comfortable homes and reduced energy use for heating. The project consisted of a literature study and four field studies that focused on how to affect occupants’ control of the indoor environment. The four studies used measurements of the temperature, relative humidity, and CO₂ concentration in 84 rental apartments. The conclusions made in the thesis are derived from an analysis of the measurements performed in the apartments. The apartments were in three multi-storey buildings in three different municipalities of the Copenhagen area of Denmark.

The influence of how total heat cost was allocated between tenants was studied in two buildings and a significant influence on the control of indoor environment was demonstrated. The measurements indicated that heat cost allocation was a driver for occupants’ behaviour. The measurements further showed the energy-saving potential of shifting from master-metering to submetering.

Two different feedback procedures were used to test the effect of providing indoor environmental feedback. The first method combined real-time feedback with monthly feedback letters. The second method combined real-time feedback with weekly feedback letters. The effects of the feedback procedures were investigated by using measurements, interviews and questionnaires.

Feedback on energy use gave occupants a monetary incentive and an environmental incentive to conserve energy. By using indoor environmental feedback it was possible to use health, comfort, monetary and environmental incentives to promote energy conservation.

The studies highlighted the importance of occupants being motivated to adapt their control of the indoor environment by acting on feedback. The results further indicated that occupants without a monetary incentive were not as interested in using the feedback as occupants with a monetary incentive.

The difference between the feedback procedures supported the findings of earlier studies, that feedback should be disseminated as frequently as possible. The studies demonstrated the importance of barrier-free access to real-time feedback, as even a little barrier caused the occupants to ignore the feedback. It is recommended that feedback should be disseminated by using a mobile platform, as a dedicated application, and not just through a website.
Case study of low-temperature heating in an existing single-family house-A test of methods for simulation of heating system temperatures

Low-temperature heating provides an efficient way of heating our buildings. To obtain a high efficiency it is important that the heating systems in the buildings are operated with both low supply and return temperatures. This study set out to investigate how typical assumptions in the modelling of heat emissions from existing hydraulic radiators affects the heating system return temperatures calculated in a building simulation model. An existing single family house with hydraulic radiators was modelled in the simulation program IDA-ICE. Simulations were performed with various levels of detail and the calculated indoor temperatures and radiator return temperatures were compared to temperatures measured in the case house. The results showed that the detail of the simulation model has a large influence on the results obtained. The estimated return temperatures from the radiators varied by up to 16 degrees C depending on the assumptions made in the simulation model. The results indicated that a detailed building simulation model can provide a good estimate of the actual heating system operation, provided that actual radiators and realistic indoor temperatures are taken into account in the model. (C) 2016 Elsevier B.V. All rights reserved.
Catenary Action in Rebars Crossing a Casting Joint Loaded in Shear

Reinforcement crossing a casting joint loaded in shear exhibits catenary action as the shear displacement increases. The load carrying capacity of such a joint is in practice often calculated by use of empirical methods to account for shear friction effects or by a first order plastic analysis if dowel action is included. The strength increase/reserve due to catenary action in the rebars is often neglected; however, in some cases it may be necessary to utilize the effect in order to ensure overall structural robustness. This paper presents results of a study, where the increased shear capacity due to catenary action was investigated experimentally in a simple push-off setup and theoretically by a second order plastic analysis. The model captures the combination of dowel and catenary action with increasing shear displacement and satisfactory correlation between the S-shaped test results and theory is found when reasonable material properties are assumed.

General information

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Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Sørensen, J. H. (Intern), Hoang, L. C. (Intern), Olesen, J. F. (Intern), Fischer, G. (Intern)
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Publication: Research - peer-review » Article in proceedings – Annual report year: 2016
Centrifuge modelling of rigid piles in soft clay

Monopiles have so far been extensively used as foundation solutions for renewable energy, with the most popular being offshore wind developments. The current design practice of monopiles subjected to lateral loading has been widely questioned, because of the lack of empirical data. The objective of this study is to employ centrifuge modelling in order to derive experimental p-y curves for rigid piles embedded in over-consolidated soft clay. A kaolin clay sample was prepared and pre-consolidated by applying a constant pressure at the soil surface, while different over-consolidation ratios were achieved within the clay sample by carrying out the experiments at different g fields. The findings suggest that the normalised shape of the p-y curves can be predicted within a sufficient accuracy using the current methodology but that the ultimate lateral resistance is underestimated at shallow depths and overestimated at greater depths.

General information
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Klinkvort EUR/L, Rambøll Danmark A/S, University of Western Australia
Authors: Klinkvort, R. (Ekstern), Poder, M. (Ekstern), Truong, P. (Ekstern), Zania, V. (Intern)
Number of pages: 6
Publication date: 2016

CFD code comparison for 2D airfoil flows
The current paper presents the effort, in the EU AVATAR project, to establish the necessary requirements to obtain consistent lift over drag ratios among seven CFD codes. The flow around a 2D airfoil case is studied, for both transitional and fully turbulent conditions at Reynolds numbers of $3 \times 10^6$ and $15 \times 10^6$. The necessary grid resolution, domain size, and iterative convergence criteria to have consistent results are discussed, and suggestions are given for best practice. For the fully turbulent results four out of seven codes provide consistent results. For the laminar-turbulent transitional results only three out of seven provided results, and the agreement is generally lower than for the fully turbulent case.

General information
State: Published
Organisations: Department of Wind Energy, Aerodynamic design, Department of Civil Engineering, Centro Nacional de Energias Renovables, Centre for Renewable Energy Sources, University of Stuttgart, National Technical University of Athens, University of Glasgow, Delft University of Technology
Authors: Sørensen, N. N. (Intern), Méndez, B. (Ekstern), Muñoz, A. (Ekstern), Sieros, G. (Ekstern), Jost, E. (Ekstern), Lutz, T. (Ekstern), Papadakis, G. (Ekstern), Voutsinas, S. (Ekstern), Barakos, G. N. (Ekstern), Colonía, S. (Ekstern), Baldacchino, D. (Ekstern), Baptista, C. (Ekstern), Ferreira, C. M. D. (Intern)
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Web of Science (2016): Indexed yes
CFRP strengthening of RC beams using a ductile anchorage system

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, Technical University of Denmark, NORUT Narvik
Authors: Schmidt, J. W. (Intern), Krabbe, J. (Ekstern), Sørensen, N. (Ekstern), Hertz, K. D. (Intern), Goltermann, P. (Intern), Sas, G. (Ekstern)
Pages: 344-349
Publication date: 2016
Challenging the assumptions for thermal sensation scales

Scales are widely used to assess the personal experience of thermal conditions in built environments. Most commonly, thermal sensation is assessed, mainly to determine whether a particular thermal condition is comfortable for individuals. A seven-point thermal sensation scale has been used extensively, which is suitable for describing a one-dimensional relationship between physical parameters of indoor environments and subjective thermal sensation. However, human thermal comfort is not merely a physiological but also a psychological phenomenon. Thus, it should be investigated how scales for its assessment could benefit from a multidimensional conceptualization. The common assumptions related to the usage of thermal sensation scales are challenged, empirically supported by two analyses. These analyses show that the relationship between temperature and subjective thermal sensation is non-linear and depends on the type of scale used. Moreover, the results signify that most people do not perceive the categories of the thermal sensation scale as equidistant and that the range of sensations regarded as ‘comfortable’ varies largely. Therefore, challenges known from experimental psychology (describing the complex relationships between physical parameters, subjective perceptions and measurement-related issues) need to be addressed by the field of thermal comfort and new approaches developed.
Characterisation of source-separated organic waste for composting in Sisimiut, Greenland

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Residual Resource Engineering, Technical University of Denmark
Authors: Díez, L. (Ekstern), Kirkelund, G. M. (Intern), Scheutz, C. (Intern)
Number of pages: 2
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Characterization of particulate residues from Greenlandic MSWI for use as secondary resources
In Greenland, waste incineration is used in the larger towns to treat the municipal solid waste. The incineration reduces the amount of waste, but produces particulate incineration residues such as fly and bottom ash that are disposed of. Most construction materials are imported to Arctic areas. The focus in this study is a characterisation of Greenlandic incineration residues to assess the potential as local secondary resources. In this study, fly ash samples from all the incinerators and bottom ash from two incinerators were collected and investigated for several physical-chemical properties. The fly ash
samples consisted of very fine-grained particles, with different grading for each incinerator. High water solubility due to high salt concentrations was seen for all fly ash samples along with high concentrations of leachable heavy metals, thus pretreatment is recommended before use as secondary material. The bottom ashes consisted of coarser particles and exhibited lower heavy metal leaching than the fly ash. All residue samples were different and evaluation of reuse should be made individually, however the fly ash shows potential as cement replacement and bottom ash as sand replacement for construction purposes.

**General information**

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Aveiro
Authors: Kirkelund, G. M. (Intern), Dias-Ferreira, C. (Ekstern), Jensen, P. E. (Intern)
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**Chemical herder effectiveness as oil spill response tool in ice-infested water**

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Aarhus University, Technical University of Denmark
Authors: van Gelderen, L. (Intern), Adamopoulou, E. (Ekstern), Fritt-Rasmussen, J. (Ekstern), Jomaas, G. (Intern)
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**Chemometric analysis for pollution source assessment of harbour sediments in Arctic locations**

**General information**

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Akvaplan-niva AS, University of Tromsø
Authors: Pedersen, K. B. (Ekstern), Lejon, T. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern)
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**Host publication information**

Title of host publication: ARTEK Event 2016 – International Conference : Sanitation in Cold Climate Regions
Chloride Ingress in Concrete with Different Age at Time of First Chloride Exposure

Concrete structures cast in spring have longer time to hydrate and are therefore denser and more resistant to chloride ingress when first subjected to deicing salts in winter than structures cast in autumn. Consequently, it is expected that a spring casting will have a longer service life.

This hypothesis is investigated in the present study by testing drilled cores from concrete cast in 2012 and 2013 on the Svendborgsund Bridge. The cores are subject to petrographic examination and mapping of chloride profiles. Moreover, chloride migration coefficients have been measured. The study shows that the effect of the extra time of hydration obtained when casting in spring increases the expected service life of the concrete structure significantly.
Combining a survey approach and energy and indoor environment auditing in historic buildings

Purpose
– This paper presents an approach where a survey study is combined with energy and indoor environment auditing in the built environment. The combination of methods presented in this paper is one way to obtain a wider perspective on the indoor environment and energy use and also let the people in the building voice their comments on the indoor environment. This is arguably even more important in historic buildings where many of the physical properties are to a higher degree unknown when compared with conventional buildings. The purpose of the paper is to report the experiences from this research project.

Design/methodology/approach – A combination of energy and indoor environment auditing and standardized occupant surveys.

Findings – The main findings in the paper are related to the good agreement between results from standardized occupant surveys and physical measurements. The possibility to triangulate problems related to poor indoor conditions was shown to be one main advantage of the combined methodology presented in the paper. A standardized survey approach also allows benchmarking, in this case with two groups representing “average” buildings as well as a group representing well-functioning buildings. The use of records from building key cards was also shown to be an effective way of keeping track of activity in the building and thereby distribute internal gains. In addition, the paper reports a linear correlation between activity level and electricity use. Originality/value – The paper shows an effective way to investigate the performance, in terms of energy use as well as indoor environment, of historic buildings in use. This type of approach could benefit property owners, as it both allows benchmarking as well as investigating individual properties before, e.g., a refurbishment.

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Authors: Rohdin, P. (Ekstern), Dalewski, M. (Intern), Moshfegh, B. (Ekstern)
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Scopus rating (2012): SJR 0.132 SNIP 0.522 CiteScore 0.38
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.262 SNIP 0.472 CiteScore 0.55
Comparative analysis of bridge cables with concave fillets
In this paper the aerodynamic performance of two new cable surfaces with concave fillets are examined and compared to cables with traditional helically filleted, plain and pattern indented surfaces. To this end, an extensive wind-tunnel campaign was undertaken to measure the aerodynamic static force coefficients up to the super-critical Reynolds number range and rain-rivulet suppression ability. Flow visualizations tests were performed to better understand the structure and development of the wake. Both innovations outperform traditional surfaces in terms of rain-rivulet suppression thanks to the ability of the concave shaped fillet to act as a ramp for the incoming rain-rivulet. Furthermore both innovations are able to suppress vortex shedding at low Reynolds numbers, in contrast to the other cable surfaces tested. Moreover the innovation with the staggered surface shows an early reduction of the drag force while maintaining a zero lift up to the super-critical range.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, FORCE Technology, VSL International Ltd
Authors: Burlina, C. (Intern), Georgakis, C. T. (Intern), Larsen, S. V. (Ekstern), Egger, P. (Ekstern)
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Comparative analysis of experimental methods for quantification of small amounts of oil in water
During core flooding experiments where water is injected into oil bearing core plugs, the produced fluids can be sampled in a fraction collector. When the core approaches residual oil saturation, the produced amount of oil is typically small (can be less than a few microliters) and the quantification of oil is then difficult. In this study, we compare four approaches to determine the volume of the collected oil fraction in core flooding effluents. The four methods are: Image analysis, UV/visible spectroscopy, liquid scintillation counting, and low-field nuclear magnetic resonance (NMR) spectrometry. The procedure followed to determine the oil fraction and a summary of advantages and disadvantages of each method are given. Our results show that all four methods are reproducible with high accuracy. The NMR method was capable of direct quantification of both oil and water fractions, without comparison to a pre-made standard curve. Image analysis, UV/visible spectroscopy, and liquid scintillation counting quantify only the oil fraction by comparing with a pre-made standard curve. The image analysis technique is reliable when more than 0.1 ml oil is present, whereas liquid scintillation counting performs well when less than 0.6 ml oil is present. Both UV/visible spectroscopy and NMR spectrometry produced high accuracy results in the entire studied range (0.006-1.1 ml). In terms of laboratory time, the liquid scintillation counting is the fastest and least user dependent, whereas the NMR spectrometry is the most time consuming. (C) 2016 Elsevier B.V. All rights reserved.

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Scopus rating (2016): CiteScore 2.56 SJR 0.764 SNIP 1.631
Web of Science (2016): Indexed yes
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.692 SNIP 1.751 CiteScore 1.95
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 1
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.648 SNIP 1.41 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.746 SNIP 1.724
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.072 SNIP 1.852
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.841 SNIP 1.435
Scopus rating (2007): SJR 0.732 SNIP 1.386
Scopus rating (2006): SJR 0.92 SNIP 1.387
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.784 SNIP 1.052
Scopus rating (2004): SJR 0.823 SNIP 1.302
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.617 SNIP 1.077
Scopus rating (2002): SJR 0.849 SNIP 0.788
Scopus rating (2001): SJR 0.481 SNIP 0.705
Web of Science (2001): Indexed yes
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Core flooding, Image analysis, Liquid scintillation counting, Low-field NMR, Oil fraction, UV/visible spectroscopy
Comparison of phosphorus recovery from incineration and gasification sewage sludge ash

In the present work, ashes from incineration and gasification of the same sewage sludge were compared in terms of P extractability using electrolytic (ED) methods. The results show that comparable recovery rates of P were achieved with a single ED step for incineration SSA and a sequential combination of two ED steps for gasification SSA, which was due to a higher influence of Fe and/or Al in P solubility for the latter. A product with lower level of metallic impurities and comparable to wet process phosphoric acid (WPA) was eventually obtained from gasification SSA. Thus, gasification becomes an interesting alternative to incineration also in terms of P separation.

Comparison of Welding Residual Stresses of Hybrid Laser-Arc Welding and Submerged Arc Welding in Offshore Steel Structures

In the offshore industry, welding-induced distortion and tensile residual stresses have become a major concern in relation to the structural integrity of a welded structure. Particularly, the continuous increase in size of welded plates and joints needs special attention concerning welding induced residual stresses. These stresses have a negative impact on the integrity of the welded joint as they promote distortion, reduce fatigue life, and contribute to corrosion cracking and premature failure in the weld components. This paper deals with the influence and impact of welding method on the welding induced residual stresses. It is also investigated whether the assumption of residual stresses up to yield strength magnitude are present in welded structures as stated in the design guidelines. The fatigue strength for welded joints is based on this assumption. The two welding methods investigated are hybrid laser-arc welding (HLAW) and submerged arc welding (SAW). Both welding methods are applied for a full penetration butt-weld of 10 mm thick plates made of thermomechanically hot-rolled, low-carbon, fine-grain S355ML grade steel used in offshore steel structures. The welding residual stress state is investigated by means of computational welding mechanics, experiments, and in accordance with existing production procedures to determine the real distribution and magnitude of the residual stresses. The experimental validation of the FE simulations includes temperature and hole-drilling measurements.
Consequence Based Design. An approach for integrating computational collaborative models (Integrated Dynamic Models) in the building design phase

In the wake of uncompromising requirements on building performance and the current emphasis on building energy consumption and indoor environment, designing buildings has become an increasingly difficult task. However, building performance analyses, including those of building energy consumption and indoor environment, are generally conducted late in the design process. As a result, building performance evaluations are omitted in the early design where changes are least expensive. Consequence based design is a framework intended for the early design stage. It involves interdisciplinary expertise that secures validity and quality assurance with a simulationist while sustaining autonomous control of building design with the building designer. Consequence based design is defined by the specific use of integrated dynamic models. These models include the parametric capabilities of a visual programming tool, the building analyses features of a building performance simulation tool and the modelling and visualisation features of a design tool. The framework is established to enhance awareness of building performance in the early stages of building design, in the aim to create High-Performance Buildings. The project relies on various advancements in the area of integrated dynamic models. It also relies on the application and test of the approach in practice to evaluate the Consequence based design and the use of integrated dynamic models. As a result, the Consequence based design approach has been applied in five case studies. All case studies concern building design projects performed in collaboration with Grontmij and various Danish architectural studios. Different types of integrated dynamic models have been implemented and tested for the individual projects. The findings from each project were used to alter and define new ways to implement integrated dynamic models for the following project. In parallel, seven different developments of new methods, tools and algorithms have been performed to support the application of the approach. The developments concern: Decision diagrams – to clarify goals and the ability to visualize any relevant building performance. AHP – the use of Analytic Hierarchy Process to clarify differences between solutions on both qualitative and quantitative evaluations. Termite – the implementation of the BPS tool solver Be10 as a plugin for Grasshopper that enables live feedback of entire building energy consumption. HQSS – a quasi-steady-state BPS tool solver dedicated for fast thermal analyses in Grasshopper. Moth – an agent-based optimization algorithm implemented in Grasshopper that attempts to combine qualitative and quantitative evaluations during optimization. Sentient models – a method to listen to user behaviour in Grasshopper and decrease the space of solutions. Surrogate models – a test of machine learning methods to speed up any BPS feedback through surrogate models with Grasshopper.

This thesis demonstrates how integrated dynamic models may include building performance feedbacks, specifically feedbacks regarding energy consumption and indoor environment in the aim to create High-Performance Buildings. It further demonstrates the inclusion of quality defined performances un-associated with High-Performance Buildings. The thesis discusses ways integrated dynamic models affect the design process and collaboration between building designers and simulationists. Within the limits of applying the approach of Consequence based design to five case studies, followed
by documentation based on interviews, surveys and project related documentations derived from internal reports and similar sources, this thesis can conclude that integrated dynamic models for these particular case studies can improve the speed of multiple and parallel performance evaluations, reduce working hours for the simulationists and are likely to improve the goal of creating High-Performance Buildings.

General information
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Relations
Projects:

Construction and Design of Post-Tensioned Pearl-Chain Bridges using SL-Technology
Pre-fabricated closed-spandrel concrete arch bridges have existed for more than 50 years. Pearl-Chain (PC) Bridges are a new award-winning state-of-the-art segmental concrete arch bridge concept invented by professor Kristian Hertz. A PC-Arch can consist of a number of pre-tensioned low-weight SL-Decks. One SL-Deck is a combination of light aggregate concrete, and regular concrete. Curved post-tensioning ducts are cast into the elements, and several SL-Decks are post-tensioned together in an arch shape to become a PC-Arch. A PC-Bridge is built by erecting a number of adjacent PC-Arches and applying a filling layer of lower stiffness above the arches to level the road surface. The present Ph.D. thesis is part of a larger development project about Pearl-Chain Bridges funded by Innovationsfonden. The project also included another Ph.D. study about the developed materials used in Pearl-Chain Bridges. A row of companies have cooperated with the DTU-team in a consortium during the three year project period: Abeo, Perstrup Betonindustri, Skandinavisk Spændbeton og Sweco.
A method for calculation of the bending moment capacity was presented. The method was illustrated in a case study of a 30 m span PC-Bridge. The case showed that the pre-compression in the arch from pre-stressing, rise/to span ratio, and layer thickness of the filling as expected had influence on the capacity and could be altered to meet the capacity demands of a specific project. For an unevenly loaded bridge, in general, the lowest capacity was found to be in the joint between SL-Decks in the loaded side of the span, and in the SL-Deck in the non-loaded side. Arches under critical loading in the ¼ point of the span have a higher positive than negative bending moment, and advantageously the PC-Arches are designed to have higher positive than negative bending moment capacities in the SL-Decks. Concrete hinges were investigated for use in PC-Bridges. The true behavior of such hinges was far from ideal, and therefore had an influence of the overall static system. The responses of two types of hinges were investigated by full-scale testing, and numerical modelling. Despite of high levels of normal force in PC-Bridges, the result showed that a Mesnager inspired hinge type had a response similar to what was predicted in the literature. A specially designed saddle bearing also had elastic and plastic rotational resistance, but this hinge type was more practical to implement in a PC-Arch.
Two full-scale 13 m span PC-Arches were successfully assembled, post-tensioned and lifted into position next to each other on a test-foundation by use of a developed fast erection procedure. The same two arches were subsequently load-tested in the ¼ point of the span in two tempi: 1) A test to 2/3 of the load carrying capacity, where the behavior of the arches during loading was recorded and evaluated. It showed that the arches deflected as expected for a regular concrete arch, and that stresses are transferred between arches via so called Hammerhead joints. 2) A test to fracture to observe the ductility in the system, and fracture type. The collapse occurred after two plastic hinges were formed in the 3/8, and 5/8 points of the span. Several warnings signs were observed when approaching the maximum loading.
Contamination Sources in Kangertussuaq, Greenland

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems, Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Davidsen, S. (Intern), Kirstein, J. K. (Intern), Jensen, P. E. (Intern)
Number of pages: 2
Pages: 64-65
Publication date: 2016

Host publication information
Title of host publication: ARTEK Event 2016 – International Conference Sanitation in Cold Climate Regions
Publisher: Arctic Technology Centre, DTU Technical University of Denmark
ISBN (Print): 9788778774316
Main Research Area: Technical/natural sciences
Electronic versions:
Book_of_Abstracts_Artek_Event_2016.pdf

Bibliographical note
Byg Report R-340

Relations
Activities:
ARTEK Event 2016 - International Conference
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Control of Single-room Ventilation with Regenerative Heat Recovery for Indoor Climate and Energy Performance
The Danish government will seek energy-efficiency improvements to meet their targeted aims. Single-room ventilation with heat recovery allows simple installation through the façade and may be broadly deployed in apartments. Danish building regulations require greater than 80% heat recovery in new constructions and will soon require 85%. The development of single-room ventilation units may aim for these requirements as a result. The exhaust temperatures in highly efficient heat exchangers may approach outdoor levels. The cold exhaust cannot contain ample moisture, so vapour will condense on the heat exchanger. Available literature suggests that uncoated rotary heat exchangers transfer this condensate to the supply air, so the drying capacity of the ventilation system may be severely limited. This could raise indoor relative humidities to unsafe levels, which could promote the growth of dust-mites and mould. Controls may increase drying capacity by increasing ventilation airflow, but this may not be sufficient to limit moisture-related risks. This research investigated the added demand-control measure of reducing variable heat recovery to increase drying capacity when using an uncoated rotary heat exchanger in single-room ventilation. Simulations demonstrated that increased airflow sufficiently lowered the relative humidity in living rooms and bedrooms during most hours of the year. Decreased heat recovery was only necessary for a limited number of hours to maintain safe indoor relative humidities in these rooms, and the overall average reduction in heat recovery was less than 3%. The combined measures only succeeded in living rooms and bedrooms, and the results confirmed that rotary heat exchangers should not be used in kitchens or bathrooms, where moisture risks may be unavoidable.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Smith, K. M. (Intern), Svendsen, S. (Intern)
Number of pages: 11
Publication date: 2016
Corrosion resistance of steel fibre reinforced concrete – a literature review

Steel fibre reinforced concrete (SFRC) is increasingly being used in the construction of prefabricated segmental linings for bored tunnels, since it entails simplified production processes and higher quality standards. However, international standards and guidelines are not consistent regarding the consideration of steel fibres for the structural verification of SFRC elements exposed to corrosive environments, hampering the development of civil infrastructure built of SFRC. In particular, the long-term effect of exposure to chlorides is in focus and under discussion. This paper reviews the existing literature concerning chloride-induced corrosion on steel fibres, as well as the impact of steel fibre corrosion on the residual-tensile strength of SFRC. The review confirms the agreement among academics and regulators regarding the superior durability of un-cracked SFRC exposed to chlorides, relative to conventional reinforcement. However, the durability of cracked SFRC is still under discussion, as the mechanisms governing the corrosion of carbon-steel fibres in cracks and its effects on the fracture behaviour of SFRC are still unclear. Nevertheless, there is insight among several researchers concerning the existence of a critical crack width, below 0.20 mm, where corrosion of carbon-steel fibres is not critical and the structural integrity of the exposed SFRC can be ensured over the long-term. A doctoral project investigating chloride-induced corrosion of steel fibres on cracked SFRC has been initiated, in order to explore the governing deterioration mechanisms.

Cracking and load-deformation behavior of fiber reinforced concrete: Influence of testing method

The characterization of the tensile behavior of cementitious materials has been a long-standing research topic and a general consensus on how to accomplish this task has not yet been reached. Many standardized tests are available but each with different test set-up and prescriptions on the definition of measured and derived parameters, including toughness, elastic properties and strength. This paper discusses a number of test procedures for selected material properties including tension and flexure. A comparative experimental study was carried out using two distinct fiber reinforced cementitious composites with strain hardening and strain softening behavior. Digital Image Correlation was utilized in the experimental program to detect and quantify the formation of cracks. Results show that the different test methodologies evaluate specific aspects of material performance. The outcome of these evaluation procedures is compared and critically analyzed.
Damping characteristics of a footbridge: Mysteries and truths

As a consequence of a paper presented by Michael Mistler at the VDI-Baudynamik-Tagung in Kassel, Germany, in April 2015, the authors checked the damping coefficients having been estimated for a footbridge in autumn 2014. Mistler stated that the critical damping ratio estimated from a halfpower bandwidth procedure to be dependent on frequency resolution for low frequency modes. Based on the data presented here this statement can be confirmed. The dependency on frequency resolution was found to be due to the leakage phenomenon on the spectral density. This fact may have been known in the academic world but not in the world of engineers applying OMA in practice. In this paper it is presented how the leakage on the spectral density estimate is affecting the damping estimation through OMA based frequency domain identification. Finally the paper compares the damping estimated in the time and frequency domain from ambient tests, with the damping estimated from the free decays. Unfortunately, bias error on damping values determined from analyses in the frequency domain is worst on low frequency modes usually being the most important ones when dealing with a resonance problem in practice.

General information

State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics, Department of Civil Engineering, Section for Structural Engineering, Centre for oil and gas – DTU, RCI Dynamics
Authors: Cantieni, R. (Ekstern), Bajric, A. (Intern), Brincker, R. (Intern)
Pages: 283-292
Publication date: 2016

Host publication information

Title of host publication: Dynamics of Coupled Structures : Proceedings of the 34th IMAC, A Conference and Exposition on Structural Dynamics 2016
Volume: 4
Publisher: Springer
Editors: Allen, M., Mayes , R. L., Rixen , D.
ISBN (Print): 978-3-319-29762-0
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Chapter: 27

Series: Conference Proceedings of the Society for Experimental Mechanics Series
ISSN: 2191-5644
Main Research Area: Technical/natural sciences
Conference: IMAC XXXIV - 34th Conference and Exposition on Structural Dynamics of Multiphysical Systems, Orlando, United States, 25/01/2016 - 25/01/2016

Daytime space cooling with phase change material ceiling panels discharged using rooftop photovoltaic/thermal panels and night-time ventilation

The possibility of using photovoltaic/thermal panels for producing cold water through the process of night-time radiative cooling was experimentally examined. The cold water was used to discharge phase change material in ceiling panels in a climatic chamber. Both night-time radiative cooling and night-time ventilation were used as the discharging method in five experiments, simulating summer conditions. The operative temperature remained within the range of Category III of standard DS/EN 15251 for 50% to 99% of the occupancy period. The percentage of electrical energy usage covered from the photovoltaic/thermal varied from 56% to 122%. The phase change material ceiling panels were thus, capable of providing an acceptable thermal environment and the photovoltaic/thermal panels were able to provide most of the required electricity and cold water needed for cooling.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Bourdakis, E. (Intern), Pean, T. Q. (Intern), Gennari, L. (Ekstern), Olesen, B. W. (Intern)
Number of pages: 9
Decentralized substations for low-temperature district heating with no Legionella risk, and low return temperatures

To improve energy efficiency and give more access to renewable energy sources, low-temperature district heating (LTDH) is a promising concept to be realized in the future. However, concern about Legionella proliferation restricts applying low-temperature district heating in conventional systems with domestic hot water (DHW) circulation. In this study, a system with decentralized substations was analysed as a solution to this problem. Furthermore, a modification for the decentralized substation system were proposed in order to reduce the average return temperature. Models of conventional system with medium-temperature district heating, decentralized substation system with LTDH, and innovative decentralized substation system with LTDH were built based on the information of a case building. The annual distribution heat loss and the operating costs of the three scenarios were calculated and compared. From the results, realizing LTDH by the decentralized substation unit, 30% of the annual distribution heat loss inside the building can be saved compared to a conventional system with medium-temperature district heating. Replacing the bypass pipe with an in-line supply pipe and a heat pump, the innovative decentralized substation system can reduce distribution heat loss by 39% compared to the conventional system and by 12% compared to the normal decentralized substation system with bypass.
Degradation of oil products in a soil from a Russian Barents hot-spot during electrodialytic remediation
A highly oil-polluted soil from Krasnoe in North-West Russia was used to investigate the degradation of organic pollutants during electrodialytic remediation. Removal efficiencies were up to 70 % for total hydrocarbons (THC) and up to 65 % for polycyclic aromatic hydrocarbons (PAH). Relatively more of the lighter PAH compounds and THC fractions were degraded. A principal component analysis (PCA) revealed a difference in the distribution of PAH compounds after the remediation. The observed clustering of experiments in the PCA scores plot was assessed to be related to the stirring rate. Multivariate analysis of the experimental settings and final concentrations in the 12 experiments revealed that the stirring rate of the soil suspension was by far the most important parameter for the remediation for both THC and PAH. Light was the second most important variable for PAH and seems to influence degradation. The experimental variables current density and remediation time did not significantly influence the degradation of the organic pollutants. Despite current density not influencing the remediation, there is potential for degrading organic pollutants during electrodialytic removal of heavy metals, as long as a stirred set-up is applied. Depending on remediation objectives, further optimisation may be needed in order to develop efficient remediation strategies.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Tromsø
Authors: Pedersen, K. B. (Ekstern), Lejon, T. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern)
Number of pages: 10
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: SpringerPlus
Delivering COBie data - Focus on curtain walls and building envelopes

COBie is a standard data framework whose main purpose is to transmit useful, reliable and usable information collected throughout the whole building process and to be consumed in order to properly maintain the facility. Focusing on Facility Management information exchanges and considering the UK BIM policies and requirements, this paper shows the results obtained applying COBie to complex products such as curtain walls. Two Information Delivery Manuals (IDMs) were also developed, in order to provide a commonly known and standardized framework, which can regulate the COBie-based information exchanges. Future developments of this study could concern the application of the developed IDMs to different case studies in order to overtake that specificity characterizing each single project and verify the validity of the proposal.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, University of Padova
Authors: Karlshøj, J. (Intern), Borin, P. (Ekstern), Carradori, M. (Ekstern), Scotton, M. (Ekstern), Zanchetta, C. (Ekstern)
Number of pages: 8
Publication date: 2016
Main Research Area: Technical/natural sciences
Electronic versions:

demandside2016_paper_64.pdf
Source: PublicationPreSubmission
Source-ID: 127794058
Publication: Research - peer-review > Paper – Annual report year: 2016

Demand side management for smart district heating

The influence on the district heating network design and operation by using the energy storage capability inside the building is studied on different types of buildings under Danish climate. The building envelope has significant role in buildings energy consumption but also in building time constant. The results show that by the extensive renovation the energy consumption and the peak load could be reduced with more than 55% for two heating systems: radiant floor heating and radiators convective heating. Light renovation case has the peak load and energy consumption decreased with values between 25% and 35%. By making the light renovation, the heating
system needs a minimum supply water temperature of 58ºC in order to cover the thermal comfort. Through extensive renovation, the supply water temperature could be reduced to 50ºC which makes it possible to transform the District Heating Temperature into Low Temperature. The building time constant for the extensive renovation is 86 hours which is double than a light building renovation and 53 hours higher than a non-renovated building. In the end of the paper is developed a formula which has the purpose to validate the results of virtual simulations. The relative percentage difference between the theoretical calculation and the virtual simulation results are between 2.5% and 17.5%.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Physics and Services, Technical University of Denmark
Authors: Big, O. (Ekstern), Li, H. (Intern), Svendsen, S. (Intern)
Number of pages: 8
Publication date: 2016
Conference: 7th International Conference on Applied Energy, Abu Dhabi, United Arab Emirates, 28/03/2015 - 28/03/2015
Main Research Area: Technical/natural sciences

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ISSN (Print): 1876-6102
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BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
Web of Science (2009): Indexed yes
Original language: English
Smart district heating, Energy performance, Thermal response of buildings, Time constants
Electronic versions:
Demand_Side_Management_for_Smart_District_Heating.pdf
Publication: Research - peer-review › Conference article – Annual report year: 2016

Dermal uptake directly from air under transient conditions: advances in modeling and comparisons with experimental results for human subjects
To better understand the dermal exposure pathway, we enhance an existing mechanistic model of transdermal uptake by including skin surface lipids (SSL) and consider the impact of clothing. Addition of SSL increases the overall resistance to uptake of SVOCs from air but also allows for rapid transfer of SVOCs to sinks like clothing or clean air. We test the model by simulating di-ethyl phthalate (DEP) and di-n-butyl phthalate (DnBP) exposures of six bare-skinned (Weschler et al. 2015, Environ. Health Perspect., 123, 928) and one clothed participant (Morrison et al. 2016, J. Expo. Sci. Environ. Epidemiol., 26, 113). The model predicts total uptake values that are consistent with the measured values. For bare-skinned participants, the model predicts a normalized mass uptake of DEP of 3.1 (μg/m(2))/μg/m(3)), whereas the experimental results range from 1.0 to 4.3 (μg/m(2))/μg/m(3)); uptake of DnBP is somewhat overpredicted: 4.6 (μg/m(2))/μg/m(3)) vs. the experimental range of 0.5-3.2 (μg/m(2))/μg/m(3)). For the clothed participant, the model predicts higher than observed uptake for both species. Uncertainty in model inputs, including convective mass transfer coefficients, partition coefficients, and diffusion coefficients, could account for overpredictions. Simulations that include transfer of skin oil to clothing improve model predictions. A dynamic model that includes SSL is more sensitive to changes that impact
external mass transfer such as putting on and removing clothes and bathing.

**General information**

State: Published  
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology  
Authors: Morrison, G. C. (Ekstern), Weschler, C. J. (Intern), Bekö, G. (Intern)  
Number of pages: 12  
Pages: 913-924  
Publication date: 2016  
Main Research Area: Technical/natural sciences

**Publication information**

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Ratings:  
BFI (2018): BFI-level 2  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): CiteScore 3.55  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 1  
Scopus rating (2015): CiteScore 3.88  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 1  
Scopus rating (2014): CiteScore 4.57  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 1  
Scopus rating (2013): CiteScore 3.63  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 1  
Scopus rating (2012): CiteScore 2.72  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): CiteScore 2.42  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 2  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 2  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.757 SNIP 2.168  
Web of Science (2008): Indexed yes  
Scopus rating (2007): SJR 0.933 SNIP 3.724  
Web of Science (2007): Indexed yes  
Scopus rating (2006): SJR 0.637 SNIP 2.622  
Web of Science (2006): Indexed yes  
Scopus rating (2005): SJR 0.347 SNIP 1.283  
Web of Science (2005): Indexed yes  
Web of Science (2004): Indexed yes
Dermal uptake of phthalates from clothing: comparison of model to human participant results

In this research, we extend a model of transdermal uptake of phthalates to include a layer of clothing. When compared with experimental results, this model better estimates dermal uptake of diethylphthalate (DEP) and di-n-butylphthalate (DnBP) than a previous model. It also demonstrates that uptake is sensitive to both the gap between skin and clothing and the time clothing is allowed to adsorb phthalates. The model predictions are consistent with the observation that exposed clothing increases dermal uptake when compared with uptake observed in bare-skin participants. Extension of this model beyond the cotton-phthalate system will be challenging until data on partition coefficients are quantified for other combinations of SVOCs, fabric materials and environmental conditions.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology
Authors: Morrison, G. (Ekstern), Weschler, C. J. (Intern), Bekö, G. (Intern)
Number of pages: 2
Publication date: 2016

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Article number: 685
BFI conference series: International Conference on Indoor Air Quality and Climate (5010063)
Main Research Area: Technical/natural sciences
Conference: 14th international conference on Indoor Air Quality and Climate, Ghent, Belgium, 03/07/2016 - 03/07/2016
SVOC, Model, Fabric, Skin, Absorption
Electronic versions:
Morrison_2016_IA_Ghent_Clothing_model.pdf
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Design and calibration of a semi-active control logic to mitigate structural vibrations in wind turbines

The design of a semi-active (SA) control system addressed to mitigate wind induced structural demand to high wind turbine towers is discussed herein. Actually, the remarkable growth in height of wind turbines in the last decades, for a higher production of electricity, makes this issue pressing than ever. The main objective is limiting bending moment demand by relaxing the base restraint, without increasing the top displacement, so reducing the incidence of harmful "p-delta" effects. A variable restraint at the base, able to modify in real time its mechanical properties according to the instantaneous response of the tower, is proposed. It is made of a smooth hinge with additional elastic stiffness and variable damping respectively given by springs and SA magnetorheological (MR) dampers installed in parallel. The idea has been physically realized at the Denmark Technical University where a 1/20 scale model of a real, one hundred meters tall wind turbine has been assumed as case study for shaking table tests. A special control algorithm has been purposely designed to drive MR dampers. Starting from the results of preliminary laboratory tests, a finite element model of such structure has been calibrated so as to develop several numerical simulations addressed to calibrate the controller, i.e., to achieve as much as possible different, even conflicting, structural goals. The results are definitely encouraging, since the best configuration of the controller leaded to about 80% of reduction of base stress, as well as to about 30% of reduction of top displacement in respect to the fixed base case.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, University of Naples Federico II, University of Naples "Parthenope"
Authors: Caterino, N. (Ekstern), Georgakis, C. T. (Intern), Spizzuoco, M. (Ekstern), Occhiuzzi, A. (Ekstern)
Design Optimization of Piles for Offshore Wind Turbine Jacket Foundations

Numerical methods can optimize the pile design. The aim of this study is to automatically design optimal piles for offshore wind turbine jacket foundations (Figure 1). Pile mass is minimized with constraints on axial and lateral capacity. Results indicate that accurate knowledge about soil characteristics can translate into significant cost reductions.

General information

State: Published
Organisations: Department of Wind Energy, Wind Turbine Structures and Component Design, Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Sandal, K. (Intern), Zania, V. (Intern)
Det beboelige drivhus

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Design, Royal Danish Academy of Fine Arts
Authors: Toftum, J. (Intern), Petri, M. (Ekstern), Rønne, C. (Intern)
Pages: 26-28
Publication date: 2016
Main Research Area: Technical/natural sciences

Detection of fungal growth and its influence on gypsum wallboard – in the process of creating sustainable building materials

General information
State: Published
Organisations: Department of Systems Biology, Fungal Degradation, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Department of Mechanical Engineering, Materials and Surface Engineering, Eukaryotic Molecular Cell Biology, University of Sydney, Aarhus University, Aalborg University
Authors: Lewinska, A. M. (Intern), Lilje, O. (Ekstern), Foley, M. (Ekstern), Trimby, P. (Ekstern), Bjerring, M. (Ekstern), Vosegaard, T. (Forskerdatabase), Peuhkuri, R. H. (Forskerdatabase), Rode, C. (Intern), Grumsen, F. B. (Intern), Hoof, J. B. (Intern), Andersen, B. (Intern)
Number of pages: 1
Publication date: 2016
Main Research Area: Technical/natural sciences
Links:
http://www.sustain.dtu.dk/

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Sustain Abstract M-14
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Developing experimental method for investigating snow deposition around buildings using snow substitutes

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Development of a Performance Calculation Program for Solar Domestic Hot Water Systems with Improved Prediction of Thermal Stratification

The transient fluid flow and heat transfer in a hot water tank during cooling caused by standby heat loss were investigated by computational fluid dynamics (CFD) calculations and by thermal measurements in previous investigation. It is elucidated how thermal stratification in the tank is influenced by the natural convection and how the heat loss from the tank sides will be distributed at different levels of the tank at different thermal conditions.

Development of IFC based fire safety assessment tools

Due to the impact that the fire safety design has on the building's layout and on other complementary systems, as installations, it is important during the conceptual design stage to evaluate continuously the safety level in the building. In case that the task is carried out too late, additional changes need to be implemented, involving supplementary work and costs with negative impact on the client.

The aim of this project is to create a set of automatic compliance checking rules for prescriptive design and to develop a web application tool for performance based design that retrieves data from Building Information Models (BIM) to evacuate the safety level in the building during the conceptual design stage. The findings show that the developed tools can be useful in AEC industry. Integrating BIM from conceptual design stage for analyzing the fire safety level can ensure precision in further design decisions.

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Diurnal and seasonal variation in air exchange rates and interzonal airflows measured by active and passive tracer gas in homes

Outdoor air delivery to buildings is an important parameter in the assessment of pollutant exposure indoors. Detailed and well controlled measurements of air exchange rates (AER) and interzonal airflows in residential environment are scarce. We measured the outdoor AERs in up to six rooms in five dwellings across four seasons using active tracer gas. Night time AERs were also estimated in the bedrooms based on occupant-generated CO₂. Passive tracer gas measurements were performed for comparison. AERs changed frequently during the day. Differences in outdoor AERs were observed between individual rooms. Window opening behavior had a strong influence on AERs, which were highest during occupied daytime periods, lowest in the night; highest in the summer, lowest in the winter. Significant differences were found between AERs measured by the different techniques. The median nighttime AER in all bedrooms across the four seasons was 0.49 h⁻¹ with the active tracer gas technique and 1.20 h⁻¹ with the CO₂ method. The average winter AER in the five homes with the passive tracer (0.63 h⁻¹) differed substantially from the corresponding AER measured with the active tracer gas (0.25 h⁻¹). Additionally, we studied the pollutant distribution from one room (source room) and interzonal airflows across the dwellings. The air within a given floor was well mixed, with the average tracer gas concentration in the non-source rooms reaching approximately 70% of the source room concentration. There was less air movement between different floors. The position of the internal doors had a strong influence on the air movement.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Aalborg University
Authors: Bekö, G. (Intern), Gustavsen, S. (Intern), Frederiksen, M. (Ekstern), Bergsøe, N. C. (Ekstern), Kolarik, B. (Ekstern), Gunnarsen, L. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
Number of pages: 10
Pages: 178-187
Publication date: 2016
Main Research Area: Technical/natural sciences

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Volume: 104
ISSN (Print): 0360-1323
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Diurnal and seasonal variation in air exchange rates and interzonal flows measured by active tracer gas in five Danish homes

We measured the air exchange rates (AER) in up to six rooms in five naturally ventilated dwellings across four seasons using active tracer gas. Night time AER was also estimated in all bedrooms based on occupant-generated CO₂. Additionally, we studied the pollutant distribution across the dwellings and airflows between rooms. AERs changed rapidly during the day and differed between rooms. Occupant behavior (window opening) strongly influenced the AERs. AERs were highest in the summer, lowest in the winter. Interzonal airflow measurements indicated that the air within a given floor is well mixed, while there is less air movement between different floors. The position of the internal doors (open/closed) had a strong influence on the air movements within the dwelling.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Clausen, G. (Intern), Bekö, G. (Intern), Toftum, J. (Intern)
Number of pages: 2
Publication date: 2016
Do new and renovated schools and kindergartens secure sufficiently high indoor environmental quality?

The present work is the part of the RENEW SCHOOL project granted by the Intelligent Energy Europe programme supported by European Commission. The aim is to promote sustainable renovation of educational buildings (schools and kindergartens) that use timber facades. The paper describes the measurements in educational buildings that are newly constructed or that have undergone energy renovation and use timber facades. The purpose of the measurements was to examine the quality of indoor environment in these buildings. The quality was assessed by physical measurements of temperature, relative humidity, light intensity and carbon dioxide concentration performed for a period of up to two month between January and April 2015. The measurements were carried out in one representative classroom in each building. The pupils assessed the classroom environment and rated the intensity of their acute health symptoms. Additionally the teachers assessed the environment in these buildings. To create the reference, measurements were also carried out in five conventional educational buildings, where no renovations were performed. The results suggest that the renovated and new buildings perform more or less similar as their conventional counterparts as regards measured parameters of indoor environment. Subjective evaluations made by pupils and teachers did not always match the physical measurements. There were also differences in subjective evaluations made by children and by teachers. In conclusion, there is no indication that the renovation of educational buildings would reduce indoor environmental quality conditions. Likewise, no considerable improvements are to be expected as well.
has been developed, with a brief description of each hydraulic typology. The operating modes have been split into three stages: filling, operation, and draining, which have been studied separately. A difference in the minimal filling velocities for a siphon development in the solar loop has been discovered in various reports. Specific features of the operation mode have been described. For the draining, existing mechanisms to initiate the emptying process have been identified and categorised. Finally, state-of-the-art hydraulic components for drainback systems have been established, with emphasis on their requirements. Based on those findings, the authors suggest potential future research paths in order to fill the knowledge gap and disseminate the drainback technology.

General information
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Organisations: Department of Civil Engineering, Section for Building Energy, University of Kassel
Authors: Botpaev, R. (Ekstern), Louvet, Y. (Ekstern), Perers, B. (Intern), Furbo, S. (Intern), Vajen, K. (Ekstern)
Number of pages: 20
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Main Research Area: Technical/natural sciences

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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.52 SJR 1.547 SNIP 1.748
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.974 SNIP 2.143 CiteScore 4.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.014 SNIP 2.704 CiteScore 4.77
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.058 SNIP 2.92 CiteScore 4.44
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.655 SNIP 2.55 CiteScore 3.65
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.326 SNIP 2.223 CiteScore 3.19
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.419 SNIP 2.161
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.301 SNIP 2.158
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.693 SNIP 2.007
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.708 SNIP 2.101
This contribution deals with the physical and chemical reasons why pure air lime mortars used in masonry of burned bricks exposed to outdoor climate have shown to be durable from the Middle Ages to our days. This sounds strange in modern times when pure air lime mortars are regarded as weak materials, which are omitted from standards for new masonry buildings, where use of hydraulic binders is prescribed.

The reasons for the durability seem to be two:
1. The old mortars have high lime contents.
2. The carbonation process creates a pore structure with a fine pored outer layer and coarser pores inside. This difference in pore size will delay the capillary suction of rain from outside, while excess water inside can be sucked to the front and evaporate.

**Durability of air lime mortar**

This PhD thesis contributes to documentation regarding durability of materials used in so-called “Pearl-Chain Bridges”. The Pearl-Chain Bridge technology is a new precast bridge solution developed at the Technical University of Denmark. The technology reintroduces the arch structure as an economical beneficial solution primarily for road and railway bridges, and allows for the faster, more environmentally friendly, and cheaper construction of such bridges. A Pearl-Chain Bridge consists of two main parts: the load-carrying Pearl-Chain arch, and the fill material on top of the arch. The construction of the Pearl-Chain arch is simple.
The arch is assembled on its side, next to the road that the bridge will span, by placing a number of plane prefabricated Super-Light Decks that consist of lightweight aggregate concrete and conventional concrete, in the desired arch shape. Mortar joints are cast between the decks, and because all decks have a duct cast through them longitudinally, they can be collected on a wire – like pearls on a string. The assembly of the arch is completed by post-tensioning the wire. A crane lifts the arch into place during the night, and subsequently the Pearl-Chain arch is stabilized by casting a fill material between the spandrel walls of the arch. Finally, the road surface is cast on top of the fill material.

New bridges are designed for a service lifetime of at least 100 years. Hence, the specifications of the materials used in Pearl-Chain Bridges are high. This PhD study documents that the materials used in Pearl-Chain Bridges have the necessary strength and durability to ensure their longevity. The scope of the PhD study is limited to assessing the fill material placed on the Pearl-Chain arch, and the mortar joints and lightweight aggregate concrete used in the Pearl-Chain arch itself. This is because these materials, and the application of them, differ from the materials in typical bridge superstructures.

Typically, arch bridges are filled with sub-base gravel; however, in order to examine the possibilities of using alternative fill materials, cement-stabilized gravel and pervious concrete were also investigated. The most suitable fill material for Pearl-Chain Bridges depends on the particular bridge design; the results obtained and presented in the present PhD study provide guidance on how to decide which fill material is most suitable regarding strength, permeability and freeze-thaw durability. In particular, the PhD study explored in depth the use of pervious concrete, because pervious concrete is a relatively unknown material in Denmark. The applicability was demonstrated by using pervious concrete fill in the very first 26 meter-long Pearl-Chain Bridge constructed. Compared with sub-base gravel and cement-stabilized gravel, pervious concrete considerably improves the drainage properties of the superstructure, which has a positive influence on the longevity of Pearl-Chain Bridges.

The mortar joints in the Pearl-Chain arch were found to be prone to crack formation during hardening, which is undesirable since it provides easy access for water and chloride ions to reach the post-tensioning wires, and initiate corrosion. This crack formation was eliminated by using an expansive mortar product with a constant expansion, and by applying a primer to the concrete surfaces adjacent to the joint, whereby the porosity along the construction joint was decreased. It was documented that the mortar joints did not decrease the durability of the Pearl-Chain arches with regard to chloride ingress, water absorption, or freeze-thaw durability. The work carried out on lightweight aggregate concrete was, from many perspectives, pioneering. This was mainly because most prior knowledge concerning lightweight aggregate concrete mix design was based on experience and had not been documented in scientific papers, but also because the lightweight aggregate concrete in Pearl-Chain Bridges can be exposed to freeze-thaw, which is not the case with lightweight aggregate concrete in typical fields of application. The freeze-thaw durability of lightweight aggregate concrete was improved by the introduction of air entrainment, which was demonstrated by measuring and correlating the air content of fresh lightweight concrete with the freeze-thaw behavior of hardened lightweight concrete. Recommendations are given to a freeze-thaw resistant lightweight aggregate concrete mix design for Pearl-Chain Bridges, which has greater strength properties than the current lightweight aggregate concrete used in Super-Light Decks for indoor purposes.

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Authors: Lund, M. S. M. (Intern), Hansen, K. K. (Intern), Hertz, K. D. (Intern)
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Dynamic stiffness of horizontally vibrating suction caissons
The promising potential for offshore wind market is on developing wind farms in deeper waters with bigger turbines. In deeper waters the design foundation configuration may consist of jacket structures supported by floating piles or by suction caissons. Taking the soil-structure interaction effects into consideration requires the prior estimation of the dynamic impedances of the foundation. Even though numerous studies exist for piles, only limited number of publications can be found for suction caissons subjected to dynamic loads. Therefore, the purpose of this study is to examine the
dynamic response of this type of foundation using the finite element method (FEM) to account for the interaction with the soil. 3D numerical models for both the soil and the suction caisson are formulated in a frequency domain. The response of the soil surrounding the foundation is considered linear viscoelastic with hysteretic type damping. In addition, non-reflective boundaries are included in the model. Two different soil profiles are presented, one when the rigid bedrock is set close to the seabed and the other one when it is far away.

The dynamic impedances at the top of the foundation are determined and compared to existing analytical solutions suggested for piles. Relatively good agreement has been achieved comparing the numerical results with the analytical solutions. Then, the effect of the soil layer shear wave velocity on the dynamic stiffness coefficients is analysed. The results have indicated that increasing the stiffness of the soil stratum the dynamic impedances grow, while the damping reduces in the frequency range investigated.
Effect of electrode shape on grounding resistances - Part 1: The focus-one protocol
Electrode grounding resistance is a major factor affecting measurement quality in electric resistivity tomography (ERT) measurements for cryospheric applications. Still, little information is available on grounding resistances in the geophysical literature, mainly because it is difficult to measure. The focus-one protocol is a new method for estimating single electrode grounding resistances by measuring the resistance between a single electrode in an ERT array and all the remaining electrodes connected in parallel. For large arrays, the measured resistance is dominated by the grounding resistance of the electrode under test, the focus electrode. We have developed an equivalent circuit model formulation for the resistance measured when applying the focus-one protocol. Our model depends on the individual grounding resistances of the electrodes of the array, the mutual resistances between electrodes, and the instrument input impedance. Using analytical formulations for the potentials around prolate and oblate spheroidal electrode models (as approximations for rod and plate electrodes), we have investigated the performance and accuracy of the focus-one protocol in estimating single-electrode grounding resistances. We also found that the focus-one protocol provided accurate estimations of electrode grounding resistances to within ±7% for arrays of 30 electrodes or more when the ratio of instrument input impedance to the half-space resistivity was 1000 m$^{-1}$ or more. The focus-one protocol was of high practical value in field operations because it helped to optimize array installation, electrode design, and placement. The measured grounding resistances may also be included in future inversion schemes to improve data interpretation under difficult environmental conditions such as those encountered in cryospheric applications.

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State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Lund University
Authors: Ingeman-Nielsen, T. (Intern), Tomaskovicova, S. (Intern), Dahlin, T. (Ekstern)
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.122 SNIP 1.143 CiteScore 1.53
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.472 SNIP 1.933 CiteScore 2.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Although electric resistivity tomography (ERT) is now regarded as a standard tool in permafrost monitoring, high grounding resistances continue to limit the acquisition of time series over complete freeze-thaw cycles. In an attempt to alleviate the grounding resistance problem, we have tested three electrode designs featuring increasing sizes and surface area, in the laboratory and at three different field sites in Greenland. Grounding resistance measurements showed that changing the electrode shape (using plates instead of rods) reduced the grounding resistances at all sites by 28%-69% during unfrozen and frozen ground conditions. Using meshes instead of plates (the same rectangular shape and a larger effective surface area) further improved the grounding resistances by 29%-37% in winter. Replacement of rod electrodes of one entire permanent permafrost monitoring array by meshes resulted in an immediate reduction of the average grounding resistance by 73% from 1.5 to 0.4 kΩ (unfrozen conditions); in addition, the length of the acquisition period during the winter season was markedly prolonged. Grounding resistance time series from the three ERT monitoring stations in Greenland showed that the electrodes were rarely perfectly grounded and that grounding resistances exceeding 1 MΩ may occur in severe cases. We concluded that the temperature, electrode shape, and lithology at the sites have a marked
impact on electrode performance. Choosing an optimized electrode design may be the deciding factor for successful data acquisition, and should therefore be considered when planning a long-term monitoring project.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aarhus University, Orbicon Greenland, Lund University, University of Copenhagen
Authors: Tomaskovicova, S. (Intern), Ingeman-Nielsen, T. (Intern), Christiansen, A. V. (Ekstern), Brandt, I. (Ekstern), Dahlin, T. (Ekstern), Elberling, B. (Ekstern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.122 SNIP 1.143 CiteScore 1.53
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.472 SNIP 1.933 CiteScore 2.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.413 SNIP 1.434 CiteScore 1.9
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.658 SNIP 2.105 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.693 SNIP 1.837 CiteScore 2.04
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.141 SNIP 1.729 CiteScore 2.51
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.755 SNIP 1.716
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.659 SNIP 2.661
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.961 SNIP 1.26
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.934 SNIP 1.535
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.965 SNIP 2.019
Effect of façade impregnation on feasibility of capillary active thermal internal insulation for a historic dormitory – A hygrothermal simulation study

Internal insulation of external walls is known to create moisture performance challenges due to increased moisture levels and condensation risk on the cold side of the insulation. Capillary active/hydrophilic insulations have been introduced to solve these moisture problems, since they are able to transport liquid moisture to the inner surface and enable it to dry. Experience with this insulation type is rare in Denmark. In hygrothermal 1D computer simulations, several more or less capillary active insulation systems (AAC, calcium silicate, IQ-Therm) in various thicknesses (30–150 mm) have been tested for their hygrothermal performance. The original construction was a 228 mm solid brick masonry wall in a Copenhagen historic dormitory. All simulated systems showed critical relative humidity values above 80% and high risk of mould growth behind the insulation and some also on the interior surface. A moisture safe construction was only achieved when exterior façade impregnation shielding against driving rain was added. The best system showed acceptable relative humidity values both behind the insulation and on the interior surface, a significant increase in minimum temperature on the interior surface, and a reduction of heat loss through the external wall by 85%. The solely application of impregnation also resulted in a moisture safe solution with significant improvements in all parameters and heat loss reduction by 45%. The main conclusion is that capillary active insulation may not be feasible on solid bare masonry walls without additional driving rain protecting especially in case of multi-storey buildings with thin walls in high precipitation areas.

General information
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Authors: Finken, G. R. (Intern), Bjarløv, S. P. (Intern), Peuhkuri, R. H. (Intern)
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BFI (2018): BFI-level 2
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.77 SJR 1.49 SNIP 2.339
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.54 SNIP 2.299 CiteScore 3.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Effect of long-term freezing and freeze/thaw-cycles on indigenous and inoculated microorganisms in dewatered blackwater

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Efla Consulting Engineers, Bavarian Nordic A/S, Norwegian University of Life Sciences, Geolnvest
Authors: Gunnarsdóttir, R. (Ekstern), Müller, K. (Ekstern), Jensen, P. E. (Intern), Jenssen, P. D. (Ekstern), Villumsen, A. (Ekstern)
Number of pages: 2
Pages: 104-105
Publication date: 2016

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Effect of Set-point Variation on Thermal Comfort and Energy Use in a Plus-energy Dwelling

When designing buildings and space conditioning systems, the occupant thermal comfort, health, and productivity are the main criteria to satisfy. However, this should be achieved with the most energy-efficient space conditioning systems (heating, cooling, and ventilation). Control strategy, set-points, and control dead-bands have a direct effect on the thermal environment in and the energy use of a building. The thermal environment in and the energy use of a building are associated with the thermal mass of the building and the control strategy, including set-points and control dead-bands. With thermally active building systems (TABS), temperatures are allowed to drift within the comfort zone, while in spaces with air-conditioning, temperatures in a narrower interval typically are aimed at. This behavior of radiant systems provides certain advantages regarding energy use, since the temperatures are allowed to drift, and it also allows the occupants to benefit from adaptive opportunities. This study presents the results of thermal environment measurements and energy use in a single-family dwelling during a one year period. A radiant floor heating and cooling system was used to condition the indoor space and the operative temperature set-points were varied during the heating and cooling seasons. The results show that a lower temperature set-point will result in a decreased energy use but it might require the occupants to adapt to slightly lower temperatures in the heating season, and vice versa in the cooling season. The terminal unit and the thermal mass of the building have significant effects on the applicability of lowered indoor temperature set-points.

Effects of Floor Covering Resistance of a Radiant Floor on System Energy and Exergy Performances

Floor covering resistance (material and thickness) can be influenced by subjective choices (architectural design, interior design, texture, etc.) with significant effects on the performance of a radiant heating and cooling system. To study the effects of floor covering resistance on system performance, a water-based radiant floor heating and cooling system (dry, wooden construction) was considered to be coupled to an air-to-water heat pump, and the effects of varying floor covering resistances (0.05 m²K/W, 0.09 m²K/W and 0.15 m²K/W) on system performance were analyzed in terms of energy and exergy.

In order to achieve the same heating and cooling outputs, higher average water temperatures are required in the heating mode (and lower temperatures in the cooling mode) with increasing floor covering resistance. These temperature requirements decrease the heat pump’s performance (lower coefficient of performance). This requires higher electricity input to the heat pump, corresponding to an increased exergy demand and consumption, to achieve the same space heating or cooling.

The required exergy input to the system (power plant where the electricity is generated) increased by 14% and 5% for heating and cooling, respectively. Increased floor covering resistance has a similar effect to an increased space heating or cooling load, on the water side of the radiant system while in fact the space heating and cooling loads are not changing. The floor covering resistance should be kept to a minimum in order not to hinder the performance of the floor heating/cooling and the whole system and to benefit from the low temperature heating and high temperature cooling potential.
Effects of oil and oil burn residues on seabird feathers

It is well known, that in case of oil spill, seabirds are among the groups of animals most vulnerable. Even small amounts of oil can have lethal effects by destroying the waterproofing of their plumage, leading to loss of insulation and buoyancy. In the Arctic these impacts are intensified. To protect seabirds, a rapid removal of oil is crucial and in situ burning could be an efficient method. In the present work exposure effects of oil and burn residue in different doses was studied on seabird feathers from legally hunted Common eider (Somateria mollissima) by examining changes in total weight of the feather and damages on the microstructure (Amalgamation Index) of the feathers before and after exposure. The results of the experiments indicate that burn residues from in situ burning of an oil spill have similar or larger fouling and damaging effects on seabird feathers, as compared to fresh oil.
Effects on pupil well-being and performance of classroom ventilation retrofits – ASHRAE RP1624

This study examines the effect on classroom indoor climate, pupil well-being, school performance, and energy consumption of four different retrofit solutions to improve classroom ventilation.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern), Wargocki, P. (Intern)
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Source: PublicationPreSubmission
Source-ID: 125224081
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016
Efficient Structural System Reliability Updating with Subspace-Based Damage Detection Information

Damage detection systems and algorithms (DDS and DDA) provide information of the structural system integrity in contrast to e.g. local information by inspections or non-destructive testing techniques. However, the potential of utilizing DDS information for the structural integrity assessment and prognosis is hardly exploited nor treated in scientific literature up to now. In order to utilize the information provided by DDS for the structural performance, usually high computational efforts for the pre-determination of DDS reliability are required. In this paper, an approach for the DDS performance modelling is introduced building upon the non-destructive testing reliability which applies to structural systems and DDS containing a strategy to overcome the high computational efforts for the pre-determination of the DDS reliability. This approach takes basis in the subspace-based damage detection method and builds upon mathematical properties of the damage detection algorithm. Computational efficiency is gained by calculating the probability of damage indication directly without necessitating a pre-determination for all damage states. The developed approach is applied to a static, dynamic, deterioration and reliability structural system model, demonstrating the potentials for utilizing DDS for risk reduction.

Electro-desalination of Buildings Suffering from Salt Weathering

Electrokinetics Across Disciplines and Continents: New Strategies for Sustainable Development

Ottosen, L. M. (Intern), Hansen, H. (Ekstern)
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Publisher: Springer
Electro-desalination of glazed tile panels - discussion of possibilities

Glaze is lost from tiles in tile panels due to presence of soluble salts and this means loss of important heritage. The present paper discusses the possibility to apply electro-desalination. An in-situ test has not been performed yet, but encouraging results have been obtained with different parts of the system. Single tiles, a variety of porous stones and the mortar on the back of a tile have all been electro-desalinated successfully in laboratory scale. Thus individually, all parts of the wall with tile panel can be electro-desalinated. The interface between mortar and tile can be problematic. In the few experiments conducted on tiles with attached mortar, the mortar was desalinated to a higher degree than the biscuit and successful desalination of the biscuit through the mortar requires further research.

In-situ pilot scale tests were performed on highly salt-contaminated walls without tiles by placing electrodes at the same side of the wall. Thus it may be possible to desalinate tile panels, without any physical damage of the fragile glaze, by placing electrodes on the back of the wall or by removing some tiles, placing electrodes in their spaces, and extracting the salts from there before the tiles are placed back again.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Aveiro, Universidade Nova de Lisboa
Authors: Dias-Ferreira, C. (Ekstern), Ottosen, L. M. (Intern), Ribeiro, A. B. (Ekstern)
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Electro-desalination of sandstone contaminated with sodium sulphate

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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016
Electro-desalination of sulfate contaminated carbonaceous sandstone – risk for salt induced decay during the process

Sodium-sulphate is known to cause severe stone damage. This paper is focused on removal of this salt from carbonaceous sandstone by electro-desalination (ED). The research questions are related to possible stone damage during ED and subsequently suction cycles are made in distilled water before, during and after ED. During suction in water the salts are concentrated in the upper part of the sandstone. After 2 days of treatment the average water soluble SO$_4^{2-}$ concentration was half the initial and for this sample corners were damaged as was the case for the reference stone. After 4 days of ED the average SO$_4^{2-}$ concentration was 15% of the initial, and here no stone damage was seen from the suction cycles. This result shows that the damaging salts are removed and that no new harmful salts are formed during ED in the actual case. Acid is produced at the anode during ED. The acid is buffered in the poultice with carbonate. The acid would be highly damaging to the carbonaceous sandstone as the binder-CaCO$_3$ is soluble in acid. From pH measurements of the poultice it seems as if the acid is buffered well, as pH is still slightly alkaline after ED, but this is a measurement of the average pH and thus it was decided to measure the compressive strength of the stones after ED. The lowest compressive strength was measured for the reference stone, which had not been treated by ED (but had the highest salt content). Thus from this investigation there is an indication, that dissolution of carbonates in the stone did not happen, though the data material is too scarce to make a final conclusion. In summary, this investigation did support that ED removes the salts without new damaging side effects in the stone.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Ottosen, L. M. (Intern)
Pages: 897-904
Publication date: 2016

Electrodialytic recovery of phosphorus from chemically precipitated sewage sludge ashes

Phosphorus scarcity requires improved recover and reuse of urban sources; the recycling of this nutrient from sewage sludge has become increasingly important in the last years. Using an innovative electrodialytic process, the present study shows the potential for P separation from Fe and Al precipitated sewage sludge ash using this technique, with a recovery rate of around 70%. Furthermore, heavy metals were removed from the phosphorous fraction, producing a pure and safe phosphorus source in the end.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Chemical and Biochemical Engineering, CHEC Research Centre
Number of pages: 1
Publication date: 2016
Main Research Area: Technical/natural sciences
Electronic versions: Poster_draft.pdf
Electrodialytic recovery of phosphorus from chemically precipitated sewage sludge ashes

Phosphorus scarcity requires improved recovery and reuse of urban sources; the recycling of this nutrient from sewage sludge has become increasingly important in the last years. Using an innovative electrodialytic process, the present study shows the potential for P separation from Fe and Al precipitated sewage sludge ash using this technique, with a recovery rate of around 70%. Furthermore, heavy metals were removed from the phosphorous fraction, producing a pure and safe phosphorus source in the end.

Electrodialytic upgrading of MSWI APC residue from hazardous waste to secondary resource

The aim of this project was to contribute to the development of electrodialytic treatment technology of air pollution control residues (APC) from municipal solid waste incineration (MSWI) to obtain maximal leaching reduction by optimization of treatment time and current density for different types of MSWI APC residues. The concept idea was in a pilot scale unit to reduce the mobility of toxic elements and salts by electrodialytic treatment enough for the residual product to constitute an environmentally safe resource for substitution of virgin resources in construction material e.g. for substitution of cement or fillers in concrete.

In general leaching could not be reduced by optimizing current density and treatment time in the pilot scale stack treatment unit, as hypothesized, even though there was evidence of dependency on current density for e.g. zinc, this was not true for most elements, and it was clear that experimental conditions and pre-treatments affected different target elements differently. Statistical analysis of the results revealed that the final pH was the major parameter determining leachability.

The robustness of the stack setup proved to be very limited. At several occasions during the project, the diluate spacers clogged, and areas with high resistance and heat development evolved. Membranes burned and had to be changed. Because the results of the pilot scale stack experiments did not give the anticipated results and tools for optimized upscaling, instead laboratory investigations were made on the influence of different membrane brands and influence of different experimental setups.
Electrokinetic Remediation of Copper Mine Tailings: Evaluating Different Alternatives for the Electric Field

**General information**

State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Universidad Tecnica Federico Santa Maria
Pages: 143-159
Publication date: 2016

**Host publication information**

Title of host publication: Electrokinetics Across Disciplines and Continents: New Strategies for Sustainable Development
Publisher: Springer
ISBN (Print): 978-3-319-20178-8
ISBN (Electronic): 978-3-319-20179-5
Chapter: 8
Main Research Area: Technical/natural sciences
DOIs: 10.1007/978-3-319-20179-5_8
Publication: Research - peer-review › Book chapter – Annual report year: 2015

Electrokinetics and zero valent iron nanoparticles: Experimental and modeling of the transport in different porous media

**General information**

State: Published
Organisations: Department of Civil Engineering, University of Malaga, Universidade Nova de Lisboa, Lehigh University, Escola Superior Agrária de Coimbra
Authors: Caseiro Reco Gomes, H. I. (Intern), Rodríguez-Maroto, J. M. (Ekstern), Ribeiro, A. B. (Ekstern), Pamukcu, S. (Ekstern), Dias-Ferreira, C. (Ekstern)
Number of pages: 16
Pages: 279-294
Publication date: 2016

**Host publication information**

Title of host publication: Electrokinetics Across Disciplines and Continents: New Strategies for Sustainable Development
Publisher: Springer
ISBN (Print): 978-3-319-20178-8
ISBN (Electronic): 978-3-319-20179-5
Chapter: 14
Main Research Area: Technical/natural sciences
DOIs: 10.1007/978-3-319-20179-5_14
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Source-ID: 2291876668
Publication: Research - peer-review › Book chapter – Annual report year: 2016

Electrokinetic Soil Remediation: An Overview

**General information**

State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Universidad Tecnica Federico Santa Maria, Universidade Nova de Lisboa
Authors: Hansen, H. (Ekstern), Ottosen, L. M. (Intern), Ribeiro, A. (Ekstern)
Pages: 3-18
Publication date: 2016

**Host publication information**

Title of host publication: Electrokinetics Across Disciplines and Continents: New Strategies for Sustainable Development
Publisher: Springer
ISBN (Print): 978-3-319-20178-8
ISBN (Electronic): 978-3-319-20179-5
Chapter: 1
Main Research Area: Technical/natural sciences
Energiforbrug til ventilation på operationsstuer

Der stilles høje krav til indeklimaet på operationsstuer, både i forhold til hygiejnec og termiske forhold. Dette stiller samtidig krav til de tekniske installationer og kan medføre et højt energiforbrug til drift af operationsstuerne. En af de mest energiforbrugende installationer er ventilationen, som typisk enten er Turbulent Air Flow (TAF) eller Laminar Air Flow (LAF). Denne artikel fokuserer på forskellen i energiforbrug ved anvendelse af de to ventilationsprincipper. En tidligere artikel beskrev fordelene ved brugen af LAF frem for TAF i forhold til en reduceret kontamineringstrisiko under operationer. Der er dog betænkeligheder omkring brugen af LAF frem for TAF, da kravet om højere luftmængder for LAF medfører et større energiforbrug.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Nielsen, L. (Ekstern), Rosenbeck, K. (Ekstern), Toftum, J. (Intern)
Pages: 14-16
Publication date: 2016
Conference: 12th REHVA World Congress, Aalborg, Denmark, 22/05/2016 - 22/05/2016
Main Research Area: Technical/natural sciences

Energy and exergy analyses of the benefits and limitations of air-to-air heat recovery

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Tokyo City University
Authors: Kazanci, O. B. (Intern), Shukuya, M. (Ekstern), Olesen, B. W. (Intern)
Number of pages: 8
Publication date: 2016
Main Research Area: Technical/natural sciences
Electronic versions: 1298_final.pdf
Source: PublicationPreSubmission
Source-ID: 126842614
Publication: Research - peer-review › Journal article – Annual report year: 2016

Energy and Exergy Performances of Air-Based vs. Water-Based Heating and Cooling Systems: A Case Study of a Single-Family House

Different indoor terminal units can be used to heat and cool indoor spaces. These terminal units mostly rely on convection and radiation heat transfer mechanisms but their relative ratios can vary significantly for air-based and water-based systems with implications on whole system performance, in terms of energy and exergy. In addition to the energy and exergy input required at the heating and cooling plants, the energy use of auxiliary components (fans and pumps) also vary depending on the chosen terminal unit.

In order to study the energy and exergy performances of air-based and water-based systems, an air heating and cooling system, and a radiant floor heating and cooling system were chosen, respectively. A single-family house was used as a case study assuming that different space heating and cooling systems were used to condition the indoor space of this
In addition to the thermal energy and exergy inputs to the system, energy and exergy inputs to the auxiliary components were also studied. Both heating and cooling cases were considered and three climatic zones were studied; Copenhagen (Denmark), Yokohama (Japan), and Ankara (Turkey).

The analysis showed that the water-based radiant heating and cooling system performed better than the air-based system both in terms of energy and exergy input to the heating/cooling plant. The relative benefits of the water-based system over the air-based system vary depending on the climatic zone. The air-based system also requires higher auxiliary energy input compared to the water-based system and this difference is mainly due to the required air-flow rates to address the heating and cooling demands, indicating a clear benefit for the water-based system over the air-based system.

The auxiliary energy and exergy input to different systems is an important parameter for the whole system performance and its effects become more pronounced and can be studied better in terms of exergy than energy. In order to fully benefit from the water-based systems, the auxiliary energy use should be minimized.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Tokyo City University
Authors: Kazanci, O. B. (Intern), Shukuya, M. (Ekstern), Olesen, B. W. (Intern)
Number of pages: 8
Publication date: 2016

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Title of host publication: Proceedings of the 2016 ASHRAE Annual Conference
Article number: ST-16-C070
Main Research Area: Technical/natural sciences
Conference: 2016 ASHRAE Annual Conference, St. Louis, MO, United States, 25/06/2016 - 25/06/2016

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Links:
http://ashraem.confex.com/ashraem/s16/webprogram/Paper19339.html

Source: PublicationPreSubmission
Source-ID: 124336545
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

**Energy concepts for self-supplying communities based on local and renewable energy sources: A case study from northern Germany**

The reduction of GHG emissions in buildings is a focus area of national energy policies, because buildings are responsible for a major share of energy consumption. Policies to increase the share of renewable energies and energy efficiency measures are implemented at local scale. Municipalities, as responsible entities for physical planning, can hold a key role in transforming energy systems towards carbon-neutrality, based on renewable energies. The implementation should be approached at community scale, which has advantages compared to only focusing on buildings or cities. But community energy planning can be a complex and time-consuming process. Many municipalities hesitate to initiate such a process, because of missing guidelines and uncertainty about possible energy potentials. Case studies help to understand applied methodologies and could show available energy potentials in different local settings. The current case study presents a community energy concept for the inner-city of Elmshorn. By estimating the energy demand, consideration of local energy saving potentials, and available energy potentials within the community, it was possible to develop several energy system variants that virtually allow a heating energy and electricity supply fully based on local, renewable energy resources. The most feasible and cost-efficient variant is the use of local food production waste in a CHP plant feeding a district heating grid. The overall aim is to show that a self-sufficient heat- and electricity supply of typical urban communities is possible and can be implemented in a cost-efficient way, if the energy planning is done systematically and in coherence with urban planning.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Petersen, J. (Intern)
Pages: 1-8
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Sustainable Cities and Society
Volume: 26
ISSN (Print): 2210-6707
Ratings:
Energy, economy and exergy evaluations of the solutions for supplying domestic hot water from low-temperature district heating in Denmark

District heating in Denmark is going through the transition from 3rd generation (80/40 °C) to 4th generation (50-55 °C/25 °C) systems in preparation for district heating based completely on renewable fuels by 2035. However, concern about Legionella growth and reduced comfort with low-temperature domestic hot water supply may be discouraging the implementation of low-temperature district heating. Aimed at providing possible solutions, this study modelled various proposals for district heating systems with supply temperatures of 65 °C, 50 °C and 35 °C and for two different building topologies. Evaluation models were built to investigate the energy, economy and exergy performances of the proposed domestic hot water systems in various configurations. The configurations of the devised domestic hot water substations were optimised to fit well with both low and ultra-low-temperature district heating and to reduce the return temperature to district heating. The benefits of lower return temperatures were also analysed compared with the current district heating situation. The evaluation results show that the decentralized substation system with instantaneous heat exchanger unit performed better under the 65 °C and 50 °C district heating scenarios, while the individual micro tank solution consumed less energy and cost less in the 35 °C district heating scenario.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Yang, X. (Intern), Li, H. (Intern), Svendsen, S. (Intern)
Number of pages: 11
Pages: 142-152
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Conversion and Management
Volume: 122
ISSN (Print): 0196-8904
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.04 SJR 2.287 SNIP 2.065
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Recently, a brand new single family home was built in Sisimiut, Greenland. The building was constructed as a wooden house typical for Greenland. However, some non-traditional measures were implemented in order to reduce the energy consumption and improve indoor air quality. Assessment of the influence of these measures is essential for their implementation on a wider scale. In particular, functionality of the state of the art ventilation system is of large concern as these systems have not been commonly used for their sensitivity towards the extremely cold climate. A detailed monitoring system was installed in the house. It enables the evaluation of the indoor air quality, as well as building's energy performance. The aim of this investigation was to evaluate the performance of the newly constructed house by and compare it with the performance of identical house built in a traditional way by using a computer model. The data obtained from the measurements in the new house were used to verify the model. Significant energy savings and improvements of indoor air quality were found in the new house when compared to the traditional one. Moreover, all the extra measures...
have a feasible payback time despite high prices of labor and transportation to Greenland.

**General information**
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Luc, K. M. (Intern), Kotol, M. (Intern), Lading, T. (Intern)
Number of pages: 8
Pages: 166-173
Publication date: 2016
Conference: The 8th International Cold Climate HVAC Conference, Dalian, China, 20/10/2015 - 20/10/2015
Main Research Area: Technical/natural sciences

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Volume: 146
ISSN (Print): 1877-7058
Ratings:
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 0.74
Scopus rating (2015): CiteScore 0.56
Scopus rating (2014): CiteScore 0.53
Scopus rating (2013): CiteScore 0.4
ISI indexed (2013): ISI indexed no
Scopus rating (2012): CiteScore 0.28
ISI indexed (2012): ISI indexed no
Scopus rating (2011): CiteScore 0.45
ISI indexed (2011): ISI indexed no
Web of Science (2010): Indexed yes
Original language: English
EnergyLab Nordhavn – Progress and Physical Implementation

EnergyLab Nordhavn is a large-scale integrated research and demonstration project that contributes to the grand challenge of transforming the energy system to efficiently integrate a large share of renewable energy. The project focuses on a cost-effective future smart energy system that integrates multiple energy infrastructures (electricity, thermal, transportation) and provides an intelligent control of subsystems and components – providing necessary flexibility for efficient utilisation of renewable energy. The project results will be based on combining a number of elements established or under establishment in Copenhagen’s Nordhavn, one of the largest development districts in Europe. With a diverse set of such elements in the electrical and heating grids, in the built environment, and involving citizens in the area, the EnergyLab Nordhavn project is well on the way to establish itself as a living laboratory and an environment for strong research-based innovation in smart energy technologies, innovative business models and energy management tools for the future sustainable low-energy city districts. Particularly exciting is the synergy between • the physical density of the environment in Nordhavn • the “settler attitude” of the new local population • new trends of co-creation and participation. • new tools creating awareness on carbon footprint and other environmental impact. EnergyLab Nordhavn partners are DTU BYG, DTU MEK, DTU CEE, Københavns Kommune, DONG Energy Electricity Distributions, HOFOR, By&Havn, ABB, Danfoss, Balslev, MetroTherm, Glen Dimplex, CleanCharge and the PowerLab facilities. The project has a total budget of € 19 mio, of which € 11 mio are funded in two rounds by the Danish Energy Technology Development and Demonstration Programme (EUDP).

**General information**
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Department of Civil Engineering, Section for Indoor Climate and Building Physics, HOFOR A/S
Authors: Greisen, C. (Intern), Honoré, K. (Ekstern), Foteinaki, K. (Intern)
Number of pages: 1
Energy Performance of Water-based and Air-based Cooling Systems in Plus-energy Housing

Energy use in buildings accounts for a large part of the energy use globally and as a result of this, international building energy performance directives are becoming stricter. This trend has led to the development of zero-energy and plus-energy buildings. Some of these developments have led to certain issues regarding thermal indoor environments, such as overheating.

Thermal comfort of occupants should not be sacrificed for energy efficiency but rather, these should be achieved simultaneously. Although the priority should be to minimize the cooling demand during the design, this is not always achieved and cooling might be needed even in residential buildings.

This paper focuses on the cooling operation of a detached, single-family house, which was designed as a plus-energy house in Denmark. The simulation model of the house was created in IDA ICE and it was validated with measurement data in a previous study. The effects of the cooling demand (internal vs. external solar shading), the space cooling method (floor cooling vs. air-cooling with ventilation system), and the availability of a nearby natural heat sink (intake air for the ventilation system being outdoor air vs. air from the crawl-space, and air-to-water heat pump vs. ground heat exchanger as cooling source) on the system energy performance were investigated while achieving the same thermal indoor conditions.

The results show that the water-based floor cooling system performed better than the air-based cooling system in terms of energy performance and also regarding the energy use of auxiliary components such as pumps and fans. The total reduction in primary energy used was 31% compared to the air-based systems with intake air from outdoors.

The integration of natural heat sinks into the cooling system of the house results in significant energy use reductions. The coupling of radiant floor with the ground enables to obtain “free” cooling, although the brine pump power should be kept to a minimum to fully take advantage of this solution. By implementing a ground heat exchanger instead of the heat pump and use the crawl-space air as intake air an improvement of 37% was achieved.

The cooling demand should be minimized in the design phase as a priority and then the resulting cooling load should be addressed with the most energy efficient cooling strategy. The floor cooling coupled with a ground heat exchanger was shown to be an effective means to minimize the energy use for cooling purposes, and this can contribute to achieving zero-energy or plus-energy targets in future buildings.

Energy Saving by Novel Bed-Integrated Local Exhaust Ventilation

High quality indoor environment in hospitals is important for patients’ healing and performance of the personnel. A novel method for minimizing spread of bio-effluents generated from hospitalized patients lying in bed was developed. The method consists of ventilated mattress (VM) which is able to suck the human bio-effluents at the area of the body where they are generated before they spread in the room. The air polluted with released bio-effluents is exhausted into the mattress near the body and is either cleaned and released back in the room or is removed from the room by connecting the mattress to the exhaust of the room background ventilation system. Comprehensive research reveals that the method
is highly efficient for removal of bio-effluents. The energy saving potential of the VM combined with constant air volume (CAV) ventilation operating at reduced ventilation rate in a single-bed hospital patient room (1.3 air changes per hour (ACH)) and double-bed patient room (1.6 ACH) was assessed by means of dynamic computer simulations. The estimated annual energy consumption for the rooms using the VM combined with CAV was compared to the annual energy consumption when the CAV ventilation was used alone at 4, 6 and 12 ACH. The air exhausted through the mattress was 1.5 L/s. The occupants were present 24 hours every day including weekends. Compared to the CAV ventilation used alone at 4, 6 and 12 ACH the use of the VM in the single-bed room decreased the annual energy consumption respectively with 55%, 71.1% and 85.9% and in the double room with 39.3%, 60.0%, and 80.4%. The use of the VM with reduced background CAV ventilation is an effective energy saving strategy for both double and single patient hospital rooms.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Sofia
Authors: Bivolarova, M. P. (Intern), Kehayova, N. (Ekstern), Melikov, A. K. (Intern)
Number of pages: 7
Publication date: 2016

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Main Research Area: Technical/natural sciences
Conference: 5th International Conference on Human-Environment System, Nagoya, Japan, 29/10/2016 - 29/10/2016
Novel hospital ventilation, Patient rooms, Ventilated mattress, Energy saving
Electronic versions:
ENERGY_SAVING_BY_NOVEL_BED_INTEGRATED_LOCAL_EXHAUST_VENTILATION.pdf
Source: PublicationPreSubmission
Source-ID: 127388037
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Engineering properties of fibres from waste fishing nets
This study is part of the international project Circular Ocean and focuses on reducing marine plastic waste within the Northern Periphery and Arctic (NPA) region by developing new sustainable solutions for the reuse of discarded waste fishing nets. Recycled plastic fibres from waste fishing nets of high-density polyethylene (HDPE) were investigated with respect to their engineering properties such as tensile strength and Young's modulus. Tensile tests were carried out on monofilament fibres from fishing nets in accordance with ASTM Standards and were performed on both new fibres and waste fibres from similar net types. Waste fishing nets of the type "Braided Polyethylene" were collected at the dump-site in Sisimiut, Greenland, and are produced by Euronete and supplied by Vónin, which is the leading supplier of fishing gear in Greenland. With this screening it is possible to evaluate the applicability of this type of discarded fishing nets as reinforcement in construction materials. The present paper focuses concrete materials and discusses how the fishing nets can be implemented in concrete in order to improve its properties.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Bertelsen, I. M. G. (Intern), Ottosen, L. M. (Intern)
Pages: 7-16
Publication date: 2016

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Title of host publication: International Conference on Materials, Systems and Structures in Civil Engineering : Conference workshop on Cold Region Engineering
Publisher: Technical University of Denmark, Department of Civil Engineering
Series: B Y G D T U. Rapport
Number: Byg R-352
ISSN: 1601-2917
Main Research Area: Technical/natural sciences
Electronic versions:
Pages_from_Cold_region_engineering_conf_proceedings_2_2.pdf
Evacuation of Bed-bound Patients- STEPS Simulations

Fires in hospitals occur, and evacuation of bed-bound patients might be necessary in case of emergency. The current study concerns the evacuation of bed-bound patients from a fire section in a hospital using hospital porters. The simulations are performed using the STEPS program. The aim of the study is to investigate the evacuation time of bed-bound hospital patients using different walking speeds from the literature, and the influence of the number of hospital porters on the total evacuation times of bed-bound patients. Different scenarios were carried out with varying staff-to-patient ratios that simulate the horizontal evacuation of 40 bed-bound patients into a different fire section.

It was found that the staff-to-patient-ratio affects the total evacuation times. However, the total evacuation times do not decrease linearly and a saturation effect is seen at a staff-to-patient ratio above 1:2.5. Simulations of evacuation of one bed-bound patient vertically, through a staircase 11 storeys high, were carried out using three different movement speeds from the literature. The simulations overestimated the experimental results. The time difference is explained by a lack of detailed knowledge of evacuation procedure, resulting in a lack of input times for the simulations. Further studies on the procedure and subsequent times are needed.

Evaluation and Comparison of Freeze-Thaw Tests and Air Void Analysis of Pervious Concrete

Pearl-Chain Bridge technology is an innovative precast arch bridge solution which uses pervious concrete as fill material. To ensure longevity of the bridge superstructure it is necessary that the pervious concrete fill is designed to be freeze-thaw durable; however, no standards exist on how to evaluate the freeze-thaw resistance of fresh or hardened pervious concrete and correspondingly what constitutes acceptable freeze-thaw durability. A greater understanding of the correlation between the freeze-thaw performance and the air void structure of pervious concrete is needed. In the present study six pervious concrete mixes were exposed to freeze-thaw testing, and their air void structure was analyzed using an
automated linear-traverse method. It was found that there is a miscorrelation between these two test methods in their assumption of whether or not the large interconnected voids effectively relieve the pressure when water freezes.

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, Section for Building Design, University of Missouri at Kansas City, Iowa State University

**Authors:** Lund, M. S. M. (Intern), Hansen, K. K. (Intern), Kevern, J. T. (Ekstern), Schaefer, V. R. (Ekstern)

**Number of pages:** 8

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**Main Research Area:** Technical/natural sciences

**Conference:** 11th fib International PhD Symposium in Civil Engineering, Tokyo, Japan, 29/08/2016 - 29/08/2016

**Electronic versions:**

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**Source-ID:** 127332974

**Publication:** Research - peer-review › Article in proceedings – Annual report year: 2016

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The thermal indoor environment and the energy performance of a plus-energy house are evaluated in the present study. The study case is EMBRACE, a two-storey dwelling of 59 m² designed to host a single family. The building includes a semi-outdoor space covered by a glazed envelope, where the thermal environment is also investigated. The house is located in Nordborg, Denmark, where it is undergoing a year-round measurement campaign, of which are presented hereafter the results ranging from June to September 2015.

The thermal environment proved to be satisfactory, with 58 and 15 hours above 26°C respectively in the first and ground floors. In general, the indoor climate was quantitatively better during the heating period (June and September) than in the cooling period (July and August). Overheating did not result to be an issue, which suggests that the installation of a cooling system could have been avoided. The energy balance proved to be positive, with a total of 1563 kWh of electricity produced by the photovoltaic cells installed on the roof, and 333 kWh used by the mechanical systems of the house during the four studied months. The air temperature in the semi-outdoor space frequently reached 2 to 3°C higher than outdoors, which increases the amount of comfortable occupancy hours in this space. The results suggest that the house could perform effectively as a plus-energy house during the whole year.

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark

**Authors:** Pean, T. Q. (Intern), Gennari, L. (Ekstern), Kazanci, O. B. (Intern), Olesen, B. W. (Intern)

**Number of pages:** 10

**Publication date:** 2016

**Host publication information**

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**Volume:** 10

**Editor:** Kvols Heiselberg , P.

**ISBN (Print):** 87-91606-36-5

**BFI conference series:** REHVA World Congress (5010061)

**Main Research Area:** Technical/natural sciences

**Conference:** 12th REHVA World Congress, Aalborg, Denmark, 22/05/2016 - 22/05/2016

**Plus-energy house, Summer performance evaluation, Low temperature heating and high temperature cooling, Radiant floor system**

**Electronic versions:**

Evaluation_of_the_energy.pdf

**Publication:** Research - peer-review › Article in proceedings – Annual report year: 2016

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**Evaluation of the energy and comfort performance of a plus-energy house under Scandinavian winter conditions**

A plus-energy house was studied in terms of indoor environmental conditions and energy balance, during Scandinavian winter conditions. The studied building, EMBRACE, is a single-family detached dwelling of 59 m² with two floors. The house also integrates a semi-outdoor space, covered by a glazed envelope, whose thermal environment has been investigated. The house is located in Nordborg, Denmark and was undergoing a year-round measurement campaign, of which are hereby presented the results from 16/11/2015 to 04/03/2016. During this period, the house was operated in...
heating mode, with five different cases investigated, combining different set-points (20 to 22°C) and ventilation heat recovery settings.

The thermal comfort indoors proved to be satisfactory, depending on the chosen set-point. Up to 92 and 98% of the time was reported within the range 21-25°C (Category I of EN 15251) respectively on the ground and first floors when the set-point was 22°C. The electrical energy balance resulted to be negative, with a photovoltaic (PV) production of 432 kWh and a consumption from the mechanical systems of 1521 kWh during the studied winter period of almost four months. Put into perspective with the summer evaluation, these results show an encouraging trend towards achieving an annual positive energy balance as designed for this plus-energy house. The thermal environmental conditions in the semi-outdoor space resulted more comfortable than the outdoors, with reduced wind velocity, protection from rain, and temperature increase of up to 2-3°C during sunny days, which increases the possibilities of occupancy in this area.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark, Tsinghua University
Authors: Pean, T. Q. (Intern), Gennari, L. (Ekstern), Kazanci, O. B. (Intern), Liu, X. (Ekstern), Olesen, B. W. (Intern)
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**Evaluation of the potential for using Greenlandic marine sediments for brick production**

Fine grained marine sediments from near the Greenlandic towns of Ilulissat, Kangerlussuaq and Sisimiut were assessed as raw materials for local production of building bricks. The assessment included both analysis of the sediment characteristics and physical properties of miniature test brick pellets. The sediment samples were, in general, very similar in respect to the investigated properties and compared well with brick clays from other parts of the world. The variable chloride content observed in two of the sediments could be a concern and should be investigated further.

**General information**

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Belmonte, L. J. (Intern), Bertelsen, I. M. G. (Intern)
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**Evaluations of different domestic hot water preparing methods with ultra-low-temperature district heating**

This study investigated the performances of five different substation configurations in single-family houses supplied with ULTDH (ultra-low-temperature district heating). The temperature at the heat plant is 46 degrees C and around 40 degrees C at the substations. To avoid the proliferation of Legionella in the DHW (domestic hot water) and assure the comfortable temperature, all substations were installed with supplementary heating devices. Detailed measurements were taken in the substations, including the electricity demand of the supplementary heating devices. To compare the energy and economic performance of the substations, separate models were built based on standard assumptions. The relative heat and
electricity delivered for preparing DHW were calculated. The results showed that substations with storage tanks and heat pumps have high relative electricity demand, which leads to higher integrated costs considering both heat and electricity for DHW preparation. The substations with in-line electric heaters have low relative electricity usage because very little heat is lost due to the instantaneous DHW preparation. Accordingly, the substations with in-line electric heaters would have the lowest energy cost for DHW preparation. To achieve optimal design and operation for the ULTDH substation, the electricity peak loads of the in-line electric heaters were analysed according to different DHW-heating strategies.
Exergy performance of different space heating systems: A theoretical study

Three space heating systems (floor heating with different floor covering resistances, radiator heating with different working temperatures, warm-air heating with and without heat recovery) were compared using a natural gas fired condensing boiler as the heat source. For the floor heating systems, the effects of floor covering resistance on the whole system performance were studied using two heat sources; a natural gas fired condensing boiler and an air-source heat pump. The heating systems were also compared in terms of auxiliary exergy use for pumps and fans.

The low temperature floor heating system performed better than other systems in terms of exergy demand. The use of boiler as a heat source for a low-exergy floor heating system creates a mismatch in the exergy supply and demand. Although an air-source heat pump could be a better heat source, this depends on the origin of the electricity supplied to the heat pump. The coefficient of performance (COP) of the heat pump has a critical value (2.57 in this study); it is beneficial to use a heat pump instead of a boiler only when the COP is above this critical value.

The floor covering resistance should be kept to a minimum, in order not to hinder the performance of the floor heating and the whole system. The exergy input to auxiliary components plays a significant role in the overall exergy performance of systems, and its effects become even more significant for low temperature heating systems.
The Technical University of Denmark has been carrying out research in the energy balance of buildings in relation to indoor climate for decades. The last two decades have seen a major role played by research in the field of Integrated Energy Design (IED) focusing on the earliest design phases. The research has showed that the greatest effect in relation to achieving net-zero-energy buildings is achieved when indoor climate and energy simulation tools are applied from the very first architectural sketches, where geometry, façade design, orientation, etc. are determined. Large architectural offices and engineering consultancies in Scandinavia have invested in software and interdisciplinary design teams to carry out Integrated Energy Design (IED). Legislation has been altered and simulations of indoor climate and energy balance are now required to obtain building permits. IED has been rolled out extensively in the building industry. Having reduced the energy needed to operate the indoor environment to almost zero by designing with knowledge and optimizing systems, the energy needed to construct the building and its systems is now prominent in importance. The CO2 impact of buildings...
has become an important parameter because sustainability certification systems like the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB) have taken the lead in Europe. The DGNB system includes Life Cycle Assessment (LCA), and the Danish government has stated that Denmark must be CO2 neutral by 2050. The focus in design is shifting from energy and indoor climate to CO2 impact. The experience from the decades of IED shows that the largest gains in reduction come from the early design phases. LCA in relation to buildings has to include the energy needed to operate the building's indoor climate as well as the CO2 embodied in the building. This makes the simulations far more complex. LCA thus tends to be placed in the last phases of design and used for certification, so that only a single iteration is needed. However, real-time LCA simulation tools are required if designers are to base design decisions not only on knowledge about indoor climate and energy balance but also on LCA. This paper presents the efforts at DTU's Department of Civil Engineering to develop a real-time LCA simulation tool, including indoor climate and energy balance simulation (based on Energy +) and the first round of implementing the tool at well-esteemed architectural offices in Scandinavia. The development of the real-time LCA-indoor climate-energy balance tool was funded by Nordic Built.

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Authors: Otovic, A. (Ekstern), Jensen, L. B. (Intern), Negendahl, K. (Intern)
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Expansion of Numbers of Parameters: Simulation of Energy and Indoor Climate in Combination with LCA

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Organisations: Department of Civil Engineering, Section for Building Design
Authors: Otovic, A. (Ekstern), Jensen, L. B. (Intern), Negendahl, K. (Intern)
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Experimental investigation of different fill materials in arch bridges with particular focus on Pearl-Chain Bridges
Pearl-Chain Bridge technology is a recently developed prefabricated arch solution for road and railway bridges allowing faster, more environmentally friendly, and cheaper bridge construction. This study compared the strength and durability properties of three different types of fill material to find the most optimal fill for Pearl-Chain Bridges. Sub-base gravel, cement-stabilized gravel, and pervious concrete were tested with respect to compressive strength, stiffness, splitting tensile strength, permeability, freeze–thaw durability, and shrinkage. This paper summarizes the advantages and disadvantages of implementing the different types of fill material in arch bridges, particularly in Pearl-Chain Bridges.

General information
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Organisations: Department of Civil Engineering, Section for Building Design
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Experimental investigations on cylindrical latent heat storage units with sodium acetate trihydrate composites utilizing supercooling

Latent heat storage units utilizing stable supercooling of sodium acetate trihydrate (SAT) composites were tested in a laboratory. The stainless steel units were 1.5 m high cylinders with internal heat exchangers of tubes with fins. One unit
was tested with 116 kg SAT with 6% extra water. Another unit was tested with 116.3 kg SAT with 0.5% Xanthan rubber as a thickening agent and 4.4% graphite powder. The heat exchange capacity rate during charge was significantly lower for the unit with SAT and Xanthan rubber compared to the unit with SAT and extra water. This was due to less convection in the thickened phase change material after melting. The heat content in the fully charged state and the heat released after solidification of the supercooled SAT mixtures at ambient temperature was higher for the unit with the thickened SAT mixture. The heat discharged after solidification of the supercooled SAT with extra water decreased over repeating charge and discharge cycles while the heat discharged from the SAT with Xanthan rubber remained stable. In both units, the solidification started spontaneously in the majority of the test cycles. This was due to the design of the unit or the method for handling the expansion and contraction of the SAT during charge and discharge.
Experimental investigations on heat content of supercooled sodium acetate trihydrate by a simple heat loss method

Sodium acetate trihydrate is a phase change material that can be used for long term heat storage in solar heating systems because of its relatively high heat of fusion, a melting temperature of 58 °C and its ability to supercool stable. In practical applications sodium acetate trihydrate tend to suffer from phase separation which is the phenomenon where anhydrous salt settles to the bottom over time. This happens especially in supercooled state. The heat released from the crystallization of supercooled sodium acetate trihydrate with phase separation will be lower than the heat released from sodium acetate trihydrate without phase separation. Possible ways of avoiding or reducing the problem of phase separation were investigated. A wide variety of composites of sodium acetate trihydrate with additives including extra water, thickening agents, solid and liquid polymers have been experimentally investigated by a simple heat loss method. The aim was to find compositions of maximum heat released from the crystallization of supercooled sodium acetate trihydrate samples at ambient temperature. It was found that samples of sodium acetate trihydrate with 0.5–2% (wt.%) Carboxy-Methyl Cellulose, 0.3–0.5 % (wt.%) Xanthan Gum or 1–2% (wt.%) of some solid or liquid polymers as additives had significantly higher heat contents compared to samples of sodium acetate trihydrate suffering from phase separation.

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Scopus rating (2015): SJR 1.974 SNIP 2.143 CiteScore 4.61
Web of Science (2015): Indexed yes
Experimental investigations on prototype heat storage units utilizing stable supercooling of sodium acetate trihydrate mixtures

Laboratory tests of two heat storage units based on the principle of stable supercooling of sodium acetate trihydrate (SAT) mixtures were carried out. One unit was filled with 199.5 kg of SAT with 9% extra water to avoid phase separation of the incongruently melting salt hydrate. The other unit was filled with 220 kg SAT mixture thickened with 1% carboxymethyl cellulose. The heat exchange capacity rate during the charging of the unit with the extra water was significantly higher than for the unit with the thickening agent due to the different levels of convection. The SAT mixtures in the units were stable and supercooled at indoor ambient temperatures for up to two months, after which the units were discharged. The energy discharged after solidification of the supercooled SAT and water mixture was 194 kJ/kg in the first test cycle, dropping to 179 kJ/kg after 20 test cycles. The energy discharged from the unit with SAT and the thickening agent after...
solidification was stable at 205 kJ/kg over 6 test cycles.
Experimental studies on removal of airborne haloanisoles by non-thermal plasma air purifiers

A laboratory study was conducted to test the performance of non-thermal plasma air purifiers on its removal effectiveness of two haloanisoles – 2,4,6-trichloroanisole (TCA) and 2,4,6-Tribromoanisole (TBA). TCA and TBA are the two major compounds found in wine cellars that can contaminate wine to produce unpalatable mouldy and musty tastes. The test was first conducted in a climate chamber. The plasma air purifier was installed in a test rig developed for the testing and challenged by airflow with certain concentrations of TCA and TBA. Air samples upstream and downstream of the air purifier was collected by Tenax tubes and the concentration of TCA and TBA were analyzed by thermal desorption GC–MS. The results showed that the plasma air purifier was effective on removing TCA and TBA with a single pass efficiency of better than 82%. The effect was further validated in a wine cellar under a realistic condition. The concentrations of TCA and TBA in the wine cellar decreased 94% and 50% respectively after running two plasma air purifiers for 5 days. The non-thermal plasma air purification technology may be used in wine cellar to remove the two airborne contaminants and prevent the wine from being contaminated during storage.
Experimental study of discharging PCM ceiling panels through nocturnal radiative cooling

PhotoVoltaic/Thermal (PV/T) panels were used for cooling water through the principle of nocturnal radiative cooling. This water was utilised for discharging Phase Change Material (PCM) which was embedded in ceiling panels in a climate chamber. Three different sets of flow rates were examined for the solar and the PCM loops, for five days each. The highest examined water flow rate (210 l/h) in the PCM loop provided the best thermal environment in the climate chamber, namely 92% of the occupancy time was within the range of Category III of Standard EN 15251. Although the lowest examined water flow rate (96 l/h) in the solar loop provided the highest average cooling power, due to the significant variations in the weather conditions during the three experimental cases, made it impossible to determine to which extent the difference in the cooling power is due to the different water flow rate. The percentage of electrical energy use that could be covered from the PV/Ts on site was 71.5% for Case 1, 68.3% for Case 2 and 86.8% for Case 3. In any case, the PV/T panels proved to be an efficient solution for the production of electrical energy, heated and chilled water.
In relation to moisture storage in porous materials, it is often assumed that the process dynamics do not affect the moisture retention. There is mounting evidence though that this notion is incorrect: various studies demonstrate that the moisture retention is influenced by the (de)saturation rates of the moisture transfer processes involved. The available evidence primarily stems from imbibition and drainage experiments on soils however, and compared to many other porous media, these tests consider rather permeable materials with relatively dominant liquid transport at comparatively large (de)saturation rates. The current knowledge may thus not be directly transferable to moisture transfer in porous media on the whole, and dedicated further research is required. This paper responds to that need, by reporting on an experimental investigation of the occurrence of dynamic effects in moisture transfer in building materials. Drying and ad-/desorption tests are executed on two building materials, in which moisture contents and moisture potentials are measured simultaneously. These are translated into dynamic retention relations and dynamic storage coefficients, which both distinctly demonstrate that moisture transfer in building materials, similar to moisture transfer in soils, is not free of dynamic effects. The findings imply that the widely accepted static theory for moisture storage in porous media is not generally valid and should be corrected for the occurrences of dynamic effects. Considering that such drying and ad-/desorption processes are dominant features in very many instances of moisture transfer in porous media, the repercussions of these findings may be large.
Experimental Study of the Behavior of Steel Structures Protected by Different Intumescent Coatings and Exposed to Various Fire Scenarios

Three different experimental setups corresponding to three different fire scenarios were used to investigate how different heating conditions and heating rates affect the behavior of two different thin intumescent coatings (solvent-based and water-based paints, respectively). The results confirm that the current procedure for the design of intumescent coatings has shortcomings, as different paints have different performances according to the heating conditions and, in particular, according to the fire’s heating rate. The tested water-based paint had better performance for low heating rates, while the tested solvent-based paint had better performance for high heating rates. However, for really low heating rates the solvent-based paint did not activate or provide proper insulation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Lucherini, A. (Ekstern), Costa, R. (Ekstern), Giuliani, L. (Intern), Jomaas, G. (Intern)
Number of pages: 8
Pages: 1065-1072
Publication date: 2016
Experimental study of the heat transfers and passive cooling potential of a ventilated plenum designed for uniform air distribution

suspended ceiling to uniformly distribute the supply air to the occupied zone. This, in effect, increases the thermal mass of the room because the upper slab of the room no longer is isolated from the occupied zone.

In this study, the cooling potential of a diffuse ceiling ventilation system is investigated by experiments focused toward characterizing the convective heat transfer of the plenum. The heat transfers are quantified from four different air flow rates, the temperature of the air supplied to the plenum and the mean surface temperature, i.e. the total heat transfer coefficient of the plenum. The established heat transfer coefficient is used for analysis of the cooling performance of the system in dynamic building simulation program which showed that during peak summer days, the scenario with ventilated plenum would exhibit temperatures in the occupied zone approx. 1-1.5 °C lower than the baseline with unventilated plenum. In conclusion this study disclosed the mean heat transfer of the plenum with an inlet jet of approx. 1.2-0.4 m/s and temperature differences of 0.5-4.5 °C and showed that ventilation supply through the plenum can be used to augment the night cooling potential.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Danish Management Group
Authors: Hviid, C. A. (Intern), Lessing, J. (Ekstern)
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Experimental Bestimmung der Dämpfung eines Bauwerkes am Beispiel einer Fußgängerbrücke - Worauf man achten sollte

General information
State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics, Department of Civil Engineering, Section for Structural Engineering, Ingenieurbüro für Baudynamik
Authors: Cantieni, R. (Ekstern), Bajric, A. (Intern), Brincker, R. (Intern)
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Main Research Area: Technical/natural sciences
Exposure Reduction to Human Bio-effluents Using Seat-integrated Localized Ventilation in Quiescent Indoor Environment

Local airflows generated from people such as the natural convection flow may determine the distribution of pollutants indoors. New seat-integrated ventilated method was developed to improve the inhaled air quality of occupants while sitting. The method named “Ventilated Cushion” was designed to suck gaseous pollutants (i.e. bio-effluents) emitted from the body of a sedentary person and exhaust them before they entrained in the person’s breathing zone or mix with the surrounding air. Full-scale experiments were performed in a climate chamber. The chamber was ventilated by an upward piston flow through the floor. A sitting person was simulated using a dressed thermal manikin which had a body shape and surface temperature distribution of a real average person under state of thermal comfort. The chair on which the thermal manikin was sitting was equipped with the ventilated cushion (VC). The interaction between the natural convection flow around the human body and the suction from the VC was studied in terms of transport of gaseous pollutants. The experiments were conducted at two room air temperatures. The performance of the VC was assessed by measuring the pollution concentration in the breathing zone of the manikin and at 0.5 m above the head of the manikin. The results showed that the concentration of the pollutants decreased when the VC was in operation. The results from this study showed that the use of the VC provides an efficient method for control of body-emitted gaseous pollutants in order to improve the inhaled air and indoor air quality.
Exposure to aerosol and gaseous pollutants in a room ventilated with mixing air distribution
The present study investigates the aerosol and gas dispersal in a mechanically ventilated room and the personal exposure to these contaminants. The study was performed in a full-scale climate chamber. The room was air conditioned via mixing total volume ventilation system. The room occupancy was simulated by a sitting dressed thermal manikin with realistic body shape. During the experiments monodisperse aerosols of three sizes and nitrous oxide tracer gas were generated simultaneously from one location in the room. The aerosol and gas concentrations in the bulk room air and in the breathing zone of the thermal manikin were measured. The results showed higher exposure to the contaminants measured at the breathing zone than at the ambient air. The behaviour of the tracer gas and the aerosols was similar.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Institute of Chemical Process Fundamentals of the CAS
Authors: Bivolarova, M. P. (Intern), Ondráček, J. (Ekstern), Ždímal, V. (Ekstern), Melikov, A. K. (Intern), Bolashikov, Z. D. (Intern)
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Exposure to ultrafine particles, intracellular production of reactive oxygen species in leukocytes and altered levels of endothelial progenitor cells
Exposure to particles in the fine and ultrafine size range has been linked to induction of low-grade systemic inflammation, oxidative stress and development of cardiovascular diseases. Declining levels of endothelial progenitor cells within systemic circulation have likewise been linked to progression of cardiovascular diseases. The objective was to determine if exposure to fine and ultrafine particles from indoor and outdoor sources, assessed by personal and residential indoor monitoring, is associated with altered levels of endothelial progenitor cells, and whether such effects are related to leukocyte-mediated oxidative stress. The study utilized a cross sectional design performed in 58 study participants from a larger cohort. Levels of circulating endothelial progenitor cells, defined as either late (CD34(+)KDR(+) cells) or early (CD34(+)CD133(+)KDR(+) cells) subsets were measured using polychromatic flow cytometry. We additionally measured production of reactive oxygen species in leukocyte subsets (lymphocytes, monocytes and granulocytes) by flow cytometry using intracellular 2',7'-dichlorofluoroscein. The measurements encompassed both basal levels of reactive oxygen species production and capacity for reactive oxygen species production for each leukocyte subset. We found that the late endothelial progenitor subset was negatively associated with levels of ultrafine particles measured within the participant residences and with reactive oxygen species production capacity in lymphocytes. Additionally, the early endothelial progenitor cell levels were positively associated with a personalised measure of ultrafine particle exposure and negatively associated with both basal and capacity for reactive oxygen species production in lymphocytes and granulocytes, respectively. Our results indicate that exposure to fine and ultrafine particles derived from indoor sources may have adverse effects on human vascular health.

General information
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Authors: Jantzen, K. (Ekstern), Møller, P. H. (Intern), Karottki, D. G. (Forskerdatabase), Olsen, Y. (Ekstern), Bekö, G. (Intern), Clausen, G. (Intern), Hersoug, L. (Ekstern), Loft, S. (Ekstern)
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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.343 SNIP 1.27 CiteScore 3.7
BFI (2014): BFI-level 1
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ISI indexed (2011): ISI indexed yes
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Web of Science (2010): Indexed yes
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Web of Science (2008): Indexed yes
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Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.007 SNIP 1.224
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Web of Science (2004): Indexed yes
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Faser i skifergas produktionen

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Authors: Nikolajew, M. M. (Intern), Jensen, L. B. (Intern)
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Field Study of Diffuse Ceiling Ventilation Performance in a Landscape Office
Performance of diffuse ceiling ventilation with regard to thermal comfort and limits of the cooling capacity of the system was studied in a 97 m²-landscape office. Seven operation scenarios were tested: two for mixing ventilation with ceiling mounted fan coils and five with diffuse ceiling ventilation. The conditions for ventilation air change rates were 1.2, 11.5 and 17.9 h⁻¹, respectively and temperature differences between supply and exhaust ranged between 5.5 and 10.6 K. The vertical room temperature distribution and the air speed in several points in the room were measured. The results show that diffuse ceiling ventilation has substantial potential for landscape office applications because it can provide important cooling capacity while maintaining an acceptable comfort level in the occupied zone. It does not generate draught in the occupied zone even at large temperature differences between supply and exhaust and great air change rates, while the same design parameters caused risk of draught in many points in the case with mixing ventilation. Good mixing in the occupied zone in case of both systems resulted in only small vertical temperature gradients. The results from the study allow extrapolating the design chart q-ΔT for diffuse ceiling ventilation systems for higher ventilation flow rates.

Fire safety in space – Investigating flame spread interaction over wires
A new rig for microgravity experiments was used for the study flame spread of parallel polyethylene-coated wires in concurrent and opposed airflow. The parabolic flight experiments were conducted at small length- and time scales, i.e. typically over 10 cm long samples for up to 20 s. For the first time, the influence of neighboring spread on the mass burning rate was assessed in microgravity. The observations are contrasted with the influence characterized in normal gravity. The experimental results are expected to deliver meaningful guidelines for future, planned experiments at a larger scale.

Arising from the current results, the issue of the potential interaction among spreading flames also needs to be carefully
investigated as this interaction plays a major role in realistic fire scenarios, and therefore on the design of the strategies that would allow the control of such a fire. Once buoyancy has been removed, the characteristic length and time scales of the different modes of heat and mass transfer are modified. For this reason, interaction among spreading flames may be revealed in microgravity, while it would not at normal gravity, or vice versa. Furthermore, the interaction may lead to an enhanced spread rate when mutual preheating dominates or, conversely, a reduced spread rate when oxidizer flow vitiation is predominant.

In more general terms, the current study supports both the SAFFIRE and the FLARE projects, which are large projects with international scientific teams. First, material samples will be tested in a series of flight experiments (SAFFIRE 1-3) conducted in Cygnus vehicles after they have undocked from the ISS. These experiments will allow the study of ignition and possible flame spread in real spacecraft conditions, i.e. over real length scale samples within real time scales. Second, concomitant research conducted within the FLARE project is dedicated to the assessment of new standard tests for materials that a spacecraft can be composed of. Finally, these tests aim to define the ambient conditions that will mitigate and potentially prohibit the flame spread in microgravity over the material studied.

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Frost damage of concrete subject to confinement
When internal frost damage is observed in real concrete structures, the usual pattern is cracks with a preferred orientation parallel to the exposed surface. When exposing concrete with poor frost resistance to a standardised freeze/thaw test in the laboratory, the orientations of the resulting cracks are more or less random. The present study is an experimental study, which aims at investigating the influence of confinement during freeze/thaw action on the developed crack pattern. Confinement is established by mounting hose clamps on cylindrical test specimens, using similar test specimens without hose clamps as reference. The results show that confinement can change the outcome of a freeze/thaw test as regards extent of internal cracking, crack orientations, and amount of surface scaling. Thus it seems likely that the difference in confinement (and therefore also in stress state) can explain the different crack patterns observed in the field and in the laboratory.

Frost susceptibility of sub-base gravel used in Pearl-Chain Bridges: an experimental investigation
This study investigates frost susceptibility of sub-base gravel determined by the ASTM D5918-13 standard as a conservative estimate of the frost heave risk of fill in overfilled arch bridges, particularly in Pearl-Chain Bridges. Frost heave of granular materials has been of great research interest from the end of the 1920s until the present day. Most new literature relates to empirical results that are several decades old. This is also the case for Danish tender specifications according to which the frost susceptibility of a sub-base gravel is solely assessed from its fines content. However, no actual frost tests have been carried out to verify this assumption. In the present study, the frost susceptibility of four different Danish gravel materials is categorised from their heave rate. We test two Danish sub-base gravel materials, with...
particle size distributions of 0–8 mm and 0–31.5 mm, respectively, and also two modified sub-base gravel materials with increased and reduced fines contents. The fines content of the gravel materials is analysed by laser diffraction, and compared with two common frost susceptibility criteria, Casagrande’s and Schaible’s, and with Danish tender specifications. Even though the two sub-base gravel materials are expected to be frost safe, 0–31.5 mm sub-base gravel shows medium frost susceptibility, whereas 0–8 mm sub-base gravel shows negligible frost susceptibility. The gravel materials with increased and reduced fines content are categorised as having low to medium frost susceptibility and low frost susceptibility, respectively. The permeability of the gravel materials is determined, and the permeability coefficient of 0–31.5 mm sub-base gravel is five times greater than that of 0–8 mm sub-base gravel. The results suggest that the criterion used to classify the frost susceptibility of Danish sub-base gravel materials based solely on their fines content is insufficient, and that the permeability coefficient should also be considered.
Further advances in modeling transdermal uptake of SVOCs

To better simulate dermal uptake of SVOCs from air, we develop an enhanced transport model that includes skin surface lipids (SSL). As modeled, clothing can remove SSL by contact transfer and it can act as a source or sink for gas-phase transfer to and from SSL. Addition of SSL increases the overall resistance to uptake of SVOCs from air but also allows for more rapid release of SVOCs to sinks like clothing or clean air. We compare the model results to reported experimental uptake of di-ethyl phthalate (DEP) and di-n-butyl phthalate (DnBP), normalized by exposed skin area and the phthalate air concentration during exposure (Weschler et al., 2015). Overall, the model predicts total uptake values that are consistent with those observed in the experiments. The model predicts a normalized mass uptake of DEP of 3.1 (µg/m²)/(µg/m³) whereas the experimental results range from 1.0 to 4.3 (µg/m²)/(µg/m³). The model somewhat over-predicts uptake of DnBP: 4.6 (µg/m²)/(µg/m³) vs the experimental range of 0.49 to 3.2 (µg/m²)/(µg/m³).
Greenlandic Waste Incineration Fly And Bottom Ash As Secondary Resource In Mortar

Today, 900 tons incineration fly ash is shipped abroad annually from Greenland for deposits, whereas the 6,000 tons incineration bottom ash is deposited locally. These incineration ashes could be valuable in concrete production, where the cement has to be shipped to Greenland. For this purpose, the effects on compressive strengths of mortars by substituting cement or sand by raw, washed and electrodiallytically treated fly ash or bottom ash were investigated.

Parts of the experimental fly ash had been pre-treated by either washing with distilled water or electrodiallytically treated to remove salts and by the latter method, also heavy metals. Mortar samples were cast where cement (5%–20%) or sand (5%–10%) was replaced with fly ash or bottom ash, together with references without replacements. The compressive strengths were measured after 7, 14, 28 and 42 days. Replacing cement by fly ash resulted in lower compressive strength at 20% content of fly ash. At 5% replacement with raw fly ash a compressive strength similar to the reference was seen. However, using washed and electrodiallytically treated ash lead to lower strengths. The lowest compressive strength was seen when replacing both sand with bottom ash and cement with fly ash.

Based on the compressive strength tests, it is found that using Greenlandic incineration ashes in mortar as 5% cement replacement could consume all ash instead of disposals, and could thus turn the ashes into a local resource and simultaneously reduce the import of cement.

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Greenland Island Infrastructures: Energy Challenges in the Fishing Industry

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Greenland island infrastructures – energy challenges to the fishing industry:

The most important export industry in Greenland are fisheries - they contribute 90% of the total export value. The local trading and processing is challenged by the fact that Greenland largely depends on island operation, which complicates and limits the infrastructure. For the fishing industry, power and water supply pose a considerable challenge, where the...
prize determination is a contributing reason for the reduced local processing and thereby the reduced occupation. A development, which challenges the livelihood of several local communities.

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**Organisations:** Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Authors:** Hendriksen, K. (Intern)

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**Greenland meltwater storage in firn limited by near-surface ice formation**

Approximately half of Greenland's current annual mass loss is attributed to runoff from surface melt(1). At higher elevations, however, melt does not necessarily equal runoff, because meltwater can refreeze in the porous near-surface snow and firn2. Two recent studies suggest that all(3) or most(3,4) of Greenland's firn pore space is available for meltwater storage, making the firn an important buffer against contribution to sea level rise for decades to come(3). Here, we employ in situ observations and historical legacy data to demonstrate that surface runoff begins to dominate over meltwater storage well before firn pore space has been completely filled. Our observations frame the recent exceptional melt summers in 2010 and 2012 (refs 5,6), revealing significant changes in firn structure at different elevations caused by successive intensive melt events. In the upper regions (more than similar to 1,900m above sea level), firn has undergone substantial densification, while at lower elevations, where melt is most abundant, porous firn has lost most of its capability to retain meltwater. Here, the formation of near-surface ice layers renders deep pore space difficult to access, forcing meltwater to enter an efficient(7) surface discharge system and intensifying ice sheet mass loss earlier than previously suggested(3).
Greenland surface mass-balance observations from the ice-sheet ablation area and local glaciers

Glacier surface mass-balance measurements on Greenland started more than a century ago, but no compilation exists of the observations from the ablation area of the ice sheet and local glaciers. Such data could be used in the evaluation of modelled surface mass balance, or to document changes in glacier melt independently from model output. Here, we present a comprehensive database of Greenland glacier surface mass-balance observations from the ablation area of the ice sheet and local glaciers. The database spans the 123 a from 1892 to 2015, contains a total of similar to 3000 measurements from 46 sites, and is openly accessible through the PROMICE web portal (http://www.promice.dk). For each measurement we provide X, Y and Z coordinates, starting and ending dates as well as quality flags. We give sources for each entry and for all metadata. Two thirds of the data were collected from grey literature and unpublished archive documents. Roughly 60% of the measurements were performed by the Geological Survey of Denmark and Greenland (GEUS, previously GGU). The data cover all regions of Greenland except for the southernmost part of the east coast, but also emphasize the importance of long-term time series of which there are only two exceeding 20 a. We use the data to analyse uncertainties in point measurements of surface mass balance, as well as to estimate surface mass-balance profiles for most regions of Greenland.

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Geological Survey of Denmark and Greenland, ASIAQ Greenland Survey, Natural History Museum of Denmark, University of Manchester, Federal Office of Meteorology and Climatology MeteoSwiss, University of Copenhagen, Zentralanstalt für Meteorologie und Geodynamik, Aarhus University, UNIVERSIDAD DE MAGALLANES, Alfred Wegener Institute for Polar and Marine Research, Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Hochschule fur Technik Stuttgart - University of Applied Sciences Stuttgart, Hokkaido University, Utrecht University
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High accuracy calibration of a dynamic vapor sorption instrument and determination of the equilibrium humidities using single salts

We present a procedure for accurately calibrating a dynamic vapor sorption (DVS) instrument using single salts. The procedure accounts for and tailors distinct calibration tests according to the fundamental properties of each salt. Especially relevant properties influencing the calibration are the heat of solution, heat of condensation, and the kinetics connected to the salt phase transition, as these influence the microclimate surrounding the salts during calibration. All these issues were dealt with to obtain precise calibration results. The DVS instrument comprises two control modes to generate and measure the relative humidity (RH). Both control modes were separately examined and combined to overcome the shortcomings of each of the two control modes and thereby obtain the most accurate results. Repeated calibration testing with the single salts (LiCl, MgCl₂, Mg(NO₃)₂, NaCl, and KNO₃) enables five discrete sorption isotherm measurements within the range of 11%–93% RH. The equilibrium RH of the solution for LiCl, MgCl₂, Mg(NO₃)₂, NaCl, and KNO₃ was determined with a standard deviation of 0.06%–0.15% (0.45% for KNO₃) RH. By comparing the measured calibration values with the well-known equilibrium RH of each salt solution, the presented method’s results are both accurate with significant agreement and precise with small variation.
House Owners' Interests and Actions in Relation to Indoor Temperature, Air Quality and Energy Use

In order to make better and more realistic predictions of energy consumption in dwellings, more knowledge is needed about how individuals and households control the indoor environment. A questionnaire survey was conducted with the objective of studying the interest and actions taken in relation to indoor temperature, air quality and energy consumption by Danish house owners living in single-family detached houses with district heating. The house owners state that they are interested in, and concerned about, the indoor temperature and air quality and that it is an important element in caring for each other in the family. Actions are taken in relation to the temperature in the way that house owners are trying to keep different temperatures in differently heated rooms, e.g. to sleep in a cool bedroom or to save heat. Besides they wear warmer clothing, slippers or thick socks indoors during the winter compared with the rest of the year. Actions are taken to improve the air quality by the majority of the house owners by opening windows. The most frequent reasons for opening windows once or several times a day was “to get fresh air” and “in relation to showering”. House owners are interested in saving energy for the sake of the environment and for their own economy, and quite a lot of households indicate that they know their own energy consumption, though only few follow it closely. Thus being concerned about energy is not necessarily related to an interest in detailed feedback on one’s own energy consumption. Results show that well-planned communication about feedback possibilities is important. Women and men answer slightly differently to some of the questions, e.g. women are more active in airing, and they wear warmer clothing, whereas men are more actively following their energy consumption.

Human responses to carbon dioxide, a follow-up study at recommended exposure limits in non-industrial environments

To extend the results of a previous study on the effects of carbon dioxide (CO₂) and bioeffluents on humans, the new study reported in this paper was carried out. The purpose of this study was to examine, whether exposure to CO₂ at 5000 ppm would cause sensory discomfort, evoke acute health symptoms, reduce the performance of cognitive tasks, or result in changes in physiological responses. The outdoor air supply rate was set high enough in a low-emission stainless-steel climate chamber to create a reference condition with CO₂ at 500 ppm when subjects were present, and chemically pure CO₂ was added to the supply air to create an exposure condition with CO₂ at 5000 ppm (the measured exposure level was ca. 4900 ppm). Ten healthy college-age students were exposed twice to each of the two conditions for 2.5 h in a design balanced for order of presentation. The raised CO₂ concentration had no effect on perceived air quality or physiological responses except for end-tidal CO₂ (ETCO₂), which increased more (to 5.3 kPa) than it was in the reference condition (5.1 kPa). Other results indicate additionally that a 2.5-h exposure to CO₂ up to 5000 ppm did not increase intensity of health symptoms reported by healthy young individuals and their performance of simple or moderately difficult cognitive tests and some tasks resembling office work. These results accord well with the current occupational exposure limit recommendation for CO₂ and with many other reports published in the literature.
Acute health symptoms, Carbon dioxide, Cognitive performance, Perceived air quality, Physiological responses
Hydrothermal conditions in cold, north facing attic spaces under the eaves with vapour-open roofing underlay in a cool, temperate climate

Measurements of relative humidity and temperature in eight cold attic spaces under the eaves with varying infiltration and passive ventilation strategies were carried out in a full-scale experimental setup in Denmark. The research project tests whether best practice recommendations given to ensure compliance with the current Danish Building Regulations (BR10) for airtightness (<1.5 l/m² s at 50 Pa pressure difference) can ensure acceptable moisture levels in attics with vapour-open roofing underlays. North facing cold attic spaces under the eaves constitute a worst case scenario. Following best practice recommendations concerning ventilation of the cold attic space under the eaves and fulfilling the requirements in BR10 regarding air tightness of the building envelope did not ensure the absence of mould growth in the attics. Through winter the attics with infiltration through leaks (dimensioned to allow an influx of 3.3 l/s of conditioned indoor air 20 °C and 60% RH at a pressure difference of 50 Pa) and ventilation (singled-sided, passive ventilation) contained more moisture and had significantly higher levels of mould growth than the non-ventilated attics. Under the same physical conditions the ‘pressure equalized’ attic rooms were found to have moisture levels in between those observed in the ventilated and non-ventilated attic rooms. Likewise, the observed levels of mould growth were in between those observed in the cases of the ventilated and non-ventilated attic rooms. Attics with reduced infiltration were not seen to display lower moisture levels but did show lower but still significant levels of mould growth.
Identification of parameters affecting the variability of energy use in residential buildings

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Identification of Parameters Affecting the Variability of Energy Use in Residential Buildings
Energy use of buildings varies significantly. When aggregating the demand profiles of a group of buildings, the variations of energy demand are critical to determine the aggregated load profile. Especially when dimensioning district energy systems, it is important to know the variability of energy demand that can guarantee the efficient operation of the system. For this reason, it is useful to distinguish the parameters that affect building energy performance the most and to estimate the magnitude of these variations on each parameter. The aim of the present study is to identify the parameters that lead to the largest variations in energy performance of residential buildings in Denmark. A set of sensitivity analysis has been carried out using an extensive search algorithm. These sensitivity analyses were then applied for modelling a reference building representing Danish single-family houses of the 1940's. The study was able to determine the key variables that affect energy use in old Danish single-family houses using sensitivity analysis and proposes a methodology for parameter optimization. This analysis pointed out that the insulation in external walls and roof lead to the largest variations in space heating demand. Also, the infiltration rate and occupancy behavior play important role on space heating consumption. It was concluded that these findings highly depend on the specific case study and the characteristics of the buildings that are examined. If outdoor climate and location differ from the current case, a different set of parameters should be investigated upon its effect on building energy use.

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IEA Project on Indoor Air Quality Design and Control in Low Energy Residential Buildings
Both new and renovated existing buildings will in the future need to be optimized in such a way that can achieve to have nearly no energy use while still providing impeccable indoor climates. Since such buildings can already be assumed to be very well insulated, airtight, and to be equipped with heat recovery systems, one of the next focal points to limiting energy consumption for thermally conditioning the indoor environment will be to possibly reducing the ventilation rate, or to make it in a new way demand controlled. However, this must be done such that it has no have adverse effects on Indoor Air Quality (IAQ).
Annex 68, Indoor Air Quality Design and Control in Low Energy Residential Buildings, is a project under IEA’s Energy Conservation in Buildings and Communities Program (EBC), which will endeavor to investigate how future residential buildings are able to have very high energy performance whilst providing comfortable and healthy indoor environments. New paradigms for demand control of ventilation will be investigated, which consider the pollution loads and occupancy in buildings. The thermal and moisture conditions of such will be considered because of interactions between the hygrothermal parameters, the chemical conditions, ventilation and the wellbeing of occupants. A flagship outcome of the project is anticipated to be a guidebook on design and operation of ventilation in residential buildings to achieve high IAQ.

Within the framework of IEA SHC Task 42 / ECES Annex 29, a simple tool for the economic evaluation of thermal energy storages has been developed and tested on various existing storages. On that account, the storage capacity costs (costs per installed storage capacity) of thermal energy storages have been evaluated via a Top-down and a Bottom-up approach. The Top-down approach follows the assumption that the costs of energy supplied by the storage should not exceed the costs of energy from the market. The maximum acceptable storage capacity costs depend on the interest rate assigned to the capital costs, the intended payback period of the user class (e.g. industry or building), the reference energy costs, and the annual number of storage cycles. The Bottom-up approach focuses on the realised storage capacity costs of existing storages. The economic evaluation via Top-down and Bottom-up approach is a valuable tool to make a rough estimate of the economic viability of an energy storage for a specific application. An important finding is that the annual number of storage cycles has the largest influence on the cost effectiveness. At present and with respect to the investigated storages, seasonal heat storage is only economical via large sensible hot water storages. Contrary, if the annual number of storage cycles is sufficiently high, all thermal energy storage technologies can become competitive.
IEA SHC Task 42/ECES Annex 29 WG A1: Engineering and Processing of PCMs, TCMs and Sorption Materials

An overview on the recent results on the engineering and characterization of sorption materials, PCMs and TCMs investigated in the working group WG A1 “Engineering and processing of TES materials” of IEA SHC Task 42 / ECES Annex 29 (Task 4229) entitled “Compact Thermal Energy Storage” is presented.

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IEA SHC Task 42/ECES Annex 29—Working Group B: Applications of Compact Thermal Energy Storage

The IEA joint Task 42 / Annex 29 is aimed at developing compact thermal energy storage materials and systems. In Working Group B, experts are working on the development of compact thermal energy storage applications, in the areas cooling, domestic heating and hot water and industry. The majority of application projects were in the field of room heating and domestic hot water. In this article, an overview is given of a large number of applications. The storage technologies used in the applications are latent heat storage, open and closed solid sorption, liquid sorption and salt hydrates and composites thereof. On a broad front, a lot of progress was made in the development of components and systems, providing knowledge and experience regarding the design, numerical modeling, building, testing and economical assessing of components and storage systems. Most important findings are that the interaction of storage materials with the materials of components can be deciding for the technical feasibility, that a number of components, like reactor, heat exchangers and evaporators are less understood than initially thought and need more development, that the inclusion of storage materials in systems generate new challenges like the occurrence of non-condensable gases and thermomechanical effects and that standardized and simplified system approaches are needed.

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Impact of Prosumer Buildings and their Clusters on the Energy System – project outline

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Imperial porphyry from Gebel Abu Dokhan, the Red Sea Mountains, Egypt.: Part I. Mineralogy, petrology and occurence
The prestigious red Imperial Porphyry was quarried from Mons Porphyrites in the Red Sea Mountains of Egypt. The porphyry, reserved for imperial use in Rome and Constantinople, was widely reused in Romanesque and Renaissance times, and in the Ottoman Empire. At the locality, the rocks vary from dark grey to red and are characterized by abundant, weakly aligned white to pink feldspar phenocrysts. The magmatic phenocrysts – plagioclase, hornblende, pyroxene, opaque components and apatite – are always altered. The red colour of the porphyry stems from alteration of phenocrysts and groundmass which generated Mn-epidote or piemontite (both rich in Mn\(^{3+}\)) and a hematite dusting (dominated by Fe\(^{3+}\)). Plagioclase relics consist of plagioclase (An\(_2-47\)) and microcline (< 5 – 6 % Ab); they recrystallized during alteration processes into a mixture of sodium feldspar with segregations of epidote group minerals, K-feldspar, and minor anorthite and calcite. Rare pyroxene retains its primary morphology but is completely altered to epidote group minerals. Primary hornblende lies along the magnesiohastingsite-edenite join but recrystallized to low-Na, low-Al\(^{IV}\) magnesiohornblende, and tremolite-actinolite. Primary oxide grains occur as exsolved ilmenite-titanomagnetite; they recrystallized to hematite or hematite-magnetite mixtures. The rocks are not pervasively recrystallized and retain a spectrum of magmatic textures. Alteration produced epidote-group minerals, notably Mn\(^{3+}\)-containing epidote and more rarely piemontite. Both are pleochroic from pink to yellow; the depth of pleochroism increases in the reddest porphyries. Other metamorphic-grade minerals include tremolite-actinolite, aluminian titanite, phlogopite, muscovite, chlorite and chaledony. These phases indicate essentially isochemical greenschist facies conditions which took place under relatively high oxygen fugacity. Mineralogical observations, rock colour and texture, and particularly the pleochroic piemontite, should allow archaeologists to reliably assign pieces of Imperial Porphyry to their Egyptian source. Elemental and isotope geochemistry of the Imperial Porphyry is described in Part II.

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Scopus rating (2015): SJR 0.342 SNIP 0.449 CiteScore 0.52
Imperial porphyry from Gebel Abu Dokhan, the Red Sea Mountains, Egypt: Part II. Geochemistry

The prestigious red Imperial Porphyry was quarried from Mons Porphyrites in the Red Sea Mountains of Egypt. It was reserved for imperial use in Rome and Constantinople and widely reused in Romanesque and Renaissance times. The mineralogy and petrology of the porphyry collected at Mons Porphyrites were treated in Part I of this report. The rocks were moderately altered; greenschist facies alteration took place under essentially isochemical conditions but relatively high oxygen fugacity. The rocks retain many magmatic textures.

Whole-rock chemical analyses show that we deal with high-K to medium-K calc-alkaline andesites and dacites with a trace element spectrum typical of volcanic rocks from an Andean subduction-zone setting. Four rock samples yielded an errorchron with an age of 560 ± 42 Ma and an initial 87Sr/86Sr ratio of 0.70283 ± 0.00011. Using Nd isotope data, values of TDM from 0.84 to 0.88 Ga and εNd from +5.1 to +5.7 were inferred. The magmas which led to formation of the Imperial Porphyry appear to be derived from a subduction-modified depleted mantle and underwent only minor contamination by older continental crust. Trace-element features, notably the high Th, U, K, Rb and Cs contents, are consistent with crust contamination. Imperial Porphyry erupted during the second Great Oxygenation Event of the Earth atmosphere.

Mineralogical observations as well as rock colour and texture, particularly the pleochroic epidote – piemontite, should allow archaeologists to reliably assign pieces of Imperial Porphyry to their Egyptian source. Major- and trace-element rock analysis or electron microprobe mineral analysis will confirm the assignment.

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Main Research Area: Technical/natural sciences
Implementation synergies that exploit situational knowledge strategically
This paper illustrates how strategic and situated forms of knowledge may increase capacity to implement energy strategies in local urban development projects. Through analysis of front runner implementation projects, we show that the involved planners utilize situational learning processes strategically to develop more viable implementation trajectories. These findings resonate well with relational and network orienteered research in contemporary planning theory. In the selected case studies, we can see that planners deliberately seek to extend traditional planning approaches, like e.g. regulation, with broader context-specific learning processes. In doing so, we argue that – what we call – an implementation synergy is established by interlacing different forms of situational knowledge with strategic knowledge about how to reach a desired energy target. In conclusion, the paper identifies different domains of knowledge that can be exploited strategically in order to create an implementation synergy in local development projects.
Incorporation of Different Fly Ashes from MSWI as Substitute for Cement in Mortar: An Overview of the Suitability of Electrodiolytic Pre-treatment

Incorporation of treated straw and wood fly ash into clay building brick

High Cd content in straw and wood fly ash, generated from biomass-fired power plants, prohibits its recycling as fertilizer spreading on the landfilled. To improve and alter the current mainstream of fly ash treatment by landfilling, different approaches were tried for treatment of straw and wood fly ash, such as washing with water to quickly recover the highly soluble salts (mainly K and Cl), and treatment of the washed fly ash with elevated heavy metal content resulted from washing by electrodialytic remediation (EDR). The finding that SiO2 (quartz) accounted for a significant portion in the treated ash, suggests the possibility of the ash reuse in sintered clay bricks. In this study, the straw and wood fly ash treated by washing and EDR was incorporated into yellow clay bricks at different substitution rates. The properties of the clay-ash bricks were studied in terms of shrinkage, water absorption, porosity, density, compressive strength and leaching behavior, and compared with the 100% clay bricks. It's promising to use the treated ash as a secondary building material.
Indeklima, energiforbrug og brugeradfærd

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern)
Number of pages: 1
Pages: 6-6
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: HVAC Magasinet
Volume: 52
Issue number: 11
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Links:
http://ipaper.ipapercms.dk/TechMedia/HVACMagasinet/2016/11/
Source: PublicationPreSubmission
Source-ID: 127357153
Publication: Communication › Journal article – Annual report year: 2016

Indeklima og bygningers totalværdi

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern)
Pages: 6
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: HVAC Magasinet
Issue number: 7
ISSN (Print): 1603-6913
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
Leder_total_konomi.pdf

Bibliographical note
Editorial in HVAC Magasinet, no.7, Juni, p. 6
Source: PublicationPre Submission
Source-ID: 125223999
Publication: Research › Editorial – Annual report year: 2016

Individually controlled localized chilled beam in conjunction with chilled ceiling: Part 1 – Physical environment
This study investigates the indoor environment generated by localized chilled beam coupled with chilled ceiling (LCBCC) and compares it with the environment generated by mixing ventilation coupled with chilled ceiling (CCMV). The experiments were performed in a mock-up of single office (4.1 m × 4.0 m × 3.1 m, L× W× H). Thermal manikin was used to simulate room occupant. The LCBCC was placed above the workstation to improve the environment locally. Combinations of indoor temperature of 26 °C and 28 °C and ventilation airflow rate of 10 and 13 l/s were studied. The total
heat load in the room was 60 W/m² (including simulation of solar radiation and miscellaneous heat loads). The results showed that uniform thermal conditions (differences smaller than 1 °K) were generated in the occupied zone with the studied system configurations. The LCBCC diminished the effect of the buoyancy flow from the simulated window and this resulted in more acceptable thermal conditions at the workstation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Gävle, Halton OY, Uponor Group
Authors: Arghand, T. (Ekstern), Bolashikov, Z. D. (Intern), Kosonen, R. (Ekstern), Aho, I. (Ekstern), Melikov, A. K. (Intern)
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of Indoor Air 2016
Article number: 483
BFI conference series: International Conference on Indoor Air Quality and Climate (5010063)
Main Research Area: Technical/natural sciences
Conference: 14th international conference on Indoor Air Quality and Climate, Ghent, Belgium, 03/07/2016 - 03/07/2016
Localized chilled beam, Mixing Ventilation, Chilled ceiling, Individual control, Local environment
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 131108993
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Individually controlled localized chilled beam in conjunction with chilled ceiling: Part 2 – Human response
The response of 24 subjects to the local environment established by localized chilled beam combined with chilled ceiling (LCBCC) was studied and compared with response to the environment generated by mixing ventilation combined with chilled ceiling (CCMV) at two temperature conditions of 26°C and 28°C. The supply airflow rate from the LCBCC was controlled by the subjects within the range of 10 to 13 L/s. In the case of CCMV subjects did not have control over the flow rate. The results showed that occupants’ overall and local thermal sensation acceptability improved at the workstation by using the LCBCC system compared to CCMV. The subjects felt less warm with the LCBCC and their thermal sensation was closer to neutral. Most of the subjects achieved acceptable air movement at the workstation by the provided individual control of the flow rate from the LCBCC. Need for air movement was reported in the case of CCMV.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Gävle, Silesian University of Technology, Halton OY, Uponor Group
Authors: Arghand, T. (Ekstern), Pastuszka, Z. (Ekstern), Bolashikov, Z. D. (Intern), Kaczmarczyk, J. (Ekstern), Kosonen, R. (Ekstern), Aho, I. (Ekstern), Melikov, A. K. (Intern)
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of Indoor Air 2016
Article number: 482
BFI conference series: International Conference on Indoor Air Quality and Climate (5010063)
Main Research Area: Technical/natural sciences
Conference: 14th international conference on Indoor Air Quality and Climate, Ghent, Belgium, 03/07/2016 - 03/07/2016
Human response, Localized chilled beam, Chilled ceiling, Individual control, Local environment
Electronic versions:
Untitled.pdf
Source: PublicationPreSubmission
Source-ID: 131109023
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Indoor air quality in a multifamily apartment building before and after energy renovation
Buildings are responsible for a substantial portion of global energy consumption. Most of the multifamily residential buildings in central Europe built in the 20th century do not satisfy the current requirements on energy efficiency. Nationwide remedial measures are taken to improve the energy efficiency of these buildings and reduce their energy consumption. Since the impact of these measures on the indoor air quality is rarely considered, they often compromise indoor air quality due to decreased ventilation and infiltration rate. We compared the indoor air quality in a multifamily apartment building in Slovakia before and after energy renovation, during two subsequent winters. Measurements of
temperature, relative humidity, concentrations of CO2, formaldehyde, NO2, and volatile organic compounds were performed during one week in January 2015 in 20 apartments in one multifamily building in Slovakia. Subjective evaluation of the indoor environment and occupant satisfaction using questionnaire has been also performed. The measurements were repeated in January 2016, after the building was energy-renovated. The renovation included thermal insulation of the façade. Natural ventilation was used in the building. Exhaust ventilation was present in bathrooms and toilets. No changes to the ventilation were done during renovation. After renovation, the ventilation rates in the apartments were significantly lower than before. Concentrations of formaldehyde, TVOC and certain individual VOCs were higher. The occupants indicated more dissatisfaction and a higher prevalence of some sick building syndrome symptoms after renovation. When residential buildings in central Europe are upgraded to more energy efficient ones, the retrofitting effort should include improved ventilation in order to ensure sufficient air exchange rates and acceptable and healthy IAQ. Without these considerations, energy reconstruction can adversely affect the quality of the indoor environment.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, SP Technical Research Institute of Sweden, Slovak University of Technology, Swedish Environmental Research Institute
Authors: Bekö, G. (Intern), Földváry, V. (Ekstern), Langer, S. (Ekstern), Arrhenius, K. (Ekstern)
Number of pages: 9
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the 5th International Conference on Human–Environment System
Article number: 20103
Main Research Area: Technical/natural sciences
Conference: 5th International Conference on Human-Environment System, Nagoya, Japan, 29/10/2016 - 29/10/2016

Indoor inhalation intake fractions of fine particulate matter: Review of influencing factors
Exposure to fine particulate matter (PM2.5) is a major contributor to the global human disease burden. The indoor environment is of particular importance when considering the health effects associated with PM2.5 exposures because people spend the majority of their time indoors and PM2.5 exposures per unit mass emitted indoors are two to three orders of magnitude larger than exposures to outdoor emissions. Variability in indoor PM2.5 intake fraction (iFin,total), which is defined as the integrated cumulative intake of PM2.5 per unit of emission, is driven by a combination of building-specific, human-specific, and pollutant-specific factors. Due to a limited availability of data characterizing these factors, however, indoor emissions and intake of PM2.5 are not commonly considered when evaluating the environmental performance of product life cycles. With the aim of addressing this barrier, a literature review was conducted and data characterizing factors influencing iFin,total were compiled. In addition to providing data for the calculation of iFin,total in various indoor environments and for a range geographic regions, this paper discusses remaining limitations to the incorporation of PM2.5-derived health impacts into life cycle assessments and makes recommendations regarding future research.

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General information
State: Published
Organisations: Department of Civil Engineering, Department of Management Engineering, Quantitative Sustainability Assessment, California Institute of Technology, Institute of Occupational Medicine, University of California at Davis, University of Michigan, Rutgers University, University of California, National Institute for Health and Welfare
Authors: Hodas, N. (Ekstern), Loh, M. (Ekstern), Shin, H. (Ekstern), Li, D. (Ekstern), Bennett, D. (Ekstern), McKone, T. E. (Ekstern), Jolliet, O. (Ekstern), Weschler, C. J. (Intern), Jantunen, M. J. (Ekstern), Lioy, P. (Ekstern), Fantke, P. (Intern)
Pages: 836-856
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Indoor Air
Volume: 26
Issue number: 6
ISSN (Print): 0905-6947
Ratings:
BFI (2018): BFI-level 2
Indoor-outdoor particle effects on health in middle-aged and elderly

A series of 5 studies in a total of 300 middle-aged and elderly individuals have related exposure to indoor and outdoor ultrafine and fine particles for 5-48 h to effects on vascular and lung function with possible explanatory inflammation and oxidative stress biomarkers. The data consistently support detrimental effect of UFP from traffic on vascular function. Indoor UFP and PM$_{2.5}$ might contribute to cardiovascular risk through endothelial damage and vascular dysfunction, respectively, whereas indoor UFP dominated by candle burning appears to have adverse lung effects. The biomarkers provided no mechanistic explanation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Copenhagen, Aarhus University
Authors: Karottki, D. G. (Ekstern), Bekö, G. (Intern), Hemmingsen, J. G. (Ekstern), Jantzen, K. (Ekstern), Clausen, G. (Intern), Sigsgaard, T. (Ekstern), Møller, P. (Ekstern), Loft, S. (Ekstern)
Number of pages: 2
Publication date: 2016

Indoor temperatures for calculating room heat loss and heating capacity of radiant heating systems combined with mechanical ventilation systems

In this study, a typical office room with a radiant heating system and a mechanical ventilation system was selected as the research subject. Indoor temperature formulas for calculating the room heat loss (including transmission heat loss and ventilation heat loss) and heating capacity of the hybrid system were determined according to the principle of heat transfer. A model to predict indoor temperatures in the room was proposed, and it was determined that the predicted indoor temperatures agreed well with the measured data. Qualitative analyses of the effects of heated surface temperature and air change rates on the indoor temperatures were performed using the proposed model. When heated surface temperatures and air change rates were from 21.0 to 29.0 degrees C and from 0.5 to 4.0 h$^{-1}$, the indoor temperatures for calculating the transmission heat loss and ventilation heat loss were between 20.0 and 20.3 degrees C and between 19.6 and 20.5 degrees C, respectively, and the indoor temperature for calculating the heating capacity of the hybrid system was between 18.2 and 19.8 degrees C. Accordingly, the relative calculation errors were between 0.3% and 0.5% and between -10.2% and 11.8% for calculating the transmission heat loss and ventilation heat loss, respectively, and between 16.0% and 17.4% for calculating the heating capacity of the hybrid system. Due to large relative calculation errors, it is necessary to consider the effect of heated surface and cool supply air on indoor temperatures for calculating ventilation heat loss and heating capacity of radiant heating systems combined with mechanical ventilation systems. (C) 2015 Elsevier B.V. All rights reserved.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Harbin Institute of Technology
Authors: Wu, X. (Ekstern), Olesen, B. W. (Intern), Fang, L. (Intern), Zhao, J. (Ekstern), Wang, F. (Ekstern)
Number of pages: 8
Pages: 141-148
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy and Buildings
Volume: 112
ISSN (Print): 0378-7788
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.506 SNIP 2.536 CiteScore 3.23
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.631 SNIP 2.081
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.564 SNIP 1.79
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.624 SNIP 2.028
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.033 SNIP 1.718
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.411 SNIP 1.788
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.293 SNIP 1.277
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.81 SNIP 1.628
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.567 SNIP 1.4
Scopus rating (2002): SJR 1.172 SNIP 1.631
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.942 SNIP 1.095
Scopus rating (2000): SJR 0.505 SNIP 1.226
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.25 SNIP 0.589
Original language: English
Radiant heating system, Mechanical ventilation system, Indoor temperature, Room heat loss, Heating capacity
DOIs:
10.1016/j.enbuild.2015.12.005
Source: FindIt
Source-ID: 2289792340
Publication: Research - peer-review › Journal article – Annual report year: 2016
Influence of heat cost allocation on occupants' control of indoor environment in 56 apartments: Studied with measurements, interviews and questionnaires

People who pay their energy bills individually based on meter readings tend to spend less energy than people who pay collectively e.g. based on floor areas. It has been hypothesised that these savings are an effect of lower indoor temperatures and ventilation rates during heating seasons. The aim of this paper was to study the indoor environment in buildings with collective and individual heat cost allocation plans, to investigate how the heat cost allocation influenced occupant behaviour and how occupants controlled the indoor environment.

The effects of the heat cost allocation type were studied by comparing indoor environmental measurements between two buildings: one with collective payment and one with individual payment. The measurements were collected at 5 min intervals at a central location in each of 56 apartments in Copenhagen, Denmark over a period of two months. Questionnaires and semi-structured interviews showed a strong influence of the heat cost allocation plan on the occupants' control strategies. Occupants whose heating bills were based on floor area focused on a healthy and comfortable indoor environment. Occupants whose heating bills were based on meter readings focused on energy conservation and heat cost savings at the expense of thermal comfort and air quality. The differences in average temperature, average CO2 concentration and average vapour pressure were 2.8 °C, 161 ppm, and 93 Pa, respectively between apartments with collective and individual heat cost allocation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Andersen, S. (Intern), Andersen, R. K. (Intern), Olesen, B. W. (Intern)
Number of pages: 8
Pages: 1-8
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Building and Environment
Volume: 101
ISSN (Print): 0360-1323
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 2.001
Web of Science (2010): Indexed yes
Influence of introduction of e-based distance learning on student experience and performance

A new project based course offered by Arctic Technology Centre, Department of Civil Engineering, Technical University of Denmark (DTU) and Department of Bioscience, Aarhus University in collaboration, targets students from the whole circumpolar area. It was developed over a three year period from being taught in class to being taught 100% online. We evaluated the results by analyzing the students' performance and experience of the course during the three years. The students' performance increased over the period of transforming the course. Multiple choice quizzes showed to be efficient tools for the students’ selfevaluation, while they did not contribute to their learning. Some contradiction between the group work format of the projects and the online teaching method was experienced by the students. Also student satisfaction decreased slightly - influenced by inconvenient features of the used learning management system, reduced instructor feedback and varying quality of the narration of the lecture videos.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aarhus University
Authors: Jensen, P. E. (Intern), Fritt-Rasmussen, J. (Ekstern)
Pages: 37-46
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the International RILEM Conference Materials, Systems and Structures in Civil Engineering 2016 : Segment on Innovation of Teaching in Materials and Structures
Publisher: Rilem publications
ISBN (Print): 978-2-35158-178-0
Main Research Area: Technical/natural sciences
Electronic versions:
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016
Influence of pH during chemical weathering of bricks: Long term exposure

Within the framework of environmental weathering of bricks in historical structures, this study focuses on new bricks currently employed for restoration projects. The bricks were subjected to an accelerated chemical weathering test by immersion in solutions with pH ranging from 3 to 13 for different lengths of time up to 432 days, data to 288 days are presented since the project is still ongoing. The study analyzed the changes of pH induced in the solutions by the presence of the bricks (this also served to adjust the pH to the intended value), as well as the concentration of various ions extracted from the bricks over time. As the bricks were taken out at the different times, their capillary absorption curves were determined, followed by a vacuum saturation with water for the determination of the open porosity, as well as the density. Finally, a 24 hour total immersion in water was also carried out proving to be practically the same as achieved after the capillary absorption rate stabilized after 6 hours in this test. The results obtained showed that the two main deterioration mechanisms are the ion-exchange at acid pH, and the alkaline corrosion undergone particularly at pH 13.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Smithsonian Institution
Authors: Rörg-Dalgaard, I. (Intern), Charola, A. E. (Ekstern)
Pages: 165-174
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the International RILEM Conference: Materials, Systems and Structures in Civil Engineering 2016 : Segment on Historical Masonry
Publisher: Rilem publications
ISBN (Print): 978-2-35158-178-0
Main Research Area: Technical/natural sciences
Electronic versions:
Influence_of_pH_during_chemical_weathering_of_bricks_long_term_exposure_IRD_and_AEC.pdf
Source: PublicationPreSubmission
Source-ID: 125897801
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Influence of the environmental parameters on nocturnal radiative cooling capacity of solar collectors

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Pean, T. Q. (Intern), Gennari, L. (Ekstern), Kazanci, O. B. (Intern), Bourdakis, E. (Intern), Olesen, B. W. (Intern)
Number of pages: 10
Publication date: 2016

Host publication information
Title of host publication: CLIMA 2016 - proceedings of the 12th REHVA World Congress
Place of publication: Aalborg, Danmark
Publisher: Aalborg University
ISBN (Print): 87-91606-36-5
BFI conference series: REHVA World Congress (5010061)
Main Research Area: Technical/natural sciences
Conference: 12th REHVA World Congress, Aalborg, Denmark, 22/05/2016 - 22/05/2016
Nocturnal radiative cooling, photovoltaic/thermal panels, Unglazed collector, Parametric analysis, Computational simulation
Electronic versions:
Pean_et_al_b_CLIMA2016.pdf
Source: PublicationPreSubmission
Source-ID: 124336515
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Information System Strategies in Facilities Management – Based on Five Process Studies

General information
Innovating a classic course in concrete structures
A large number of changes, new activities and approaches have been tested at DTU in the teaching of concrete structures: Use of mandatory assignments, handing out solutions before or after exercises, detailed or summary solutions, brush-up teaching materials, strengthened consistency in solutions, videolectures recorded from lectures or produced from Powerpoint, electric examples, inductive approach, repetition for reexams with or without lectures or supervisor or E-learning material, instruction videos for lab testing and many other things. The author will present his approaches and the resulting impact on the students learning – what worked very well and what had no effect. The author will also identify which of these activities, that can be implemented easily and have the largest effect - eventually with the inclusion of the students.

Integrating LCA and Risk Assessment for Decision Support
The study aims at developing a methodology using decision analysis theory and tools to find the optimal policy (or design) of the studied system, to ensure both sustainability and meanwhile manage risks.

General information
State: Published
Organisations: Department of Management Engineering, Section for Building Design, Management Science, Implementation and Performance Management, Centre for Facilities Management, Engineering Systems
Authors: Ebbesen, P. (Intern), Karlshøj, J. (Intern), Bonke, S. (Intern), Jensen, P. A. (Intern)
Pages: 37-55
Publication date: 2016

Host publication information
Title of host publication: Proceedings of CFM’s Second Nordic Conference: Facilities Management Research and Practice – Does FM Contribute to Happiness in the Nordic Countries
Publisher: Polyteknisk Boghandel og Forlag
Editor: Anker Jensen, P.
ISBN (Electronic): 9788750211044
Main Research Area: Technical/natural sciences
Electronic versions:
CFM_Nordic_Conference_2016_proceedings.pdf
Source: PublicationPreSubmission
Source-ID: 125713871
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Goltermann, P. (Intern)
Pages: 29-36
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the International RILEM Conference Materials, Systems and Structures in Civil Engineering 2016 : Segment on Innovation of Teaching in Materials and Structures
Publisher: Rilem publications
ISBN (Print): 978-2-35158-178-0
Main Research Area: Technical/natural sciences
Electronic versions:
Inno_inTeaching_conf_proceedings.pdf
Source: PublicationPreSubmission
Source-ID: 127049158
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

General information
State: Published
Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, Department of Civil Engineering, Section for Structural Engineering, Traffic modelling and planning
Authors: Dong, Y. (Intern), Miraglia, S. (Intern), Manzo, S. (Intern), Hauschild, M. Z. (Intern)
Number of pages: 1
Internal insulation applied in heritage multi-storey buildings with wooden beams embedded in solid masonry brick facades

The use of internal insulation is investigated in a heritage building block with wooden beam construction and masonry brick walls as part of an energy renovation. Measurements were carried out and compared to results from a hygrothermal simulation model. The risk of mould growth in the wooden beams and in the interface between the insulation and the brick wall was evaluated. Three different insulation strategies for applying internal insulation were investigated: 1) insulation applied on the entire interior facade; 2) 200 mm gap in the insulation above the floor; and 3) 200 mm gap in the insulation both above the floor and below the ceiling. The solution with a 200 mm gap in the insulation above and below the floor/ceiling showed that at low rain exposure coefficients (Catch Ratio, CR ≤ 0.1) and with wall orientations towards west, this solution can be moisture-safe. However, it not recommended to apply internal insulation on north-orientated walls, since the drying potential is reduced. Additionally, caution should be exercised also with west-orientated walls.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Harrestrup, M. (Intern), Svendsen, S. (Intern)
Number of pages: 14
Pages: 59-72
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Building and Environment
Volume: 99
ISSN (Print): 0360-1323
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Investigating the influence of cold climate conditions on structural dynamics

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Koss, H. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Paper – Annual report year: 2017

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General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Karlshøj, J. (Intern)
Publication date: 2016

Publication information
Original language: English
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 127792306
Publication: Research - peer-review › Book – Annual report year: 2016
Stachybotrys mycotoxins: from culture extracts to dust samples

The filamentous fungus Stachybotrys chartarum is known for its toxic metabolites and has been associated with serious health problems, including mycotoxicosis, among occupants of contaminated buildings. Here, we present results from a case study, where an ultra-high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) method was developed for known and tentatively identified compounds characterized via UHPLC-quadruple time-of-flight (QTOF) screening of fungal culture extracts, wall scrapings and reference standards. The UHPLC-MS/MS method was able to identify 12 Stachybotrys metabolites, of which four could be quantified based on authentic standards and a further six estimated based on similarity to authentic standards. Samples collected from walls contaminated by S. chartarum in a water-damaged building showed that the two known chemotypes, S and A, coexisted. More importantly, a link between mycotoxin concentrations found on contaminated surfaces and in settled dust was made. One dust sample, collected from a water-damaged room, contained 10 pg/cm² macrocyclic trichothecenes (roridin E). For the first time, more than one spirocyclic drimane was detected in dust. Spirocyclic drimanes were detected in all 11 analysed dust samples and in total amounted to 600 pg/cm² in the water-damaged room and 340 pg/cm² in rooms adjacent to the water-damaged area. Their wide distribution in detectable amounts in dust suggested they could be good candidates for exposure biomarkers.

General information
State: Published
Organisations: Department of Systems Biology, Metabolomics Platform, Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Dosen, I. (Intern), Andersen, B. (Intern), Phippen, C. (Intern), Clausen, G. (Intern), Nielsen, K. F. (Intern)
Number of pages: 14
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Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Analytical and Bioanalytical Chemistry
Volume: 408
ISSN (Print): 1618-2642
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.03 SJR 0.943 SNIP 1.039
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.064 SNIP 1.083 CiteScore 3.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.126 SNIP 1.222 CiteScore 3.26
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.229 SNIP 1.282 CiteScore 3.55
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.347 SNIP 1.282 CiteScore 3.51
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.363 SNIP 1.275 CiteScore 3.47
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.354 SNIP 1.236
Key figures for joint assessment of indoor environmental quality (IEQ) and energy consumption in modern buildings – a literature review

Energy efficiency in buildings should not be reached on the expense of indoor environmental quality (IEQ). This statement is often used in connection to design and certification of sustainable buildings. The fact that it is also valid during the actual operation seems to be often forgotten. Nodaway’s energy management and operational diagnostics focus mostly on energy consumption. Consequently also present key figures comprise performance indicators related to energy use. The fact that modern buildings are not spared from IEQ related problems indicates that there is a need for joint assessment of energy and IEQ performance. The aim of this paper was to review relevant literature to form a scientific background for development of key figures enabling the joint assessment of energy and IEQ. The review resulted in forty cited publications. Majority of them focused explicitly on energy performance and indoor environment was mentioned only marginally or was not mentioned at all. We can also conclude that energy related key figures are well established and used for standard energy management as well as in different optimization algorithms involving analysis of measurements and calibrated simulations. One publication was identified that integrates thermal comfort into broader matrix of key figures. Methods for long-term evaluation of IEQ indicators suggested by standard EN 15251 seems to be usable for determination of key figures for joint assessment. Further research is needed to determine and test key figures that would directly combine performance indicators related to both energy use and IEQ.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Technical University of Denmark, ENERGOCENTRUM PLUS
Authors: Tisov, A. (Ekstern), Siroky, J. (Ekstern), Kolarik, J. (Intern)
Number of pages: 10
Publication date: 2016

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Title of host publication: Proceedings of the 12th REHVA World Congress
BFI conference series: REHVA World Congress (5010061)
Main Research Area: Technical/natural sciences
Conference: 12th REHVA World Congress CLIMA 2016, Aalborg, Denmark, 22/05/2016 - 22/05/2016
Key figure, Performance indicator, Energy management, Indoor environmental quality, Operational diagnostics
Laboratory study on the cooling effect of flash water evaporative cooling technology for ventilation and air-conditioning of buildings

This paper presents a simple cooling technology using flash water evaporation. The technology combines a water atomizer with a plate heat exchanger used for heat recovery of a ventilation system. It is mainly used to cool the ventilation airflow from outdoors and is particularly suitable to be used in warm/hot and dry environment where dehumidification of outdoor air is not needed. A laboratory experiment was designed and conducted to evaluate the cooling effectiveness of this technology. The experiment was conducted in a twin-climate chamber. One chamber simulated warm/hot and dry outdoor environments and the other simulated an air-conditioned indoor environment. The flash water evaporation cooling device was installed in the chamber that simulated indoor environment. The air from the chamber simulating outdoor environment was introduced into the cooling device and cooled by the flash water evaporation. Two outdoor summer climates were simulated in the study, i.e. the design summer climate of Las Vegas and the extreme summer climate of Copenhagen represented hot/dry and warm/dry climates. The results showed that the flash evaporative cooling technology, a simple and green cooling technology, is effective for ventilation and air-conditioning in warm/hot and dry climate zones. The technology can provide fresh outdoor air with a temperature of 4 to 7 °C lower than room air temperature.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Shanghai Research Institute of Building Sciences, Technical University of Denmark
Authors: Fang, L. (Intern), Yuan, S. (Ekstern), Yang, J. (Ekstern)
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the 9th international conference on indoor air quality, ventilation & energy conservation in buildings
Main Research Area: Technical/natural sciences
Indirect evaporative cooling, Heat recovery, Water atomizer, Ventilation
Electronic versions:

Laboratory Testing of Solar Combi System with Compact Long Term PCM Heat Storage

To enable the transition from fossil fuels as a primary heat source for domestic hot water preparation and space heating solar thermal energy has great potential. The heat from the sun has the disadvantage that it is not always available when there is a demand. To solve this mismatch a thermal seasonal storage can be used to store excess heat from the summer to the winter when the demand is higher than the supply. Installing a long term thermal storage in a one family house it needs to be compact and sensible heat storages are not suitable. A latent heat storage with a phase change material (PCM) can provide a more compact way of storing heat. Sodium acetate trihydrate (SAT) is a good candidate material as it has a relatively high heat of fusion and in addition it has the ability to supercool to room temperature without solidifying. In this paper results from the test of a solar combi system with a latent heat storage with SAT is presented. The SAT heat storage modules were heated to 80 °C by the solar collectors 53 times in the test period from June to November 2015 and this enabled the modules to supercool. Supercooling was achieved for 39 days for a SAT module after which 11 kWh of heat were discharged.

General information
State: Published
Organisations: Section for Building Energy , Department of Civil Engineering
Number of pages: 8
Pages: 330-337
Publication date: 2016

Host publication information
Laboratory Test of a Cylindrical Heat Storage Module with Water and Sodium Acetate Trihydrate

Cylindrical heat storage modules with internal heat exchangers have been tested in a laboratory. The modules were filled with water and sodium acetate trihydrate with additives. The testing focused on the heat content of the storage material and the heat exchange capacity rate during charge of the module. For the tests with the phase change materials, the focus was furthermore on the stability of supercooling and cycling stability. Testing the module with sodium acetate trihydrate and 6.4% extra water showed that phase separation increased and the heat released after solidification of supercooled phase change material was reduced over 17 test cycles. The heat released after solidification of the supercooled sodium acetate trihydrate with thickening agent and graphite was stable over the test cycles. Stable supercooling was obtained in 7 out of 17 test cycles with the module with sodium acetate trihydrate with extra water and in 6 out of 35 test cycles for the module with thickening agent.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Department of Buildings and Energy
Authors: Dannemand, M. (Intern), Kong, W. (Intern), Johansen, J. B. (Intern), Furbo, S. (Intern)
Pages: 122-127
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Procedia
Volume: 91
ISSN (Print): 1876-6102
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.425 SNIP 0.563 CiteScore 1.08
Large-scale CO₂ measurement campaigns in Danish schools

In two large measurement campaigns performed in 2009 and 2014 more than 1500 spot measurements of CO₂ were made by pupils in Danish primary school classes. In 2009 56% of the measurements exceeded the recommended value of 1000 ppm CO₂. This percentage had increased to 60% in 2014. Changing the behaviour of the pupils had a positive effect, as the proportion of classrooms exceeding 1000 ppm CO₂ in separate measurement (students outside and airing in the break preceding the measurement lesson in which the measurement was made) was 39%. The principle of ventilation had a substantial impact on the measured CO₂ concentrations. In 80% of the classrooms with natural ventilation the concentration of CO₂ exceeded 1000 ppm, while the fraction was 40% in classrooms with balanced mechanical ventilation.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Clausen, G. (Intern), Toftum, J. (Intern), Bekö, G. (Intern)
Number of pages: 2
Publication date: 2016
Letbetonkonstruktioner

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Goltermann, P. (Intern)
Publication date: 2016

Host publication information
Title of host publication: Teknisk Ståbi
Publisher: Nyt Teknisk Forlag
Edition: 24
ISBN (Print): 9788757126772
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 127569532
Publication: Education › Book chapter – Annual report year: 2016

Life cycle assessment of soil and groundwater remediation: Groundwater impacts of electrokinetic remediation

General information
State: Published
Organisations: Department of Civil Engineering, Universidade do Algarve, Escola Superior Agrária de Coimbra, Universidade Nova de Lisboa
Authors: Nunes, L. M. (Ekstern), Caseiro Rec Gomes, H. I. (Intern), Teixeira, M. R. (Ekstern), Dias-Ferreira, C. (Ekstern), Ribeiro, A. B. (Ekstern)
Number of pages: 30
Pages: 173-202
Publication date: 2016

Host publication information
Title of host publication: Electrokinetics Across Disciplines and Continents : New Strategies for Sustainable Development
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ISBN (Print): 978-3-319-20178-8
ISBN (Electronic): 978-3-319-20179-5
Chapter: 10
Series: Electrokinetics Across Disciplines and Continents: New Strategies for Sustainable Development
Main Research Area: Technical/natural sciences
DOI:
10.1007/978-3-319-20179-5_10
Source: FindIt
Source-ID: 2291876414
Publication: Research - peer-review › Book chapter – Annual report year: 2016

Linear epitope mapping of peanut allergens demonstrates individualized and persistent antibody-binding patterns

General information
State: Published
Organisations: Department of Civil Engineering, Department of Micro- and Nanotechnology, Fluidic Array Systems and Technology, National Food Institute, Research Group for Gut Microbiology and Immunology, Technical University of Denmark, Roche NimbleGen, Medical University of Vienna, Medical University of Vienna, Universidad Nacional de San Martin
Authors: Hansen, C. S. (Intern), Dufva, M. (Intern), Bøgh, K. L. (Intern), Sullivan, E. (Ekstern), Patel, J. (Ekstern), Eiwegger, T. (Ekstern), Szépfalusi, Z. (Ekstern), Nielsen, M. (Ekstern), Christiansen, A. (Intern)
Pages: 1728-1730
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Living Labs – From scientific labs to the smart city
Research laboratories are characterized by the fact that the experiments are carried out under very well controlled conditions. In some research fields, field trials are a well-established methodology where many of the parameters involved
are not controlled by the researchers in their experiments. Living Labs can be compared with these field tests, trials and setups. However control of parameters is often not possible in living lab trials and experiments. Data collection is one of the important subjects and tasks in such research. Often, the researchers and research communities are part of these living labs. Hereby the scientific approach has to be carefully evaluated and methods adjusted accordingly.

Examples of living labs can be found across DTU. A very small living lab is made at the Library where a lighting system is established that can be influenced by students and researches through open interfaces. The basic idea is to enable innovators to perform their developments and research in this real world setup and learn to define solutions that are applicable there.

On a larger scale, DTU is promoting the whole campus as a living lab that can be used for research and development by its employees, but also partners from outside. This proposition can be found under the term “Smart Campus” with it’s own homepage. Here you find the example from the library above, the Smart Avenue that enables communication and IT solutions on the campus, enabled through intelligent street lightning that in the same time is part of the Doll Living Lab setup placed in the area.

Lyngby Smart City is a living lab approach facilitated by the City of Knowledge. Together with the labs presented above, we find a direct chain from scientific research labs at DTU over the campus lab, out into the real world living labs near Lyngby and from there into the big smart city of Copenhagen to be promoted to the world markets. This way the value chain “from research to invoice” is instantiated into not only an innovation and business strategy, but rather a research strategy that aims at elevating DTU’s research to an even more leading international position.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Heller, A. (Intern)
Number of pages: 1
Publication date: 2016
Main Research Area: Technical/natural sciences
Links:
http://www.sustain.dtu.dk/

Bibliographical note
Sustain Abstract L-2
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Load carrying capacity of shear wall t-connections reinforced with high strength wire ropes
Traditionally, U-bar loop connections with keyed joints have been used in vertical shear connections between precast concrete wall elements. However, in the recent years, connections with looped high strength wire ropes instead of U-bar loops have proven to be a much more construction-friendly solution. The wire ropes have no bending stiffness and therefore allow for an easier vertical installation of the wall elements. During the last 10 – 15 years, a number of shear tests on plane wire rope connections have been carried out. However, to the best knowledge of the authors, tests on wire rope connections for assembly of precast elements in different planes, such as T- and L-connections, have not yet been published. This paper presents the results of a large test series recently conducted at the University of Southern Denmark to study the shear behaviour of high strength wire rope T-connections grouted with mortar. The test results are evaluated based on the experiences gained from test and modelling of similar plane connections. It is found that T-connections, in contrast to the plane connections, are more prone to fail by rupture of the brittle wire ropes rather than crushing of the joint mortar. Even so, it is found that a ductile post peak response can be obtained for T-connections, especially when so-called double wire boxes are used.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, University of Southern Denmark
Authors: Jørgensen, H. B. (Ekstern), Bryndom, T. (Ekstern), Larsen, M. (Ekstern), Hoang, L. C. (Intern)
Number of pages: 11
Publication date: 2016

Host publication information
Title of host publication: fib Symposium 2016: Performance-based approaches for concrete structures : Proceedings
Main Research Area: Technical/natural sciences
Precast concrete elements, Shear connections, Wire rope loops, Mortar connections
Electronic versions:
Joergensen_et_al_fib_CapTown2016.pdf
Lokalmiljøet omkring stationen: Sammenhængen mellem oplevet tryghed og brugen af kollektiv transport

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Strandbygaard, S. K. (Intern)
Number of pages: 5
Publication date: 2016
Conference: Trafikdage på Aalborg Universitet 2015, Aalborg, Denmark, 24/08/2015 - 24/08/2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Selected Proceedings from the Annual Transport Conference at Aalborg University
Volume: 2015
ISSN (Print): 1603-9696
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
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BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Original language: English
Electronic versions:
Trafikdage_Aalborg_Udvidet_resume_Lokalmilj_et_omkring_stationen_Sammenh_ngen_mellem_oplevet_tryghed_og_bru_gen_af_kollektiv_transport_1.pdf
Source: PublicationPreSubmission
Source-ID: 127800628
Publication: Research - peer-review » Article in proceedings – Annual report year: 2016

Low field NMR surface relaxivity studies of chalk and argillaceous sandstones

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Haldor Topsoe AS
Authors: Katika, K. (Intern), Fordsmand, H. (Ekstern), Fabricius, I. L. (Intern)
Publication date: 2016

Host publication information
Title of host publication: 13th International Bologna Conference on Magnetic Resonance in Porous Media : Book of Abstracts
Article number: 028
Main Research Area: Technical/natural sciences
Electronic versions:
Katika_et_al_16.pdf
Source: PublicationPreSubmission
Low Temperature District Heating for Future Energy Systems: Subtask D: Case studies and demonstrations

This report titled “Case studies and demonstrations” is the subtask D report of the IEA DHC|CHP Annex TS1 project “Low Temperature District Heating for Future Energy Systems” carried out between 2013 and 2016. The project was led by Fraunhofer Institute for Building Physics (IBP) with the other participants being VTT Technical Research Centre of Finland (VTT), Technical University of Denmark (DTU), Norwegian University of Science and Technology (NTNU), Stuttgart Technology University of Applied Sciences (HFT) and SSE Enterprise in United Kingdom. The demonstration cases described in the report include examples on low temperature district heating systems, solar heating in a district heating system, heat pump based heat supply and energy storages for both peak load management and for seasonal heat storage. Some demonstrations have been implemented while others are at planning phase. The implemented cases have provided measurement data for the verification of different calculation tools and analysis while the projects in planning phase have benefited on simulation results on operation of a realised system. The collaboration group would like to thank the partners for the cooperation making the presentation of the case studies possible in this report.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, SSE Enterprise, Hochschule fur Technik Stuttgart - University of Applied Sciences Stuttgart, VTT - Technical Research Centre of Finland, Fraunhofer Institute for Wind Energy and Energy System Technology (IWES), Norwegian University of Science and Technology
Number of pages: 45
Publication date: 2016

Publication information
Publisher: International Energy Agency
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
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Source-ID: 142179725
Publication: Research › Report – Annual report year: 2017

Low Temperature Heating and High Temperature Cooling In Buildings

A heating and cooling system could be divided into three parts: terminal units (emission system), distribution system, and heating and cooling plant (generation system). The choice of terminal unit directly affects the energy performance, and the indoor environment in that space. Therefore, a holistic system evaluation is necessary to ensure an optimal indoor environment for the occupants and to achieve energy efficiency simultaneously. Low temperature heating and high temperature cooling systems are one of the possible approaches to heat or cool indoor spaces in buildings.

In this thesis, a single-family house designed for plus-energy targets and equipped with a radiant water-based floor heating and cooling system was studied by means of full-scale measurements, dynamic building simulations and thermodynamic evaluation tools. Thermal indoor environment and energy performance of the house were monitored for one year while different control strategies were tested. Theoretical analyses consisted of comparing the performance of different heating and cooling systems using energy, exergy, and entransy methods under steady-state conditions. Dynamic simulations were used to study the energy performance of heating and cooling systems for achieving the same thermal indoor environment.

The results show that it is crucial to minimize the heating and cooling demands in the design phase since these demands determine the terminal units and heat sources and sinks that could be used. Low temperature heating and high temperature cooling systems (a radiant water-based floor heating and cooling system in this study) proved to be superior to compared systems, evaluated with different system analysis tools; energy, exergy, and entransy.

Radiant systems should be coupled to appropriate heating and cooling sources, and energy requirements of auxiliary components (pumps, fans, etc.) should be minimized. Radiant systems could be coupled to renewable heat sources and sinks (e.g. ground), which would result in considerable energy savings. Water-based heating and cooling systems require considerably less auxiliary energy compared to air-based systems. Exergy analysis can be used to optimize a system holistically where different quality energy forms, such as electricity and heat, are used.

Control of the radiant system and its interaction with the ventilation system are critical for an optimized operation. Measurements, simulations, and calculations proved that a system in which the radiant system heats or cools the space and the ventilation system only provides the required amount of fresh air for indoor air quality concerns is the optimal solution. Application of radiant floor heating is particularly beneficial in high-ceilinged spaces, as it can provide a uniform temperature distribution and decrease heat losses due to thermal stratification.
To obtain the most rational use of available resources, energy analysis alone is not sufficient. It is not enough to consider only the quantity of energy; the temperatures and temperature differences within a system should also be considered. Although a single-family house was used for evaluations in this thesis, the results and developed calculation methodologies can be applied to a wider range of buildings using similar heating and cooling systems.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Energy
Authors: Kazanci, O. B. (Intern), Olesen, B. W. (Intern), Kolarik, J. (Intern)
Number of pages: 230
Publication date: 2016

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Publisher: Technical University of Denmark, Department of Civil Engineering
ISBN (Print): 9788778774491
Original language: English
Series: B Y G D T U. Rapport
Number: R-356
ISSN: 1601-2917
Main Research Area: Technical/natural sciences
Electronic versions:
Thesis_til_orbit.pdf

Relations
Projects:
Low Temperature Heating and High Temperature Cooling in Buildings
Publication: Research › Ph.D. thesis – Annual report year: 2016

Magnesium-oxide boards cause moisture damage inside facades in new Danish buildings
Magnesium oxide board, “MgO-board”, is a factory-made sheathing board product, which has been widely used in the last 5 years in ventilated facades on new or renovated buildings in Denmark. In winter 2014/15, a number of problems began to appear with these boards since the boards and adjoining building elements seemed to suffer from some sort of disease, which manifested itself by damages such as significant moisture, boards leaking salty water (‘tears’), corrosion of fittings and anchors and mould growth.
The damages were caused by the fact that MgO-boards absorb moisture from outside air in periods with high outdoor humidity (90-100% RH) and form water drops on the surfaces. The drops contain a high amount of soluble chloride ions
and appear on the surfaces of the boards and may often run down the boards and to adjacent structures. Metal fixtures for the MgO-and siding boards may corrode heavily within a few years. The binder in MgO-boards is formed by chemical reaction between MgO and MgCl₂, known as magnesium oxychloride cement or Sorel cement. Also organic matter can be found in the material. The paper presents results of investigations of properties for moisture ab- and desorption curves and transport of MgO-boards.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Indoor Climate and Building Physics, Bunch Building Physics ApS
Authors: Hansen, K. K. (Intern), Bunch-Nielsen, T. (Ekstern), Greik, B. (Intern), Rode, C. (Intern)
Pages: 151-161
Publication date: 2016

Host publication information
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Publisher: Rilem publications
ISBN (Print): 978-2-35158-178-0
Main Research Area: Technical/natural sciences
Electronic versions:
Pages_from_Moisture_conf_proceedings.pdf
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Managed airing behaviour and the effect on pupil perceptions and indoor climate in classrooms
An intervention study with four different scenarios for airing classrooms were carried out in a school where manual opening of windows was the main source of ventilation. Two scenarios included a visual CO2 display unit to signal to the pupils and teachers when to open windows. The other two scenarios used two different window opening schedules. Measurements of CO2, temperature and periods with open windows were recorded, and pupils expressed their perception of the indoor environment in the classroom. With a visual CO2 display unit in the classroom, pupils were able to modify their behavior and reduce by approximately 40-60% the duration when the CO2 concentration was above 1000 ppm. With only scheduled window opening, a similar improvement was not observed. Although not significant, pupils’ perception of the air quality seemed better when the intervention was running, but they also perceived the temperature as being colder.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Sweco Denmark Inc., DEAS
Authors: Toftum, J. (Intern), Wohlgemuth, M. M. (Ekstern), Christensen, U. S. (Ekstern), Bekö, G. (Intern), Clausen, G. (Intern)
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of Indoor Air 2016
Article number: 500
BFI conference series: International Conference on Indoor Air Quality and Climate (5010063)
Main Research Area: Technical/natural sciences
Conference: 14th international conference on Indoor Air Quality and Climate, Ghent, Belgium, 03/07/2016 - 03/07/2016
School environment, Ventilation, CO2, Intervention
Source: PublicationPreSubmission
Source-ID: 125224068
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

Mapping one year's design processes at an architecture firm specialized in sustainable architecture- How do sustainability certification systems affect design processes?
The current study mapped how a Danish architecture firm integrated sustainability in their projects over a year. All the projects concerned were aimed at being sustainable within the framework of the DGNB certification system. The focus of DGNB is equally divided between environmental, economic and social aspects. During the mapping process, a picture was drawn of the state of the art for integrating DGNB in design processes and of the challenges involved. Case studies formed the basis of the study and helped substantiate the complexity of integrating DGNB’s criteria as design parameters in practice.
The framework for the study is the increased focus in recent decades on minimizing the energy consumption used for
operating buildings, because the building industry accounts for 40% of the total energy consumption in the EU. This focus has led to more optimized design processes within the framework of the Integrated Energy Design (IED) method, in which many decisions related to indoor climate and energy consumption are made in the early stages of the design process and have therefore become an important design factor for both architects and engineers. The tendency is now to widen the perspective to design decisions in all phases of the entire lifecycle of a building. Life Cycle Assessment (LCA) moves to the fore in the design process to make it possible to meet the overall purpose of reducing CO₂ emissions and the general environmental impact of the entire building industry.

**General information**
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Organisations: Department of Civil Engineering, Section for Building Design, Section for Building Energy, JJW Arkitekter, Danske Arkitektvirkomsheder
Authors: Landgren, M. (Ekstern), Jensen, L. B. (Intern), Heller, A. (Intern), Kiesslinger, J. (Ekstern), Hornbek, O. (Ekstern), Sattrup, P. (Ekstern)
Pages: 423-434
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Main Research Area: Technical/natural sciences
Conference: International Conference on Integrated Design, Bath, United Kingdom, 29/06/2016 - 29/06/2016
Source: PublicationPreSubmission
Source-ID: 127782465
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

**Mapping one year's design processes at an architecture firm specialized in sustainable architecture - How do sustainability certification systems affect design processes?**

**General information**
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Section for Building Energy
Authors: Landgren, M. (Intern), Jensen, L. B. (Intern), Heller, A. (Intern), Kiesslinger, J. (Ekstern), Hornbek, O. (Ekstern), Sattrup, P. A. (Intern)
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**Materials, Systems and Structures in Civil Engineering 2016 – Post event description of MSSCE2016 and the RILEM week 2016**

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Authors: Jensen, O. M. (Intern)
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Source-ID: 127670362
Publication: Communication › Report – Annual report year: 2016

**Measurements of Dermal and Oral Emissions from Humans**
Human related pollutants (bioeffluents) emitted through skin and via exhaled breath were measured. Two climate chambers were connected via flexible ducts. The ducts were in one chamber attached to a breathing mask, through which five subjects exhaled on one occasion the air into the other chamber: Human bioeffluents emitted orally were in this way
isolated from those that were emitted dermally. On another occasion, the subjects exhaled the air into the chamber where they were sitting, thus exposure contained oral and dermal bioeffluents. Another twenty subjects assessed the air quality in the chambers. They judged the air quality in the chamber with dermal bioeffluents to be lower than in the one containing orally exhaled bioeffluents, and similar to the air quality in the chamber with all bioeffluents. The chemical compounds with slightly elevated concentrations differed between the two chambers.

**Measurements of dermal uptake of nicotine directly from air and clothing**

Dermal uptake directly from air is a significant contributor to total exposure for certain organic compounds, and has been recently experimentally verified for two phthalates. The objective of the current study was to investigate whether airborne nicotine can be dermally absorbed. Two bare-skinned subjects together with a subject wearing clean clothes were dermally exposed to environmental tobacco smoke (ETS) for three hours in a climate chamber; during the exposure all three subjects breathed clean air through hoods covering their heads. The clothed subject later repeated his exposure wearing a shirt previously exposed to tobacco smoke. Urine samples were subsequently analyzed for nicotine and two of its metabolites. The results demonstrate that nicotine can be dermally absorbed directly from air at rates comparable to passive smoking. Wearing clean clothes significantly decreases uptake, while wearing exposed clothes results in substantial uptake.

**Measurements of Dermal Uptake of Nicotine Directly from Air and Clothing**

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark, Aarhus University, Waseda University
Authors: Tsushima, S. (Ekstern), Bekö, G. (Intern), Bossi, R. (Ekstern), Tanabe, S. (Ekstern), Wargocki, P. (Intern)
Number of pages: 2
Publication date: 2016

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Human bioeffluents, Perceived air quality, Sensory assessment, Chemical analysis

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Missouri University of Science and Technology
Authors: Bekö, G. (Intern), Morrison, G. C. (Ekstern), Weschler, C. J. (Intern), Koch, H. M. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
Number of pages: 2
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BFI conference series: International Conference on Indoor Air Quality and Climate (5010063)
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Exposure Pathway, Biomonitoring, Indoor Environment, E-cigarettes

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Missouri University of Science and Technology

**Measurements of Dermal Uptake of Nicotine Directly from Air and Clothing**

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Missouri University of Science and Technology
Measuring the effects of using ICT/BIM in construction projects

This paper focuses on presenting part of the findings from a research project completed in the period of 2009-2013. The research project was funded by the Danish Building & Property Agency with the primary aim to identify and measure the economic effects of using ICT/BIM in construction projects. Firstly, this paper presents a conceptual evaluation method developed in order to define and describe how case studies focusing on use of ICT/BIM in construction projects could be completed in order to measure (both quantitatively and qualitatively) the effects achieved from using ICT/BIM in construction projects. In this context effects are defined both as tangible and intangible effects (both economically and non-economically) directly and/or indirectly as a consequence of using ICT/BIM in construction projects. Secondly, the paper presents and analyses findings achieved from completing four case studies in Denmark, with focus on the method and how it effectively can be used to complete case studies documenting the effects of using ICT/BIM in construction projects. The case studies completed involved construction projects in which the participating companies were client consultants, architects, consulting engineers or contractors. Participating companies were of different sizes and construction projects were at different stages, including the design, construction and operation stage. The findings presented in the paper are firstly that using the developed evaluation method to document the effects of using ICT/BIM in construction projects requires extensive efforts in documenting and tracing the contextual conditions for achieving the effects in order to fully understand the value of using ICT/BIM in construction projects. Secondly, the findings indicate that using ICT/BIM in construction projects has a significant impact on the processes completed in both design and construction and that an advanced field-study approach is necessary in order to be able to measure the effects.

Mercury Levels In Fly Ash And Apc Residue From Municipal Solid Waste Incineration Before And After Electrodiaylytic Remediation

Fly ash (FA) and Air Pollution Control (APC) residues collected from three municipal solid waste incinerators (MSWI) in Denmark and Greenland were treated by electrodialytic remediation at pilot scale for 8 to 10 h. The original residues and the treated material were analysed for mercury (Hg) in order to assess the influence of the electrodialytic treatment on the concentrations of this element. Mercury levels varied with the MSWI residue, ranging from 0.41 mg kg⁻¹ in FA sample from electrostatic precipitator (ESP) to 8.38 mg kg⁻¹ in MSWI residues from a semi-dry system with lime and activated carbon. Two distinct behaviours were observed for mercury as a result of the electrodialytic treatment. This element became enriched in the MSWI residues from the semi-dry system with activated carbon, whereas it decreased in ESP’s and cyclone’s FA. This work presents for the first time information about the effect of electrodialytic treatment on mercury levels and discusses the valorisation options for these MSWI residues.
Method for reducing excess heat supply experienced in typical Chinese district heating systems by achieving hydraulic balance and improving indoor air temperature control at the building level

A common problem with Chinese district heating systems is that they supply more heat than the actual heat demand. The reason for this excess heat supply is the general failure to use control devices to adjust the indoor temperature and flow in the building heating systems in accordance with the actual heat demand. This results in 15-30% of the total supplied heat being lost. This paper proposes an integrated approach that aims to reduce the excess heat loss by introducing pre-set thermostatic radiator valves combined with automatic balancing valves. Those devices establish hydraulic balance, and stabilize indoor temperatures. The feasibility and the energy consumption reduction of this approach were verified by means of simulation and a field test. By moving the system from centrally planned heat delivery to demand-driven heat delivery, excess heat loss can be significantly reduced. Results show that once the hydraulic balance is achieved and indoor temperatures are controlled with this integrated approach, 17% heat savings and 42.8% pump electricity savings can be achieved. The energy savings will also have a positive environmental effect with seasonal reductions of 11 kg CO₂, 0.1 kg SO₂, and 0.03 kg NOx per heating square meter for a typical case in Harbin.
Method to investigate and plan the application of low temperature district heating to existing hydraulic radiator systems in existing buildings

This study presents a method to adapt existing hydronic systems in buildings to take advantage of low temperature district heating (LTDH). Plate radiators connected to double string heating circuits were considered in an optimization procedure, based on supply and return temperatures, to obtain the required logarithmic mean temperature difference (LMTD) for a low temperature heating system. The results of the analysis are presented as the average reduction of LMTD over the heating season compared to the base case design conditions. Two scenarios were investigated based on the assumption of a likely cost reduction in the end users' energy bills of 1% for each 1 °C reduction of return and average supply and return temperatures. The results showed possible discounts of 14% and 16% respectively, due to more efficient operation of the radiators. These were achieved without any intervention in the thermal envelope or to the heating systems, through simply adjusting the temperatures according to demand and properly controlling the plate radiators with thermostatic radiator valves (TRVs).

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State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, University of Nottingham
Authors: Tunzi, M. (Ekstern), Østergaard, D. S. (Intern), Svendsen, S. (Intern), Boukhanouf, R. (Ekstern), Cooper, E. (Ekstern)
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Scopus rating (2016): CiteScore 5.17 SJR 1.999 SNIP 1.798
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.647 SNIP 2.63 CiteScore 5.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Modeling energy flexibility of low energy buildings utilizing thermal mass

In the future energy system a considerable increase in the penetration of renewable energy is expected, challenging the stability of the system, as both production and consumption will have fluctuating patterns. Hence, the concept of energy flexibility will be necessary in order for the consumption to match the production patterns, shifting demand from on-peak hours to off-peak hours. Buildings could act as flexibility suppliers to the energy system, through load shifting potential, provided that the large thermal mass of the building stock could be utilized for energy storage. In the present study the load shifting potential of an apartment of a low energy building in Copenhagen is assessed, utilizing the heat storage capacity of the thermal mass when the heating system is switched off for relieving the energy system. It is shown that when using a 4-hour preheating period before switching off the heating system, the thermal mass of the building releases sufficient heat to maintain the operative temperature above 20°C for 15 hours. This potential increases with longer preheating period. The thermal behaviour of the external envelope and internal walls is examined, identifying the heat losses of the external envelope and the thermal capacity of the internal walls as the main parameters that affect the load shifting potential of the apartment.
Modelling and multi-scenario analysis for electric heat tracing system combined with low temperature district heating for domestic hot water supply

Low temperature district heating (LTDH) is a cost-efficient way of supplying space heating and domestic hot water (DHW) for buildings in urban areas. However, there is concern that the potential hygiene problems (Legionella) might occur if LTDH is implemented, especially for large buildings. In this study, electric heat tracing system was investigated as a solution to this dilemma. A model of electric heat tracing system for multi-storey buildings was built. Various pipe materials and insulation thicknesses as the parameters of the model were compared to make a comprehensive study. The performance of the electric heating tracing system with LTDH was simulated by taking the user pattern into account. A smart control method based on thermostatic and real-time control was developed, and compared with normal control method. The impact of user pattern was tested by applying standard, stochastic, and real load profiles to the model. The energy and economy performances of electric heat tracing system in different scenarios were simulated by Matlab. The results were compared to the conventional circulation system with the current generation district heating. The electric heat tracing system with LTDH showed good performance on heat loss saving, and it also gave benefits to district heating network by sharing part of the heating load.
Modelling diversity in building occupant behaviour: a novel statistical approach

We propose an advanced modelling framework to predict the scope and effects of behavioural diversity regarding building occupant actions on window openings, shading devices and lighting. We develop a statistical approach based on generalised linear mixed models to account for the longitudinal nature of observations on occupants, and to provide a coherent method to capture observed variability amongst occupant/room pairings through built-in probabilistic terms describing occupant diversity in a tractable manner within building energy simulation. The contribution of the proposed method is demonstrated using collected behavioural data from three long-term monitoring campaigns (an office building in Switzerland and residential units in Germany and Denmark).

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Gartenmann Engineering SA, RWTH Aachen University
Authors: Haldi, F. (Ekstern), Calì, D. (Intern), Andersen, R. K. (Intern), Wesseling, M. (Ekstern), Müller, D. (Ekstern)
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Scopus rating (2016): CiteScore 1.96 SJR 0.894 SNIP 1.287
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.2 SNIP 1.566 CiteScore 2.27
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.285 SNIP 1.679 CiteScore 2.31
Modelling glacier-bed overdeepenings and possible future lakes for the glaciers in the Himalaya-Karakoram region

Surface digital elevation models (DEMs) and slope-related estimates of glacier thickness enable modelling of glacier-bed topographies over large ice-covered areas. Due to the erosive power of glaciers, such bed topographies can contain numerous overdeepenings, which when exposed following glacier retreat may fill with water and form new lakes. In this study, the bed overdeepenings for ~28000 glaciers (40 775km2) of the Himalaya-Karakoram region are modelled using GlabTop2 (Glacier Bed Topography model version 2), in which ice thickness is inferred from surface slope by parameterizing basal shear stress as a function of elevation range for each glacier. The modelled ice thicknesses are uncertain (±30%), but spatial patterns of ice thickness and bed elevation primarily depend on surface slopes as derived from the DEM and, hence, are more robust. About 16 000 overdeepenings larger than 104m2 were detected in the modelled glacier beds, covering an area of ~2200 km2 and having a volume of ~120 km3 (3-4% of present-day glacier volume). About 5000 of these overdeepenings (1800 km2) have a volume larger than 106m3. The results presented here are useful for anticipating landscape evolution and potential future lake formation with associated opportunities (tourism, hydropower) and risks (lake outbursts).
Moisture-induced stresses in glulam frames

Wood is a hygroscopic and moisture-sensitive material that seeks to achieve equilibrium moisture content (EMC) with its surrounding environment. For softwood timber structures exposed to variations in climate throughout their service life, this behaviour results in variable moisture-content gradients that cause moisture-induced stresses in the direction of and perpendicular to the fibres. Although Eurocode 5 (EC5) states that moisture-induced stresses should be considered, they are often not adequately dealt with in building design due to the difficulties in predicting the stresses involved by hand. Accordingly, there is a need for advanced computer tools to study how the long-term stress behaviour of timber structures is affected by creep and cyclic variations in climate. A beam model to simulate the overall hygro-mechanical and visco-elastic behaviour of (inhomogeneous) glulam structures is presented. A two-dimensional transient, non-linear moisture transport model for wood is also developed and linked with this beam model. The combined models are used to study the long-term deformations and stresses in a curved frame structure exposed to both mechanical loading and cyclic climate...
conditions. It is shown that the moisture-induced deformations and stresses are of such magnitude that the design codes employed should take them into account. Thus it is argued that climate-related loads should be treated as separate load contributions that can be included in different load combinations.

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- **Organisations:** Department of Civil Engineering, Linnaeus University
- **Authors:** Ormarsson, S. (Ekstern), Gislason, O. V. (Intern)
- **Number of pages:** 12
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  - BFI (2016): BFI-level 1
  - Scopus rating (2016): SJR 0.547 SNIP 1.056 CiteScore 1.5
  - Web of Science (2016): Indexed yes
  - BFI (2015): BFI-level 1
  - Scopus rating (2015): SJR 0.566 SNIP 1.056 CiteScore 1.05
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 1
  - Scopus rating (2014): SJR 0.724 SNIP 1.391 CiteScore 1.21
  - BFI (2013): BFI-level 1
  - Scopus rating (2013): SJR 0.579 SNIP 1.385 CiteScore 1.25
  - ISI indexed (2013): ISI indexed yes
  - BFI (2012): BFI-level 1
  - Scopus rating (2012): SJR 0.607 SNIP 1.279 CiteScore 0.87
  - ISI indexed (2012): ISI indexed yes
  - BFI (2011): BFI-level 1
  - Scopus rating (2011): SJR 0.519 SNIP 1.13 CiteScore 0.92
  - ISI indexed (2011): ISI indexed yes
  - BFI (2010): BFI-level 1
  - Scopus rating (2010): SJR 0.874 SNIP 1.419
  - BFI (2009): BFI-level 1
  - Scopus rating (2009): SJR 0.944 SNIP 1.248
  - Web of Science (2009): Indexed yes
  - BFI (2008): BFI-level 1
  - Scopus rating (2008): SJR 0.821 SNIP 1.018
  - Scopus rating (2007): SJR 0.81 SNIP 1.063
  - Web of Science (2007): Indexed yes
  - Scopus rating (2006): SJR 0.451 SNIP 0.98
  - Web of Science (2006): Indexed yes
  - Scopus rating (2005): SJR 0.402 SNIP 0.843
  - Web of Science (2005): Indexed yes
  - Scopus rating (2004): SJR 0.472 SNIP 1.123
  - Web of Science (2004): Indexed yes
  - Scopus rating (2003): SJR 0.553 SNIP 0.995
  - Scopus rating (2002): SJR 0.491 SNIP 1.04
  - Scopus rating (2001): SJR 0.655 SNIP 1.024
Moisture transport properties of brick – comparison of exposed, impregnated and rendered brick

In regards to internal insulation of preservation worthy brick façades, external moisture sources, such as wind-driven rain exposure, inevitably has an impact on moisture conditions within the masonry construction. Surface treatments, such as hydrophobation or render, may remedy the impacts of external moisture. In the present paper the surface absorption of liquid water on masonry façades of untreated, hydrophobated and rendered brick, are determined experimentally and compared. The experimental work focuses on methods that can be applied on-site, Karsten tube measurements. These measurements are supplemented with results from laboratory measurements of water absorption coefficient by partial immersion. Based on obtained measurement results, simulations are made with external liquid water loads for determination of moisture conditions within the masonry of different surface treatments. Experimental results showed a very clear reduction of the liquid water uptake for hydrophobated cases. However, hygrothermal simulations demonstrated clear differences in the effect of the surface treatments on the moisture content of brick depending on the brick type.

Multi-angled Façade System for Office Building Renovation

This paper presents an interdisciplinary study situated within the fields of architectural design and engineering, focusing on studying and analysing the potential of multi-angled façade systems in optimizing indoor climate and energy performance and in creating new architectural qualities when renovating office buildings. The architectural potential is presented with the help of AutoCAD software. The energy efficiency and indoor climate are investigated and evaluated by using correlational research and simulation research methods with the software IDA ICE. From a functional perspective, the multi-angled façade increases the area of the office room and provides more space. There are many potential aesthetic benefits provided by multi-angled façades such as improved optical and visual quality from inside the office room and the possibility for daylight penetration and a view to outside from one part of the façade while the other part might be blocked by a shading device. From outside, the solutions may provide an interesting façade with a more dynamic form. Different scenarios are simulated and the results show that the saving in total primary energy consumption (area weighted) from a multi-angled façade compared to a renovated flat façade varies between 4.9 and 6.5 kWh/(m²·year), depending on the orientation of the façade. The increase in the office façade area, when renovated with a multi-angled façade, is by 19%, while the increase of the yearly primary energy consumption (not area weighted), is by 4.4% to 9.8%, depending on the orientation of the façade.
Multi-physical and multi-scale deterioration modelling of reinforced concrete: modelling corrosion-induced concrete damage

In this paper, corrosion-induced damage is investigated by means of numerical simulations utilizing a coupled lattice and finite element method (FEM) modelling approach. While the reinforcement and corrosion product domain are discretized by the FEM, a lattice approach is used for the discretization of the concrete domain. To model the expansive nature of solid corrosion products, a thermal analogy is used. The modelling approach further accounts for the penetration of solid corrosion products into the available pore space of the surrounding cementitious materials and non-uniform distribution of corrosion products along the circumference of the reinforcement. Finally, results of numerical simulations in terms of corrosion-induced deformations and cracking are compared to experimental data obtained by digital image correlation and published in the literature.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, Stanford University, Norwegian University of Science and Technology
Authors: Michel, A. (Intern), Lepech, M. (Ekstern), Stang, H. (Intern), Geiker, M. (Ekstern)
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Multi-physics, Multi-scale, Deterioration, Lattice, FEM, Fracture
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Source: PublicationPreSubmission
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Multi-Physics and Multi-Scale Deterioration Modelling of Reinforced Concrete
Deterioration of reinforced concrete infrastructure such as bridges, tunnels, and buildings represents one of the major challenges currently facing developed countries. While engineering tools and methods for structural modelling and design of new reinforced concrete infrastructure are mature, methods and tools for modelling decades-long deterioration and maintenance are much less developed. In this paper, a multi-physics and multi-scale modelling approach for structural deterioration of reinforced concrete components due to reinforcement corrosion is presented. The multi-disciplinary modelling approach includes physical, chemical, electrochemical, and fracture mechanical processes at the material and meso-scale, which are further coupled with mechanical deterioration processes at the structural scale.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, Stanford University, Norwegian University of Science and Technology
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Multi-physics corrosion modeling for sustainability assessment of steel reinforced high performance fiber reinforced cementitious composites

Using a newly developed multi-physics transport, corrosion, and cracking model, which models these phenomena as a coupled physiochemical processes, the role of HPFRCC crack control and formation in regulating steel reinforcement corrosion is investigated. This model describes transport of water and chemical species, the electric potential distribution in the HPFRCC, the electrochemical propagation of steel corrosion, and the role of microcracks in the HPFRCC material.
Numerical results show that the reduction in anode and cathode size on the reinforcing steel surface, due to multiple crack formation and widespread depassivation, are the mechanism behind experimental results of HPFRCC steel corrosion studies found in the literature. Such results provide an indication of the fundamental mechanisms by which steel reinforced HPFRCC materials may be more durable than traditional reinforced concrete and other tension-softening cementitious composites. Finally, these results are extended to provide greater insight into the assessment and design of more sustainable steel reinforced HPFRCC structures.
Nearly-zero energy buildings

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Oak Ridge National Laboratory
Authors: Toftum, J. (Intern), Baxter, V. (Ekstern)
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 1.01
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.514 SNIP 0.731
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.561 SNIP 0.891
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.544 SNIP 1.104
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.498 SNIP 0.742
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.93 SNIP 0.956
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.614 SNIP 1.187
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.791 SNIP 0.903
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.677 SNIP 1.639
Web of Science (2007): Indexed yes
New Concept for Museum Storage Buildings – Evaluation of Building Performance Model for Simulation of Storage

Museums keep and protect a part of our material cultural heritage for future generations; however the museums only exhibit a little part of their collections and most of the objects are kept in storage. Unfortunately the climates of many storage rooms are not ideal for keeping the chemical and physical decay of the objects as low as possible. Museum storage buildings should be able to provide a considerable stable indoor environment in terms of temperature and relative humidity. This paper explores how to simulate and build low energy museums storage buildings, and the paper shows that it is possible to make a building of low building expenses, very low running expenses and very high quality. In addition it is described that the energy consumption is only 2% compared to normal HVAC solutions, and the 2% can be delivered by excess wind power from Danish windmills resulting in that the building is close to be CO2 neutral. The analysis shows very good agreement between simulations and measurements, meaning that the proposed methods can be used for designing museum storage buildings. The analysis also shows, that the weather conditions of previous years, affect the indoor environment of the following years.

New insight into the microtexture of chalks from NMR analysis

An integrated petrographical and petrophysical study was carried out on a set of 35 outcrop chalk samples, covering a wide range of lithologies and textures. In this study various chalk rock-types have been characterized, in terms of microtextures and porous network, by integrating both geological, sediment-petrological and petrophysical data, including porosity, permeability, low-field NMR (Nuclear Magnetic Resonance), MICP and specific surface area (BET) measurements. The data allow an in depth understanding of the NMR signal of chalks, with a focus on tight chalks,
including all low reservoir quality chalks independently of their sedimentological and/or diagenetic history. The study aims to develop an NMR-based approach to characterize a broad range of chalk samples. The provided laboratory low-field NMR chalk classification can be used as a guide to interpret NMR logging data. Based on the petrographical and petrophysical analysis, 6 groups of samples were identified, each of them characterized by a unique NMR signature: (1) micritic chalks, (2) grainy chalks, (3) cemented chalks, (4) marl-seam chalks, (5) argillaceous chalks and (6) silicified chalk. NMR T2 distributions were linked to pore body size and T2 logarithmic (T2log) was calculated. It is apparent that tight chalks, whether their characteristics are sedimentological or diagenetic, yield smaller pore body sizes (T2log < 20 ms), as well as narrower pore throats (average radius < 150 nm) and lower permeability values (typically below 0.2 mD). Grainy chalks possess T2 distributions reflecting larger pore sizes (T2log > 60 ms) and pore throats (average radius > 290 nm) and higher permeabilities (up to 13 mD). The marl-seam chalk samples yield bimodal T2 distributions, with a first peak related to the micritic matrix pores and a second peak related to intraparticle pores within fossils. For all samples, permeability was inferred from NMR spectra using SDR (Schlumberger Doll Research) model.

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State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, KU Leuven, University of Mons, University Bourgogne Franche-Comté, BRGM, Université Bourgogne Franche-Comté, TOTAL SA
Authors: Fay-Gomord, O. (Ekstern), Soete, J. (Ekstern), Katika, K. (Intern), Galaup, S. (Ekstern), Caline, B. (Ekstern), Descamps, F. (Ekstern), Lasseur, E. (Ekstern), Fabricius, I. L. (Intern), Saiag, J. (Ekstern), Swennen, R. (Ekstern), Vandycke, S. (Ekstern)
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.36 SJR 1.518 SNIP 1.512
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.481 SNIP 1.878 CiteScore 3.04
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.183 SNIP 1.725 CiteScore 2.66
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.6 SNIP 1.436 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.442 SNIP 1.375 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.42 SNIP 1.606
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.216 SNIP 1.068
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.422 SNIP 1.055
Scopus rating (2007): SJR 1.483 SNIP 1.31
Scopus rating (2006): SJR 1.674 SNIP 1.542
Numerical limit analysis of keyed shear joints in concrete structures

This paper concerns the shear capacity of keyed joints, which are transversely reinforced with overlapping U-bar loops. It is known from experimental studies that the discontinuity of the transverse reinforcement affects the capacity as well as the failure mode; however, to the best of the knowledge of the authors, previous theoretical works and present design equations in standards do not account for this important effect. In this paper, a detailed model based on finite element limit analysis is introduced to assess the effect of the discontinuous reinforcement. The model is based on the lower bound theorem and uses the modified Mohr-Coulomb yield criterion, which is formulated for second-order cone programming. The model provides a statically admissible stress field as well as the failure mode. Twenty-four different test specimens are modelled and the calculations are compared to the experimental results. The results of the model show satisfactory agreement with the experimental observations. The model produces significantly better estimates of the shear capacity than the design equations of Eurocode 2.
Numerical Limit Analysis of Precast Concrete Structures

Design and analysis of precast concrete structures in the ultimate limit state is largely done by simple analytical calculations and linear elastic finite element analysis, which necessarily leads to suboptimal designs. Numerical limit analysis provides a framework well suited for this task; the framework is based on the theory of rigid-plasticity, and the resulting mathematical optimisation problem can be solved efficiently using modern algorithms. This paper gives a brief introduction to convex optimisation and numerical limit analysis. The mathematical formulation of lower bound load optimisation as well as material optimisation is given and a four-storey shear wall is analysed using load optimisation. The analysis yields a capacity more than three times larger than the design load for the critical load case, and the collapse mode and stress distribution are analysed. Finally, numerical limit analysis of three-dimensional precast structures is discussed.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, ALECTIA A/S
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Ekstern)
Number of pages: 8
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Main Research Area: Technical/natural sciences
Precast concrete, Limit analysis, Rigid-plasticity, Finite element, Numerical modelling
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Numerical modelling of porous cement-based materials by superabsorbent polymers
The development of new cementitious materials raises new challenges with regard to structural design. One of the potential applications of superabsorbent polymers (SAP) is to deliver well-defined porosity to cement systems. This is particularly interesting for the development of porous cement-based materials with high technical performance. In this paper, a numerical approach to model the basic mechanical properties of the porous cement with SAP is developed. The modelling approach is based on computational micromechanics and uses a representative volume element that emulates
the microstructure of the cement-based material to determine the overall material response and the local behaviour. Using this approach several sensitivity analyses are undertaken examining various parameters. The modelling approach is compared with experimental results showing reasonable correlation. The proposed approach provides faster and cheaper tool to design porous materials due to a reduction in the required experimental effort.

**General information**

State: Published
Organisations: Department of Civil Engineering, ITAinnova - Instituto Tecnológico de Aragón
Authors: Viejo, I. (Ekstern), Esteves, L. P. (Intern), Laspalas, M. (Ekstern), Bielsa, J. M. (Ekstern)
Number of pages: 10
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Scopus rating (2016): CiteScore 5.15 SJR 3.46 SNIP 3.166
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.69 SNIP 3.227 CiteScore 4.54
Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 4.201 SNIP 3.664 CiteScore 4.44
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 4.335 SNIP 3.993 CiteScore 4.54
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.622 SNIP 3.866 CiteScore 3.92
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.171 SNIP 3.423 CiteScore 3.77
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.613 SNIP 2.796
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.369 SNIP 2.596
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.474 SNIP 1.959
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.654 SNIP 1.851
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.168 SNIP 1.916
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.908 SNIP 1.679
Web of Science (2005): Indexed yes
Numerical simulation of residual stresses at holes near edges and corners in tempered glass: A parametric study

This work presents 3D results of the thermal tempering simulation by the Finite Element Method in order to calculate the residual stresses in the area of the holes near edges and corners of a tempered glass plate. A viscoelastic material behavior of the glass is considered for the tempering process. The structural relaxation is taken into account using Narayanaswamy’s model. The motivation for this work is to study the effect of the reduction of the hole and edge minimum distances, which are defined according to EN 12150-1. It is the objective of the paper to demonstrate and elucidate the influence of the hole and edge distances on the minimal residual compressive stresses at holes after the tempering process. The residual stresses in the area of the holes are calculated varying the following parameters: the hole diameter, the plate thickness and the interaction between holes and edges and corners. Furthermore a comparison between the minimal residual stresses at holes and the residual stresses at other areas of the glass plate (edge, chamfer and far-field stresses) is made.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Technical University of Darmstadt
Authors: Pourmoghaddam, N. (Ekstern), Nielsen, J. H. (Intern), Schneider, J. (Ekstern)
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Residual stresses, Tempered glass, Heat transfer coefficient, Finite element simulation, Edge and hole distance, EN 12150-1
Source: PublicationPreSubmission
Source-ID: 126052881
Publication: Research - peer-review » Book chapter – Annual report year: 2016

Numerical simulation of the effects of hanging sound absorbers on TABS cooling performance

Recently there has been a considerable increase in the use of Thermally-Active Building Systems (TABS) in Europe as an energy-efficient and economical cooling and heating solution for buildings. However, this widespread solution requires large uncovered hard surfaces indoors, which can lead to a degradation of the room acoustic comfort. Therefore, challenges arise when this system has to be combined with acoustic requirements.

Soffit-hanging sound absorbers embody a promising solution. This study focuses on quantifying their impact on the cooling performance of TABS, assessed by means of the cooling capacity coefficient of the ceiling deck. The influence of different ceiling coverage ratios (0-30-45-60 and 80%) as well as the influence of the distance at which the absorbers are placed is studied by numerical simulations using a new, specially-developed TRNSYS Type. Tests were performed in a test room simulating a two-person office of 20 m², with a typical cooling load of 42 W/m².

The results show that covering 60% of the ceiling surface with sound absorbers hanging at 300 mm from the ceiling active deck is expected to reduce the cooling capacity coefficient of TABS by 15.8%. This drops to 25.4% with a coverage of 80%. The presence of acoustic panels also affects the thermal comfort: the operative temperature in the room increases by 0.9°C in the former case and up to 1.6°C in the latter. Results also show that comfort ventilation supplied to the enclosure has a considerable influence on the thermal conditions in the room; if the ventilation is removed, then the operative temperature increases by 1.8°C for a 60%-
covered ceiling.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Rage, N. (Intern), Kazanci, O. B. (Intern), Olesen, B. W. (Intern)
Number of pages: 10
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Electronic versions:
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OMA Identification of a wind turbine rotor hub for monitoring purpose

General information
State: Published
Organisations: Technical University of Denmark, Department of Civil Engineering, Section for Structural Engineering, Aalborg University
Authors: Juul, M. Ø. Ø. (Ekstern), Kovacs, E. (Ekstern), Brincker, R. (Intern), Balling, O. (Ekstern)
Pages: 4055-4060
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Main Research Area: Technical/natural sciences
Source: FindIt
Source-ID: 2350391393
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

Online Anomaly Energy Consumption Detection Using Lambda Architecture
With the widely use of smart meters in the energy sector, anomaly detection becomes a crucial mean to study the unusual consumption behaviors of customers, and to discover unexpected events of using energy promptly. Detecting consumption anomalies is, essentially, a real-time big data analytics problem, which does data mining on a large amount of parallel data streams from smart meters. In this paper, we propose a supervised learning and statistical-based anomaly detection method, and implement a Lambda system using the in-memory distributed computing framework, Spark and its extension Spark Streaming. The system supports not only iterative refreshing the detection models from scalable data sets, but also real-time anomaly detection on scalable live data streams. This paper empirically evaluates the system and the detection algorithm, and the results show the effectiveness and the scalability of the lambda detection system.

General information
State: Published
Organisations: Department of Management Engineering, Systems Analysis, DTU Climate Centre, Department of Civil Engineering, Section for Building Energy, Centre for IT-Intelligent Energy Systems in Cities, University College of Northern Denmark
Authors: Liu, X. (Intern), Iftikhar, N. (Ekstern), Nielsen, P. S. (Intern), Heller, A. (Intern)
Number of pages: 17
Pages: 193-209
Publication date: 2016
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Main Research Area: Technical/natural sciences
On the need for integrating LCA into decision making

The need for sustainable solutions has gained attention both in academia and industry research due to increasing demands of human beings, which are incompatible with limitations in resources availability. Several methods, such as Life Cycle Assessment (LCA), were developed in the past decades to assess the environmental profile of products and services. However, when decision makers have several alternatives at hand to solve a problem, environmental performance is not the only criterion for choosing the best alternative. Other criteria such as risks and economical costs and benefits that are associated with the alternatives will also influence the final choice. Sometimes the most environmentally sustainable alternative may not be the safest or cheapest one. How to make a balanced decision considering environmental performance together with other criteria is not straightforward.

Decision analysis is broadly used to help decision makers identify the best solution among alternatives. The decision is based on expected utility generation, which incorporates consequences (or impacts) associated with each alternative. Depending on the research field and goal of the study, the included consequences can be e.g. environmental impacts, property damages from natural hazards and/or human health impacts. We examined the current decision analysis practice as it is applied in different research fields. The review shows that generally environmental impacts are considered less often than the other consequences. Meanwhile, LCA has been applied in many research fields to assess a wide range of environmental impacts associated with products or services. There is a huge potential for integrating LCA into other decision analysis tools to include assessments of the environmental profile of alternatives. This will provide the possibility of systematical inclusion of environmental considerations in the decision making process, thus facilitating a more holistic decision. However, due to different scopes and purposes of LCA and other decision analysis tools, the integration is not straightforward. The lack of consistency in e.g. system boundaries and handling of uncertainty needs to be carefully managed.

Open BIM in course on advanced building design

A course in advanced building design worth 10 ECTS points is offered to master’s students at the Technical University of Denmark. Students are given a task to design a 20-40 storey office building in teams of six students. In addition to submission of reports and technical analysis the students shall hand in BIM models in open BIM, specifically in IFC-format. The paper describes how the course and use of BIM is evaluated by the students, and the finding correcting the delivered BIM models in IFC-format. Use of model servers and BCF are briefly described. Issues regarding challenges in coordination, teamwork building and mutual dependencies were registered from students’ evaluation of the course. Overall, the students reported becoming familiar with open BIM and experienced the freedom to choose their preferred BIM tool for each specific job to see if it was possible to coordinate a building design project using open BIM. Graduate students working in the building construction industry expressed satisfaction with the course.
Open BIM in courses in engineering education

The Technical University of Denmark has included open BIM in its BIM or BIM-related courses for bachelor, master and PhD students studying civil or architectural engineering. A majority of students are introduced to open BIM during their education, and those who are selecting courses in advanced BIM or building design are becoming more familiar with the concept. A number of students are including open BIM in their bachelor projects or master theses. The main reason for including open BIM in teaching is that open BIM has been a mandatory deliverable in Denmark since 2007 in state-financed construction projects through the IFC format. From 2013 the requirements also included social housing and all public building projects.

Students are exploring the capabilities of open BIM, and have been able both to identify satisfactory results as well as propose enhancements in order to compensate for shortcomings in the existing specification or implemented solutions in software products.

Optimization of bridge cables with concave fillets

In this paper the aerodynamic performance of new cable surfaces with concave fillet are examined and compared to plain, dimpled and helically filleted surfaces. To this end, an extensive wind-tunnel campaign was undertaken. Preliminary flow visualizations tests and static tests were performed to better understand the structure and development of the wake and the related aerodynamic forces. Subsequent improvements in design were focused on drag reduction and rain rivulet suppression. For this purpose a number of samples with different concave fillet’s height were tested in static condition to estimate the aerodynamic forces. Both new cable surfaces outperform traditional surfaces in terms of rain-rivulet suppression thanks to the ability of the concave shape of the fillet to act as a ramp for the incoming rain-rivulet. Furthermore, both improved innovations with lowest height of the concave fillet show optimal drag coefficients in the supercritical Reynolds range and an early suppression of vortex shedding formation.
Optimization of energy planning strategies in municipalities: Are community energy profiles the key to a higher implementation rate of renewable energies?

The paper evaluates the current status of community energy planning in northern Europe via a review of literature, practice and the performance of a barrier analysis for successful community energy planning. Main findings of the paper are that current community energy planning lacks a systematic approach, suffers from insufficient information, tools and resources. Municipalities are often unable to take on a steering role in community energy planning. To overcome these barriers and guide municipalities in the pre-project phase, a decision-support methodology, based on community energy profiles (CEP), is presented. The methodology was applied in a case study in Germany. With CEPs, a possibility to merge qualitative data from local settings into generic energy modelling is shown, which could contribute to improved community energy strategies.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Petersen, J. (Intern)
Number of pages: 12
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Electronic versions:
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Source: PublicationPreSubmission
Source-ID: 119653584
Publication: Research - peer-review › Paper – Annual report year: 2016

Optimization of pile design for offshore wind turbine jacket foundations

The aim of this study is to use numerical methods of structural design optimization to design piles for offshore wind turbine jacket foundations. Pile mass is minimized with constraints on axial and lateral capacity. Results indicate that accurate knowledge about soil characteristics can translate into significant cost reductions.

General information
State: Published
Organisations: Department of Wind Energy, Wind Turbine Structures and Component Design, Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Sandal, K. (Intern), Zania, V. (Intern)
Number of pages: 4
Publication date: 2016
Main Research Area: Technical/natural sciences
Electronic versions:
Optimization_of_pile_design.pdf
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Source-ID: 127745640
Publication: Research › Paper – Annual report year: 2016

Optimizing electrode shapes for ERT monitoring in permafrost areas

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aarhus University, Orbicon Greenland, Lund University, University of Copenhagen
Authors: Tomaskovicova, S. (Intern), Ingeman-Nielsen, T. (Intern), Christiansen, A. V. (Ekstern), Brandt, I. (Ekstern), Dahlin, T. (Ekstern), Elberling, B. (Ekstern)
Number of pages: 2
Pages: 988-989
Publication date: 2016

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Organophosphate esters in dust samples collected from Danish homes and daycare centers

Organophosphates are used in a wide range of materials and consumer products and are ubiquitous in indoor environments. Certain organophosphates have been associated with various adverse health effects. The present paper reports mass fractions of organophosphates in dust samples collected from 500 bedrooms and 151 daycare centers of children living in Odense, Denmark. The identified compounds include: tris(isobutyl) phosphate (TIBP), tri-α-butylyphosphate (TNBP), tris(2-chloroethyl) phosphate (TCEP), tris(2-chloroisopropyl) phosphate (TCIPP), tris(1,3-dichloroisopropyl) phosphate (TDCIPP), tris(2-butoxyethyl) phosphate (TBOEP), triphenylphosphate (TPHP), 2-ethylhexyl-diphenyl phosphate (EHDP), tris(2-ethylhexyl) phosphonate (TEHP) and tris(methylphenyl) phosphate (TMPP). Both the number of organophosphates with median values above the limit of detection and the median values were higher for samples from daycare centers than for samples from homes. Organophosphates with median mass fractions above the limit of detection were: TCEP from homes (6.9 μg g⁻¹), and TCEP (16 μg g⁻¹), TCIPP (5.6 μg g⁻¹), TDCIPP (7.1 μg g⁻¹), TBOEP (26 μg g⁻¹), TPHP (2.0 μg g⁻¹) and EHDPP (2.1 μg g⁻¹) from daycare centers. When present, TBOEP was typically the most abundant of the identified OPs. The sum of the organophosphate dust mass fractions measured in this study was roughly in the mid-range of summed mass fractions reported for dust samples collected in other countries. On a global scale, the geographical distribution of organophosphates in indoor dust is quite variable, with higher concentrations in industrialized countries. This trend differs from that for phthalate esters, whose geographic distribution is more homogeneous. Exposure to organophosphates via dust ingestion is relatively low, although there is considerable uncertainty in this assessment.
Particle deposition in a realistic geometry of the human conducting airways: Effects of inlet velocity profile, inhalation flowrate and electrostatic charge: Effects of inlet velocity profile, inhalation flowrate and electrostatic charge

Understanding the multitude of factors that control pulmonary deposition is important in assessing the therapeutic or toxic effects of inhaled particles. The use of increasingly sophisticated in silico models has improved our overall understanding, but model realism remains elusive. In this work, we use Large Eddy Simulations (LES) to investigate the deposition of inhaled aerosol particles with diameters of $d_p=0.1,0.5,1,2.5,5$ and $10\mu m$ (particle density of 1200 $kg/m^3$). We use a reconstructed geometry of the human airways obtained via computed tomography and assess the effects of inlet flow conditions, particle size, electrostatic charge, and flowrate. While most computer simulations assume a uniform velocity at the mouth inlet, we found that using a more realistic inlet profile based on Laser Doppler Anemometry measurements resulted in enhanced deposition, mostly on the tongue. Nevertheless, flow field differences due to the inlet conditions are largely smoothed out just a short distance downstream of the mouth inlet as a result of the complex geometry. Increasing the inhalation flowrate from sedentary to activity conditions left the mean flowfield structures largely unaffected. Nevertheless, at the higher flowrates turbulent intensities persisted further downstream in the main bronchi. For $dp>2.5\mu m$, the overall Deposition Fractions (DF) increased with flowrate due to greater inertial impaction in the oropharynx. Below $dp=1.0\mu m$, the DF was largely independent of particle size; it also increased with flowrate, but remained significantly lower. Electrostatic charge increased the overall DF of smaller particles by as much as sevenfold, with most of the increase located in the mouth–throat. Moreover, significant enhancement in deposition was found in the...
left and right lung sub-regions of our reconstructed geometry. Although there was a relatively small impact of inhalation flowrate on the deposition of charged particles for sizes dp<2.5μm, impaction prevailed over electrostatic deposition for larger particles as the flowrate was increased. Overall, we report a significant interplay between particle size, electrostatic charge, and flowrate. Our results suggest that in silico models should be customized for specific applications, ensuring all relevant physical effects are accounted for in a self-consistent fashion.

**General information**

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Cyprus
Authors: Koullapis, P. G. (Ekstern), Kassinos, S. C. (Ekstern), Bivolarova, M. P. (Intern), Melikov, A. K. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2016): BFI-level 2
Scopus rating (2016): SJR 1.2 SNIP 1.368 CiteScore 2.84
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.276 SNIP 1.46 CiteScore 2.76
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.233 SNIP 1.718 CiteScore 3.01
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.522 SNIP 1.783 CiteScore 3.14
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.326 SNIP 1.733 CiteScore 2.99
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.269 SNIP 1.615 CiteScore 2.82
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.174 SNIP 1.747
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.39 SNIP 1.867
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.455 SNIP 1.899
Scopus rating (2007): SJR 1.575 SNIP 2.14
Scopus rating (2006): SJR 1.518 SNIP 2.11
Scopus rating (2005): SJR 1.223 SNIP 2.208
Scopus rating (2004): SJR 1.057 SNIP 1.909
Scopus rating (2003): SJR 1.314 SNIP 1.737
Scopus rating (2002): SJR 1.124 SNIP 1.605
Scopus rating (2001): SJR 1.234 SNIP 2.158
Scopus rating (2000): SJR 1.525 SNIP 1.971
Scopus rating (1999): SJR 1.137 SNIP 1.835
Original language: English
Computational fluid-particle dynamics simulation, Large eddy simulation, Aerosol deposition in the human upper airways, Steady inhalation, Inlet conditions, Electrostatic image charge force
Performance of alusilica as mineral admixture in cementitious systems

The aim of this project is to study the effect of alusilica (ALS) as a mineral admixture on the fresh properties and development of mechanical properties of cementitious systems. ALS consists of relatively pure, amorphous silicium-dioxide – a chemical compound which is known to be useful as mineral admixture in concrete. The project has been carried out in cooperation with the company alufluor (Helsingborg, Sweden), and MSc Ebbe Skyum Jens. The application of ALS was investigated as partial cement substitution in mortar. A total of three mortar mixtures were produced: 1) reference, i.e. no substitution of cement, 2) cement clinker and gypsum substituted partly with ALS before grinding (referred to as “co-ground”), and 3) cement (i.e. ground cement clinker and gypsum) partly substituted with ALS and subsequently blended (referred to as “blended”). The level of substitution was 10% ALS relative to the total binder mass (cement+ALS). The water/binder-ratio (w/b) is 0.5 for all mixtures. The produced ALS-substituted powder was studied by scanning electron microscopy (SEM) and Energy Dispersive X-ray Analysis (EDAX) to investigate if the ALS agglomerates in the raw material were broken by the grinding procedure.

On the fresh mortar air content was measured by the pressure method, ASTM C231/C231M-14 and the flow was measured by ASTM C1437-13. Casting was done in standard mortar molds 4×4×16 cm3. After demolding, each mortar specimen was weighed over and under water to evaluate their homogeneity and air content, and subsequently they were immersed in lime water until further testing. Mechanical testing generally followed EU standard EN 196-1. In accordance with the EU standard, measurements of mechanical properties were done at a minimum of 3 samples at each test time 1, 2, 3, 7, 14, 28, 56 and 112 days. On hardened samples air content was additionally measured by point counting. The inclusion of ALS in the mortar as a mineral admixture with the cement substitution ratio of 10% resulted in a higher air content and lower flowability in comparison with the reference mortar. Compared with blending ALS during mixing, mortar containing co-ground ALS has properties closer to the reference mortar.

ALS substitution seems to only have a minor effect on the flexural strength throughout the hardening. Mortar with ALS substitution, exhibited a lower compressive strength as compared to the reference mortar. However, a major part of this strength reduction seems to be caused by the lower flowability and the related higher air content. The ALS substituted systems may potentially be optimized through adjustment of a plasticizing agent, and in that case there is not expected to be a strength reduction. It is concluded that ALS can be a useful cement substitution.

For further tests it might be relevant to investigate the performance of ALS-systems at a low w/b, e.g. 0.3 and at higher temperatures, e.g. 40-60°C which is realistic to be encountered also in practice. For such conditions a more clear advantage of ALS as a cement substitution may be present. Additionally it would be relevant to investigate the durability properties of ALS substituted systems.
Performance of alusilica as mineral admixture in cementitious systems
This paper presents a preliminary study of the effect of alusilica (ALS) as a mineral admixture on the fresh properties and
development of mechanical properties of cementitious systems. Cement was substituted with ALS with the ratio of 10%
during grinding or blended during mixing. The produced ALS-substituted powder was studied by scanning electron
microscopy (SEM) and Energy Dispersive X-ray Analysis (EDAX). Flow of the fresh mortar, air content and mechanical
properties of the hardening mortar were measured. The results show that the inclusion of ALS in the mortar as a mineral
admixture resulted in a higher air content and lower flowability in comparison with the reference mortar. Mortar with ALS
substitution, exhibited a lower compressive strength as compared to the reference mortar. This can be accounted for by
the higher air content. By appropriately adjusting the flow of the fresh mortar, it is believed that ALS can be a useful
cement substitution.

Performance of chemical herders for in situ burning of crude oil in ice infested waters

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Adamopoulou, E. (Ekstern), van Gelderen, L. (Intern), Jomaas, G. (Intern)
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Pervious concrete fill in Pearl-Chain Bridges: Using small-scale results in full-scale implementation

Pearl-Chain Bridge technology is a new prefabricated arch solution for highway bridges. This study investigates the feasibility of pervious concrete as a filling material in Pearl-Chain Bridges. The study is divided into two steps: (1) small-scale tests where the variation in vertical void distribution and strength properties is determined for 800 mm high blocks cast in different numbers of layers, and (2) full-scale implementation in a 26 m long Pearl-Chain Bridge. With a layer thickness of 27 cm, the small-scale tests indicated homogenous results; however, for the full-scale implementation, the same degree of homogeneity was not shown. (C) 2015 Elsevier Ltd. All rights reserved.

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Lund, M. S. M. (Intern), Hansen, K. K. (Intern), Truelsen, R. (Ekstern), Johansen, L. (Ekstern)
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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.54 SNIP 2.299 CiteScore 3.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.554 SNIP 2.594 CiteScore 2.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.88 SNIP 3.043 CiteScore 3.07
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Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.706 SNIP 3.37 CiteScore 3.12
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.493 SNIP 3.537 CiteScore 2.74
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.362 SNIP 1.969
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.08 SNIP 1.848
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.914 SNIP 1.479
Scopus rating (2007): SJR 0.936 SNIP 1.703
This paper describes an experimental investigation of the shear behavior of beams consisting of steel Reinforced Engineered Cementitious Composites (R/ECC). This study investigates and quantifies the effect of ECC's strain hardening and multiple cracking behavior on the shear capacity of beams loaded in shear. The experimental program consists of R/ECC beams with short (8 mm) randomly distributed Polyvinyl Alcohol (PVA) fiber and conventional Reinforced Concrete (R/C) counterparts for comparison with varying shear reinforcement arrangements. Beams were loaded until failure while a Digital Image Correlation (DIC) measurement technique was used to measure surface displacements and crack formation. The shear crack mechanisms of R/ECC are described in detail based on findings of DIC measurements and can be characterized by an opening and sliding of the cracks. Multiple micro-cracks developed in a diagonal arrangement between the load and support points due to the strain-hardening response of ECC in tension. The strain-hardening response strongly influenced the shear response of the beam specimen.
Phosphorous recovery from sewage sludge ash suspended in water in a two-compartment electrodialytic cell

Phosphorus (P) is indispensable for all forms of life on Earth and as P is a finite resource, it is highly important to increase recovery of P from secondary resources. This investigation is focused on P recovery from sewage sludge ash (SSA) by a two-compartment electrodialytic separation (EDS) technique. Two SSAs are included in the investigation and they contained slightly less P than phosphate rock used in commercial fertilizer production and more heavy metals. The two-compartment electrodialytic technique enabled simultaneous recovery of P and separation of heavy metals. During EDS the SSA was suspended in water in the anolyte, which was separated from the catholyte by a cation exchange membrane. Electrolysis at the anode acidified the SSA suspension, and hereby P, Cu, Pb, Cd and Zn were extracted. The heavy metal ions electromigrated into the catholyte and were thus separated from the filtrate with P. More than 95% P was extracted from both SSAs. The charge transfer to obtain this varied when treating the two SSAs, and for one ash it was about 30% higher than for the other as a result of a higher buffering capacity against acidification. The repeatability of EDS results between experiments with the same SSA and the same experimental conditions was good, which shows that the process is easy to control at the studied laboratory conditions. About 80% P and 10% of the heavy metals remained in the filtrate from the anolyte after treatment of both SSAs. The heavy metal content relative to P in the filtrate by far meet the limiting values for use of industrial wastes as fertilizers, thus the filtrate is ready for direct processing into P-fertilizer.

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Ottosen, L. M. (Intern), Jensen, P. E. (Intern), Kirkelund, G. M. (Intern)
Number of pages: 7
Polluted sediments in arctic harbors and electrodialytic remediation

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Akvaplan-niva AS
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Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Pore-scale modeling of vapor transport in partially saturated capillary tube with variable area using chemical potential
Here we illustrate the usefulness of using the chemical potential as the primary unknown by modeling isothermal vapor transport through a partially saturated cylindrically symmetric capillary tube of variable cross-sectional area using a single equation. There are no fitting parameters and the numerical solutions to the equation are compared with experimental results with excellent agreement. We demonstrate that isothermal vapor transport can be accurately modeled without modeling the details of the contact angle, microscale temperature fluctuations, or pressure fluctuations using a modification of the Fick-Jacobs equation. We thus conclude that for a single, axisymmetric pore, the enhancement factor depends upon relative humidity boundary conditions at the liquid bridge interfaces, distance between liquid bridges, and bridge lengths.

General information
State: Published
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Web of Science (2017): Indexed yes
Possibilities and Limitations of Thermally Activated Building Systems: Simply TABS and a Climate Classification for TABS

The strong political market drive towards energy savings in the building sector calls for efficient solutions. Using so called low temperature heating and high temperature cooling systems such as for instance thermally activated building systems (TABS) has a significant impact on the required energy source. With TABS it is possible to utilize otherwise insufficient energy sources such as waste heat or ground coupled heat exchangers.

Today simulation of TABS is possible with most building simulation tools. However such simulations are rather time consuming and cost intensive. It would be beneficial to have a tool that can be used to assess the general usability of TABS considering only rough boundary conditions. The Simple Simulation Tool in combination with the Climate Classification for TABS introduced in this thesis offer this solution.

The Simple Simulation Tool has proven to be a valid tool for the early assessment for the use of TABS in modern Buildings. Not only is it possible to runs simulations in accordance to ISO 11855-4 but also to determine the minimal required plant sizes for cooling, the duration until overheating, the maximum internal temperatures for insufficient plant sizes (using a simplified heat loss approach) and the maximum allowed cooling power to prevent undercooling.

The climate Classification can be used to predict the building behaviour throughout Europe. Based on a very select number of building characteristics it can be seen if heating, cooling or both will be mostly needed to operate the building within acceptable boundaries. It will also allow the user to see if dehumidification will be needed for undisturbed operation of TABS.
With the combination of both tools it is possible to provide a holistic evaluation of a building proposal at a very early design stage.

**General information**  
State: Published  
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics  
Authors: Behrendt, B. (Intern), Christensen, J. E. (Intern), Olesen, B. W. (Intern)  
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**Potentials and challenges of biogas from fish industry waste in the arctic**  
The fish industry is a main industry in many Arctic locations. In most places by-products are disposed of at sea. Oxygen depletion and dead sea bottom is observed, as the organic material is biodegraded and methane produced; contributing to the global warming. In this study, the biogas potential of fish industry by-products from Greenland was investigated. Methane potential of Greenlandic shrimp, crab, and halibut by-products as well as co-digestion of shrimp by-products with waste water sludge and common brown algae was tested in lab scale batch experiments at mesophilic conditions. Fate of indicator microorganisms was investigated. All residues had biogas potentials similar to or higher than conventional feedstocks like manure and silage. Waste water sludge and brown algae had potentials comparable to manure. The combined shrimp and algae digestion showed indication of synergistic effects. Indicator bacteria were reduced significantly while coliphages (virus indicators) were not. Fish and seafood by products from the fish processing industry constitute a significant resource for energy and may provide an economic incentive to install digesters, which can also partly stabilize waste water sludge, though additional heat treatment may be necessary depending on final use of digestate.

**General information**  
State: Published  
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Chemical and Biochemical Engineering  
Authors: Jensen, P. E. (Intern), Heiske, S. (Intern)  
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Potentials and challenges of biogas from fish industry waste in the Arctic

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Pragmatic Use of LOD - a Modular Approach
The concept of Level of Development (LOD) is a simple approach to specifying the requirements for the content of object-oriented models in a Building Information Modelling process. The concept has been implemented in many national and organization-specific variations and, in recent years, several solutions have been proposed to address the challenge of the LOD concept being either too simple to fully describe the requirements for BIM deliverables or too complex to be operational in practice. This study reviews several existing LOD concepts and concludes that addressing the completeness and reliability of deliveries along with use-case-specific information requirements provides a pragmatic approach for a LOD concept. The proposed solution combines LOD requirement definitions with Information Delivery Manual-based use case requirements to match the specific needs identified for a LOD framework. This framework can act as a basis for future LOD solutions to harmonize the conceptual understanding of LOD definitions.

General information
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Organisations: Department of Civil Engineering, Section for Building Design
Authors: Treldal, N. (Intern), Vestergaard, F. (Intern), Karlshøj, J. (Intern)
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Predicted and actual indoor environmental quality: Verification of occupants' behaviour models in residential buildings
Occupants' interactions with the building envelope and building systems can have a large impact on the indoor environment and energy consumption in a building. As a consequence, any realistic forecast of building performance must include realistic models of the occupants' interactions with the building controls (windows, thermostats, solar shading etc.). During the last decade, studies about stochastic models of occupants' behaviour in relation to control of the indoor environment have been published. Often the overall aim of these models is to enable more reliable predictions of building performance using building energy performance simulations (BEPS). However, the validity of these models has only been sparsely tested. In this paper, stochastic models of occupants' behaviour from literature were tested against measurements in five apartments. In a monitoring campaign, measurements of indoor temperature, relative humidity and CO2 concentration was measured in the living room and bedroom at five minute intervals in five apartments with similar layout in a building located in Copenhagen, Denmark. Outdoor temperature, relative humidity, wind speed and solar radiation were obtained from a weather station close by. The stochastic models of window opening and heating set-point adjustments were implemented in the BEPS tool IDA ICE. Two apartments from the monitoring campaign were simulated using the implemented models and the measured weather data. The results were compared to measurements from the monitoring campaign to get an estimate of the forecast's realism. The simulations resulted in realistic predictions in a sense that the measured values were within or close to the range of the simulated values. The variation in the simulated
and measured variables between apartments and over time was similar. However, comparisons of the average stochastic predictions with the measured temperatures, relative humidity and CO2 concentrations revealed that the models did not predict the actual indoor environmental conditions well.
Building energy performance simulation, Heating set-point adjustments, Model, Stochastic models, Verification, Window opening behaviour

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Preface

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technion-Israel Institute of Technology, Ghent University
Authors: Jensen, O. M. (Intern), Kovler, K. (Ekstern), De Belie, N. (Ekstern)
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Preface

General information
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Organisations: Department of Civil Engineering, Section for Building Design
Authors: Azenha, M. (Ekstern), Gabrijel, I. (Ekstern), Schlicke, D. (Ekstern), Kanstad, T. (Ekstern), Jensen, O. M. (Intern)
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Prestressing of reinforcing bars in concrete slabs due to concrete expansion induced by alkali-silica reaction

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Building Design, University of Southern Denmark
Authors: Hansen, S. G. (Ekstern), Barbosa, R. A. (Intern), Hoang, L. C. (Intern)
Number of pages: 12
Publication date: 2016

Probabilistic Design and Management of Sustainable Concrete Infrastructure Using Multi-Physics Service Life Models
This paper looks to address the grand challenge of integrating construction materials engineering research within a multi-scale, inter-disciplinary research and management framework for sustainable concrete infrastructure. The ultimate goal is to drive sustainability-focused innovation and adoption cycles in the broader architecture, engineering, construction (AEC) industry. Specifically, a probabilistic design framework for sustainable concrete infrastructure and a multi-physics service life model for reinforced concrete are presented as important points of integration for innovation between construction materials engineers and the broader AEC industry.

First, the paper details a probabilistic framework for design of reinforced concrete infrastructure to achieve targeted improvements in sustainability indicators. The framework, compliant with the 2010 fib Model Code requirements for environmental design, consists of concrete service life models and life cycle assessment (LCA) models. Both types of models (service life and LCA) are formulated stochastically so that the service life and time(s) to repair, as well as total sustainability impact, are described by a probability distribution. A central component of this framework is a newly developed multi-physics service life model of reinforced concrete members subjected to chloride-induced corrosion. The corrosion model is based on stringent physical laws describing thermodynamics and kinetics of electrochemical processes including various reinforcement corrosion phenomena, such as activation, resistance, and concentration polarization as well as the impact of temperature, relative humidity, and oxygen. To describe corrosion-induced damage, a thermal analogy is used to model the expansive nature of solid corrosion products. A mechanical model further accounts for the penetration of solid corrosion products into the available pore space of the surrounding cementitious materials as well as nonuniform distribution of corrosion products along the circumference of the reinforcement. A FEM based mechanical model is used to simulate corrosion-induced cracking damage.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Stanford University, Norwegian University of Science and Technology
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Main Research Area: Technical/natural sciences
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Untitled.pdf
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Propagation of steel corrosion in concrete: Experimental and numerical investigations

This paper focuses on experimental and numerical investigations of the propagation phase of reinforcement corrosion to determine anodic and cathodic Tafel constants and exchange current densities, from corrosion current density and corrosion potential measurements. The experimental program included studies on RC specimens with various binder compositions, concrete cover thicknesses, and concrete cover crack widths. Modelling and fitting of experimental data using an electrochemical model allowed for the determination of parameters, which are key parameters for electrochemical modelling tools. The numerical model was, furthermore, used to identify electrochemical parameters, which are independent of concrete cover thickness and crack width and at the same time allow for determination of the corrosion current density and corrosion potential of concrete structures within an acceptable error. Very good comparisons between the experimentally measured and numerically simulated corrosion current densities and corrosion potentials were found for the various RC specimens. Anodic and cathodic Tafel constant between 0.01 and 0.369 V/dec and 0.01 and 0.233 V/dec, respectively, were found in the present study through numerical simulations of the experimental data. Anodic and cathodic exchange current densities ranged from 1.0E-12 to 1.0E-09 A/mm² and 1.0E-12 to 1.1E-09 A/mm², respectively.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, University of the Witwatersrand, Norwegian University of Science and Technology
Qaanaaq Distrikt – infrastruktur og erhvervsgrundlag: Sammenfatning af pilotprojekt om lokal baseret erhvervsudvikling

I denne rapport analyseres udviklingsdynamikker i Qaanaaq distrikt. Målet med analysen er, at identificere potentialer for en bæredygtig erhvervsudvikling samt at kvalificere forståelsen af, hvordan disse kan udnyttes i praksis. På baggrund af et meget stort antal interview i og uden for distriktet og en række skriftlige kilder samt forskningslitteratur belyses erhvervsgrundlaget i distriktet som et samspil mellem de naturlige ressourcer, de menneskelige ressourcer samt de institutionelle rammer.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalborg University
Authors: Hendriksen, K. (Intern), Hoffmann, B. (Ekstern)
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Publication: Research › Report – Annual report year: 2016

Rapid detection and identification of Stachybotrys and Chaetomium species using tissue PCR analysis

Indoor fungi are a worldwide problem causing negative health effects for infected building's occupants and even deterioration of building structures. Different fungal species affect buildings and their inhabitants differently. Therefore, rapid and accurate identification of fungi to the species level is essential for health risk assessment and building remediation. This study focuses on molecular identification of two common indoor fungal genera: Stachybotrys and Chaetomium. This study proposes two new DNA barcode candidates for Stachybotrys and Chaetomium: the gene encoding mitogen activated protein kinase (hogA) and the intergenic region between histone 3 and histone 4 (h3-h4) as well as it introduces a rapid - 3.5 h - protocol for direct Stachybotrys and Chaetomium species identification, which bypasses culture cultivation, DNA extraction and DNA sequencing.

General information
State: Published
Organisations: Department of Systems Biology, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Eucaryotic Molecular Cell Biology, Aalborg University
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Scopus rating (2016): CiteScore 2.05 SJR 0.723 SNIP 0.8
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Real-time monitoring and structural control of a wind turbine using a rocking system

The design of a semi-active (SA) control system to mitigate wind induced structural demand to high wind turbine towers is discussed herein. A variable restraint at the base, able to modify in real time its mechanical properties according to the instantaneous response of the tower, is proposed. A special control algorithm has been properly designed to drive MR dampers. It requires the tower is equipped with sensors for measurement of displacements and stresses. The real-time monitoring of the tower response is needed in order to make the SA system works in the sense of mitigating the structural demand against wind gust. A finite element model of a wind turbine model has been adopted to perform several numerical...
simulations. On the basis of these results, the optimal calibration of the controller has been found as the one allows to achieve different and conflicting, structural goals.

Recycled fishing nets as reinforcement of existing concrete structures

Large amounts of fishing nets are discarded every year polluting the oceans with plastic fibers on a global scale. Due to the big fishing industry in Greenland, an alternative use for discarded fishing nets would have a decreasing effect on the amount of marine litter in the Arctic. A use for discarded fishing nets could be as fiber-reinforced polymer (FRP) composites for near surface mounted reinforcement (NSMR). NSMR prolongs the lifetime of existing structures, and thus reduces the amount of materials transported to Greenland, reducing CO2-emission and expenses. The effect of NSMR FRP bars made from discarded fishing nets is examined with regards to the formation of cracks, load and failure of the beam. Results show a tendency for beams with NSMR FRP bars to prolong the linear elastic region, thus postponing the formation of cracks. Further, a tendency for reducing the formation of cracks in the shear zone and resisting a higher load is seen. A method for casting NSMR FRP bars with discarded fishing nets was developed, evaluated and suggestions for improvements were made. This study paves the way for the possibility of using discarded fishing nets as NSMR FRP bars but requires further studies.
Reducing burden of disease from residential indoor air exposures in Europe (HEALTHVENT project)

Background: The annual burden of disease caused indoor air pollution, including polluted outdoor air used to ventilate indoor spaces, is estimated to correspond to a loss of over 2 million healthy life years in the European Union (EU). Based on measurements of the European Environment Agency (EEA), approximately 90 % of EU citizens live in areas where the World Health Organization (WHO) guidelines for air quality of particulate matter sized \(<2.5 \text{ mm} (PM_{2.5})\) are not met. Since sources of pollution reside in both indoor and outdoor air, selecting the most appropriate ventilation strategy is not a simple and straightforward task.

Methods: A framework for developing European health-based ventilation guidelines was created in 2010–2013 in the EU-funded HEALTHVENT project. As a part of the project, the potential efficiency of control policies to health effects caused by residential indoor exposures of fine particulate matter (PM_{2.5}), outdoor bioaerosols, volatile organic compounds (VOC), carbon oxide (CO), radon and dampness was estimated. The analysis was based on scenario comparison, using an outdoor-indoor mass-balance model and varying the ventilation rates. Health effects were estimated with burden of diseases (BoD) calculations taking into account asthma, cardiovascular (CV) diseases, acute toxication, respiratory infections, lung cancer and chronic obstructive pulmonary disease (COPD).

Results: The quantitative comparison of three main policy approaches, (i) optimising ventilation rates only; (ii) filtration of outdoor air; and (iii) indoor source control, showed that all three approaches are able to provide substantial reductions in the health risks, varying from approximately 20 % to 44 %, corresponding to 400 000 and 900 000 saved healthy life years in EU-26. PM_{2.5} caused majority of the health effects in all included countries, but the importance of the other pollutants varied by country.

Conclusions: The present modelling shows, that combination of controlling the indoor air sources and selecting appropriate ventilation rate was the most effective to reduce health risks. If indoor sources cannot be removed or their emissions cannot be limited to an accepted level, ventilation needs to be increased to remove remaining pollutants. In these cases filtration of outdoor air may be needed to prevent increase of health risks.
Hybrid testing constitutes a cost-effective experimental full scale testing method. The method was introduced in the 1960's by Japanese researchers, as an alternative to conventional full scale testing and small scale material testing, such as shake table tests. The principle of the method is to divide a structure into a physical substructure and a numerical substructure, and couple these in a test. If the test is conducted in real-time it is referred to as real time hybrid testing.

The hybrid testing concept has developed significantly since its introduction in the 1960', both with respect to the size and the complexity of the physical and numerical substructures. However, due to a rapid increase in the computational time, a further increase in the size and complexity of the numerical substructures is challenged. In this thesis a number of elements that can help to improve the size and complexity of kinematic nonlinear numerical substructures are presented, with special emphasis on the use of basis reduction methods. Three elements that can help to improve the accuracy are presented and illustrated.

In kinematic nonlinear systems, various deformation modes are coupled through a nonlinear strain measure. If these coupling-activated modes are not represented in the basis reduction, a significant increase in the structural stiffness can
appear, which can ruin the numerical accuracy. One way to represent the coupling-activated modes is by use of so-called modal derivatives. Equations to evaluate these exist. However, due to singularities these can only by solved approximately. A modified and a novel set of system of equations of motion governing the modal derivatives are, therefore, derived. From these a set of improved modal derivatives are found. By use of an example it is, furthermore, illustrated that the modal derivatives determined from the novel system represent the exact modal derivatives.

One of the most time consuming tasks in the numerical time integration is the evaluation of the internal restoring forces. Due to its nonlinear format, a time consuming element-by-element assembling is used. It is shown, that by adopting an existing mathematical reformulation technique, the costly element-by-element assembling is replaced by a significantly more efficient global assembling in a reduced co-ordinate system.

By use of the novel modal derivatives an efficient basis formulation is arranged, combining linear modes with modal derivatives. The basis is based on a Taylor series, and is, therefore, referred to as a Taylor basis. The basis predicts a relation between the linear normal modes and the modal derivatives. Utilizing this basis formulation, the modal derivatives are included without introducing further unknowns into the system. The basis formulation is shown to exhibit high precision and to reduce the computational cost significantly. Furthermore, the basis formulation exhibits a significant higher stability, than standard nonlinear algorithms.

A real-time hybrid test is performed on a glass fibre reinforced polymer composite box girder. The test serves as a pilot test for prospective real-time tests on a wind turbine blade. The Taylor basis is implemented in the test, used to perform the numerical simulations. Despite of a number of introduced errors in the real-time hybrid testing loop, the test confirms the high stability and efficiency of the Taylor basis.

General information
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Section for Structural Engineering
Authors: Andersen, S. (Intern), Poulsen, P. N. (Intern), Stang, H. (Intern)
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Regional climate-model performance in Greenland firm derived from in situ observations

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Authors: Charalampidis, C. (Ekstern), van As, D. (Ekstern), Langen, P. L. (Ekstern), Fausto, R. S. (Ekstern), Vandecruix, B. R. M. (Intern), Box, J. E. (Ekstern)
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nr35_p75_78.pdf
Reliable selection of earthquake ground motions for performance-based design

A decision support process is presented to accommodate selecting and scaling of earthquake motions as required for the time domain analysis of structures. Prequalified code-compatible suites of seismic motions are provided through a multi-criterion approach to satisfy prescribed reduced variability of selected Engineering Demand Parameters. Such a procedure, even though typically overlooked, is imperative to increase the reliability of the average response values, as required for the code-prescribed design verification of structures. Structure-related attributes such as the dynamic characteristics, as well as criteria related to the seismic motions variability and their compliance with a target spectrum are quantified through a newly introduced index, $\delta_{sv-sc}$, tailored to prioritize motions suites for the response history analysis. An actual multi-story building is used to demonstrate the efficiency of the method, by being subjected to numerous suites of motions that were highly ranked according to both the proposed approach ($\delta_{sv-sc}$) and the conventional index ($\delta_{conv}$), already used by most existing code-based earthquake records selection and scaling procedures. The findings reveal the superiority of the herein proposed multi-criterion approach, particularly in terms of extensively reducing the intra-suite response variability of ground motions, while at the same time increasing the reliability of the design values. They also demonstrate that the new index greatly reduces the size of the suite of selected ground motions, for a given level of target reliability, with respect to the conventional methods.

Remaining stress-state and strain-energy in tempered glass fragments

When tempered glass breaks, it shatters into relatively small pieces depending on the residual stress state in the glass. This has been known for centuries and is currently used in standards for classifying whether a piece of glass is tempered or not. However, the process of fragmentation is complex and only a few, relatively simple, models have been suggested for predicting the fragment size. The full theoretical explanation is still to be found and this work aims at providing another brick to the puzzle. The strain-energy present in tempered glass is obviously contributing to the fragmentation process and some authors e.g. Barsom (J Am Ceram Soc 51(2):75, 1968), Gulati (Glass processing days, Tamglass Engineering Oy, Tampere, 1997), Warren (Fractography of glasses and ceramics IV, Alfred University, Alfred, 2001) and Tandon and Glass (Fracture mechanics of ceramics—active materials, nanoscale materials, composites, glass and fundamentals, Springer, Houston, 2005) have proposed models for the fragments size based on an energy approach. Often an estimate of the remaining strain energy in the fragment is used; which leaves the questions: (a) what parameters are important for the remaining strain energy? (b) what is the magnitude of the remaining strain energy? (c) is there a simple way to estimate the remaining strain energy?

The present paper applies a quasi-static finite element model in order to answer these questions. In the present paper an example on the deformation and the stress redistribution in a fragment is given. Furthermore, a parametric investigation on the strain energy remaining in cylindrical- and prismatic fragments is given. It is shown, that there exists a simple relation between the thickness of the glass pane and the remaining strain energy in the fragment. A simple method for estimating the remaining strain energy in a fragment of a given shape and initial residual stress state is presented.
Remediation of ash - comparison of two different electrodialytic cells and applicability of treated soil in brick materials

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Universidade Nova de Lisboa
Authors: Ferreira, A. R. (Ekstern), Ottosen, L. M. (Intern), Ribeiro, A. B. (Ekstern)
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Publication date: 2016

Replacement of 5% of OPC by fly ash and APC residues from MSWI with electrodialytic pre-treatment

Fly ash (FA) and air pollution control (APC) residues are waste products from Municipal Solid Waste Incineration (MSWI). They are classified as hazardous waste due to the content of leachable heavy metals (HM), salts and/or dioxins. An electrodialytic (ED) process was applied to FA and APC residues as pre-treatment prior to incorporation in mortar, aiming to stabilize and remove HM and chlorides. Eight ED experiments were performed for 7 days with a L/S ratio of 3.5. The number of compartments (2 or 3) and current density (0.1 or 1.0 mA cm⁻²) varied. After ED treatment the heavy metals left in the ash were not leached to the same extent as in the original ash.

In mortar 5% of Ordinary Portland Cement was replaced by FA and APC residues (raw and ED upgraded). The studied parameters: compressive strength, HM leachability, and Cl content. The ED pre-treatment resulted in a decrease in both leaching of HM and the Cl content. The compressive tests presented comparable values to the reference mortars. This study suggests that the characteristics of FA and APC residues from MSWI after pre-treatment allows them to be reused in building materials, giving a new edge to waste management.

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Universidade Nova de Lisboa
Authors: Magro, C. (Ekstern), Kirkelund, G. M. (Intern), Guedes, P. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern), Ribeiro, A. (Ekstern)
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Replacing critical radiators to increase the potential to use low-temperature district heating – A case study of 4 Danish single-family houses from the 1930s

Low-temperature district heating is a promising technology for providing homes with energy-efficient heating in the future. However, it is of great importance to maintain thermal comfort in existing buildings when district heating temperatures are lowered. This case study evaluated the actual radiator sizes and heating demands in 4 existing Danish single-family houses from the 1930s. A year-long dynamic simulation was performed for each of the houses to evaluate the potential to lower the heating system temperatures. The results indicate that there is a large potential to use low-temperature district heating in existing single-family houses. In order to obtain the full potential of low-temperature district heating, critical radiators must be replaced. Based on a novel method, a total of nine radiators were identified to be critical to ensure thermal comfort and low return temperatures in two of the case-houses. If these radiators were replaced it would be possible to lower the average heating system temperatures to 50 °C/27 °C in all four houses.

General information
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Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Østergaard, D. S. (Intern), Svendsen, S. (Intern)
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BFI (2014): BFI-level 2
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Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 2.54 SNIP 2.593 CiteScore 5.02
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Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.998 SNIP 2.25 CiteScore 4.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Results of IEA SHC Task 45: Large Scale Solar Heating and Cooling Systems. Subtask A: "Collectors and Collector Loop"
The IEA SHC Task 45 Large Scale Solar Heating and Cooling Systems, carried out between January 2011 and December 2014, had the main objective to assist in the development of a strong and sustainable market of large solar heating systems by focusing on high performance and reliability of systems. Within this project, subtask A had the more specific objectives of investigating ways to evaluate the influence that different operating conditions can have on the collector performance, assure proper and safe installation of large solar collector fields, and guarantee their performance and yearly energy output. The results of the different investigations are presented, with a particular focus on how different parameters such as tilt, flow rate and fluid type, can affect the collector efficiency. Other presented results include methods to guarantee and check the thermal performance of a solar collector field and guidelines to design collector fields in such a way that the flow distribution is improved and the risks related to stagnation are minimized.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Department of Buildings and Energy, PlanEnergi, AEE INTEC, 1427795 Ontario Inc.
Authors: Bava, F. (Intern), Nielsen, J. E. (Ekstern), Knabl, S. (Ekstern), Brunger, A. (Ekstern), Furbo, S. (Intern), Fink, C. (Ekstern)
Pages: 546-556
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Main Research Area: Technical/natural sciences

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Journal: Energy Procedia
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Risk Analysis in Road Tunnels – Most Important Risk Indicators

Methodologies on fire risk analysis in road tunnels consider numerous factors affecting risks (risk indicators) and express the results by risk measures. But only few comprehensive studies on effects of risk indicators on risk measures are available. For this reason, this study quantifies the effects and highlights the most important risk indicators with the aim to support further developments in risk analysis. Therefore, a system model of a road tunnel was developed to determine the risk measures. The system model can be divided into three parts: the fire part connected to the fire model Fire Dynamics Simulator (FDS); the evacuation part connected to the evacuation model FDS+Evac; and the frequency part connected to a model to calculate the frequency of fires. This study shows that the parts of the system model (and their most important risk indicators) affect the risk measures in the following order: first, fire part (maximum heat release rate); second, evacuation part (maximum pre-evacuation time); and, third, frequency part (specific frequency of fire). The plausibility of these results is discussed with view to experiences from experimental studies and past fire incidents. Conclusively, further research can focus on these most important risk indicators with the aim to optimise risk analysis.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Bundesanstalt für Materialforschung und Prüfung
Authors: Berchtold, F. (Ekstern), Knaust, C. (Ekstern), Thöns, S. (Intern), Rogge, A. (Ekstern)
Pages: 637-648
Publication date: 2016
Roadmap for improving roof and façade windows in nearly zero-energy houses in Europe

Windows are central for the development of liveable nearly zero-energy homes and require careful consideration. Various studies have indicated that the effect of windows on energy consumption may change significantly with improved building insulation levels. Current guidelines on windows may therefore not apply in very well-insulated buildings, and more up-to-date information is needed about window solutions that are appropriate for the new conditions. This study maps the effect of multiple combinations of window size and basic glazing—and frame properties on energy, daylighting and thermal comfort in nearly zero-energy houses located in the European cities Rome and Copenhagen. The aim was to identify options that can support the easy and robust design of future homes with typical use of roof and façade windows. Hourly daylight levels were calculated in DAYSIM, while space heating demand and operative temperatures were calculated in EnergyPlus. The results support previous findings on the limited ability of nearly zero-energy buildings to utilise solar gains. It was found that U-values are becoming increasingly important for the energy performance of windows. The paper sketches the increased flexibility and related possibilities that may appear with improved roof window frame constructions and glazing U-values far lower than currently standard levels.
Advanced waterflooding (injection of water with selective ions in reservoirs) is a method of enhanced oil recovery (EOR) that has attracted the interest of oil and gas companies that exploit the Danish oil and gas reservoirs. This method has been applied successfully in oil reservoirs and in the Smart Water project performed in a laboratory scale in order to evaluate the EOR processes in selected core plugs. A major step towards this evaluation is to identify the composition of the injected water that leads to increased oil recovery in reservoirs and to define changes in the petrophysical properties of the rock due to the water injection. During advanced waterflooding of reservoirs, or in the Smart Water project, during core flooding experiments, several chemical and petrophysical processes occur in the grains and pore space due to rock, brine and oil interactions. These processes may affect the rate and amount of oil recovered. Advanced waterflooding experiments of reservoir rocks are performed on laboratory scale, but the mechanisms that describe the effects of water injection on the rock minerals are poorly understood. After many decades, a methodology on how this technique should be performed on specific geological structures and why it is sometimes successful; has yet to be established. The presence of both oil and water in the pore space, several different ions present in the injected water that contact the pore walls, possible changes in the fluid wetting the surface of the grains and high stress applied on the minerals, comprise the complex system of waterflooding. These parameters affect the fluid/liquid, solid/liquid and solid/solid interfaces. The changes of the petrophysical and mechanical properties of the core affected from waterflooding are the main topic of research in the present study. In an effort to simplify the complex system of waterflooding, the parameters that affect the solid/liquid interfaces simultaneously, during the experiments, are studied individually. Many chemical and petrophysical phenomena have been documented in previous studies that may affect either the
mechanical or physical properties of the rock during waterflooding experiments. The phenomena include decreased pore stiffness and subsequent compaction and can be related to a variety of parameters; including precipitation and dissolution reactions, as well as adsorption reactions and changes in wettability. In order to understand the potential mechanisms under the action of water injection, the present study investigates the effect of the selected ions on the solid/fluid interface of the porous medium under reservoir conditions by studying the following conditions separately: 1) during coreflooding experiments, the rock is subjected to high external stresses that resemble the reservoir stresses; 2) the fluid distribution within the pore space changes during the flow through experiments and wettability alterations may occur; 3) different ions, present in the salt water injected in the core, interact with the surface of the mineral.

This study aims to improve the theoretical understanding of the detailed mechanisms involved in waterflooding, using advanced and sensitive tools on a laboratory scale to illustrate the potential mechanisms behind the action of water injection on oil and brine bearing rocks. In order to investigate the action of pore water with selective ions on the solid/fluid interface, low field nuclear magnetic resonance (NMR) spectrometry, ultrasonic velocities, electrical resistivity and mineralogical characterization are performed on quarry and reservoirs cores. The rocks are saturated with fluids similar to the ones used in the core flooding experiments. Ultrasonic velocities and electrical resistivity data are collected to detect changes with respect to strength and pore geometry of the rock. Low field NMR spectrometry is used to detect changes in texture, wettability and pore-fluid distribution. While investigating the petrophysical properties of reservoir rocks, information concerning the mineralogy is an important factor for the establishment of a rock physical model. Therefore, additional experiments are performed: X-ray diffraction (XRD), backscatter electron microscopy images (BSEM), mercury injection capillary pressure (MICP) curves and specific surface analysis (BET) illustrate the mineralogy and texture of the rock samples.

Chalk from Stevns Klint near Copenhagen, Denmark, (a rock analogue to reservoir chalk from the North Sea) was used for rock mechanical testing in order to understand the potential mechanisms behind the action of ions in high concentration on the chalk surface; such as precipitation and dissolution. The effect of the divalent ions on the elasticity and pore collapse of this rock was observed and validated from the ultrasonic velocity data. Low field NMR was used to detect any precipitation that may occur in the pore space of chalk saturated with divalent ions. Precipitation occurred only in single cases; therefore, it is doubtful whether it is the responsible mechanism for the water weakening of chalk. The same rock material was used to illustrate the use of low field NMR to detect differences in the texture of chalk; in our case a carbonate mudstone and a carbonate wackestone as previously observed by electron microscopy. The solid-fluid affinity of chalk from the Gorm field, Berea sandstone and chloride bearing greensand from the Solsort field was defined from low field NMR data. Longitudinal relaxation time (T1), transverse relaxation time (T2) and self-diffusion coefficient of the fluids within the core plugs were measured at different saturation states; water, reservoir oil and oil and water at irreducible water saturation. T1/T2 ratio proved a non-destructive and fast way to determine the solid-fluid affinity and fluid distribution within the pore space of the selected rocks.

Finally, supplementary experimental work includes the determination of small amounts of oil in water samples from the NMR T2 distribution. Low field NMR spectrometry was able to accurately determine the oil and water volume in effluents. This is found very useful, because when the oil reaches residual saturation during core flooding experiments, the produced oil is very small and the quantification of these fluids is often difficult.

### General information

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Katika, K. (Intern), Fabricius, I. L. (Intern)
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**Role of clothing in both accelerating and impeding dermal absorption of airborne SVOCs**

To assess the influence of clothing on dermal uptake of semi-volatile organic compounds (SVOCs), we measured uptake of selected airborne phthalates for an individual wearing clean clothes or air-exposed clothes and compared these results with dermal uptake for bare-skinned individuals under otherwise identical experimental conditions. Using a breathing hood to isolate dermal from inhalation uptake, we measured urinary metabolites of diethylphthalate (DEP) and di-n-butylphthalate (DnBP) from an individual exposed to known concentrations of these compounds for 6h in an experimental
chamber. The individual wore either clean (fresh) cotton clothes or cotton clothes that had been exposed to the same chamber air concentrations for 9 days. For a 6-h exposure, the net amounts of DEP and DnBP absorbed when wearing fresh clothes were, respectively, 0.017 and 0.007 μg/kg/(μg/m³); for exposed clothes the results were 0.178 and 0.261 μg/kg/(μg/m³), respectively (values normalized by air concentration and body mass). When compared against the average results for bare-skinned participants, clean clothes were protective, whereas exposed clothes increased dermal uptake for DEP and DnBP by factors of 3.3 and 6.5, respectively. Even for non-occupational environments, wearing clothing that has adsorbed/absorbed indoor air pollutants can increase dermal uptake of SVOCs by substantial amounts relative to bare skin.

General information
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Organisations: Department of Mechanical Engineering, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Missouri University of Science and Technology, Ruhr-Universität Bochum, Fraunhofer Wilhelm-Klauditz-Institut (WKI)
Authors: Morrison, G. C. (Ekstern), Weschler, C. J. (Intern), Bekö, G. (Intern), Koch, H. M. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern)
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BFI (2015): BFI-level 2
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Scopus rating (2014): SJR 1.598 SNIP 1.326 CiteScore 3.07
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.27 SNIP 1.132 CiteScore 2.6
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BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.338 SNIP 1.162 CiteScore 2.66
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Scopus rating (2011): SJR 1.467 SNIP 1.345 CiteScore 2.47
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.746 SNIP 1.193
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.809 SNIP 1.175
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Scopus rating (2008): SJR 1.603 SNIP 1.118
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.39 SNIP 1.319
Scopus rating (2006): SJR 1.492 SNIP 1.38
Scopus rating (2005): SJR 1.187 SNIP 1.176
Scopus rating (2004): SJR 1.051 SNIP 1.089
Scopus rating (2003): SJR 1.035 SNIP 0.883
Roles of the human occupant in indoor chemistry

Over the last decade, influences of the human occupant on indoor chemistry have been investigated in environments ranging from simulated aircraft cabins to actual classrooms. We have learned that ozone reacts rapidly with constituents of skin surface lipids on exposed skin, hair, and clothing, substantially reducing indoor ozone concentrations but increasing airborne levels of mono-and bifunctional compounds that contain carbonyl, carboxyl, or alpha-hydroxy ketone groups. Moreover, occupants transfer skin oils to and shed skin flakes (desquamation) onto indoor surfaces. Evidence for the presence of skin flakes/oils has been found in airborne particles, settled dust, and wipes of indoor surfaces. These occupant residues are also anticipated to scavenge ozone and produce byproducts. Under typical conditions, occupancy is anticipated to decrease the net level of oxidants in indoor air. When occupants scavenge ozone, the level of SOA derived from ozone/terpene chemistry decreases; the fraction of SVOCs in the gas-phase increases, and the fraction associated with airborne particles decreases. Occupants also remove organic compounds, including certain chemically active species, via bodily intake. Studies reviewed in this paper demonstrate the pronounced influences of humans on chemistry within the spaces they inhabit and the consequences of these influences on their subsequent chemical exposures.
Screening of heavy metal containing waste types for use as raw material in Arctic clay-based bricks

In the vulnerable Arctic environment, the impact of especially hazardous wastes can have severe consequences and the reduction and safe handling of these waste types are therefore an important issue. In this study, two groups of heavy metal containing particulate waste materials, municipal solid waste incineration (MSWI) fly and bottom ashes and mine tailings (i.e., residues from the mineral resource industry) from Greenland were screened in order to determine their suitability as secondary resources in clay-based brick production. Small clay discs, containing 20 or 40% of the different particulate waste materials, were fired and material properties and heavy metal leaching tests were conducted before and after firing. Remediation techniques (washing in distilled water and electrodialytical treatment) applied to the fly ash reduced leaching before firing. The mine tailings and bottom ash brick discs obtained satisfactory densities (1669-2007 kg/m³) and open porosities (27.9-39.9%). In contrast, the fly ash brick discs had low densities (1313-1578 kg/m³) and high open porosities (42.1-51. %). However, leaching tests on crushed brick discs revealed that heavy metals generally became more available after firing for all the investigated materials and that further optimisation is therefore necessary prior to incorporation in bricks.

General information
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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Danish Technological Institute
Authors: Belmonte, L. J. (Intern), Ottosen, L. M. (Intern), Kirkelund, G. M. (Intern), Jensen, P. E. (Intern), Vestbø, A. P. (Ekstern)
Number of pages: 13
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Main Research Area: Technical/natural sciences
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A novel ventilation method for minimizing the spread of bioeffluent contaminants generated from sedentary people indoors was developed and studied. The concept of the method consists of a ventilated cushion which is able to suck the human bioeffluents at the area of the body where they are mainly generated before they disperse around a room. The polluted air near the body is exhausted into the cushion and it is removed from the room by a separate exhaust system. The performance of the method was studied in series of experiments. Full-scale room and a dressed thermal manikin sitting in front of a desk were used to simulate one person office. The chair on which the thermal manikin was sitting had the ventilated cushion (VC). Tracer gases, carbon dioxide (CO₂) and nitrous oxide (N₂O), were used to simulate bioeffluents emitted by the manikin's armpits and groin region respectively. The experiments were conducted at 26°C room air temperature. The performance of the VC in conjunction with mixing total-volume background ventilation at 1 air change per hour (ACH) was compared with that of mixing background ventilation alone operating at 1, 1.5, 3 and 6 ACH. Experiments at exhaust airflow rate from the cushion at 1.5, 3 and 5 L/s were performed. The pollution removal efficiency was assessed by measuring the pollution concentration in the breathing zone of the manikin and at several other locations in the room bulk air. Exhausting air through the VC decreased the concentration of the tracer gases at the breathing zone and in the room. The higher the exhaust flowrate, the more the concentration was decreased.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Bivolarova, M. P. (Intern), Rezgals, L. (Ekstern), Melikov, A. K. (Intern), Bolashikov, Z. D. (Intern)
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Settlement Patterns

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Aalborg University
Authors: Hendriksen, K. (Intern), Hoffmann, B. (Ekstern), Knudsen, R. (ed.) (Ekstern)
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Shear capacity of ASR damaged structures – in-depth analysis of some in-situ shear tests on bridge slabs
This paper deals with the influence of alkali-silica reaction (ASR) on the shear capacity for concrete slabs without shear reinforcement. An experimental full-scale in-situ program consisting of four slabs from a bridge (Vosnæsvej) has been carried out and the results have been published in ref. [1] with the principal author of this paper as co-author. After the experiments, a detailed measurement of the test specimens was conducted. Based on these measurements a thorough analysis of the experimental results was carried out and evaluated by a plastic model for shear capacity, Crack Sliding Model (CSM) and Eurocode 2 (EN 1992-1-1). The analysis shows that three experiments were highly affected by the preparation of the experimental setup. Only one experiment contained useful information about the shear capacity. The analysis of this experiment shows that the shear capacity is not reduced as much as the measured concrete compressive strength indicates. Furthermore, the analysis shows that the ASR-induced prestress may be the reason for this phenomenon.

General information
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Organisations: Department of Civil Engineering, Section for Building Design, Section for Structural Engineering, University of Southern Denmark
Authors: Hansen, S. G. (Ekstern), Barbosa, R. A. (Intern), Hoang, L. C. (Intern), Hansen, K. K. (Intern)
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Simulation and optimization study on a solar space heating system combined with a low temperature ASHP for single family rural residential houses in Beijing

A pilot project of the solar water heating system combined with a low temperature air source heat pump (ASHP) unit was established in 2014 in a detached residential house in the rural region of Beijing, in order to investigate the system application prospect for single family houses via system optimization design and economic analysis. The established system was comprised of the glass heat-pipe based evacuated tube solar collectors with a gross area of 18.8 m² and an ASHP with a stated heating power of 8 kW for the space heating of a single family rural house of 81.4 m². The dynamic thermal performance of the pilot system was measured for continuous 20 days under typical cold climate conditions and the test data was used to validate the TRNSYS simulation model established. On the basis of model validation, system optimizations of both the existing pilot household and the typical rural house with good building insulation were undertaken to figure out the system economical efficiency in the rural regions of Beijing. The results show that the payback periods of the solar space heating system combined with the ASHP with the collector areas 15.04-22.56 m² are 17.3-22.4 years for the established pilot household on the current electricity price level of 0.5 RMB/kWh, comparing with the reference condition of the fully ASHP space heating. It is further found that the equivalent solar heat price per kWh is too high under the current solar market cost price and collector technology. To put forward the integrated solar space heating for reducing carbon emission, it is suggested that the Beijing municipal government should offer some financial subsidy to compensate the equivalent solar heat price per kWh.

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Simulation Study of Discharging PCM Ceiling Panels through Night-time Radiative Cooling

The energy consumption globally has been increasing drastically the past decades, mainly due to the population growth and the industrial and technological progress. In order to address this issue, the European Union has launched several directives to decrease energy use, increase energy efficiency and increase use of renewable energy sources. The aim is that by 2020 all new buildings should be nearly zero-energy buildings. A solution that could contribute to this is the combination of photovoltaic panels for the production of electricity and phase change material (PCM) for the reduction of peak cooling demand.

In the present simulation study, the coupling of nighttime radiative cooling with PCM for cooling an office room was investigated. For cooling water through nighttime radiative cooling two types of solar panels were utilized, an unglazed solar collector and photovoltaic/thermal (PV/T) panels. Apart from cold water for space cooling, the installation was capable of providing domestic hot water from both types of panels and electricity from the PV/Ts. This system was simulated for the period from 1st of May until 30th of September, under the weather conditions of Copenhagen (Denmark), Milan (Italy) and Athens (Greece).

In Athens and Milan the operative temperature was within the range of Category III of EN 15251 (23 – 26oC, 73.4 – 78.8oF) for 81% and 83% of the occupancy period respectively, while in Copenhagen it was within the range only for 63%. Furthermore, the percentage of PCM used at the end of the occupancy period was 86%, 81% and 80% for Copenhagen, Milan and Athens, respectively. Nighttime radiative cooling provided for Copenhagen 61%, for Milan 36% and for Athens 14% of the cooling energy required for discharging the PCM. Furthermore, the average cooling power per unit area provided by the PV/T panels was 43 W/m² for Copenhagen, while for Milan and Athens it was 36 W/m² and 34 W/m², respectively. The cooling power of the unglazed solar collector was negligible. Finally, the total electricity produced in Copenhagen for the simulated period was 371 kWh, while for Milan and Athens it was 380 and 439 kWh, respectively.

It was concluded that the nighttime radiative cooling can be a satisfying solution for providing space cooling to office buildings. The performance of the installation could be improved by implementing a solar shading system and a more precise control strategy.
Simulation Study of the Energy Performance of Different Space Heating Methods in Plus-energy Housing

Due to a shortage of energy resources, the focus on indoor environment and energy use in buildings is increasing which sets higher standards for the performance of HVAC systems in buildings. The variety of available heating systems for both residential buildings and office buildings is therefore increasing together with the performance of the systems.

This paper reports the results of a simulation study carried out using the commercially available building simulation software IDA ICE. The considered house was designed as a plus-energy house and it was located in Denmark. The dynamic building simulation model has been validated and calibrated with measurement data from the house in a previous study. The studied systems were radiant floor heating, warm-air heating through ventilation system and radiator heating. The energy performance of systems for achieving the same thermal comfort was compared.

The effects of several parameters on system energy performance for each space heating solution were investigated; floor covering resistance of the floor heating system, having a heat recovery on the exhaust in the ventilation system, and different working temperature levels for the radiator heating. For all cases the heat source was a natural gas fired condensing boiler, and for the floor heating cases also an air-to-water heat pump was used to compare two heat sources. The systems were also compared in terms of auxiliary energy use for pumps and fans.

The results show that the investigated floor heating systems had the best performance in terms of energy with a total energy saving of 23% compared to warm-air heating with heat recovery. It can furthermore be coupled to other heat sources than a boiler. The floor covering resistance of the floor heating system should be kept to a minimum to fully benefit from the low temperature heating potential since an increased floor covering requires higher average water temperatures in the floor loops and decreases the COP of the heat pump. The water-based heating systems required significantly less auxiliary energy input compared to the air-based heating system.

Furthermore, the results show that low temperature heating systems, as seen in floor heating in this study, can contribute to achieving plus-energy targets by minimizing the energy use for space heating purposes while achieving necessary thermal comfort for the occupants.
Snowdrift – visualisation on an architectural model in wind tunnel testing

Wind-driven snow in cold regions is a significant problem for the built environment and the integration of snow deposition into the early design process is not sufficient implemented. Snowdrift simulation on a reduced scale in wind tunnel testing often investigates the similarity of particle transport and deposition at and around buildings in comparison to the nature phenomenon. Although a number of studies performed the deposition on a test model with different snow substitutes, the scaling of the phenomenon is still not understood or inaccurate. The study is a visual method of the snow effects on architectural models. A visual performance of the snowdrift simulation was carried out in a small boundary-layer wind tunnel at DTU Civil Engineering. The particle distribution and the effect of the substitute material on the surface and around the test model were performed. The applied method is an alternative approach hence the model design and the visual effect was primarily considered. Main aspects in the model design were different materials and sizes (matter of scale) which were photographed in picture series and time laps. The method indicates the aerodynamic phenomenon as a visual understanding of the physical process.

Social and technological aspects of disaster resilience

Large scale projects tasked with designing infrastructures and urban networks resilient to disasters face a common challenge, i.e. the need to address concomitant technological issues and social problems. What is more, conflicting technologies and the diverse philosophical underpinnings of distinct academic disciplines pose difficulties in the collaboration among experts of different fields. These difficulties and possible ways to tackle them have been highlighted by a questionnaire developed in the framework of an EU project named ANDROID (Academic Network for Disaster Resilience to Optimize Educational Development). More specifically, the project investigated the level of interdisciplinary work in current research and educational projects within the field of disaster resilience. Findings illustrate the number and
types of disciplines involved in disaster resilience projects and suggest that a higher degree of integration between
different disciplines in tertiary education could promote a transdisciplinary approach to disaster resilience, resulting in
design efficiency and innovation.

General information
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Solidification behavior and thermal conductivity of bulk sodium acetate trihydrate composites with thickening agents and graphite

Sodium acetate trihydrate is a promising phase change material for long term storage of solar thermal energy if supercooling is actively utilized. Well performing thermal energy storages need to be able to charge and discharge energy at a high rate. The relatively low thermal conductivity of the phase change material limits the heat exchange capacity rate to and from the storage. Another factor that limits the heat transfer is the contraction and expansion of the salt hydrate during the phase change. This density change causes formation of cavities inside the solid storage material. Investigations of the solidification behavior, the formation of cavities and thermal conductivity of composites based on sodium acetate trihydrate crystalizing with or without supercooling are presented in this paper. The thermal conductivity was measured with an ISOMET hot disc surface measurement probe. Samples that crystalized without supercooling tended to form solid crystals near the heat transfer surface and cavities away from the heat transfer surface. The measured thermal conductivity was up to 0.7 W/m K in solid sodium acetate trihydrate. Samples that crystalized from supercooled state formed fewer large cavities but had a lower thermal conductivity. A composite with sodium acetate trihydrate, thickening agent and 5% graphite flakes had a thermal conductivity of up to 1.1 W/m K.

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Space heating with ultra-low-temperature district heating - A case study of four single-family houses from the 1980s

District heating is predicted to play a large role in the future fossil free energy system. Apart from providing energy savings by utilizing surplus heat, the district heating system also provides flexibility to fluctuating electricity generation by bridging the electricity and the heating sector. These benefits can be maximized if district heating temperatures are lowered as much as possible. In this paper we report on a project where 18 Danish single-family houses from the 1980s were supplied by ultra-low-temperature district heating with a supply temperature as low as 45 °C for the main part of the year. The houses were heated by the existing hydraulic radiator systems, while domestic hot water was prepared by use of district heating and electric boosting. This paper evaluated the heating system temperatures that were necessary in order to maintain thermal comfort in four of the houses. First the four houses were modelled in the building simulation tool IDA ICE. The simulation models included the actual radiator sizes and the models were used to simulate the expected thermal comfort in the houses and resulting district heating return temperatures. Secondly measurements of the actual district heating return temperatures in the houses were analysed for different times of the year. The study found that existing Danish single-family houses from the 1980s can be heated with supply temperatures as low as 45 °C for the main part of the year. Both simulation models and test measurements showed that there is a large potential to lower the district heating temperatures.

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Stabilitet af tynde skalkonstruktioner

This thesis deals with the stability theory and its application on thin imperfect shell structures. Thin and slender structures are often used in modern load-bearing structures where the common material is a metal, particularly steel or aluminum. This thesis only deals with stability theory for conservative systems.

Stability theory is by many structural engineers considered a difficult and complicated subject. Therefore in this thesis a simple and systematic method has been developed which only requires knowledge on tensor analysis and elementary calculus of variations.

In the first part of the thesis the new theory has been used to develop a theory of stability. The equilibrium system, the stability of which is considered, may often be investigated by a linear theory. In this theory of shear forces in the direction of the shell normal are neglected and equilibrium is formulated in the undeformed configuration. The classical theory of stability evolves by formulating equilibrium conditions for adjacent configurations. These are created by means of a first variation of the position vector.

The present theory requires, as all shell theories, a number of assumptions and simplifications in order to obtain a kind of clearness. By using calculus of variations one has the advantage that only those terms which are important appear in the equations. Thus one does not need to estimate the important parameters and those unimportant.

In the first part also an approximate non-linear theory is formulated. This theory may also take into account imperfections. In the second part of the thesis the new theory is used in a calculation of a circular cylindrical shell axially loaded. The numerical solution is carried out by means of difference equations. The eigen-value problem is solved and furthermore two kinds of imperfections and their influence on the load-carrying capacity are analyzed.

General information

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Stable oxygen isotope variability in two contrasting glacier river catchments in Greenland

Analysis of stable oxygen isotope (δ18O) characteristics is a useful tool to investigate water provenance in glacier river systems. In order to attain knowledge on the diversity of δ18O variations in Greenlandic rivers, we examined two contrasting glacierised catchments disconnected from the Greenland Ice Sheet (GrIS). At the Mittivakkat Gletscher river, a small river draining a local temperate glacier in southeast Greenland, diurnal oscillations in δ18O occurred with a 3 h time lag to the diurnal oscillations in run-off. The mean annual δ18O was -14.68±0.18‰ during the peak flow period. A hydrograph separation analysis revealed that the ice melt component constituted 82±5% of the total run-off and dominated the observed variations during peak flow in August 2004. The snowmelt component peaked between 10:00 and 13:00 local time, reflecting the long travel time and an inefficient distributed subglacial drainage network in the upper part of the glacier. At the Kuannersuit Glacier river on the island Qeqertarsuaq in west Greenland, the δ18O characteristics were examined after the major 1995-1998 glacier surge event. The mean annual δ18O was -19.47±0.55 ‰. Despite large spatial variations in the δ18O values of glacier ice on the newly formed glacier tongue, there were no diurnal oscillations in the bulk meltwater emanating from the glacier in the post-surge years. This is likely a consequence of a tortuous subglacial drainage system consisting of linked cavities, which formed during the surge event. Overall, a comparison of the δ18O compositions from glacial river water in Greenland shows distinct differences between water draining local glaciers and ice caps (between -23.0 and -13.7 ‰) and the GrIS (between -29.9 and -23.2 ‰). This study demonstrates that water isotope analyses can be used to obtain important information on water sources and the subglacial drainage system structure that is highly desired for understanding glacier hydrology.
**Staff-to-child ratios in day-care centres: a concern with respect to fire safety**

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**Strength and deformation properties of volcanic rocks in Iceland**

Tunnelling work and preinvestigations for road traces require knowledge of the strength and de-formation properties of the rock material involved. This paper presents results related to tunnel-ling for Icelandic water power plants and road tunnels from a number of regions in Iceland.

The volcanic rock from Iceland has been the topic for rock mechanical studies carried out by Ice-landic guest students at the Department of Civil Engineering at the Technical University of Den-mark over a number of years in cooperation with University of Iceland, Vegagerðin (The Icelandic Road Directorate) and Landsvirkjun (The National Power Company of Iceland). These projects involve engineering geological properties of volcanic rock in Iceland, rock mechanical testing and parameter evaluation. Upscaling to rock mass properties and modelling using Q- or GSI-methods have been studied by the students and are available in their MSc-theses, but will not be covered here.

The present contribution gives a short engineering geological overview of the volcanic rock for-mations in Iceland. Furthermore, the results of a number of unconfined, Brazilian, and a limited number of triaxial compression tests are presented and evaluated. The results are grouped accord-ing to engineering geological classification and classification properties such as bulk density. Correlations between the bulk density and the logarithm to the elasticity modulus and strength parameters are established and discussed.

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Volcanic rocks, Iceland, UCS test, Brazilian test, Elasticity modulus
Stress relaxation in tempered glass caused by heat soak testing

Heat soak testing of tempered glass is a thermal process required after the tempering process itself to bring glasses of commercial soda-lime-silica-glass to failure that are contaminated with nickel sulphide inclusions, diameter 50 mm to 500 mm typically. Thus, the tests avoid a so-called "spontaneous" breakage of the glass in building elements at ambient temperatures months or years later. According to industry standards, the duration of the tests typically differs between 1 h and 4 h at temperatures of 290 ± 10 °C. Although this temperature is well below the transformation temperature of commercial soda-lime-silica glass, it causes stress relaxation in tempered glass and the fracture pattern of the glass changes accordingly, especially thin glasses are affected. Based on the Tool-Narayanaswamy-Model, this paper comprises the theoretical background of the stress-relaxation-process and the results of a parameter study for its most influential technical parameters. Results are compared to photoelastic measurements of temper stresses and fracture patterns of tempered glass before and after a heat treatment similar to heat soak testing.
Structural health monitoring approach for detecting ice accretion on bridge cables using the autoregressive model

Ice accretion on cables of bridge structures poses serious risk to the structure as well as to vehicular traffic when the ice falls onto the road. Detection of ice formation, quantification of the amount of ice accumulated, and prediction of icefalls will increase the safety and serviceability of the structure. In this paper, an ice accretion detection algorithm is presented based on the Continuous Wavelet Transform (CWT). In the proposed algorithm, the acceleration signals obtained from bridge cables are transformed using wavelet method. The damage sensitive features (DSFs) are defined as a function of the wavelet energy at specific wavelet scales. It is found that as ice accretes on the cables, the mass of cable increases, thus changing the wavelet energies. Hence, the DSFs can be used to track the change of cables mass. To validate the proposed algorithm, we use the data collected from a laboratory experiment conducted at the Technical University of Denmark (DTU). In this experiment, a cable was placed in a wind tunnel as ice volume grew progressively. Several accelerometers were installed at various locations along the testing cable to collect vibration signals.
Structures that Include a Semi-Outdoor Space: Part 2: Thermal Environment

The thermal environment of buildings with a second "skin" and semi-outdoor space is examined in the present study. A literature review was conducted on similar structures and only a few studies were found focusing on the thermal environment. Two different building case studies were chosen with different building and shield geometry, different levels of insulation but same shield material; Dome of Visions (DoV) and EMBRACE. Both buildings were modelled in IDA ICE 4.6.2 simulation software in order to assess the thermal environment of the building and assess how long the semi outdoor space of each building can be used by the occupants. The study was based on weather data for Copenhagen. In addition to the simulations, physical measurements were performed in DoV to assess the thermal environment in the semi-outdoor space. Since existing standards are not applicable for semi-outdoor spaces, an alternative method was followed with adjustable clothing level and three different tolerance levels. The semi-outdoor area of both buildings was found to provide more than double the comfortable occupancy hours compared to outdoors and the semi outdoor spaces can be roughly used for 45% of the year. Finally, the semi-outdoor space’s temperature in DoV was higher than the ambient throughout winter by at least 3°C.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
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Structures that Include a Semi-Outdoor Space: Part 1: Energy Performance

There are several examples of buildings that are partially or entirely covered by a transparent shield, such that a semi-outdoor space between the building and the shield is created. The purpose of the present study was to investigate the impact of the addition of a shield on the energy use of a building. Two case study buildings were examined; the EMBRACE dwelling, which has a climate shield on two of
its sides and the “Dome of Visions (DoV)”, in which a dwelling is enclosed in a domeshaped climate shield. Simulations were performed using IDA ICE software, where both buildings were simulated in two versions; with and without their climate shield. The results of the two versions were compared in terms of peak load and energy demand in the Copenhagen region, for three different cases: during the heating season, during the cooling season and during the cooling season with natural ventilation in the semi-outdoor space. In EMBRACE, the heating and cooling demand were only slightly affected by the addition of the climate shield. However, when implementing natural ventilation in the semi-outdoor space both the peak cooling load and the energy demand were reduced during the cooling season by 30.8% and 14.6% respectively. In DoV, the addition of the shield resulted in a reduced heating demand (-37.7%) but significantly higher cooling demand (109.8%), although with natural ventilation the peak cooling load and the energy demand were reduced, by 34.8% and 61.6% respectively, compared to the unshielded version of the building.

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Semi-outdoor space, Climate shield, Energy demand, Peak load

Subjective Evaluation of the Microenvironment Generated by a Hospital Bed with Localized Ventilation System
A novel method for local hospital bed ventilation, called HBIVCU (Hospital Bed with Integrated Ventilation and Cleansing Unit), was studied in a human subject experiment. The goal of this study was to identify human response to the microenvironment generated by a hospital bed with installed HBIVCU and to compare with human response to the micro-environment at a hospital bed without local ventilation. 32 participants took part in two experimental conditions - hospital bed with and without installed HBIVCU. Subject’s votes on the bed microenvironment were collected via standardized questionnaires. The subjects evaluated the perceived air quality in the ventilated bed as better compared to that in the non-ventilated bed. The whole body thermal sensation (WTS) and acceptability votes were decreasing over time for the non-ventilated bed condition. Significant differences in the local thermal sensation LTS and the LTS acceptability votes between the two conditions could be found only for some body parts and time intervals. No draught was reported.

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Human subject response, Hospital bed ventilation, Cross-infection control, Perceived air quality, Thermal sensation

Subjective Evaluation of the Microenvironment Generated by a Hospital Bed with Localized Ventilation System
A novel method for local hospital bed ventilation, called HBIVCU (Hospital Bed with Integrated Ventilation and Cleansing Unit), was studied in a human subject experiment. The goal of this study was to identify human response to the microenvironment generated by a hospital bed with installed HBIVCU and to compare with human response to the micro-environment at a hospital bed without local ventilation. 32 participants took part in two experimental conditions - hospital bed with and without installed HBIVCU. Subject’s votes on the bed microenvironment were collected via standardized questionnaires. The subjects evaluated the perceived air quality in the ventilated bed as better compared to that in the non-ventilated bed. The whole body thermal sensation (WTS) and acceptability votes were decreasing over time for the non-ventilated bed condition. Significant differences in the local thermal sensation LTS and the LTS acceptability votes between the two conditions could be found only for some body parts and time intervals. No draught was reported.
Successful Implementation of Energy Strategies in Local Communities through Strategic Navigation between Professions

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Aalborg University
Authors: Petersen, J. (Intern), Quitzau, M. (Ekstern)
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**Suction caissons subjected to monotonic combined loading**
Suction caissons are being increasingly used as offshore foundation solutions in shallow and intermediate water depths. The convenient installation method through the application of suction has rendered this type of foundation as an attractive alternative to the more traditional monopile foundation for offshore wind turbines. The combined loading imposed typically to a suction caisson has led to the estimation of their bearing capacity by means of 3D failure envelopes. This study aims to analyse the behaviour of suction caissons for offshore wind turbines subjected to combined loading. Finite element models of the caisson-soil are developed in order to derive the failure envelopes considering both sand and clay profiles. The numerical modelling is being validated by the failure mechanisms reported in the literature for skirted foundations. The sensitivity of the load response curves on the selection of the constitutive soil model is examined. The failure envelopes of a single suction caisson obtained by the numerical models are in good agreement with the corresponding ones suggested by closed-form expressions.

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Technical University of Denmark
Authors: Penzes, P. (Ekstern), Jensen, M. (Ekstern), Zania, V. (Intern)
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**Supply of domestic hot Water at comfortable temperatures by low-temperature district heating without risk of Legionella**
In Denmark, about 25% of the primary energy is consumed for covering the heat demand in the buildings. To achieve a complete renewable energy system by 2050, which is the goal set by the Danish government, methods that are more efficient and economical for heat supply are urgently needed. Considering the overall energy efficiency and environment effect, the district heating (DH) is a cost-effective way of supplying heat to high heat density area. Currently, the DH system in most countries are still with supply and return temperature at 80/40 °C. The efficiency of the DH system can be improved by applying lower supply/return temperatures (55/25°C), which has been defined as the 4th generation district heating (4DH) or low-temperature district heating (LTDH). Compared to the current district heating, LTDH can give more access to the renewable energy sources (RES) with low heat quality, increase the recovered heat from industrial process and geothermal heat exchanging process, increase the heat recovery of flue gas condensation and increase the coefficient of performance (COP) of the heat pump if applied. Moreover, the low supply/return temperature in the network can also reduce the heat loss. To make utmost use of low-temperature energy sources, it can be beneficial to apply ultra-low-temperature district heating (ULTDH) in the future energy-efficient buildings, especially when heat pump is used for heat production. The supply temperature of ULTDH should be sufficient to ensure the comfort indoor temperature for space heating but lower than LTDH. Therefore, to meet the comfort and hygiene requirements for DHW supply, supplementary heating methods should be combined.
However, one obstacle to realize the LTDH/ULTDH is the concern of the violation of the comfort and hygiene requirements of DHW supply. According to the Danish standard, the supply for DHW should be able to reach 45 °C for the kitchen use and 40 °C for other uses for comfort. Regarding to the hygiene requirements, large DHW system with DHW storage tank and circulation has to use high temperature regime to get rid of Legionella. The storage tank should be able to reach 60 °C and the circulation should be operated no lower than 50°C. While the DHW system with small DHW volume has very low risk of Legionella. This study investigated available solutions for supplying DHW with LTDH or ULTDH meeting the comfort and hygiene requirements. Both the sterilization methods and optimized DHW system design methods are included. For the sterilization methods, we selected the most widely used treatments, and analyzed the feasibility of applying them in the LTDH scenario, the installation and operation difficulty, and the economy based on the review of substantial documents and relevant standards. In terms of the DHW system design methods, the optimal system configurations and operation methods were designed and evaluated with respect to the different DH scenarios and building typologies. Model studies were built to simulate the performances of the proposed systems under ideal situations. Some case studies were used as reference works to compare with the model results.

Considering the disinfection mechanism of different sterilization methods and the regulation for water quality in Denmark, the approaches of photocatalysis, UV light and filtration have good disinfection efficacy for Legionella if supplied by LTDH, and inject no additives into the water. Thus, they can be considered as feasible sterilization solutions.

In terms of the DHW system design methods, in addition to ensure the safe and hygiene DHW supply, the potential DHW systems should also be optimized for better energy and economy performances. Therefore, targeting to different DH systems and building typologies, the optimal solutions can be different. This research investigated a variety of potential solutions by classifications.

For the LTDH scenario, the decentralized substation system is an optimal solution for buildings with new or deep-renovated DHW substations. The decentralized substation system eliminates the risk of Legionella by minimizing the total DHW volume in use. Large amount of the equipment heat loss can be saved by the local DHW preparation and the supplementary heating is unnecessary. As a result, the energy and exergy efficiency of the decentralized substation system are higher than other solutions, while the energy cost of decentralized substation system is the lowest. To fit the LTDH scenario better, two improved forms of the decentralized substation system were devised by replacing the bypass function, so that lower return temperature can be reached. One form is to replace the bypass by an in-line supply riser with a micro heat pump covering the generated heat loss and ensuring the acceptable waiting time for DHW. The improved decentralized substation system has the potential of saving 13% heat loss compared to the decentralized substation system with bypass. The other form is to redirect the bypass flow to the bathroom heating during the non-heating season. With well insulated supply pipe, the bathroom heating flow can substitute for the bypass function and be efficiently cooled down to room temperature by floor heating. The electric heat tracing system can be applied in multi-storey buildings where the DHW circulation pipes can be replaced and in buildings that have special requirements for DHW hygiene, such as hospitals or nursing homes. The electric heat tracing system guarantees the comfort and hygiene DHW supply by supplementary heating locally using electricity. Being improved by the smart control method which can response to the dynamic DHW load profile, the electric heat tracing system can save 50% energy for covering the heat loss compared with the conventional DHW circulation system.

In terms of ULTDH scenario, one solution is the instantaneous heat exchanger unit (IHEU) combined with a micro electric storage tank. The solution can be easily installed in a new building or an existing building with IHEU. The micro tank solution has less heat loss than the substations with normal heat storage. Moreover, the micro tank helps to reduce the peak load of the electric heater, and ensure the acceptable waiting time. Thereby, the bypass function of the heat exchanger can be replaced, which results in lower return temperature and less heat loss. Another solution for ULTDH is the micro heat pump system. Compared to the micro tank solution, the micro heat pump system requires more energy for equivalent DHW preparation, but less electricity. However, the heat loss of the heat pump unit should be taken into account when planning the system. The exergy efficiency of the two solutions are similar, but the micro tank solution has lower energy consumption and energy cost.

In summation, the decentralized substation system with instantaneous heat exchanger unit (IHEU) performed better under the medium-temperature district heating and low-temperature district heating scenarios, while the individual micro tank solution consumed less energy and cost less in the ultra-low-temperature district heating scenario.
Suspended electrodialytic extraction of toxic elements for detoxification of three different mine tailings

Environmental effects of mining activities partly origin from the production of tailings, and the exposure of these to ambient physical and chemical conditions. Removal of toxic elements from tailings prior to deposition could improve environmental performance and reduce risks. Experimental results have shown that electrokinetic treatment can remove Cd, Cu, Pb, and Zn from tailings soils; As from tailings; and Cu from tailings. Still, however, a major concern is the long treatment-time required for the element-transport through the tailings matrix. Therefore several enhancement methods have been investigated including pre-treatment of the tailings with acid; insertion of bipolar electrodes; and implementation of pulsed or sinusoidal electric fields. In line with these efforts, we investigated the efficiency when extracting toxic elements from a suspension of tailings, rather than from a solid matrix, which could well be implemented as a final treatment step prior to deposition of tailings. Six electrodialytic experiments in laboratory scale with three different mine tailings (Codelco, Zinkgruvan, and Nalunaq) show that it is possible to extract residual Cu from the all the three suspended mine tailings, although with some difference between the tailings. From the Zinkgruvan sediment, which had the lowest Cu removal, Pb could also be extracted, while Cd and Zn were less extractable.
Sustainability certification systems as guidelines for early-phase urban design processes

The German Sustainable Building Council (Deutsche Gesellschaft für Nachhaltiges Bauen or DGNB) has one of the most comprehensive sustainability certification systems for urban districts (UD). Their explicit aim is that the system should impact the very earliest design decisions. The Technical University of Denmark has tested the DGNB-UD system in two experimental design projects for similar locations to find out how it can be used in the early-phase design process. This paper describes these two independent design processes, compares them and discusses their general features.

We found that DGNB-UD addresses a broad sustainable focus and can be used as a tool for setting sustainability goals from the very first design steps. The system tends to promote multifunctional compromise solutions that meet several criteria at the same time. Using the DGNB-UD certification system in the early design phases therefore does have some effect on the urban design in terms of a bias towards certain design traits.

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Sustainable flood risk management – What is sustainable?

Sustainable flood risk management has to be achieved since flood protection is a fundamental societal service that we must deliver. Based on the discourse within the fields of risk management and sustainable urban water management, we discuss the necessity of assessing the sustainability of flood risk management, and propose an evaluation framework for doing so. We argue that it is necessary to include quantitative sustainability measures in flood risk management in order to exclude unsustainable solutions. Furthermore, we use the concept of absolute sustainability to discuss the prospects of maintaining current service levels without compromising future generation’s entitlement of services. Discussions on the sustainability of different overall flood risk schemes must take place. Fundamental changes in the approaches will require fundamental changes in the mind-sets of practitioners as well as lawmakers, politicians and the general public, which inevitably will take some time. Right now, the importance lies in setting an agenda where sustainability is important and needs to be quantified and assessed when managing flood risk.

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Tårs 10000 m2 CSP + Flat Plate Solar Collector Plant - Cost-Performance Optimization of the Design

A novel solar heating plant with Concentrating Solar Power (CSP) collectors and Flat Plate (FP) collectors has been put into operation in Tårs since July 2015. To investigate economic performance of the plant, a TRNSYS-Genopt model, including a solar collector field and thermal storage tank, was established. The optimization showed that there was a synergy in combining CSP and FP collectors. Even though the present cost per m² of the CSP collectors is high, the total energy cost is minimized by installing a combination of collectors in such solar heating plant. It was also found that the CSP collectors could raise flexibility in the control strategy of the plant. The TRNSYS-Genopt model is based on individually validated component models and collector parameters from experiments. Optimization of the cost performance of the plant has been conducted in this paper. The simulation model remains to be validated with annual measured data from the plant.

General information

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Technical, economic and environmental investigation of using district heating to prepare domestic hot water in Chinese multi-storey buildings

The development of DH (District Heating) is an environmentally friendly and energy-efficient strategy in China. Currently, the vast majority of DH systems are SH (Space Heating) only and do not provide DHW (Domestic Hot Water). DHW is mainly produced by individual water heaters due to the cost-effective issues of the centralized DHW systems. From the perspective of long-term development, DHW produced via DH systems would be more sustainable because DH is an important precondition for an environmental safe use of domestic waste fuels. This paper presents an approach that uses flat stations simultaneously utilizes the industrial waste heat to prepare DHW via the DH network. A building model of a multi-storey building in Beijing was developed to investigate the technical feasibility. An economic evaluation was made using net present value to compare the annualized cost for individual water heaters and flat stations. The environment impact in terms of CO2 emission when fossil fuels are used to produce DHW was quantified. The results show that flat stations are technically feasible if a few renovations are implemented, and that the use of flat stations is a more sustainable, economic and environmentally friendly approach than the existing DHW preparation technologies.

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Organisations: Department of Civil Engineering, Section for Building Energy, Danfoss AS, Tsinghua University
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Number of pages: 12
Technical-Environmental-Economical Evaluation of the Implementation of a Highly Efficient District Heating System in China

Over the past 30 years, China has experienced unprecedented urbanization, modernization, and economic development. In the last two decades, China has become one of the largest DH markets in the world, with a total DH production in 2013 amounting to 3,197,032 TJ. This number is still increasing steadily due to the process of rapid urbanization, expansion of the building area, enhancement of building services, and increases in comfort level. The fast pace of urbanization brings out significant challenges to the building heating and water supply in the cities. Therefore, the appropriate technical approaches are urgently needed to improve the efficiency of the DH systems, and create maximum synergy between energy security and air pollution abatement.

The main hypothesis of this industrial PhD project was that by comparing Danish and Chinese DH systems it is possible to learn from the Danish experience and transfer state-of-the-art DH technologies to China and thus improve efficiency, economic operation, and environment protection in Chinese DH systems.

There were three sub-hypotheses in this research. The first two sub-hypotheses focused on SH systems to improve the efficiency of Chinese DH systems. The third sub-hypothesis focused on integrating DHW supply into DH systems to improve the overall efficiency of Chinese DH systems.

A typical issue in Chinese DH systems is that the DH plant has to provide much more heat than the consumers actually need. The main reason for this is the lack of flow control and temperature control at the end-users, which has resulted in significant amounts of energy being wasted. The first and second sub-hypotheses therefore focused on hydraulic control and thermal control, respectively.

The first sub-hypothesis was that hydraulic balance can be achieved in multi-storey building heating systems if the appropriate flow and pressure control devices are applied to the terminal heat emitters. The basic configuration of the technical approach is to apply Thermostatic Radiator Valves (TRV) with pre-setting function to radiators, and apply differential pressure controllers to the apartment loops or the risers. The analysis used a mathematic hydraulic model developed by the author to investigate the hydraulic performance of multistory buildings. With hydraulic conditions calculated from the hydraulic balance model, the building’s thermal performance under design condition was simulated using IDA Indoor Climate and Energy 4.6.2. The results show the hydraulically balanced heating system achieves 16% heat savings and 74% pump electricity savings.

The second sub-hypothesis was that indoor comfort can be improved by activating the thermostatic sensors of TRV. At present, heating is still billed as a fixed charge based on the floor heating area. This gives heat consumers no incentive to save heat and results in a lack of energy-saving consciousness. Consequently, consumers emit heat into the atmosphere by opening the window when indoor temperatures are higher than the comfort level. A building model was developed based on a real case, and real weather data were used in the simulation in IDA Indoor Climate and Energy 4.6.2. The building model simulation verified that indoor temperature can be controlled around a constant level by setting thermostatic sensors. At the same time, heat consumption and pump power consumption were quantified and shown to be much reduced compared to the situation with no indoor temperature control. The simulation results showed that system-wide use of TRV can reduce heating consumption by 17% and pump electricity consumption by 42% compared to the situation without TRV control. Furthermore, the use of TRV enables a constant room temperature and changes the system from constant flow to variable flow.

The third hypothesis was that the efficiency of China’s district heating systems could be improved by changing the current situation with regard to domestic hot water (DHW) applications. The vast majority of DH systems in China only provide SH and do not produce domestic hot water. DHW is mainly produced by individual water heaters powered by fossil fuels, which puts pressure on air pollution and energy supply security. To solve this problem, the hypothesis was developed that DHW production can be integrated into DH systems by using the flat stations concept. A multi-storey building with standard apartments was modelled to investigate the technical feasibility of this approach. On the premise of technical feasibility, an economic evaluation was made using net present value (NPV) to compare the annualized cost of using individual water heaters and flat stations. Environmental impacts were considered in terms of particle and CO2 emissions when various fuels are used to produce DHW. The results show that flat substations solutions are technically feasible if a few technical measures are implemented. The flat station approach is also more economically beneficial than individual water heaters and has less environmental impact.

Chinese DH systems are characterized by low efficiency. There is a large margin for system improvement when compared with Danish DH systems. The thesis evaluates Chinese DH systems from the technical, environmental and economical points of view. The major issues in current Chinese DH systems are addressed through the three sub-hypotheses stated above. The thesis demonstrates that the efficiency of Chinese DH systems can be significantly improved if good solutions can be found for their hydraulic and thermal balances and the supply of DHW.
Tensile Capacity of U-bar Loop Connections with Precast Fiber Reinforced Dowels

This paper describes an investigation of the tensile capacity of in-situ cast U-bar loop connections between precast concrete elements. The basic idea is to introduce a small precast cylindrical dowel of fiber reinforced mortar that fits into the bend diameter of the overlapping U-bars. The remaining part of the connection is cast in-situ with a regular mortar, which then encapsulates the precast dowel. Different dowel configurations have been investigated, including the use of steel or synthetic fibers with or without lacer bars placed within the precast dowel.

The experimental results show that use of a precast fiber reinforced dowel performs at a slightly lower load level, as compared to a connection grouted solely with regular mortar and reinforced with the same amount of transverse reinforcement. However, the load-displacement response of specimens with a fiber reinforced dowel is closer to ideal ductile behavior than that of the specimens grouted with regular mortar. The experimental results of the tensile tests are compared with calculations based on an upper bound plasticity model and satisfactory agreement has been obtained.

Testing of PCM Heat Storage Modules with Solar Collectors as Heat Source

A latent heat storage based on the phase change material Sodium Acetate Trihydrate (SAT) has been tested as part of a demonstration system. The full heat storage consisted of 4 individual modules each containing about 200 kg of sodium acetate trihydrate with different additives. The aim was to actively utilize the ability of the material to supercool to obtain long storage periods. The modules were charged with solar heat supplied by 22.4 m² evacuated tubular collectors. The investigation showed that it was possible to fully charge one module within a period of 270 minutes with clear skies. In long periods with high level of irradiance several modules were charged in parallel due to the limited heat exchange capacity of the integrated heat exchanger of the modules. After the modules were heated to more than 80°C they were set to passively cool down. Modules reached 30°C in a period of parallel cool down without the sodium acetate trihydrate solidified in 3 of the 4 modules. Further tests showed that stable supercooling at ambient temperature is possible.
The effect of a rotary heat exchanger in room-based ventilation on indoor humidity in existing apartments in temperate climates

The investigation constructed and simulated moisture balance equations for single-room ventilation with a non-hygrosopic rotary heat exchanger. Based on literature, the study assumed that all condensed moisture in the exhaust subsequently evaporated into the supply. Simulations evaluated the potential for moisture issues and compared results with recuperative heat recovery and whole-dwelling ventilation systems. To assess the sensitivity of results, the simulations used three moisture production schedules to represent possible conditions based on literature. The study also analyzed the sensitivity to influential parameters, such as infiltration rate, heat recovery, and indoor temperature. With a typical moisture production schedule, the rotary heat exchanger recovered excessive moisture from kitchens and bathrooms, which provided a mold risk. The rotary heat exchanger was only suitable for single-room ventilation of dry rooms, such as living rooms and bedrooms. The sensitivity analysis concluded that varying heat recovery or indoor temperature could limit indoor relative humidity in dry rooms when a moderate risk was present. The rotary heat exchanger also elevated the minimum relative humidity in each room, which could help to avoid negative health impacts. A discussion emphasized the potential benefits of selecting heat recovery to match the individual needs of each room.

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The Effect of Thermal Mass on Annual Heat Load and Thermal Comfort in Cold Climate Construction

Thermal mass in building construction refers to a building material's ability to absorb and release heat based on changing environmental conditions. In building design, materials with high thermal mass used in climates with a diurnal temperature swing around the interior set-point temperature have been shown to reduce the annual heating demand. However, few studies exist regarding the effects of thermal mass in cold climates. The purpose of this research is to determine the effect of high thermal mass on the annual heat demand and thermal comfort in a typical Alaskan residence using energy modeling software. The model simulations show that increased thermal mass can decrease the risk of summer overheating in Alaskan residences. They also show that increased thermal mass does not significantly decrease the annual heat load in residences located in cold climates. These results indicate that while increased thermal mass does have advantages in all climates, such as a decrease in summer overheating, it is not an effective strategy for decreasing annual heat demand in typical residential buildings in Alaska. (C) 2015 American Society of Civil Engineers.

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The effects of mixing air distribution and heat load arrangement on the performance of ceiling radiant panels under cooling mode of operation

The cooling power of radiant panels can be affected by the arrangement of heat loads and by the room air distribution system. This impact can be important because often the cooling output is the critical factor for the design and usability of radiant panels. In this study, the impact of heat load arrangement and air distribution generated in a room by linear slot diffuser, radial multi-nozzle diffuser and radial swirl induction unit on the cooling power of radiant panels was compared. The impact on the thermal environment was also studied. Measurements were carried out without and with supply air in a test chamber equipped with two ceiling radiant panels and air distribution units flush with the radiant panels. The heat load was generated through the walls and with heated cylinders. The cooling power of the radiant panels was increased with the studied air distribution methods. The increase was from 5% to 17% depending on the air distribution method and the heat load arrangement. The most significant effect of the heat load arrangement occurred when heat loads are located unevenly and their convection flow turns or weakens the supply air jet flushing the radiant panels.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Halton OY, Aalto University
Authors: Mustakallio, P. (Ekstern), Kosonen, R. (Ekstern), Melikov, A. K. (Intern)
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Scopus rating (2013): SJR 0.561 SNIP 0.891
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.498 SNIP 0.742
ISI indexed (2011): ISI indexed yes
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The Influence of Brittle Daniels System Characteristics on the Value of Load Monitoring Information

This paper addresses the influence of deteriorating brittle Daniels system characteristics on the value of structural health monitoring (SHM). The value of SHM is quantified as the difference between the life cycle benefits with and without SHM. A value of SHM analysis is performed within the framework of the Bayesian pre-posterior decision theory and requires (1) structural performance modelling and prediction, (2) structural integrity management models, (3) the (pre-posterior) modelling of SHM and (4) the coupling of SHM and the structural performance models. The pre-posterior decision theoretical framework facilitates that the value of SHM can be quantified before the SHM system is quantified and before data are acquired. The results of this study support decisions to select structural systems for which the SHM strategy load monitoring is optimal.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Federal Institute for Materials Research and Testing
Authors: Thöns, S. (Intern), Schneider, R. (Ekstern)
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Publication date: 2016
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Value of information, Structural performance, Deterioration, Daniels systems
Electronic versions: 442_Thons.pdf
Source: PublicationPreSubmission
Source-ID: 124913197
Publication: Research - peer-review › Paper – Annual report year: 2016
The influence of electrodialytic remediation on dioxin (PCDD/PCDF) levels in fly ash and air pollution control residues

Fly ash and Air Pollution Control (APC) residues collected from three municipal solid waste incinerators in Denmark and Greenland were treated by electrodialytic remediation at pilot scale for 8-10 h. This work presents for the first time the effect of electrodialytic treatment on polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), and how these levels impact on the valorization options for fly ash and APC residue. PCDD/PCDF levels in the original residues ranged between 4.85 and 197 ng g⁻¹, being higher for the electrostatic precipitator fly ash. The toxic equivalent (TEQ) varied ten fold, ranging 0.18-2.0 ng g⁻¹ I-TEQ with penta and hexa-homologs being most significant for toxicity. After the electrodialytic treatment PCDD/PCDF levels increased in the residues (between 1.4 and 2.0 times). This does not mean PCDD/PCDF were synthesized, but else that soluble materials dissolve, leaving behind the non-water soluble compounds, such as PCDD/PCDF. According to the Basel Convention, PCDD/PCDF levels in these materials is low (<15 mg WHO-TEQ kg⁻¹) and the fly ash and APC residue could eventually be valorized, for instance as construction material, provided end-of-waste criteria are set and that a risk assessment of individual options is carried out, including the end-of-life stage when the materials become waste again.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Physics, Aveiro University
Authors: Dias-Ferreira, C. (Ekstern), Kirkelund, G. M. (Intern), Jensen, P. E. (Intern)
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BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.39 SJR 1.417 SNIP 1.606
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.51 SNIP 1.57 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.593 SNIP 1.651 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.724 SNIP 1.767 CiteScore 3.92
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.818 SNIP 1.623 CiteScore 3.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.961 SNIP 1.515 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.867 SNIP 1.421
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.836 SNIP 1.573
The Linkage of Urban and Energy Planning for Sustainable Cities: The Case of Denmark and Germany

The reduction of GHG emissions in buildings is a focus area of national energy policies in Europe, because buildings are responsible for a major share of the final energy consumption. It is at local scale where policies to increase the share of renewable energies and energy efficiency measures get implemented. Municipalities, as local authorities and responsible entity for land-use planning, have a direct influence on urban patterns and energy use, which makes them key actors in the transition towards sustainable cities. Hence, synchronizing urban planning with energy planning offers great potential to increase society’s energy-efficiency; this has a high significance to reach GHG-reduction targets. In this paper the actual linkage of urban planning and energy planning in Denmark and Germany was assessed; substantive barriers preventing their integration and driving factors that lead to successful transitions towards a holistic urban energy planning procedures were identified.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Petersen, J. (Intern)
Publication date: 2016
The necessity of recovering soluble phosphorus from sewage sludge ashes before use in concrete based on concrete setting and workability

By replacing cement with alternative ashes, such as sewage sludge ashes (SSA) from mono-incineration plants, it is possible to reduce the CO₂-emmission from the production of cement. SSA contains a large amount of phosphate which can be extracted before addition in concrete. The Danish Standard DS/EN 450-1 states an upper limit for total phosphorus in concrete, but it does not account for the solubility. The aim of this study is to determine an upper limit for soluble phosphorus in concrete, thus minimize the formation of calcium phosphate to an acceptable level. The analysis will be based on the setting and workability. When adding soluble phosphorus salts to a mortar the setting process is extended with no pronounced difference between different soluble phosphorus salts. It is therefore assumed, that the soluble phosphorus (SP) influences the concrete setting. A logarithmic relationship between the increased addition of SP and the initial setting time is seen. By comparison with the limit for initial setting time established in DS/EN 450-1 it is possible to establish a limit for SP of 0.54 wt% cement. When studying the workability an objective limit for SP of 0.16 wt% cement can be established. SSA from the Danish mono-incineration plant at Spildevandscenter Avedøre is examined. At a pH-value of 13 it is possible to replace 55% and 16% of the cement, based on the set limits, with SSA from Spildevandscenter Avedøre, before it is necessary to extract SP from SSA before adding to the concrete mixture. Former studies have shown a replacement of up to 20% of the cement with SSA is feasible regarding compressive strength, and therefore it is necessary to consider the limit for SP of 0.16% wt% cement.
Theoretical overview of heating power and necessary heating supply temperatures in typical Danish single-family houses from the 1900s

As existing buildings are renovated and energy-efficiency measures are implemented to meet requirements for reduced energy consumption, it becomes easier to heat our homes with low-temperature heating. This study set out to investigate how much the heating system supply temperature can be reduced in typical Danish single-family houses constructed in the 1900s. The study provides a simplified theoretical overview of typical building constructions and standards for the calculation of design heat loss and design heating power in Denmark in the 1900s. The heating power and heating demand in six typical Danish single-family houses constructed in the 1900s were estimated based on simple steady-state calculations. We found that the radiators in existing single-family houses should not necessarily be expected to be over-dimensioned compared to current design heat loss. However, there is considerable potential for using low-temperature space heating in existing single-family houses in typical operation conditions. Older houses were not always found to require higher heating system temperatures than newer houses. We found that when these houses have gone through reasonable energy renovations, most of them can be heated with a supply temperature below 50 degrees C for more than 97% of the year. (C) 2016 Elsevier B.V. All rights reserved.

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Authors: Østergaard, D. S. (Intern), Svendsen, S. (Intern)
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Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
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Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
THE Pd–Ni–Fe–S Phase System At 550 and 400 °C

The condensed Pd–Ni–Fe–S phase system was studied at 550 and 400 °C by synthesis in evacuated silica glass tubes and a combination of textural and electron microprobe studies. The monosulfide Fe1–xS–Ni1–xS solid solution persists at both temperatures. Maximum solubility of Pd, exhibited at elevated x values in the mss formula, is 0.7 at.% at 550 °C and up to 0.1 at.% at 400 °C. The field of sulfide melt is reduced to a narrow Ni-Pd rich stripe at 550 °C and is absent at 400 °C. Sulfur contents of the melt are limited to the interval 30–40 at.% S at 550 °C, i.e., it is metal-rich. Retreat of the melt field at 550 °C results in a plethora of phase associations in its place. Compositional fields of alloys associated with melt and of those associated with ∼(Ni,Fe)3±xS2 extend to high Pd contents. Several sulfur-poor associations contain alloys with only low nickel contents, close in composition to Pd3Fe. Shrinkage of the ∼(Ni,Fe)3±xS2 phase field (the β1-β2 pair of Kitakaze et al. 2011) and the appearance of pentlandite represent the most important developments in the phase system between 725 and 400 °C. The ∼(Ni,Fe)3±xS2 phase dissolves up to 2 at.% Pd at 550 °C. Pentlandite associated with Pd-rich phases dissolves up to 4 at.% Pd at 550 °C and 5.4 at.% Pd at 400 °C. The latter value represents almost 92% Pd occupancy of the octahedral site. At 550 °C, Pd-rich pentlandite coexists with sulfide melt which contains between 17 and 47 at.% Pd. The rare occurrences of such Pd-rich pentlandite in nature could indicate the presence of Pd-rich residual melts. Other cases of Pd-rich pentlandite associate with Pd-rich alloy or phases like PdS and Pd2S. In the association with mss, Pd is concentrated in the sulfide melt, especially at a low temperature. At low temperatures or high S fugacities, nickel prefers mss but pentlandite and ∼(Ni,Fe)3±xS2 complicate this simple scheme. For mineral associations with elevated sulfur fugacities, pyrrhotite (mss) appears to be a principal solid-state collector of Pd at high temperatures, with its gradual release on cooling, making it available for subsequent reactions. At low sulfur fugacities Pd concentrates in its Fe-Ni alloys. Because of the inverse relationship between Ni solubility in PdS and the temperature of formation, the
composition of natural vysotskite (and Pd-rich braggite) may serve as a temperature indicator.
THE Pd-Ni-Fe-S PHASE SYSTEM AT 550 AND 400 degrees C

The condensed Pd-Ni-Fe-S phase system was studied at 550 and 400 degrees C by synthesis in evacuated silica glass tubes and a combination of textural and electron microprobe studies. The monosulfide Fe1-xS-N1-xS solid solution persists at both temperatures. Maximum solubility of Pd, exhibited at elevated x values in the mss formula, is 0.7 at.% at 550 degrees C and up to 0.1 at.% at 400 degrees C. The field of sulfide melt is reduced to a narrow Ni-Pd rich stripe at 550 degrees C and is absent at 400 degrees C. Sulfur contents of the melt are limited to the interval 30-40 at.% S at 550 degrees C, i.e., it is metal-rich. Retreat of the melt field at 550 degrees C results in a plethora of phase associations in its place. Compositional fields of alloys associated with melt and of those associated with similar to(Ni,Fe)(3 +/- x)S-2 extend to high Pd contents. Several sulfur-poor associations contain alloys with only low nickel contents, close in composition to Pd3Fe. Shrinkage of the (Ni,Fe)(3)S-2 phase field (the beta(1)-beta(2) pair of Kitakaze et al. 2011) and the appearance of pentlandite represent the most important developments in the phase system between 725 and 400 degrees C. The similar to(Ni,Fe)3 +/- S-2 phase dissolves up to 2 at.% Pd at 550 degrees C. Pentlandite associated with Pd-rich phases dissolves up to 4 at.% Pd at 550 degrees C, and 5.4 at.% Pd at 400 degrees C. The latter value represents almost 92% Pd occupancy of the octahedral site. At 550 degrees C, Pd rich pentlandite coexists with sulfide melt which contains between 17 and 47 at.% Pd. The rare occurrences of such Pd-rich pentlandite in nature could indicate the presence of Pd-rich residual melts. Other cases of Pd-rich pentlandite associate with Pd rich alloy or phases like PdS and Pd22S. In the association with mss, Pd is concentrated in the sulfide melt, especially at a low temperature. At low temperatures or high S fugacities, nickel prefers mss but pentlandite and similar to(Ni,Fe)(3 +/- x)S-2 complicate this simple scheme. For mineral associations with elevated sulfur fugacities, pyrrhotite (mss) appears to be a principal solid-state collector of Pd at high temperatures, with its gradual release on cooling, making it available for subsequent reactions. At low sulfur fugacities Pd concentrates in its Fe-Ni alloys. Because of the inverse relationship between Ni solubility in PdS and the temperature of formation, the composition of natural vysotskite (and Pd-rich braggite) may serve as a temperature indicator.
Thermal comfort and ventilation effectiveness in an office room with radiant floor cooling and displacement ventilation

The influence of displacement ventilation and a cooled floor on indoor climate in the cooling season were experimentally studied in a room representing an office with a shaded window, occupied by two simulated employees. The aim was to investigate whether the combination of these two systems can retain the favorable air and temperature distribution patterns and high ventilation effectiveness that are typically attained by displacement ventilation, while exploiting the energy conservation advantages of a high temperature cooling system. The tests were performed under a range of boundary conditions, varying the nominal air change rate from 4.5h⁻¹ down to 1.5h⁻¹. Contaminant removal and mean-age-of-air measurements were performed to characterize the ventilation effectiveness and air velocity; air and operative temperature profiles were measured, together with thermal manikin equivalent temperatures, to evaluate the thermal environment. The combined system was able to achieve good ventilation effectiveness close to a heat source, so that in the occupant’s breathing zone the ventilation effectiveness was significantly better than for ideal mixing, even at a nominal air change rate as low as 1.5h⁻¹. However, for a broad range of boundary conditions, decreasing the floor temperature resulted in vertical air temperature differences of up to 6K and vertical equivalent temperature differences of up to 8K for a seated person. Thus although the maximum draught rating at ankle level was 21% at the highest nominal air change rate of 4.5h⁻¹, even for an occupant sitting 1 meter in front of the supply diffuser, the local thermal discomfort occasioned by the excessive vertical temperature differences gives chilled ceilings the advantage over chilled floors for use with displacement ventilation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Slovak University of Technology, University of Padova
Authors: Krajcik, M. (Ekstern), Tomasi, R. (Ekstern), Simone, A. (Intern), Olesen, B. W. (Intern)
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Main Research Area: Technical/natural sciences

Publication information
Thermal environment in simulated offices with convective and radiant cooling systems under cooling (summer) mode of operation

The thermal environment in a double office room and in a six-person meeting room obtained with chilled beam (CB), chilled beam with radiant panel (CBR), chilled ceiling with ceiling installed mixing ventilation (CCMV) and four desk partition-mounted local radiant cooling panels with mixing ventilation (MVRC) under summer (cooling) condition was compared. MVRC system was measured only for the office room case. CB provided convective cooling while the remaining three systems (CBR, CCMV and MVRC) provided combined radiant and convective cooling. Solar radiation, office equipment, lighting and occupants were simulated to obtain two different heat load conditions: 38 W/m² and 64 W/m² in the case of office room, and 71 W/m² and 86 W/m² in the case of meeting room. Air temperature, globe (operative) temperature, radiant asymmetry, air velocity and turbulent intensity were measured and draught rate calculated. Manikin-based equivalent temperature (MBET) was determined by using two thermal manikins to identify the impact of the local thermal conditions generated by the studied systems on occupants' thermal perception. The results revealed that the differences in the thermal conditions achieved with the four systems were not significant. CB and CBR provided slightly higher velocity level in the occupied zone. The operative temperature in the studied cases with chilled ceiling in operation with mixing ventilation was almost the same as the operative temperature obtained with the active chilled beam (i.e. only convective cooling). The heat load distribution played major role for the airflow pattern in all studied systems.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Halton OY, Aalto University
Authors: Mustakallio, P. (Ekstern), Bolashikov, Z. D. (Intern), Kostov, K. (Ekstern), Melikov, A. K. (Intern), Kosonen, R. (Ekstern)
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
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BFI (2012): BFI-level 1
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
Thermal tracing of retained meltwater in the lower accumulation area of the Southwestern Greenland ice sheet

We present in situ firn temperatures from the extreme 2012 melt season in the southwestern lower accumulation area of the Greenland ice sheet. The upper 2.5 m of snow and firn was temperate during the melt season, when vertical meltwater percolation was inefficient due to a similar to 5.5 m thick ice layer underlying the temperate firn. Meltwater percolation and refreezing beneath 2.5 m depth only occurred after the melt season. Deviations from temperatures predicted by pure conductivity suggest that meltwater refroze in discrete bands at depths of 2.0-2.5, 5.0-6.0 and 8.0-9.0 m. While we find no indication of meltwater percolation below 9 m depth or complete filling of pore volume above, firn at 10 and 15 m depth was respectively 4.2-4.5 °C and 1.7 °C higher than in a conductivity-only simulation. Even though meltwater percolation in 2012 was inefficient, firn between 2 and 15 m depth the following winter was on average 4.7 degrees C warmer due to meltwater refreezing. Our observations also suggest that the 2012 firn conditions were preconditioned by two warm summers and ice layer formation in 2010 and 2011. Overall, firn temperatures during the years 2009-13 increased by 0.6 °C.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Uppsala University, Geological Survey of Denmark and Greenland, Cooperative Institute for Research in Environmental Sciences
Authors: Charalampidis, C. (Ekstern), Van As, D. (Ekstern), Colgan, W. T. (Ekstern), Fausto, R. S. (Ekstern), Macferrin, M. (Ekstern), Machguth, H. (Intern)
Number of pages: 10
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Publication date: 2016
Main Research Area: Technical/natural sciences
Thermo Active Building Systems (TABS) - Performance in practice and possibilities for optimization

The project "Thermo Active Building Systems (TABS) – Performance in practice and possibilities for optimization" was carried out at DTU Byg in the period from 1.9.2012 until 31.12.2014. The aim of the project was to conduct field measurements in modern office buildings equipped with TABS systems to fill the gap in missing data on the practical performance of such buildings. The project comprised both field data collection regarding indoor environmental quality and occupant satisfaction and analyses of data from Building Management Systems (BMS) accompanied by building energy simulations. The project was financed by Bjarne Saxhof foundation.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Kolarik, J. (Intern)
Number of pages: 70
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BYG_Report_SR_16_04.pdf
Source: PublicationPreSubmission
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Publication: Research › Report – Annual report year: 2016

The use of image analysis to quantify the orientation of cracks in concrete

Cracks formed in concrete due to frost action (or other expansive reactions) can lead to further damage e.g. because they increase moisture transport. The extent of the consequential damage in concrete is likely influenced by the orientation of the initial cracks. Traditional quantification of the crack orientation is a time consuming manual process. In this paper, a method using automatic image analysis is proposed. The method is based on using image gradients to detect cracks and their orientation. The method produces results that concur with visual observation and manual counting in addition to being substantially quicker.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Andreassen, E. N. (Ekstern), Elbrønd, A. B. (Ekstern), Hasholt, M. T. (Intern)
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Main Research Area: Technical/natural sciences
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Three Different Ways of Calibrating Burger's Contact Model for Viscoelastic Model of Asphalt Mixtures by Discrete Element Method

In this paper the viscoelastic behavior of asphalt mixture was investigated by employing a three-dimensional discrete element method. Combined with Burger's model, three contact models were used for the construction of constitutive asphalt mixture model with viscoelastic properties in the commercial software PFC3D, including the slip model, linear stiffness-contact model, and contact bond model. A macro-scale Burger's model was first established and the input parameters of Burger's contact model were calibrated by adjusting them so that the model fitted the experimental data for the complex modulus. Three different approaches have been used and compared for calibrating the Burger's contact model. Values of the dynamic modulus and phase angle of asphalt mixtures were predicted by conducting DE simulation under dynamic strain control loading. The excellent agreement between the predicted and the laboratory test values for the complex modulus shows that DEM can be used to reliably predict the viscoelastic properties of asphalt mixtures.

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Authors: Feng, H. (Intern), Pettinari, M. (Intern), Stang, H. (Intern)
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Three-dimensional submodel for modelling of joints in precast concrete structures

The shear capacity of in-situ cast joints is crucial to the overall stability of precast concrete structures. The current design is based on empirical formulas, which account for neither the reinforcement layout of the joint nor the three-dimensional stress states present within the joint. In this paper, a semi-analytical submodel is presented. The model is formulated as an optimisation problem within the framework of numerical limit analysis. The presented submodel is capable of describing the key mechanisms within the joint and the model is verified by comparison to existing numerical models. The shear capacity of the joint subjected to triaxial stress states is analysed and the results are discussed.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, ALECTIA A/S
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Ekstern)
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Links:
Topography optimization for simplified structural fire safety

Topography optimization is applied in an idealized structural fire safety model, where the minimum compliance problem is constrained by temperature-controlled structural degradation. The constraint ensures a certain structural stiffness after a prescribed time. As this time period is extended, resulting optimized topologies tend to become thicker or introduce redundant members that can take over when structural parts near the origin of the fire lose their load carrying capability. Hence, the structural degradation model acts as an erosion operator on the topology and indirectly enforces a minimum length scale on the final designs.

General information
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Organisations: Department of Mechanical Engineering, Department of Civil Engineering, Section for Building Design, Solid Mechanics, Technical University of Denmark
Authors: Madsen, S. (Intern), Lange, N. P. (Ekstern), Giuliani, L. (Intern), Jomaas, G. (Intern), Lazarov, B. S. (Intern), Sigmund, O. (Intern)
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Scopus rating (2015): SJR 1.696 SNIP 2.195 CiteScore 2.59
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Scopus rating (2013): SJR 2.049 SNIP 2.853 CiteScore 2.69
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Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.855 SNIP 2.627 CiteScore 2.23
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Scopus rating (2011): SJR 1.7 SNIP 2.735 CiteScore 2.26
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.76 SNIP 2.343
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
To What Degree Thermal Cycles Affect Chalk Strength

Chalk reservoirs could potentially undergo destabilization as the result of repeated cold water injection into a hot reservoir during water flooding. Preliminary results of an ongoing study are presented in this paper, which compare the impact of temperature cycling on mechanical behavior on dry and water saturated chalk. Sixty disks of dry Kansas chalk exposed to different number of temperature cycles were tested for tensile strength using a Brazilian test. Changes in elastic properties as function of number of temperature cycles of the same chalk, but now saturated in water, were studied using triaxial cell experiments. For dry rock, no significant effects of temperature cycling was found on average tensile strength, however the range of the tensile failure stress is doubled for the samples exposed to 50 temperature cycles, as opposed to those to none. For water saturated cores, the temperature cycling had a significant effect and a significant accumulative irreversible deformation was seen for the core exposed to cyclical temperature variations, so that the elastic bulk modulus consequently increased more than for a core that had been tested at constant temperature. The inconsistency of the results from the two tests suggests the importance of the pore fluid.

Triaxial tests in Fontainebleau sand

The purpose of this internal report is to examine the influence of relative density on the strength and deformation characteristics of Fontainebleau sand. Compression triaxial tests were performed on saturated sand samples with different densities and initial confining pressure. Note that the testing procedure and the data processing were carried out according to the specifications of ETCS-F1.97.
Ultrafine particle exposure in Danish residencies

We measured ultrafine particle concentrations in 56 Danish residences, estimated the daily integrated exposure of the occupants and apportioned this exposure to source events. The residential daily integrated particle number (PN) exposure in the homes was substantial and source events, especially candle burning, cooking, toasting and unknown activities, were responsible on average for ~65% of the residential integrated exposure. Residents of another 60 homes were then asked to carry a backpack equipped with a GPS recorder and a portable monitor to measure real-time individual exposure over ~48 h. UFP exposure occurring in various microenvironments was estimated. The fractional contribution of each microenvironment to the daily integrated personal exposure corresponded to the fractions of the day the subjects spent in each microenvironment. The home environment accounted for 50% of the daily personal exposure, indoor environments other than home or vehicles contributed with ~40%, and being in transit or outdoors contributed 5% or less.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Copenhagen, Lund University
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Number of pages: 2
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Unsteady-state human-body exergy consumption rate and its relation to subjective assessment of dynamic thermal environments

Few examples studied applicability of exergy analysis on human thermal comfort. These examples relate the human-body exergy consumption rate with subjectively obtained thermal sensation votes and had been based on steady-state calculation methods. However, humans are rarely exposed to steady-state thermal environments. Therefore, the first objective of the current paper was to compare a recently introduced unsteady-state model with previously used steady-state model using data obtained under both constant and transient temperature conditions. The second objective was to explore a relationship between the human-body exergy consumption rate and subjective assessment of thermal environment represented by thermal sensation as well as to extend the investigation towards thermal acceptability votes. Comparison of steady-state and unsteady-state model showed that results from both models were comparable when applied to data from environments with constant operative temperature. In contrast, when applied to data with temperature transients the prediction of particular models differed significantly and the unsteady-state model resulted in better prediction of mean skin temperature. The results of the present study confirmed previously indicated trends that lowest human body exergy consumption rate is associated with thermal sensation close to neutrality. Moreover, higher acceptability was in general associated with lower human body exergy consumption rate. (C) 2016 Elsevier B.V. All rights reserved.

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Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
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Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
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BFI (2012): BFI-level 2
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Scopus rating (2010): SJR 1.631 SNIP 2.081
Web of Science (2010): Indexed yes
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Scopus rating (2009): SJR 1.564 SNIP 1.79
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BFI (2008): BFI-level 1
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Web of Science (2008): Indexed yes
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Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.411 SNIP 1.788
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.293 SNIP 1.277
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.81 SNIP 1.628
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.567 SNIP 1.4
Scopus rating (2002): SJR 1.172 SNIP 1.631
Upgrading and recovery of fertilizer value of ash from PYRONEER gasification

Low temperature circulating fluidised bed gasifier, alias Pyroneer, allows the production of energy from biomass with high inorganic content like sewage sludge. The use of the resulting Pyroneer ashes in agriculture is important, as they are rich in essential nutrients like P: fertilizer supply is currently dependent on mineral reserves of P, most of which are located outside the European Union. Major concerns are however, the presence of heavy metals and the low plant availability of P in Pyroneer ashes.

Electrodialysis has been studied by other researchers at the Technical University of Denmark as a technique to recover P and remove heavy metals from incineration sewage sludge ashes. In this method, an electrical current is applied to a suspension of ash in an aqueous solution, so as to electromigrate the dissolved ions towards the electrode of opposite polarity. Ion exchange membranes delimitate different compartments and allow the separation of the ionic species, depending on their charge. Thus, P in its neutral to negative forms in solution (H3PO4/H2PO4-/HPO42-/PO43-) could be separated from metallic cations, including heavy metals (Cd2+, Cu2+, etc.). Previous results showed that most P was recovered in an acidic solution depleted of metals, which can potentially be used in the fertilizer industry. The present PhD study aims to investigate the separation of P from heavy metals in different sewage sludge ashes, with focus on the characteristics deciding P solubility and the development of the suitable electrodialytic method. In total, four ashes produced from three different feedstock were studied:

- One from Pyroneer co-gasification of sewage sludge, in which P was 100% precipitated with phosphate accumulating microorganisms, and wheat straw.
- One from Pyroneer gasification of sewage sludge, in which P was 50% precipitated with Al and Fe salts.
- Two from separate Pyroneer gasification and incineration of the same sewage sludge, the P of which was 30% precipitated with Fe salts.

The results showed that significant amounts of Al/Fe(III)-phosphates could be found through an alkaline leaching in the two ashes from gasification of sewage sludge with chemically precipitated P. In contrast, a considerable lower proportion of Al/Fe(III)-phosphates were found for the incineration sewage sludge ashes, whereas Ga was found to control P solubility at low pH for the ash with biologically precipitated P. Using a 2-compartment electrodialytic cell, in which the ash suspension was acidified, over 80% of P could be recovered from both the Pyroneer ashes with biologically precipitated P and the incineration sewage sludge ashes. However, P recovery was limited to a 40% for the other two ashes using the same setup, which was due to the higher presence of Al/Fe(III)-phosphates. In order to increase the extraction of P for these ashes, an innovative electrodialytic method was designed, for which a patent application was filed. In this new technique, a 2-compartment cell was combined sequentially with a second cell, in which the ash suspension was alkalinised in order to dissolve Al/Fe(III)-phosphates, achieving a recovery of up to 70% of P. The final recovery product in all cases was a diluted H3PO4 acid solution (<10 g P/L) with a lower ratio of metallic impurities than in the original ash.

Further modifications of the electrodialytic cell allowed a reduction of the ratios of most metals to P to the levels of wet process phosphoric acid, widely used in the manufacturing of fertilizers.

Several other improvements can entail a higher % of P recovery and an optimisation of the electricity consumption. Another membrane technique (forward osmosis) can also increase the concentration of P with minor energy consumption. Nevertheless they need to be addressed in future studies.
Uptake of chemicals from indoor air: Pathways and health effects

Building occupants are exposed to manufactured chemicals. Exposure in the indoor environment can occur via non-dietary ingestion (e.g. indoor dust), inhalation and dermal absorption including dermal uptake directly from air. The extent of dermal uptake from air has been previously studied for volatile organic compounds (VOC). Not much is however known about its role for semivolatile organics (SVOC) and therefore this exposure pathway is often neglected in exposure assessments. Dermal uptake received attention with regards to contact transfer from contaminated surfaces. Recent modeling efforts however indicate that direct uptake of certain semivolatile organic compounds from air may occur. Experimental verification of this hypothesis is emerging. Recent studies have demonstrated that dermal uptake of certain phthalates directly from air can be comparable to or larger than the corresponding intake from inhalation. Further experiments have been conducted with nicotine and the results are similar. Some of the SVOCs present indoors may have adverse health effects or are categorized as potential endocrine-disrupting compounds. It has been suggested that the health effects of a chemical may depend on the pathway of exposure. However, studies that investigate the health consequences of dermal uptake of SVOCs from air are lacking.

Use of Discarded Fishing Nets as Near Surface Mounted Reinforcement for Prolonging Lifetime of Existing Structures

General information
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Authors: Sigvardsen, N. M. (Intern)
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Source-ID: 125833355
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016
Using BCF as a mediator for task management in building design

buildingSMART has adopted the BIM Collaboration Format (BCF) to improve interoperability in the field of process information exchange. The original scope of BCF was linked to a need to communicate BIM-related tasks, but a further expansion of the BCF format should be considered to add additional support to industry requirements for task management. The research described in this paper was based on literature studies of industry needs and evaluations of the current BCF specification and its implementation in software, and it identified some challenges in the current state of BCF. Based on these findings, we propose an information system consisting of decentralised model and task servers using both BCF and IFC. Using IDM Part 2 as an example, we further propose an architecture to expand BCF.

Using resistivity method to characterize water flow patterns in permafrost environment (Ilulissat, Greenland)

Validation of a numerical model of acoustic ceiling combined with TABS

Thermally-Active Building Systems (TABS) have proven to be an energy-efficient and economical cooling and heating solution for commercial buildings. However, acoustic comfort is often jeopardized in such buildings, due to the thermal requirements of the system. More knowledge is required to understand to which extent a layer of hanging sound absorbers will impede the heating and cooling performance of the system, and how this translates on the thermal comfort for the occupants.

In order to address these issues, this study focuses on validation of a new TRNSYS component (Type Ecophon Acoustic Elements) developed to simulate partially covered suspended ceilings such as hanging sound absorbers. The tool is validated by numerically modelling a set of similar experiments carried out in full-scale by a previous study. For this, a total of 12 scenarios from two case studies have been modelled, with varying suspended ceiling coverage ratios, type of suspended ceilings, internal heat gains and TABS water supply temperatures.

The results obtained from the simulations are very close to the experimental results. The first set of measurements analyzed the effect of the above-mentioned parameters in the heat flow from TABS; the difference between the numerical results and measurements is in the range of -6.9% to +5.2%. The second evaluates the impact on TABS cooling capacity.
coefficient and room temperatures. The simulated cases led to absolute differences +4.3% higher in average for the cooling capacity coefficient. The operative temperature in the room is particularly well estimated, with a maximum relative difference of +0.3°C in total of five scenarios.

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics  
**Authors:** Rage, N. (Intern), Kazanci, O. B. (Intern), Olesen, B. W. (Intern)  
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**Validation of a simple dynamic thermal performance characterization model based on the piston flow concept for flat-plate solar collectors**

A simple dynamic characterization model of flat-plate solar collectors based on the piston flow concept is used both to identify the collector characteristic parameters and to predict the dynamic thermal performance. The heat transport time originally defined as \((1 - e^{-1})^{-1}T_{op}\) by Amrizal et al. (2012) for the model turns out to be the collector static response time constant \(\tau_C\) by analytical derivation. The nonlinear least squares method is applied to determine the characteristic parameters of a flat-plate solar air collector previously tested by the authors. Then the obtained parameters are used to predict the dynamic behavior of the collector outlet temperature. The model coefficients particularly \(c_3\) in the simple dynamic characterization model are examined by the collector dynamic prediction under variable meteorological conditions. Meanwhile, the prediction accuracy of the simple dynamic model based on the first-order difference method is compared to that of the numerical solution of the collector ordinary differential equation (ODE) model using the fourth-order Runge-Kutta method. The improved thermal inertia model (TIM) on the basis of closed-form solution presented by Deng et al. (2016a) is also considered. The results show that the prediction performance of the simple dynamic model is nearly as accurate as the ODE numerical solution and the TIM by Deng et al. (2016a) except some special conditions such as sharply changed solar irradiance and collector inlet temperature.

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, Section for Building Energy, Chinese Academy of Sciences, Tsinghua University  
**Authors:** Deng, J. (Ekstern), Yang, M. (Ekstern), Ma, R. (Ekstern), Zhu, X. (Ekstern), Fan, J. (Intern), Yuan, G. (Ekstern), Wang, Z. (Ekstern)  
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Valorisation of ferric sewage sludge ashes: Potential as a phosphorus source

Sewage sludge ashes (SSA), although a waste, contain elements with socio-economic and environmental potential that can be recovered. This is the case of phosphorus (P). SSA from two Danish incinerators were collected during two years and characterized. The sampling was done immediately after incineration (fresh SSA) or from an outdoor deposit (deposited SSA). Although morphology and mineral composition were similar, physico-chemical and metal concentration differences were found between incinerator plants and sampling periods. No differences were observed between

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deposited and fresh SSA, except for the parameters directly influenced by disposal conditions (e.g. moisture content). All the SSAs had high concentrations of P (up to 16 wt%), but they all exceeded Danish EPA Cd and Ni thresholds for direct application at agricultural soil. Fresh and deposited SSA were acid washed aiming P extraction, achieving 50 g P/kg (approx. 37% of total P), but metals were also co-extracted to the liquid phase. To avoid and/or minimize the metals pollution of the extracted P, selective P recovery from the SSA was tested, using the electrodialytic (ED) process. ED laboratory cells, with 3 compartments (3c) and 2 compartments (2c), and two acid concentrations (H₂SO₄, 0.08 M and 0.19 M) were used for 7 days. The most concentrated acid solution increased P solubilization. The 2c-cell combined with the higher acid concentration resulted in higher P recoveries, 125 g of P/kg of SSA in the anolyte. The obtained results showed that the ED process is a valuable tool for the SSA valorisation as it promotes simultaneous P recovery and metals extraction from the SSA. (C) 2016 Elsevier Ltd. All rights reserved.

**General information**

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Organisations: Department of Civil Engineering, Universidade Nova de Lisboa  
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Scopus rating (2014): SJR 1.777 SNIP 2.482 CiteScore 3.43  
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ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 1  
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ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 1.698 SNIP 2.085 CiteScore 2.99  
ISI indexed (2011): ISI indexed yes  
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BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 1.555 SNIP 1.78  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 1.502 SNIP 1.899  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.378 SNIP 2.13
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Web of Science (2006): Indexed yes
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Scopus rating (2004): SJR 1.289 SNIP 1.939
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.847 SNIP 1.269
Web of Science (2003): Indexed yes
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Valorisation of Phosphorus Extracted from Dairy Cattle Slurry and Municipal Solid Wastes Digestates as a Fertilizer
Phosphorus is a vital cell component and an essential and irreplaceable element. Yet at the current rate of exploitation, the phosphate’s reserves will be fast depleted. Dairy cattle slurry and digestates from anaerobic digestion of municipal solid wastes (MSW) are organic wastes containing phosphorus which can potentially be used as a secondary source of this nutrient. The present study investigated the effect of pH in phosphorus release from these wastes using acid and base extraction followed by phosphorus recovery via precipitation, targeting the production of a fertilizer. Results showed that when using HNO₃, 100 % of P content was extracted from dairy cattle slurry (2.0<pH<3.3) and 90 % from MSW digestates (1.2<pH<1.5). The maximum extraction was obtained after 2.5 h for dairy cattle slurry and 48 h for MSW digestates. The extraction efficiencies using NaOH were only 22 % for dairy cattle slurry (12.9<pH<13.4) and 9 % for MWS digestates (13.0<pH<13.4). Phosphorus precipitation from extracted solutions was carried out at a molar ratio of 1:1:1 for Mg:N:P and at pH around 8.0. Analysis of the harvested precipitates by XRD and SEM–EDS ruled out the formation of struvite, but validated the formation of amorphous calcium phosphates, a potential fertilizer that can help to close the cycle of this nutrient. During the process, heavy metals might become enriched in the precipitates. In the perspective of producing a fertilizer this is an undesirable process, and one that should be taken into account when considering phosphorus recovery from wastes.

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Polytechnic Institute of Coimbra, Aveiro University
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Value of Information by updating model uncertainties utilising proof loading in the context of series and Daniels systems

In this paper, an approach is presented for the determination of the Value of Information (VoI) in relation to models which can represent structural systems such as e.g. towers, cables, jackets. Stochastic capacities and loads are assumed for the models studied herein. The VoI is obtained with a prior and a pre-posterior decision analysis. The prior decision analysis takes basis in the design phase of the structural system. Pre-posterior decision analysis builds upon modelling results of not yet conducted experiments. In order to perform the prior and pre-posterior Bayesian decision analysis, the expected life-cycle benefit of the considered systems are computed. The difference in the expected benefits relating to the prior and pre-posterior decision analysis leads to the VoI. The system models are probabilistically computed using the Monte Carlo / Importance sampling simulations to estimate their probability of failure. Next to the intrinsic uncertainties in loads and capacities further uncertainties accounting for the model uncertainties are included in the simulations. As an SHM strategy, proof loading is considered and modelled as a process accompanying the construction. The costs of proof loading and probable component failures are considered explicitly. The analyses results point to high Value of Information for component proof loading in systems with a low reliability.

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Verification of Occupants' Behaviour Models in Residential Buildings

During the last decade, studies about stochastic models of occupants' behaviour in relation to control of the indoor environment have been published. Often the overall aim of these models is to enable more reliable predictions of building performance using building performance simulations (BPS). However, the validity of these models has only been sparsely tested.

In this talk three methods for evaluating the models' performance (listed below) will be described, discussed and exemplified using a dataset of window openings from Denmark.

1) Validation of state - TPR/FPR method
2) Validation of state transitions - Residuals method
3) Validation by simulation

The first two methods rely on a full dataset different to the one the models were derived from. In the TPR/FPR method, the probability of an event is calculated using the model under evaluation. The probability is then compared to random numbers to determine if the event takes place or not. Finally, the simulated window position is compared to the measured ones and the True Positive Rate and False Positive Rate along with other metrics can be calculated and compared. The method evaluates the models abilities to predict the position of the window and the method works well if the model only relies on outdoor conditions. However, if the model under evaluation relies on variables that are affected by the window position (most indoor environmental variables), the method has inherent problems.

In the Residuals method the probabilities are compared directly to the measurements and no comparisons with random numbers are required. This has the benefit of avoiding feedback problems described above. The method evaluates the models abilities to predict the events rather than the position of the window. In the method, the model is used to calculate transition probabilities based on the dataset. In each time step, the probabilities are subtracted from the observed transitions, to find the residuals. Finally, the residuals can be averaged, and compared.

The validation by simulation relies on detailed Building Performance Simulations (BPS) using models under evaluation. In the method, different models of occupant behaviour are implemented in a BPS programme and detailed simulations are
performed. The simulation results are compared to measurements in the simulated building to see which models best predicted the measurements. The method works under the assumption that any differences between measurements and simulation results are due to the occupant behaviour models’ inabilities to make correct predictions. This assumption is only true if all other sources of uncertainty have been ruled out by careful calibration of the BPS model.

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Vertical Dynamic Stiffness of Offshore Foundations
Nowadays, pile and suction caisson foundations are widely used to support offshore structures which are subjected to vertical dynamic loads. The dynamic soil-structure interaction of floating foundations (foundations embedded in a soil layer whose height is greater than the foundation length) is investigated by numerical analyses of representative finite element models. The 3D numerical model is compared and validated with existing analytical solutions. A parametric study is carried out analyzing the effect of the slenderness ratio Hp/d and the height and the stiffness of the soil layer on the dynamic stiffness and damping.

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General information
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Organisations: Office for Innovation & Sector Services, Department of Environmental Engineering, Department of Civil Engineering, Environmental Chemistry, Water Resources Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering, Section for Building Design, Residual Resource Engineering, Water Technologies, Production and Service Management, Department of Management Engineering, Engineering Systems, Department of Transport, Transport policy and behaviour, Geological Survey of Denmark and Greenland, Aarhus University, DCE -
Viscoelastic Pavement Modeling with a Spreadsheet

The aim herein was to equip civil engineers and students with an advanced pavement modeling tool that is both easy to use and highly adaptive. To achieve this, a mathematical solution for a layered viscoelastic half-space subjected to a moving load was developed and subsequently implemented in a spreadsheet environment. The final program can consider up to five fully bonded layers, each isotropic, homogeneous and weightless. The top layer (as well as others if desired) is linear viscoelastic, while the remaining layers are linear elastic. The load is applied vertically to the surface of the system, uniformly spread over a circle, and moving with constant speed along a straight line. The final workbook, named ELLVA1, offers a near real-time solution for the history of stress, strain, and displacement inside the system at any point of interest resulting from a single pass. Despite built-in formulation approximations and limitations of operating under a spreadsheet environment, computation results are shown to be almost exact.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Levenberg, E. (Intern)
Pages: 746-755
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Pavement mechanics, Response modeling, Layered half-space, Viscoelasticity, Spreadsheet
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Visualization of the structural changes in plywood and gypsum board during the growth of Chaetomium globosum and Stachybotrys chartarum

Fungal growth in indoor environments is associated with many negative health effects. Many studies focus on brown- and white-rot fungi and their effect on wood, but there is none that reveals the influence of soft-rot fungi, such as Stachybotrys spp. and Chaetomium spp., on the structure of building materials such as plywood and gypsum wallboard. This study
focuses on using micro-computed tomography (microCT) to investigate changes of the structure of plywood and gypsum wallboard during fungal degradation by *S. chartarum* and *C. globosum*. Changes in the materials as a result of dampness and fungal growth were determined by measuring porosity and pore shape via microCT. The results show that the composition of the building material influenced the level of penetration by fungi as shown by scanning electron microscopy (SEM). Plywood appeared to be the most affected, with the penetration of moisture and fungi throughout the whole thickness of the sample. Conversely, fungi grew only on the top cardboard in the gypsum wallboard and they did not have significant influence on the gypsum wallboard structure. The majority of the observed changes in gypsum wallboard occurred due to moisture. This paper suggests that the mycelium distribution within building materials and the structural changes, caused by dampness and fungal growth, depend on the type of the material.

**General information**

**State:** Published

**Organisations:** Department of Systems Biology, Eucaryotic Molecular Cell Biology, Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Sydney, Aalborg University

**Authors:** Lewinska, A. M. (Intern), Hoof, J. B. (Intern), Peuhkuri, R. H. (Ekstern), Rode, C. (Intern), Lilje, O. (Ekstern), Foley, M. (Ekstern), Trimby, P. (Ekstern), Andersen, B. (Intern)

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- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 2.05 SJR 0.723 SNIP 0.8
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 0.816 SNIP 0.873 CiteScore 2.04
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 0.903 SNIP 1.037 CiteScore 2.28
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 0.917 SNIP 1.019 CiteScore 2.5
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 0.87 SNIP 1.004 CiteScore 2.32
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 0.9 SNIP 0.972 CiteScore 2.29
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- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 0.945 SNIP 1.05
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.993 SNIP 1.156
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 0.926 SNIP 1.031
Waste handling in Arctic island operated societies, examples from Qeqertarsuaq and Qaanaaq

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
Number of pages: 2
Pages: 94-95
Publication date: 2016

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Publisher: Arctic Technology Centre, DTU Technical University of Denmark
ISBN (Print): 9788778774316
Main Research Area: Technical/natural sciences
Electronic versions:
Book_of_Abstracts_Artek_Event_2016.pdf

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Wastewater treatment in Kangerlussuaq, Greenland by chemical coagulation and UV disinfection

General information
State: Published
Organisations: Department of Environmental Engineering, Water Technologies, Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Chhetri, R. K. (Intern), Klupsch, E. (Ekstern), Andersen, H. R. (Intern), Jensen, P. E. (Intern)
Number of pages: 2
Pages: 51-52
Publication date: 2016
Water and sanitation in Greenlandic communities

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Technical University of Denmark
Authors: Jensen, P. E. (Intern), Hammeken, K. (Ekstern)
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Event: Abstract from Water Innovations for Healthy Arctic Homes, Anchorage, United States.
Main Research Area: Technical/natural sciences

Water supply in the high Arctic Island operated societies; Qaanaaq, an example

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
Number of pages: 2
Pages: 84-85
Publication date: 2016

Welcome

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Jensen, O. M. (Intern)
Number of pages: 1
Publication date: 2016

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Title of host publication: International RILEM Conference on Materials, Systems and Structures in Civil Engineering
Publisher: Rilem publications
Wettability of Chalk and Argillaceous Sandstones Assessed from T1/T2 Ratio
Low-field NMR relaxation of the fluids inside the porous rock is the result of bulk and surface relaxation of the protons inside the pore fluid. Bulk relaxation is a fluid property when the solid-fluid interaction is minimized. Surface relaxation is the result of the solid-fluid interaction related to mineral properties. Thus, longitudinal, T1, and transverse, T2, relaxation times should in principle be similar. However, microscopic magnetic gradients related to minerals can shorten T2 as compared to T1 provided the saturating fluid has high affinity to the solid. We consequently find that the T1/T2 ratio can quantify the affinity between the rock and wetting pore fluid. The affinity is a measure directly linked to wettability.

In order to investigate the T2-shortening, we performed T1-T2 NMR experiments on different samples of chalk, Berea sandstone, and chloritic greensand, saturated either with water, oil or oil/water at irreducible water saturation. The T1/T2 ratio obtained from T1-T2 maps reflects the T2-shortening. We compare the T1/T2 ratio for the same type of rock, saturated with different fluids. The chalk shows high affinity for water, Berea sandstone has no clear preference for oil and water whereas chloritic greensand shows different behavior for small and large pores.
Wind turbines and seismic hazard: a state-of-the-art review

Wind energy is a rapidly growing field of renewable energy, and as such, intensive scientific and societal interest has been already attracted. Research on wind turbine structures has been mostly focused on the structural analysis, design and/or assessment of wind turbines mainly against normal (environmental) exposures while, so far, only marginal attention has been spent on considering extreme natural hazards that threat the reliability of the lifetime-oriented wind turbine’s performance. Especially, recent installations of numerous wind turbines in earthquake prone areas worldwide (e.g., China, USA, India, Southern Europe and East Asia) highlight the necessity for thorough consideration of the seismic implications on these energy harnessing systems. Along these lines, this state-of-the-art paper presents a comparative survey of the published research relevant to the seismic analysis, design and assessment of wind turbines. Based on numerical simulation, either deterministic or probabilistic approaches are reviewed, because they have been adopted to investigate the sensitivity of wind turbines’ structural capacity and reliability in earthquake-induced loading. The relevance of seismic hazard for wind turbines is further enlightened by available experimental studies, being also comprehensively reported through this paper. The main contribution of the study presented herein is to identify the key factors for wind turbines’ seismic performance, while important milestones for ongoing and future advancement are emphasized.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Katsanos, E. (Intern), Thöns, S. (Intern), Georgakis, C. T. (Intern)
Pages: 2113-2133
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Main Research Area: Technical/natural sciences

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BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.272 SNIP 3.75 CiteScore 3.42
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Scopus rating (2013): SJR 1.275 SNIP 2.464 CiteScore 2.75
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.126 SNIP 2.39 CiteScore 2.36
ISI indexed (2012): ISI indexed yes
Wood ash used as partly sand and/or cement replacement in mortar

Wood ash (WA) is the residue generated during incineration of wood and wood products. The WAs in focus of this work are from incineration of virgin wood. Physical and chemical properties of WA vary significantly depending on many factors related to the wood species and the incineration process, and the present work reports a characterization of three different WAs. Properties of mortar samples with the WAs used as partly cement and/or sand replacement are reported. Compressive strength development and porosity are the mortar properties in focus. The overall aim of the work is to evaluate the influence from the differences in ash characteristics to the properties of the mortar samples. The characteristics of the ashes did vary considerably. For example, one ash had very high loss on ignition (LoI) of 14% compared to 3% for the other ashes. Ash solubility in water ranged from 18% to 28%. Two of the ashes were dry and sampled just after the incineration, whereas one ash had a water content of 15%, because the ash was sprayed with water to avoid dust during ash handling at the incineration plant. Regardless of replacing cement or sand with WAs, the compressive strength decreased compared to a reference without ash, however, the decrease was small for two of the ashes. Using the ash with the high LoI resulted in significantly lower compressive strength compared to the other two ashes. The mortar samples with two of the ashes (with low LoI) had qualities, which were very encouraging in order to use WA as partly cement replacement (<10%). At higher percentages the workability was so low that extra water needed to be added and the results depended on the water:cement ratio rather than the ash mass.
Cement replacement, Compressive strength, Mortar, Wood fly ash

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智能建筑: 集能源效率、灵活与舒适性于一体

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Publisher: State of Green
Original language: Chinese
3-D cohesive finite element model for application in structural analysis of heavy duty composite pavements

The problem of stiffness degradation in composite pavement systems from localised fracture damage in the quasibrittle cement bound granular mixture are today taken into account only by empirical formulas. These formulas deals with a limited number of materials in a restricted range of design options and would yield unrealistic results in ultimate loading conditions. Cohesive modelling is one of the primary methods to handle localised damage in quasi-brittle materials, e.g., concrete, describing the potential crack in a discrete manner. To increase the versatility of existing methods this paper presents a numerical analysis of the fracture behaviour of cement bound granular mixtures in composite concrete block pavement systems applying a cohesive model. The functionality of the proposed model is compared to experimental investigations of beam bending tests. The pavement is modelled as a slab on grade and parameters influencing the response such as geometry, material parameters and loading position are studied and compared to experimental results. It is found that a cohesive model is suitable for the description of the fracture behaviour of cement bound granular mixtures. Moreover, it can be shown that adequately good prediction of the structural response of composite pavements is obtained for monotonic loading without significant computational cost, making the model applicable for engineering design purpose. It is envisaged that the methodology implemented in this study can be extended and thereby contribute to the ongoing development of rational failure criteria that can replace the empirical formulas currently used in pavement engineering.

General information
State: Published
Organisations: Department of Civil Engineering, COWI A/S
Authors: Skar, A. (Intern), Poulsen, P. N. (Intern)
Pages: 417-431
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Scopus rating (2015): SJR 1.54 SNIP 2.299 CiteScore 3.24
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.554 SNIP 2.594 CiteScore 2.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.88 SNIP 3.043 CiteScore 3.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.706 SNIP 3.37 CiteScore 3.12
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.493 SNIP 3.537 CiteScore 2.74
ISI indexed (2011): ISI indexed yes
A case-study in performance-based design using yield frequency spectra

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Vamvatsikos, D. (Ekstern), Katsanos, E. (Intern), Aschheim, M. (Ekstern)
Publication date: 2015

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Publication: Research - peer-review › Article in proceedings – Annual report year: 2015

Advanced air distribution: Improving health and comfort while reducing energy use
Indoor environment affects the health, comfort, and performance of building occupants. The energy used for heating, cooling, ventilating, and air conditioning of buildings is substantial. Ventilation based on total volume air distribution in spaces is not always an efficient way to provide high-quality indoor environments at the same time as low-energy consumption. Advanced air distribution, designed to supply clean air where, when, and as much as needed, makes it possible to efficiently achieve thermal comfort, control exposure to contaminants, provide high-quality air for breathing and minimizing the risk of airborne cross-infection while reducing energy use. This study justifies the need for improving the present air distribution design in occupied spaces, and in general the need for a paradigm shift from the design of collective environments to the design of individually controlled environments. The focus is on advanced air distribution in spaces, its guiding principles and its advantages and disadvantages. Examples of advanced air distribution solutions in spaces for different use, such as offices, hospital rooms, vehicle compartments, are presented. The potential of advanced air distribution, and individually controlled macro-environment in general, for achieving shared values, that is, improved health, comfort, and performance, energy saving, reduction of healthcare costs and improved well-being is demonstrated. Performance criteria are defined and further research in the field is outlined.
Advanced air distribution method combined with deodorant material for exposure reduction to bioeffluents contaminants in hospitals

The separate and combined effect of a ventilated mattress and acid-treated activated carbon fibre (ACF) fabric on reducing the exposure to body generated gaseous pollutants in hospital environment was studied. Full-scale experiments were performed in a climate chamber furnished as a single-bed hospital patient room at reduced background ventilation rate of 1.6 air changes per hour. The bed of the patient was equipped with the ventilated mattress (VM) having an exhaust opening from which bioeffluents generated from human body were sucked and discharged from the room. To enhance the pollutant removal, acid-treated activated carbon fibre material was used in some of the experiments in the form of patient’s cover. The simulated pollution source was ammonia gas released from the patient’s groins. The results show that when using the ventilated mattress the ammonia gas concentration in the room was significantly reduced compared to the concentration measured when the VM was not in operation. The concentration of ammonia gas in the room was 100% removed when the VM operating at 1.5 L/s and the ACF material used as a cover were used together.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Otsuma Women’s University
Authors: Bivolarova, M. P. (Intern), Mizutani, C. (Ekstern), Melikov, A. K. (Intern), Bolashikov, Z. D. (Intern)
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Publication date: 2015

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Local air distribution, Air cleaning, Indoor air quality (IAQ), Hospital environment

Aerodynamics of bridge hangers in smooth and turbulent flow and implications on aeroelastic stability

The aerodynamics of circular cylinders featuring geometric imperfections, such as bridge cables, has received much attention in recent years due to the recognition that such imperfections can be the cause of large amplitude vibrations. Bridge cables are usually made of strands or wires protected by an extruded High Density PolyEthylene (HDPE) circular sheath [1]. In the last 20 years, several bridge cable manufacturers have introduced surface modifications on HDPE sheath in order to reduce the drag and to ensure the aerodynamic stability in all climatic conditions. In the case of plain HDPE sheaths, although manufacturers put in place all efforts to obtain smooth, perfectly circular sections, superficial irregularities such as roughness, labeling and ovalling make the aerodynamic behaviour deviate from that of perfect circular cylinder. The imperfections are the result of the manufacturing process, of mechanical damage occurring during transport and installation, as well as of the ageing process due to the exposure to environmental factors. Few experimental works are already available dealing with the effects of imperfections on the aerodynamics of bridge cables. For example, Matteoni and Georgakis and Larose et al. [2,3] confirming previous research showed that the appearance of a negative pressure bubble on one side of a real HDPE tube at the critical Reynolds number range leads to a rapid drop in the drag coefficient and the appearance of a non negligible mean lift force. Moreover, Matteoni and Georgakis, measuring roughness and shape deviation of the wind tunnel model, justified the measured aerodynamic coefficients. Flamand et al. [4], using the Proper Orthogonal Decomposition (POD), measured the spatial and temporal correlation of the pressure pattern along the HDPE tube with surface and section irregularities, to characterise a bi-stable behaviour occurring at the critical Reynolds number regime; they showed that only three modes are sufficient to faithfully represent the fluctuation of the pressure field around the cable. Matteoni and Georgakis [5] studied the wind induced response of a full scale yawed bridge cable section model, for varying Reynolds numbers and wind angles-of-attack, using passive dynamic wind tunnel tests. They demonstrated that the in-plane aerodynamic damping of a bridge cable section and the overall dynamic response are strongly affected by changes in the angle of attack. This result is in agreement with the prediction of the quasi-steady theory using the result of static tests, although it was not possible to directly compare the regions of instability based on the static and passive dynamic tests. However, although many authors demonstrated the effects of superficial and sectional imperfection on aerodynamics, little attention has been paid to the refined measurement of aerodynamic data of a real cable and to their use in quasi-steady stability criteria. The purpose of the research herewith is...
to investigate the aerodynamics of a plain bridge hanger in smooth and turbulent flow and to evaluate the prediction of aerodynamic stability using the different models in literature, correlating these results with the measured imperfections of the tested cable.

Agent-Based Decision Control—How to Appreciate Multivariate Optimisation in Architecture

Early stage building performance optimisation as a viable approach is yet to be applied efficiently in building design processes, especially in the early design stages where the design space is open and changes are inexpensive. This article proposes a method of entire building energy optimisation in the early design stage. The main focus is to demonstrate the optimisation method, which is done in two ways. Firstly, the newly developed agent-based optimisation algorithm named Moth is tested on three different single objective search spaces. Here Moth is compared to two evolutionary algorithms. Secondly, the method is applied to a multivariate optimisation problem. The aim is specifically to demonstrate optimisation for entire building energy consumption, daylight distribution and capital cost. Based on the demonstrations Moth’s ability to find local minima is discussed. It is concluded that agent-based optimisation algorithms like Moth open up for new uses of optimisation in the early design stage. With Moth the final outcome is less dependent on pre- and post-processing, and Moth allows user intervention during optimisation. Therefore, agent-based models for optimisation such as Moth can be a powerful substitute for traditional stochastic optimisation.

Aggregation of building energy demands for city-scale models

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Building Energy, Centre for IT-Intelligent Energy Systems in Cities, Department of Management Engineering, Systems Analysis, DTU Climate Centre, Energy Systems Analysis, Section for Building Design
Authors: Gianniou, P. (Intern), Heller, A. (Intern), Nielsen, P. S. (Intern), Negendahl, K. (Intern), Rode, C. (Intern)
Number of pages: 9
Air distribution in a multi-occupant room with mixing or displacement ventilation with or without floor or ceiling heating

This study performed a comparative analysis of the air distribution in a multi-occupant room with mixing or displacement ventilation and the effect of adding floor or ceiling heating to each of them. The vertical distribution of indoor air temperature and velocity in the occupied zone and the horizontal distribution of indoor containment concentration in the breathing zone were measured for all six systems with a supply air temperature of 19.0°C and an air change rate of 4.2 h⁻¹. The results showed that the mean vertical air temperature difference in the occupied zone varied from 0.1°C to 0.6°C; the mean local turbulence intensity varied from 12.0% to 14.1% with mixing ventilation with or without floor or ceiling heating, and the corresponding values were 1.5°C to 2.5°C and 7.3% to 9.8% with displacement ventilation with or without floor or ceiling heating. Mean air distribution effectiveness varied from 0.93 to 1.0 for mixing ventilation and from 1.06 to 1.14 for displacement ventilation with or without floor or ceiling heating. The results are relevant to the design and control of mixing and displacement ventilation with or without floor or ceiling heating in a multi-occupant room.

General information
State: Published
Organisations: Section for Indoor Environment, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Xi'an Jiaotong University
Authors: Wu, X. (Ekstern), Fang, L. (Intern), Olesen, B. W. (Intern), Zhao, J. (Ekstern), Wang, F. (Ekstern)
Number of pages: 8
Pages: 1109-1116
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Main Research Area: Technical/natural sciences

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Scopus rating (2015): SJR 0.644 SNIP 0.888
Web of Science (2015): Indexed yes
Scopus rating (2014): SJR 0.578 SNIP 0.846
Web of Science (2014): Indexed yes
Scopus rating (2013): SJR 0.618 SNIP 0.89
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.587 SNIP 1.109
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.541 SNIP 0.74
Web of Science (2011): Indexed yes
Scopus rating (2010): SJR 1.027 SNIP 0.955
Web of Science (2010): Indexed yes
Scopus rating (2009): SJR 1.767 SNIP 1.187
Web of Science (2009): Indexed yes
Scopus rating (2008): SJR 0.866 SNIP 0.903
Web of Science (2008): Indexed yes
Air quality Performance of Ductless Personalized Ventilation in Conjunction with Displacement Ventilation: Impact of Walking Person

The present experiment evaluates the impact of air disturbances from a walking person on inhaled air by ductless personalized ventilation (DPV) with displacement ventilation (DV), when a seated occupant is the source of pollution: bio-effluents and exhaled air. The measurements took place in a full-scale office room with two side by side workstations. Each desk included a DPV, a personal computer and desk lamps. Two dressed, breathing thermal manikins were used as seated occupants. DV floorstanding air supply was installed at the wall facing the workstations. A real person was walking between the desks and the DV supply. Pollution from feet and exhaled air by one manikin was simulated with tracer gases. Room temperature of 26 °C and 90 L/s DV supply flow rate were kept constant. Measurements under numerous combinations of DPV operation modes and supply flow rates were performed. Tracer gas concentrations in inhaled air by the two manikins were measured. The DPV was not able to protect the exposed person from contaminants emitted from a sitting and polluting occupant when there were disturbances close to the DPV. However, using the DPV at the polluting manikin's workstation resulted in better inhaled air quality for the polluting manikin.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
Authors: Bolashikov, Z. D. (Intern), Lu, P. (Ekstern), Melikov, A. K. (Intern), Tomasz, M. (Ekstern)
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“Ductless” personalized ventilation, Exposure, Bio-effluents
Source: PublicationPreSubmission
Source-ID: 131108427
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015

Air temperature investigation in microenvironment around a human body
The aim of this study is to investigate the temperature boundary layer around a human body in a quiescent indoor environment. The air temperature, mean in time and standard deviation of the temperature fluctuations around a breathing thermal manikin are examined in relation to the room temperature, body posture and human respiratory flow. To determine to what extent the experiments represent the realistic scenario, the additional experiments were performed with a real human subject. The results show that at a lower room air temperature (20°C), the fluctuations of air temperature increased close to the surface of the body. The large standard deviation of air temperature fluctuations, up to 1.2°C, was recorded in the region of the chest, and up to 2.9°C when the exhalation was applied. The manikin leaned backwards increased the
air temperature in the breathing zone, which was opposite from the forward body inclination. Exhalation through the mouth created a steady air temperature drop with increased distance from the mouth without disturbing the region of the chest. Exhalation through the nose did not affect the air temperature in front of the chest due to physics of the jets flow from the nose. The additional carbon dioxide (CO₂) measurements showed that the exhaled air from the nose could penetrate the region below the chest. Small discrepancies between the results obtained with the breathing thermal manikin and a real human subject suggest that the manikin can be used for accurate measurements of occupant's thermal microenvironment.

**General information**

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Organisations: Department of Civil Engineering, Section for Indoor Environment, Section for Indoor Climate and Building Physics, National University of Singapore
Authors: Licina, D. (Intern), Melikov, A. K. (Intern), Sekhar, C. (Ekstern), Tham, K. W. (Ekstern)
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- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
- Web of Science (2014): Indexed yes
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- Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
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- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 1.235 SNIP 2.001
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 1.028 SNIP 1.865
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 0.924 SNIP 1.38
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 0.788 SNIP 1.778
Alternative solutions for inhibiting Legionella in domestic hot water systems based on low-temperature district heating

Abstract
District heating is a cost-effective way of providing heat to high heat density areas. Low-temperature district heating (LTDH) is a promising way to make district heating more energy-efficient and adaptable to well-insulated buildings with low heating demand in the future. However, one concern is the multiplication of Legionella due to insufficient temperature elevation with low-temperature supply. The aim of this study was to find optimal solutions to this dilemma for specific situations. The solutions were of two types: alternative system designs and various methods of sterilization. The alternative design approach can eliminate the risk factors of Legionella by local temperature boosting and restricting system volume. Decentralized substations, micro heat pumps, electric heating elements and electric heat tracing are all investigated as alternative designs. With regard to sterilization methods, thermal treatment, ionization, chlorine, chlorine dioxide, ultraviolet light, photocatalysis and filtration are discussed as the most frequently used methods in hot water systems. The characteristics, efficacy and operation methods of LTDH using the solutions investigated are documented and compared. Finally, recommendations are given for their use in practice.

Practical application: The methods for inhibiting Legionella should fit into applicable situations according to their characteristics. This study aims to recommend optimum solutions for inhibiting Legionella in LTDH scenarios, and includes a comprehensive overview of their efficiency, installation, operation and costs, so as to give adequate information for selecting appropriate solutions. In addition to sterilization methods, alternative system design implemented with new technologies can also help prevent Legionella in hot water systems. They have the additional benefit of reducing the heat loss of the hot water system. The alternative design solutions both enrich our options for water sanitation and improve the energy efficiency of our energy systems.

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Authors: Yang, X. (Intern), Li, H. (Intern), Svendsen, S. (Intern)
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Ammonium citrate as enhancement for electrodialytic soil remediation and investigation of soil solution during the process

Seven electrodialytic experiments were conducted using ammonium citrate as enhancing agent to remediate copper and chromium-contaminated soil from a wood-preservation site. The purpose was to investigate the effect of current density (0.2, 1.0 and 1.5 mA cm\(^{-2}\)), concentration of enhancing agent (0.25, 0.5 and 1.0 M) and remediation times (21, 42 and 117 d) for the removal of Cu and Cr from a calcareous soil. To gain insight on metal behavior, soil solution was periodically collected using suction cups. It was seen that current densities higher than 1.0 mA cm\(^{-2}\) did not increase removal and thus using too high current densities can be a waste of energy. Desorption rate is important and both remediation time and ammonium citrate concentration are relevant parameters. It was possible to collect soil solution samples following an adaptation of the experimental set-up to ensure continuous supply of ammonium citrate to the soil in order to keep it saturated during the remediation. Monitoring soil solution gives valuable information on the evolution of remediation and helps deciding when the soil is remediated.

Final concentrations in the soil ranged from 220 to 360 mg Cu kg\(^{-1}\) (removals: 78–86%) and 440–590 mg Cr kg\(^{-1}\) (removals: 35–51%), being within the 500 mg kg\(^{-1}\) limit for a clean soil only for Cu. While further optimization is still required for Cr, the removal percentages are the highest achieved so far, for a real Cu and Cr-contaminated, calcareous soil. The results highlight EDR potential to remediate metal polluted soils at neutral to alkaline pH by choosing a good enhancement solution.
A model to predict concentrations of DnBP metabolites in urine from a vapor-phase exposure

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, U.S. Environmental Protection Agency, Tsinghua University, Rutgers University, Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Fraunhofer Wilhelm-Klauditz-Institut (WKI), Missouri University of Science and Technology
Authors: Lorber, M. (Ekstern), Gong, M. (Ekstern), Weschler, C. (Ekstern), Bekö, G. (Intern), Koch, H. (Ekstern), Salthammer, T. (Ekstern), Schripp, T. (Ekstern), Toftum, J. (Intern), Morrison, G. (Ekstern), Zhang, Y. (Ekstern), Clausen, G. (Intern)
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Lorber_2015_ISES_Abstract_model_DnBP_in_ureine_from_air.pdf
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Source-ID: 119503258
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Mitigation of global warming and transitioning to a green and sustainable world are counteracted by a number of barriers and dilemmas. The paper analyzes a number of these barriers and dilemmas in order to highlight efficient strategies and solutions for a sustainable development. The dilemmas include the following examples: • There are limits to economic and material growth in a finite globe, but most governments in industrial countries are calling for more growth in a period of financial crisis. • More equity is required to stem the desire for growth, but inequity is increasing. • The increase in global temperature should stay below two degrees centigrade in order to avoid irreversible consequences, but the present path points to four degrees or more. • At least 50% of known reserves of fossil fuels must remain underground in order to avoid a temperature increase higher than two degrees, but a number of industrial countries are now promoting exploitation of new fossil sources like shale gas and oil from tar sand. • Reversing population growth facilitates sustainable development, but most governments of industrial nations appear to be more concerned about decreases in their population.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Meyer, N. I. (Intern)
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Analysis of possible influence on pigments after applied electrochemical desalination

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Rörig-Dalgaard, I. (Intern)
Pages: 181-181
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Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2015

A new Laplace transformation method for dynamic testing of solar collectors

A new dynamic method for solar collector testing is developed. It is characterized by using the Laplace transformation technique to solve the differential governing equation. The new method was inspired by the so called New Dynamic Method (NDM) (Amer E. et al (1999) [1]) but totally different. By integration of the Laplace transformation technique with the Quasi Dynamic Test (QDT) model (Fischer S. et al (2004) [2]), the Laplace – QDT (L-QDT) model is derived. Two experimental methods are then introduced. One is the shielding method which needs to shield and un-shield solar collector continuously during test period. The other is the natural test method which doesn't need any intervention. The new L-QDT model with the shielding method are tested by TRNSYS (Klein S. et al (1988) [3]) simulation. Experiments were carried out at Technical University of Denmark by using the L-QDT method and the natural experimental method. The identified collector parameters are then compared and analyzed with those obtained by the steady state test method and the QDT test method. The results comparison shows that the L-QDT method and the natural experimental method are also valid.

It can be concluded that the new Laplace test method can obtain reasonable and accurate collector parameters under transient weather condition.

General information
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Organisations: Department of Civil Engineering, Section for Building Physics and Services
Authors: Kong, W. (Intern), Perers, B. (Intern), Fan, J. (Intern), Furbo, S. (Intern), Bava, F. (Intern)
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.83 SJR 1.697 SNIP 2.044
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
In this paper, a new simplified model to calculate surface temperature and heat transfer of radiant floor heating and cooling system was proposed and established using the conduction shape factor. Measured data from references were used to validate the proposed model. The results showed that the maximum differences between the calculated surface temperature and heat transfer using the proposed model and the measured data were 0.8 °C and 8.1 W/m² for radiant floor heating system when average water temperature between 40 °C and 60 °C. For the corresponding values were 0.3
°C and 2.0 W/m² for radiant floor cooling systems when average water temperature between 10 °C and 20 °C. Numerically simulated data in this study were also used to validate the proposed model. The results showed that the surface temperature and heat transfer of radiant floor calculated by the proposed model agreed very well with the numerically simulated data when average water temperature changing from 25 °C to 45 °C for radiant floor heating systems and from 10 °C to 20 °C for radiant floor cooling systems. Hence, the proposed model was validated to be applicable and was believed to be potentially beneficial for the design and control of radiant floor heating and cooling systems. © 2015 Elsevier B.V. All rights reserved.
An optimised method for electrodialytic removal of heavy metals from harbour sediments

A 2-compartment electrodialytic cell set-up for treatment of solid materials has in many respects proven superior to other types of cells in removing heavy metals from sediments. Most notably, remediation times were shorter, energy consumption was lower and higher removal efficiencies were observed. By employing multivariate modelling and investigating additional experimental variables, the relative importance of variables effecting remediation was determined and response surfaces for heavy metal removal were calculated. Employing optimal conditions it was possible to remove targeted metals (Pb, Cu, Zn), by 73-96 %, and remediation objectives could be met in a large region of the studied experimental domain.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, UiT The Arctic University of Norway
Authors: Pedersen, K. B. (Ekstern), Jensen, P. E. (Intern), Ottosen, L. M. (Intern), Lejon, T. (Ekstern)
Number of pages: 8
Pages: 432-439
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Journal: Electrochimica Acta
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.74 SJR 1.357 SNIP 1.167
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.349 SNIP 1.344 CiteScore 4.86
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.391 SNIP 1.482 CiteScore 4.59
A Numerical Comparison of Ionic Multi-Species Diffusion with and without Sorption Hysteresis for Cement-Based Materials

A finite element solution for a mass transport model for porous materials accounting for sorption hysteresis is presented in this paper. The model is prepared for modeling of concrete durability, but the general presentation makes it suitable for other porous materials like soil and tissues. The model is an extended version of the Poisson–Nernst–Planck (PNP) system of equations. The PNP extension includes a two-phase vapor and liquid model coupled by a sorption hysteresis function and a chemical equilibrium term. The strong and weak solutions for the equation system are shown, and a finite element formulation is established by Galerkin’s method. A single-parameter implicit time integration scheme is used for
solving the transient response, and the out-of-balance solution is minimized by using a modified Newton–Raphson scheme in which the tangential stiffness is not computed exactly. The sorption hysteresis is added to the solution procedure by a rate function. The hysteresis effect is described by scanning curves defined between two boundary sorption isotherms. A numerical example was constructed to show the applicability and compare a simple approach and a extended approach within the sorption hysteresis model. The examples illustrate the impact of changing relative humidity at the mass transport boundary on the adsorption and desorption stages of a cement-based material. Changes in the pore solution ion concentrations are a result of the changing moisture content, which are shown by the example. Comparing the two approaches showed significant deviations in the liquid content and ion concentrations, in parts of the domain considered.

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Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Norwegian University of Science and Technology
Authors: Jensen, M. M. (Intern), Johannesson, B. (Intern), Geiker, M. R. (Ekstern)
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Scopus rating (2016): CiteScore 2.16 SJR 0.767 SNIP 1.316
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.728 SNIP 1.317 CiteScore 1.94
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.932 SNIP 1.433 CiteScore 1.91
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.04 SNIP 1.433 CiteScore 2.03
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.942 SNIP 1.522 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.921 SNIP 1.337 CiteScore 1.81
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.615 SNIP 1.203
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.612 SNIP 1.088
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.7 SNIP 0.924
Application of microstructurally-designed mortars for studying early-age properties: Microstructure and mechanical properties

A recently-developed technique for stopping hydration without altering the microstructure by invasive methods is studied. This technique is based on the replacement at the mixing stage of cement/binder grains that would otherwise remain unhydrated in real systems at defined hydration stages with inert quartz particles. This technique allows studying hydration-dependent properties in a static equivalent system, where these processes can be decoupled from hydration.

A comprehensive comparison between real and equivalent systems, in terms of mechanical properties as well as physico-chemical ones is presented. Results of mechanical properties support the validity of the approach. Microstructural characterization by means of mercury intrusion porosimetry shows comparable results in terms of total porosity and breakthrough radii. Thermogravimetric analysis shows comparable amounts of hydration products formed. These results suggest that the method can constitute a useful tool for studying the behavior of cementitious materials at early ages, in particular transport phenomena and shrinkage.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, Swiss Federal Laboratories for Materials Science and Technology (Empa), Lafarge Centre de Recherche, Sika Technology AG
Authors: Di Bella, C. (Ekstern), Wyrzykowski, M. (Ekstern), Griffa, M. (Ekstern), Termkhajornkit, P. (Ekstern), Chanvillard, G. (Ekstern), Stang, H. (Intern), Eberhardt, A. (Ekstern), Lura, P. (Ekstern)
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Scopus rating (2016): CiteScore 5.15 SJR 3.46 SNIP 3.166
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.69 SNIP 3.227 CiteScore 4.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Application of users' light-switch stochastic models to dynamic energy simulation

The design of an innovative building should include building overall energy flows estimation. They are principally related to main six influencing factors (IEA-ECB Annex 53): climate, building envelope and equipment, operation and maintenance, occupant behaviour and indoor environment conditions. Consequently, energy-related occupant behaviour should be taken into account by energy simulation software. Previous researches (Bourgeois et al. 2006, Buso 2012, Fabi 2012) already revealed the differences in terms of energy loads between considering occupants' behaviour as stochastic processes rather than deterministic inputs, due to the uncertain nature of human behaviour. In this paper, new stochastic models of users' interaction with artificial lighting systems are developed and implemented in the energy simulation software IDA ICE. They were developed from field measurements in an office building in Prague. The aim is to evaluate the impact of a user's switching action over whole building energy consumption. Indeed, it is interesting not only to see the variance related to electric energy consumption, but the overall effect on a building's energy load.
Assembly and lifting of Pearl-Chain arches

Pearl-Chain arches were invented at the Technical University of Denmark in cooperation with the company Abeo A/S. The system uses specially designed, pre-fabricated concrete elements that are post-tensioned together into an arch shape, which is then lifted into place. The arches can be used both in buildings and bridges.

The assembly and lifting of two Pearl-Chain arches, with a span of 13 m and rise of 1 m, is considered in this paper. Precast “Super-Light Deck” elements were used for the arches, which had a thickness of 22 cm. Both arches were successfully lifted, rotated in mid-air, and placed adjacent to one another on prepared footings. The arches’ span and shape were continuously monitored during the entire construction sequence, and deformations stayed within an anticipated level.

Assessing and updating the reliability of concrete bridges subjected to spatial deterioration - principles and software implementation

Inspection and maintenance of concrete bridges is a major cost factor in transportation infrastructure, and there is significant potential for using information gained during inspection to update predictive models of the performance and reliability of such structures. In this context, this paper presents an approach for assessing and updating the reliability of prestressed concrete bridges subjected to chloride-induced reinforcement corrosion. The system deterioration state is determined based on a Dynamic Bayesian Network (DBN) model that considers the spatial variability of the corrosion process. The overall system reliability is computed by means of a probabilistic structural model coupled with the deterioration model. Inspection data are included in the system reliability calculation through Bayesian updating on the basis of the DBN model. As proof of concept, a software prototype is developed to implement the method presented here. The software prototype is applied to a typical highway bridge and the influence of inspection information on the system deterioration state and the structural reliability is quantified taking into account the spatial correlation of the corrosion process. This work is a step towards developing a software tool that can be used by engineering practitioners to perform reliability assessments of ageing concrete bridges and update their reliability with inspection and monitoring data.
Association between classroom ventilation mode and learning outcome in Danish schools

Associations between learning, ventilation mode, and other classroom characteristics were investigated with data from a Danish test scheme and two widespread cross-sectional studies examining air quality in Danish schools. An academic achievement indicator as a measure of the learning outcome was calculated from the scores of a standardized Danish test.
scheme adjusted for a socioeconomic reference index. Pupils in schools with balanced mechanical ventilation had significantly higher achievement indicators than pupils in schools with natural ventilation, where airing took place mostly by manual window opening. Also, the carbon dioxide concentration was lower in classrooms with balanced mechanical ventilation. There was no consistent association between the achievement indicators and the person specific room volume, construction/renovation year, or the occupancy. Measurements of carbon dioxide concentrations and temperatures in 820 classrooms in 389 schools were available. In 56% and 66% of the classrooms included in the two studies, the measured CO₂ concentration was higher than 1000ppm. The findings of this study add to the growing evidence that insufficient classroom ventilation have impacts on learning outcomes.

**General information**

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**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Indoor Environment, Technical University of Denmark

**Authors:** Toftum, J. (Intern), Kjeldsen, B. U. (Intern), Wargocki, P. (Intern), Menå, H. R. (Ekstern), Hansen, E. M. (Ekstern), Clausen, G. (Intern)

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Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 1

Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 1

Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 1

Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57

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BFI (2012): BFI-level 1

Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 1

Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 1

Scopus rating (2010): SJR 1.235 SNIP 2.001

Web of Science (2010): Indexed yes

BFI (2009): BFI-level 1

Scopus rating (2009): SJR 1.028 SNIP 1.865

Web of Science (2009): Indexed yes

BFI (2008): BFI-level 1

Scopus rating (2008): SJR 0.924 SNIP 1.38
Barriers and drivers for energy-efficient homes in Greenland

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Authors: Lading, T. (Intern)
Number of pages: 32
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Main Research Area: Technical/natural sciences
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Tove_Lading_R_374_samlet.pdf
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Behavior of a solar collector loop during stagnation
A mathematical model simulating the emptying behavior of a pressurized solar collector loop with solar collectors with a good emptying behavior is developed and validated with measured data. The calculated results are in good agreement with the measured results. The developed simulation model is therefore suitable to determine the behavior of a solar collector loop during stagnation. A volume ratio $R$, which is the ratio of the volume of the vapour in the upper pipes of the solar collector loop during stagnation and the fluid content of solar collectors, is introduced to determine the mass of the collector fluid pushed into the expansion vessel during stagnation, $M_{in}$. A correlation function for the mass $M_{in}$ and the volume ratio $R$ for solar collector loops is obtained. The function can be used to determine a suitable size of expansion vessels for solar collector loops.

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Organisations: Department of Civil Engineering, Section for Building Physics and Services
Authors: Chen, Z. (Intern), Dragsted, J. (Intern), Furbo, S. (Intern), Perers, B. (Intern), Fan, J. (Intern)
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Publication information
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.46 SNIP 0.654 CiteScore 1.37
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.759 SNIP 1.024 CiteScore 1.65
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.737 SNIP 1.214 CiteScore 1.75
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.699 SNIP 1.373 CiteScore 1.35
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.546 SNIP 1.024 CiteScore 1.08
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.469 SNIP 1.25 CiteScore 1.01
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.548 SNIP 1.224
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.679 SNIP 1.123
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.689 SNIP 1.076
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.551 SNIP 0.914
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.169 SNIP 1.368
Scopus rating (2005): SJR 1.113 SNIP 1.138
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.625 SNIP 1.572
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.976 SNIP 1.38
Scopus rating (2002): SJR 0.673 SNIP 0.519
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.712 SNIP 0.954
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.696 SNIP 0.805
Scopus rating (1999): SJR 0.349 SNIP 1.221
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Solar collector loop, Stagnation, Volume ratio
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Big Data som værktøj til at styre byens energi

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Organisations: Department of Civil Engineering, Section for Building Physics and Services
Authors: Heller, A. (Intern)
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Big_data_for_Smart_Energy_Cities_IDA_Presentation_27_01_2014.pdf

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Big Data som værktøj til at styre byens energi
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Organisations: Department of Civil Engineering, Section for Structural Engineering, FORCE Instituttet, Grontmij A/S, NIRAS A/S
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Brugeradfærd og indeklima i bebyggelse før og efter energirenovation

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Building automation - providing data for business opportunities: Building technologies impact the bigger picture

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Building certification schemes and the quality of indoor environment
Building certification schemes create a new standard for the built environment reflecting the growing environmental consciousness and the need for “green buildings”. They are expected to signify an outstanding quality and excellence. Buildings, which receive a high degree of certification, are consequently presumed to guarantee the outstanding indoor environmental quality (IEQ). There still exists, however, scarcity of data supporting this postulation, especially as regards the ratings and perceptions of occupants of certified buildings.

This PhD attempts to shed a light on this topic and supplement with new measuring data. It attempts additionally to formulate recommendations regarding future revisions of building certifications, so that the IEQ requirements, human needs and expectations are sufficiently addressed.

These objectives were attained initially by reviewing the scientific literature, providing information on the performance of building certification schemes in relation to IEQ and ratings of building occupants. Then, information was collected on IEQ in existing office buildings certified as green buildings with particular focus on the work performance indicators, acute health symptoms, and perceptions and comfort.

Information on IEQ in the existing buildings was collected through field campaigns. They comprised measurements in 6 office buildings in Singapore certified using the Green Mark (GM) Certification Scheme. The measurements were additionally carried out in 6 office buildings that are not certified, and do not qualify for GM certification. The study looked into seven dimensions in a holistic and longitudinal approach. A special on-line software was developed for collecting responses from building occupants. It integrates the questions regarding satisfaction, acute health symptoms, information on the conditions and parameters supporting and distracting from the efficient work, as well as the self-estimated performance and objectively measured performance using different tasks examining various cognitive skills. The data on absence rates was collected, too, and the range of environmental measurements performed.

Literature review showed that holistic and transversal IEQ studies comparing Green and Non-Green buildings are rare, with most of the evidence over-represented by post-occupancy surveys. Generally results show that green buildings outperform non-green for most of the IEQ parameters, with exception of acoustic, lighting, and glare.

Results of measurements were modeled with statistical methods. They were then correlated with the measurements of IEQ parameters in the buildings. The results and analyses were specifically aiming in examining the differences between Green Mark and Non-Green Mark buildings. Physical measurements did not differ significantly between Green Mark and Non-Green Mark. Occupants’ satisfaction, importance and perceptions of IEQ parameters were observed to be better in GM buildings compared with the NGM buildings and the difference could be caused both by actual exposures and psychosocial factors. Air quality is the most important IEQ parameter for occupants in Green Mark buildings. Acoustical and visual privacy is problematic in Green Mark buildings. The odds of SBS symptoms in Green Mark are half of the odds in Non-Green Mark. Occupant self-assessment performance is...
better in GM buildings but no significant differences were observed for objective performance between occupants in both types of buildings. Annual sick-leave was lower in the Green Mark buildings; the difference was one day per year. In conclusion, Green Mark buildings have generally a positive impact on occupants, compared with Non-Green Mark buildings.

Improvements and future modifications of the building certification schemes are discussed. O.C.E.A.N (Organization, commitment, environment, aesthetics and natural) approach and a metric to integrate human satisfaction responses in certification schemes are recommended. Additionally, experiences collected during the fieldwork are used to upgrade the software for collection of subjective responses with an intent to use it for developing a common standard that can be used for gauging and benchmarking IEQ in buildings, as well as for examining the performance of buildings.

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**Building energy demand aggregation and simulation tools: a Danish case study**

Nowadays, the minimization of energy consumption and the optimization of efficiency of the overall energy grid have been in the agenda of most national and international energy policies. At the same time, urbanization has put cities under the microscope towards achieving cost-effective energy savings due to their compact and highly dense form. Thus, accurate estimation of energy demand of cities is of high importance to policy-makers and energy planners. This calls for automated methods that can be easily expandable to higher levels of aggregation, ranging from clusters of buildings to neighbourhoods and cities. Buildings occupy a key place in the development of smart cities as they represent an important potential to integrate smart energy solutions. Building energy consumption affects significantly the performance of the entire energy network. Therefore, a realistic estimation of the aggregated building energy use will not only ensure security of supply but also enhance the stabilization of national energy balances.

In this study, the aggregation of building energy demand was investigated for a real case in Sønderborg, Denmark. Sixteen single-family houses -mainly built in the 1960s- were examined, all connected to the regional district heating network. The aggregation of building energy demands was carried out according to typologies, being represented by archetype buildings. These houses were modelled with dynamic energy simulation software and with a simplified simulation tool, which is based on monthly quasi-steady state calculations, using a visual parametric programming language (Grasshopper) coupled with a 3D design interface (Rhinoceros). The estimated heat demand of the examined houses from both simulation tools is compared to actual measured data of heat consumption. An assessment of the two different types of tools follows, which will indicate the suitability of each tool depending on the desired accuracy of results and on the purpose of analysis.

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Building energy optimization in the early design stages: A simplified method

This paper presents the application of multi-objective genetic algorithms for holistic building design that considers multiple criteria; building energy use, capital cost, daylight distribution and thermal indoor environment. The optimization focus is related to building envelope parameters. To obtain relevant feedback from multi-objective optimizations in early design stages, evaluation speed is a key concern. The paper presents a fast evaluation method fit for the early design stages. It uses a combination of two different quasi-steady-state methods for energy and indoor environment evaluations, a Radiance implementation for daylight simulations and a scripted algorithm for capital cost evaluations. The application of the method is developed around an integrated dynamic model which allows visual design feedback from all evaluations to be an integrated part of the design tool experience. It is concluded, that quasi-steady-state methods implemented as part of integrated dynamic models are fast and flexible enough to support building energy-, indoor environment- and cost-optimization the early design stages.

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Building performance simulation software for planning of energy efficiency retrofits

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Building performance simulation in the early design stage: An introduction to integrated dynamic models
Designing with building performance simulation feedback in the early design stage has existed since the early days of computational modeling. However, as a consequence of a fragmented building industry building performance simulations (BPSs) in the early design stage are closely related to who is creating and operating the BPS models. This paper critically reviews the different ways designers and analysts use BPS in the early design stage. One of the key findings is that most tools and methods used in the early design stages are insufficient to provide valid feedback while in the same time being flexible enough to accommodate a rapid changing design process. The main concern points to the way geometrical
models and analytical models are combined and how this affects the way the buildings are designed and perform. This paper concludes that integrated dynamic models may combine a design tool, a visual programming language and a BPS to provide better support for the designer during the early stages of design as opposed to alternatives such as the current implementation of IFC or gbXML or the unaccompanied use of simulation packages. (C) 2015 Elsevier B.V. All rights reserved.

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Building renovation with interior insulation on solid masonry walls in Denmark - A study of the building segment and possible solutions

The segment size of the Danish multi-story building stock from the period 1851-1930 is established through a unique major database managed by the Danish authorities. The outcome illustrates a large segment with 219,202 apartment units distributed over 14,832 unique buildings, all sharing characteristic geometry. Reduction of average U-value for the exterior façade is investigated in different dimensions, insulation degrees and thicknesses. The analysis shows that compared to insulation of only the infill walls below windows, fully covering insulation yields further 100-150% average U-value reduction. The large segment poses arguments for research into challenges raised by full surface insulation. (C) 2015 The Authors. Published by Elsevier Ltd.

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The goal towards a fossil free energy system is expressed in amongst others European and national targets, and puts pressure on the application of renewable energy sources combined with energy efficiency. Many cities are even more ambitious than their national targets and want to be among the first to demonstrate that they can become not only smart fossil-free energy cities but sustainable in a wider sense, including water, waste, transportation and more. In the current paper, the research agenda to support such goals through smart city efforts is presented for a few European cases as examples, focusing on the impacts that buildings play in the overall energy system. Here buildings are not only consumers but rather prosumers that are able to produce renewable energy themselves. Buildings moreover offer potential storage capacities that can be utilized in demand shifting, which is necessary to enable increased penetration of renewable energy in the energy grids.

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Calculated thermal performance of solar collectors based on measured weather data from 2001-2010

This paper presents an investigation of the differences in modeled thermal performance of solar collectors when meteorological reference years are used as input and when multi-year weather data is used as input. The investigation has shown that using the Danish reference year based on the period 1975-1990 will result in deviations of up to 39% compared with thermal performance calculated with multi-year the measured weather data. For the newer local reference years based on the period 2001-2010 the maximum deviation becomes 25%.

The investigation further showed an increase in utilization with an increase in global radiation. This means that besides increasing the thermal performance with increasing the solar radiation, the utilization of the solar radiation also becomes better.
Can we establish relationship between outdoor air ventilation and health based on the published epidemiological data?

Appropriate exposure control is prerogative for reducing the burden of disease (BOD) due to inadequate air quality indoors (IAQ). Ventilation with outdoor air is one of the available exposure control methods and is widespread. It is often assumed that this method will bring tangible effects on health. This paper examines whether the available archival epidemiological evidence provides information on the link between outdoor air ventilation and health that can be used for regulative purposes, when ventilation requirements for non-industrial built environments are set. To achieve this goal, multidisciplinary review was carried out of the scientific literature on health and outdoor air ventilation in non-industrial indoor environments (not covered by previous reviews on this topic) and of major reviews on this topic. The results show, that effects on health were seen for wide range of ventilation rates from 6-7 L/s per person, which were the lowest ventilation rates, at which no effects on some health outcomes were observed in field studies, until 25-40 L/s per person, which were in some studies the highest ventilation rates needed so no effects on health outcomes were seen. The actual contaminant exposures at various levels of ventilation were no characterized. It was observed that available data have many limitations, such as insufficient statistical power, incomplete data on the strength of pollution sources, diversity and variability of ventilation rates, at which effects have been seen, no standardized duration of exposures and diversity of the outcomes, as well as different sensibility of populations exposed. The health-ventilation relationship cannot thus competently be established, also because it must be admitted that outdoor air ventilation is only indirectly related to health by modifying exposures affecting health. It is concluded, that currently available epidemiological data do not provide sound basis for outdoor air ventilation requirements that can be universally applicable in different public and residential buildings to protect against health risks. They show minimum rates at which some health outcomes can be avoided, but these may not be generalized for the entire population of buildings, and thus cannot be used for setting minimum standards and/or regulations. Consequently, ventilation should not be advocated as the only solution to modify exposures, and should be implemented together with, and preferably after, other methods of controlling exposures have been fully exploited.
Thermo active building systems (TABS) have been applied in office buildings as a promising energy efficient solution in many European countries. The utilization of building thermal mass helps to provide high quality thermal environments with less energy consumption. However, the concept of TABS is entirely new in Japan. This paper introduces and evaluates TABS under Tokyo weather conditions to clarify the potential of using TABS in Japan. Cooling capacity of thermo active building systems used in an office building was evaluated by means of dynamic simulations. Two central rooms of the office were selected for the analysis. Six water control strategies were studied and two of those were found reasonable and suitable for TABS use in Tokyo. These two strategies are: free-cooling using underground heat exchanger combined with TABS and free-cooling with desiccant dehumidification system. For these two cases, the operative temperature was between 22-27 °C during 97 similar to 99% of the occupation time. The operative temperature drift was less than 4 °C per day. The pump miming time was 7 hours per day and the cooling power of the TABS was 36 W/m² floor area. For those free-cooling cases, the average supply water temperature was 20 °C, which shows that free-cooling is achievable using underground heat exchangers even considering the temperature increase of the ground during cooling season.
Challenges to sustainable Arctic tourist lodging: a proposed solution for Greenland

The beauty of nature in Greenland and the selling point of Greenlandic tourism Our ice is melting, yet it is still here' have been attracting more tourists in recent years. Therefore, demand for tourist accommodation is expected to grow in the future. Staying overnight in small huts is a traditional way for nomadic Greenlanders and for tourists. However, the austere condition of the existing huts cannot meet requirements nowadays. Meanwhile, climate change is causing retreat of ice, so tourist attractions might change in the future. Therefore the contradiction of improved lodging', environmental friendliness' and flexibility of location' raise the problem for the future development of tourist accommodation. The aim of this work is to explore a desirable solution by developing stand-alone mobile tourist huts with light and heating based on renewable energy supply, and sustainable black waste water management. The cabin can be disassembled into pieces and transported to new areas by trucks, snow scooters, boats or dog-sledges with almost no disturbance to the environment of the original location. In addition, cultural sustainability is also taken into account.
Changing surface-atmosphere energy exchange and refreezing capacity of the lower accumulation area, West Greenland

We present 5 years (2009-2013) of automatic weather station measurements from the lower accumulation area (1840 m a.s.l.-above sea level) of the Greenland ice sheet in the Kangerlussuaq region. Here, the summers of 2010 and 2012 were both exceptionally warm, but only 2012 resulted in a strongly negative surface mass budget (SMB) and surface meltwater run-off. The observed run-off was due to a large ice fraction in the upper 10 m of firn that prevented meltwater from percolating to available pore volume below. Analysis reveals an anomalously low 2012 summer-averaged albedo of 0.71 (typically ∼ 0.78), as meltwater was present at the ice sheet surface. Consequently, during the 2012 melt season, the ice sheet surface absorbed 28 % (213 MJ m-2) more solar radiation than the average of all other years. A surface energy balance model is used to evaluate the seasonal and interannual variability of all surface energy fluxes. The model reproduces the observed melt rates as well as the SMB for each season. A sensitivity analysis reveals that 71 % of the additional solar radiation in 2012 was used for melt, corresponding to 36 % (0.64 m) of the 2012 surface lowering. The remaining 64 % (1.14 m) of surface lowering resulted from high atmospheric temperatures, up to a +2.6 °C daily average, indicating that 2012 would have been a negative SMB year at this site even without the melt-albedo feedback. Longer time series of SMB, regional temperature, and remotely sensed albedo (MODIS) show that 2012 was the first strongly negative SMB year, with the lowest albedo, at this elevation on record. The warm conditions of recent years have resulted in enhanced melt and reduction of the refreezing capacity in the lower accumulation area. If high temperatures continue, the current lower accumulation area will turn into a region with superimposed ice in coming years.
Fiber reinforced concrete (FRC) with discrete, short and randomly distributed fibers can be specified and designed for structural applications in flexural members. In certain cases, fibers are used as the only reinforcement, while in other cases fibers are used in combination with a reduced amount of conventional reinforcement. While practical applications for FRC have been developed, shortcomings in test methods for determining mechanical properties and overly conservative design approaches limit the economic viability of FRC. The measured mechanical properties of FRC, determined through standard test methods, vary widely depending on the prescribed test method. These variations in mechanical properties impact the structural design, typically resulting in increased dimensions of the FRC structural element. To address these shortcomings in evaluation methods and how measured mechanical properties are considered in structural design, the work presented in this thesis analyzes in detail many commonly used test methods on three types of FRC, including Polypropylene Fiber Reinforced Concrete (PP-FRC), Polyvinyl Alcohol Fiber Reinforced Concrete called Engineered Cementitious Composite (ECC) and Steel Fiber Reinforced Concrete (SFRC). These materials are representative for the two main types of tension-softening and strainhardening FRC. The direct tension tests most realistically describe the tensile properties and result in a cohesive relationship between model parameters that can be used in the design of FRC structures. However, direct tension tests may be difficult to conduct in standard testing laboratories and may not be best suited for quality control purposes. For this reason, alternative test methods are needed to obtain the most relevant properties of FRC. The assessment of the mechanical properties through flexural testing is generally easier to perform than direct tension tests in conventional testing laboratories. Various standardized test methods, based on beams and plates in flexure, are typically used to characterize FRC. However, the suitability of these methods for FRC materials with tension softening and hardening responses is not fully understood, and therefore investigated in this thesis. Advantages, disadvantages and specific features of various test methods are evaluated in detail and recommendations for modifications in standardized test methods are given to characterize FRC either with softening or hardening post cracking responses in the most efficient way. Based on the findings in the characterization of FRC, a modeling approach to predict
the flexural behavior of FRC elements is developed. The model predicts the flexural behavior of FRC by assuming a loaded structure consisting of a multitude of interconnected cracked segments, called Representative Flexural Segments (RFS), combined with rigid segments representing uncracked regions. The behavior of the RFS is characterized by the energy needed to deform a segment by a given rotational angle which can be derived either from material properties in direct tension and compression or from flexural beam tests. The model considers the balance between work done on the deformed structure and the energy required to induce the corresponding rotational deformations in the RFS. The flexural response in terms of load-deflection of a structural element can be accurately predicted for a FRC with either softening or hardening post cracking behavior in direct tension or bending. The model is verified through experimental results of four-point bending beams and round determinate panels. Additionally, potential applications of SFRC representing a tension-softening FRC and ECC representing a strain-hardening FRC are investigated and used for model verification. This universally applicable model has been found to predict the flexural behavior of a structure in good agreement with experimentally obtained results. The model considers the balance between work done on the deformed structure and the energy required to induce the corresponding rotational deformations in the RFS. The flexural response in terms of load-deflection of a structural element can be accurately predicted for a FRC with either softening or hardening post cracking behavior in direct tension or bending. The model is verified through experimental results of four-point bending beams and round determinate panels. Additionally, potential applications of SFRC representing a tension-softening FRC and ECC representing a strain-hardening FRC are investigated and used for model verification. This universally applicable model has been found to predict the flexural behavior of a structure in good agreement with experimentally obtained results. Specifically, an example application of FRC as an alternative to traditional shear reinforcement (i.e., stirrups) with fibers; and prefabricated lightweight composite roof and floor panels with an ECC slab. The use of steel fibers to replace traditional shear reinforcement is not without precedent in current reinforced concrete design codes. However, more detailed information is provided in this thesis on the formation of shear cracks and fiber bridging mechanisms to utilize the capacity of FRC. Based on the shear stress-strain responses and DIC measurements of the specimen deformations, a conceptual description of the shear crack opening, crack sliding and subsequent failure of reinforced concrete and reinforced FRC with a strain hardening behavior in tension are proposed. For reinforced concrete, forces are transferred over the shear crack only by stirrups, aggregate interlock and dowel effect of longitudinal reinforcement. The crack development mechanism for reinforced FRC with strain hardening behavior in tension is more complex due to the fiber bridging mechanisms, which induces multiple cracking resulting in smaller crack openings at a given shear stress as well as higher ultimate shear stress. A new prefabricated lightweight composite roof and floor panel with ECC slabs has been developed as one of the main objectives in this PhD project. The lightweight prefabricated modular system consists of thin ECC plates connected to lightweight steel joists. The modular concept introduced aims at ease of manufacturing and storage processes of the panels by casting the ECC slab in relatively small elements and subsequently joining them with the lightweight steel profiles. The proposed design of prefabricated lightweight composite panel with an ECC slab is investigated experimentally to inspect the structural behavior of the panel under service and at ultimate conditions. In summary, the work presented in this thesis offers new insights into application of FRC in structural elements, presents findings on experimental evaluation (tension, bending, shear, creep) and characterization of FRC and suggests a universally applicable model to predict the flexural response of both strain-hardening and tension-softening FRC.
Chemometric Analysis for Pollution Source Assessment of Harbour Sediments in Arctic Locations

Pollution levels, pollutant distribution and potential source assessments based on multivariate analysis (chemometrics) were made for harbour sediments from two Arctic locations; Hammerfest in Norway and Sisimiut in Greenland. High levels of heavy metals were detected in addition to organic pollutants. Preliminary assessments based on principal component analysis (PCA) revealed different sources and pollutant distribution in the sediments of the two harbours. Tributyltin (TBT) was, however, found to originate from point source(s), and the highest concentrations of TBT in both harbours were found adjacent to the former shipyards. Polyaromatic hydrocarbons (PAH) ratios and PCA plots revealed that the predominant source in both harbours was pyrogenic related to coal/biomass combustion. Comparison of commercial polychlorinated biphenyls (PCB) mixtures with PCB compositions in the sediments indicated relation primarily to German, Russian and American mixtures in Hammerfest; and American, Russian and Japanese mixtures in Sisimiut. PCA was shown to be an important tool for identifying pollutant sources and differences in pollutant composition in relation to sediment characteristics.

General information

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Chloride migration in concrete with superabsorbent polymers

Superabsorbent polymers (SAP) can be used as a means for internal curing of concrete. In the present study, the development of transport properties of concrete with SAP is investigated. The chloride migration coefficient according to NT BUILD 492 is used as a measure of this. Twenty concrete mixtures are tested 7, 14, and 28 days after casting. The development of degree of hydration is followed for 20 corresponding paste mixtures.

Both when SAP is added with extra water to compensate the SAP water absorption in fresh concrete and without extra water, the internal curing water held by SAP may contribute to increase the degree of hydration. No matter if SAP is added with or without extra water, it appears that the so-called gel space ratio can be used as a key parameter to link age and mixture proportions (water-to-cement ratio and SAP dosage) to the resulting chloride migration coefficient; the higher the volume of gel solid relative to the space available for it, the lower the chloride migration coefficient, because the pore system becomes more tortuous and the porosity becomes less.
Concrete, Superabsorbent polymer (SAP), Internal curing, Chloride migration, Microstructure, Transport
Combining engineering and data-driven approaches: Calibration of a generic fire risk model with data

Two general approaches may be followed for the development of a fire risk model: statistical models based on observed fire losses can support simple cost-benefit studies but are usually not detailed enough for engineering decision-making. Engineering models, on the other hand, require many assumptions that may result in a biased risk assessment. In two related papers we show how engineering and data-driven modelling can be combined by developing generic risk models that are calibrated to statistical data on observed fire events. The focus of the present paper is on the calibration procedure. A framework is developed that is able to deal with data collection in non-homogeneous portfolios of buildings. Also incomplete data sets containing only little information on each fire event can be used for model calibration. To illustrate the capabilities of the proposed framework, it is applied to the calibration of a generic fire risk model for single family houses to Swiss insurance data. The example demonstrates that the bias in the risk estimation can be strongly reduced by model calibration.
Comfort and performance impact of personal control over thermal environment in summer: Results from a laboratory study

Field studies suggest that the availability of adjustable thermostats, operable windows and other controls has a positive impact on comfort, the incidence of building related symptoms and productivity. This laboratory study was designed to further investigate how having or not having control over the thermal environment affects human responses to the indoor environment. The study was conducted in summer in a field laboratory that was kept at 28°C. A total of 23 subjects were exposed twice for about 2.5h. During the first session (A) subjects were able to fine-tune their local thermal environment at any given time with a personal desk fan with continuous, stepless adjustable control. During the second session (B) subjects still had the desk fans, but this time the fans were controlled from an adjacent room by the researchers who adjusted the individual air speed profiles so they were identical to those recorded during the first session. Thus, each
subject was exposed to two customized conditions with identical exposure, only different from a psychological point of view. During the two sessions identical questionnaires and performance tests were used to evaluate subjects' comfort, SBS symptom incidence and performance. As expected, perceived control over the environment was significantly higher during session A, but there were no differences in perceived comfort and SBS symptom intensity. Both self-assessed and objectively measured performance was significantly better during session B. About two-thirds of the subjects indicated to prefer the situation as during the first session when they themselves controlled the air movement.

**General information**
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Organisations: Department of Civil Engineering, Section for Indoor Environment, Eindhoven University of Technology, Maastricht University, Technical University of Denmark
Authors: Boerstra, A. C. (Ekstern), te Kulve, M. (Ekstern), Toftum, J. (Intern), Loomans, M. G. (Ekstern), Olesen, B. W. (Intern), Hensen, J. L. (Ekstern)
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
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BFI (2012): BFI-level 1
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Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.924 SNIP 1.38
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.788 SNIP 1.778
Compact seasonal PCM heat storage for solar heating systems

Space heating of buildings and preparation of domestic hot water accounts for a large part of the society’s energy consumption. Solar radiation is an abundant and renewable energy source which can be harvested by solar collectors and used to cover heating demands in the built environment. The seasonal availability of solar energy does however not match with the heating demands in buildings which typically are large in winter periods when limited solar energy is available. Heat can be stored over a few days in water stores but continuous heat losses limits the storage periods. The possibility of storing heat from summer where solar energy is widely available to winter periods where the heating demands are large, allows for implementing more renewable energy in our energy system.

The phase change material (PCM) sodium acetate trihydrate (SAT) melts at 58 °C. The melting process requires a significant amount of energy. When completely melted, SAT can cool down below the melting temperature and remain in liquid state. When the SAT remains in this supercooled state at ambient temperature, the energy used for the melting process is stored without any additional heat losses occurring. When the solidification of the supercooled SAT is started, the temperature of the SAT rises to the melting temperature and the stored heat is released. Utilizing this principle makes it possible to store heat seasonally.

A number of problems, barriers and proposed solutions for operating a storage based on stable supercooled SAT have been identified. Key problems include phase separation of SAT which causes the heat storage potential to be reduced over repeated heating and cooling cycles. This problem can be reduced by making PCM composites of the SAT with extra water or thickening agents. Another key problem is achieving stable supercooling of the PCM in the storage period. The supercooling stability can be compromised by local high pressures in the storage tanks or by external particles coming in contact with the supercooled SAT. A closed PCM chamber which can operate with minimal pressure changes caused by the changing density of the SAT during heating and cooling have shown increased stability of supercooling.

Two differently designed heat storage prototypes in steel and stainless steel with different PCM composites have been tested under controlled laboratory conditions. One design was a flat rectangular unit consisting of a 5 cm high PCM chamber with heat exchangers on the outer surfaces. This design was tested with 200 kg SAT with extra water and with 220 kg of SAT with the thickening agent carboxymethyl cellulose. Supercooling was stable for up to two months in one test with this unit when an external expansion device allowed for operating the storage with minimal pressure built up. Stable supercooled failed in some test cycles.

Cylindrical shaped units with a height of 1.5 meters were tested with 116 kg SAT with extra water and with SAT with the thickening agent Xanthan rubber. Supercooling was achieved for shorter periods in these units in few of the test cycles. Spontaneous solidification started in these prototypes due to the design of the inner surfaces of the PCM chamber and the method for handling the expansion of the PCM.

By testing the prototype units it was found that the heat content of SAT with extra water was reduced over the repeated test cycles. The heat contents of the SAT mixtures with thickening agents were stable over the test cycles. Higher heat content and discharge powers were achieved in the units with SAT and thickening agents. The heat transfer was lower in the units with SAT and thickening agents during charge due to a reduced heat transfer by convection in the thickened PCM.

Investigations by a simple heat loss method on samples of 200 g SAT with additives have elucidated possible ways to avoid phase separation and optimize the heat stored in the supercooled SAT. It was found that composites of SAT with thickening agents or liquid polymers had the highest heat content of the investigated additives. Investigations of SAT composites with extra water, thickening agents and graphite elucidated the thermal conductivity and the solidification behavior in bulk size samples. It was found that thickening agents had an effect on where cavities were formed during the solidification and cooling and the associated contraction of the PCM. Graphite flakes showed to have better effect on increasing thermal conductivity in SAT composites compared to graphite powder. The amount of
thickening agents required to keep the graphite suspended and evenly distributed in the SAT composite was also elucidated.

Overall, the research has shown that it is possible to utilize stable supercooling of SAT for seasonal heat storage in actual application sized units. Furthermore, investigations have elucidated the potential for increasing the performance of a storage by using SAT composites with additives.

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Organisations: Department of Civil Engineering, Section for Building Energy
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Comparative analysis of modified PMV models and SET models to predict human thermal sensation in naturally ventilated buildings
In this paper, a comparative analysis was performed on the human thermal sensation estimated by modified predicted mean vote (PMV) models and modified standard effective temperature (SET) models in naturally ventilated buildings; the data were collected in field study. These prediction models were developed on the basis of the original PMV/SET models and consider the influence of occupants' expectations and human adaptive functions, including the extended PMV/SET models and the adaptive PMV/SET models. The results showed that when the indoor air velocity ranged from 0 to 0.2m/s and from 0.2 to 0.8m/s, the expectancy factors for the extended PMV model and the extended SET model were from 0.770 to 0.974 and from 1.330 to 1.363, and the adaptive coefficients for the adaptive PMV model and the adaptive SET model were from 0.029 to 0.167 and from-0.213 to-0.195. In addition, the difference in thermal sensation between the measured and predicted values using the modified PMV models exceeded 25%, while the difference between the measured thermal sensation and the predicted thermal sensation using modified SET models was approximately less than 25%. It is concluded that the modified SET models can predict human thermal sensation more rationally and accurately compared with the modified PMV models in naturally ventilated buildings probably because air velocity has a strong effect on human thermal sensation in naturally ventilated buildings.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Xi'an University of Architecture and Technology
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Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
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Comparison of 2-compartment, 3-compartment and stack designs for electrodialytic removal of heavy metals from harbour sediments

Comparisons of cell and stack designs for the electrodialytic removal of heavy metals from two harbour sediments, were made. Multivariate modelling showed that sediment properties and experimental set-ups had the highest influence on the heavy metal removal indicating that they should be modelled and analysed separately. Clean-up levels of Cu, Pb and Zn were significantly higher for the cell designs, implying that longer time and relatively more electric charge and energy would be necessary to achieve similar clean-up levels in the stack design experiments. In the studied experimental domain, the optimal current density for the 2- and 3-compartment cells was 0.12mA/cm² (center value) removing the
highest quantity of Cu, Pb and Zn per Wh. The highest percentages removed were 82% Cu, 81% Pb and 92% Zn were however achieved at higher current density. For the stack experiments conducted at same electric charge per unit sediment, energy consumption was a magnitude higher and the highest clean-up levels were 21% Cu, 42% Pb and 73% Zn.

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, University of Tromsø  
**Authors:** Pedersen, K. B. (Ekstern), Ottosen, L. M. (Intern), Jensen, P. E. (Intern), Lejon, T. (Ekstern)  
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- Web of Science (2015): Indexed yes  
- BFI (2014): BFI-level 2  
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- BFI (2011): BFI-level 1  
- Scopus rating (2011): SJR 1.621 SNIP 1.803 CiteScore 4.15  
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- BFI (2008): BFI-level 1  
- Scopus rating (2008): SJR 1.533 SNIP 1.47  
- Web of Science (2008): Indexed yes  
- Scopus rating (2007): SJR 1.563 SNIP 1.595  
- Web of Science (2007): Indexed yes  
- Scopus rating (2006): SJR 1.534 SNIP 1.736
Comparison of two different electrodialytic cells for separation of phosphorus and heavy metals from sewage sludge ash

With decreasing availability of phosphorus from primary resources its recovery from waste streams becomes increasingly more important. Sewage sludge ash is rich in phosphorus, but the direct use as fertilizer is limited because of inorganic contaminants such as heavy metals and strong bonding of phosphorous in the ash. Electrodialysis (ED) can be used to recover phosphorus and simultaneously remove heavy metals. The present work is an experimental screening of different options for ED in relation to experimental setup and combination with acid addition. Experiments for stirred ash suspensions utilizing a three compartment cell setup where the anode, cathode and stirred suspension are separated by ion exchange membranes are reported. Simplifying this experimental setup by removing the anion exchange membrane brings the anode in direct contact with the stirred ash suspension. Through this adjustment, half-reactions at the anode contribute to the acidity of the stirred suspension resulting in increased dissolution of both phosphorus and heavy metals (Cd, Cu, Cr, Pb, Zn, Ni) and better separation of most heavy metals from the stirred ash suspension. When the ash is suspended in an acidic solution, these effects increase significantly in early stages of the experiments. The combination of ED in a two compartment setup and initial acidification of the stirred suspension is most effective in dissolving of phosphorus and separation of heavy metals. In this setup, up to 96% of the phosphorus in the ash was dissolved after 7 d. Using the three compartment setup and initially suspending the ash in distilled water, resulted in 53% dissolution of the total recovered phosphorus after 7 d.

General information
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Authors: Ebbers, B. (Intern), Ottosen, L. M. (Intern), Jensen, P. E. (Intern)
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Scopus rating (2016): CiteScore 4.39 SJR 1.417 SNIP 1.606
Construction-friendly ductile shear joints for precast concrete panels

The scope of this paper is the shear capacity of in-situ cast joints between precast concrete panels. Current practice with vertical lowering of the wall panels experiences difficulties in the assembly phase, since the traditional U-bar connection requires an overlap in a horizontal plane to allow for the mounting of a vertical locking bar. Where limited space is available bending and subsequent straightening of the U-bars are required to assemble the adjacent panels, a procedure which imposes substantial ductility requirements on the reinforcement as well as some manual workload. This paper introduces a construction-friendly design with U-bars overlapping in the same plane as the panel itself. The design allows for a trouble-free vertical lowering of the panels without pre or post processing of the preinstalled reinforcement loops. Furthermore, an overall more ductile behavior of the joint is obtained. The solution is tested in a push-off experimental setup and the influence of important geometric parameters of the keyed shear joint is investigated. The first peak load carrying capacity is assessed using plasticity models, and the failure modes are identified by the use of digital image correlation. The upper bound models produce satisfactory results capturing the experimental tendencies and predicting the mode of shear failure in the shear keys.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Sørensen, J. H. (Intern), Hoang, L. C. (Intern), Fischer, G. (Intern), Olesen, J. F. (Intern)
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Contribution of various microenvironments to the daily personal exposure to ultrafine particles: Personal monitoring coupled with GPS tracking

Exposure to ultrafine particles (UFP) may have adverse health effects. Central monitoring stations do not represent the personal exposure to UFP accurately. Few studies have previously focused on personal exposure to UFP. Sixty non-smoking residents living in Copenhagen, Denmark were asked to carry a backpack equipped with a portable monitor, continuously recording particle number concentrations (PN), in order to measure the real-time individual exposure over a period of similar to 48 h. A GPS logger was carried along with the particle monitor and allowed us to estimate the contribution of UFP exposure occurring in various microenvironments (residence, during active and passive transport, other indoor and outdoor environments) to the total daily exposure. On average, the fractional contribution of each microenvironment to the daily integrated personal exposure roughly corresponded to the fractions of the day the subjects spent in each microenvironment. The home environment accounted for 50% of the daily personal exposure. Indoor environments other than home or vehicles contributed with similar to 40%. The highest median UFP concentration was obtained during passive transport (vehicles). However, being in transit or outdoors contributed 5% or less to the daily exposure. Additionally, the subjects recorded in a diary the periods when they were at home. With this approach, 66% of the total daily exposure was attributable to the home environment. The subjects spent 28% more time at home according to the diary, compared to the GPS. These results may indicate limitations of using diaries, but also possible inaccuracy and miss-classification in the GPS data. (C) 2015 Elsevier Ltd. All rights reserved.

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Section for Indoor Environment, University of Copenhagen, University of Southern Denmark, Lund University
Authors: Bekö, G. (Intern), Kjeldsen, B. U. (Intern), Olsen, Y. (Ekstern), Schipperijn, J. (Ekstern), Wierzbicka, A. (Ekstern), Karottki, D. G. (Ekstern), Toftum, J. (Intern), Loft, S. (Ekstern), Clausen, G. (Intern)
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Organisations: Arctic Technology Centre, ARTEK, Department of Civil Engineering
Authors: Fiebig, J. (Intern)
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Cost optimization of load carrying thin-walled precast high performance concrete sandwich panels
The paper describes a procedure to find the structurally and thermally efficient design of load-carrying thin-walled precast High Performance Concrete Sandwich Panels (HPCSP) with an optimal economical solution. A systematic optimization approach is based on the selection of material's performances and HPCSP's geometrical parameters as well as on material cost function in the HPCSP design. Cost functions are presented for High Performance Concrete (HPC), insulation layer, reinforcement and include labour-related costs. The present study reports the economic data corresponding to specific manufacturing process and actual financial parameters for the Danish prefabrication industry. The strength based design of HPCSP is in competence with the format of Eurocode 2 and takes into account failure modes related to flexure, shear, HPCSP buckling/slenderness, local HPC plate buckling and maximum deflections. The solution of the optimization problem is performed in the computer package software Matlab® with SQP lab package and integrates the processes of HPCSP design, quantity take-off and cost estimation. The proposed optimization process outcomes in complex HPCSP design proposals to achieve minimum cost of HPCSP.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Building Design
Authors: Hodicky, K. (Intern), Hansen, S. (Intern), Hulin, T. (Intern), Schmidt, J. W. (Intern), Stang, H. (Intern)
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Coupling and quantifying resilience and sustainability in facilities management

Purpose – The purpose of this paper is to consider how to couple and quantify resilience and sustainability, where sustainability refers to not only environmental impact, but also economic and social impacts. The way a particular function of a building is provisioned may have significant repercussions beyond just resilience. The goal is to develop a decision support tool for facilities managers.

Design/methodology/approach – A risk framework is used to quantify both resilience and sustainability in monetary terms. The risk framework allows to couple resilience and sustainability, so that the provisioning of a particular building can be investigated with consideration of functional, environmental, economic and, possibly, social dimensions. Findings – The method of coupling and quantifying resilience and sustainability (CQRS) is illustrated with a simple example that highlights how very different conclusions can be drawn when considering only resilience or resilience and sustainability.

Research limitations/implications – The paper is based on a hypothetical example. The example also illustrates the difficulty in deriving the costs and probabilities associated with particular indicators.

Practical implications – The method is generic, allowing the method to be customized for different user communities. Further research is needed to translate this theoretical framework to a practical tool for practitioners and to evaluate the CQRS method in practice.
Originality/value – The intention of this research is to fill the gap between the need for increasing sustainability and resilience of the built environment and the current practices in property maintenance and operation.

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Department of Management Engineering, Centre for Facilities Management, Systems Analysis, DTU Climate Centre, Energy Systems Analysis
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ISI indexed (2012): ISI indexed no
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Coupling of phase change material with nighttime radiative cooling

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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Pean, T. (Intern), Bourdakis, E. (Intern), Olesen, B. W. (Intern)
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Publisher: Technical University of Denmark (DTU)
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Crude oil burning mechanisms: A conceptual model review

In order to improve predictions for the burning efficiency and the residue composition of in-situ burning of crude oil, the burning mechanism of crude oil was studied in relation to the composition of its hydrocarbon mixture, before, during and after the burning. The surface temperature, flame height, mass loss rate and residues of three hydrocarbon liquids (n-octane, dodecane and hexadecane), two crude oils (DUC and REBCO) and one hydrocarbon liquid mixture of the aforementioned hydrocarbon liquids were studied using the Crude Oil Flammability Apparatus. The experimental results were compared to the predictions of four conceptual models that describe the burning mechanism of multicomponent fuels. Based on the comparisons, hydrocarbon liquids were found to be best described by the Equilibrium Flash Vaporization model, showing a constant gas composition and gasification rate. The multicomponent fuels followed the diffusion-limited gasification model, showing a change in the hydrocarbon composition of the fuel and its evaporating gases, as well as a decreasing gasification rate, as the burning progressed. This burning mechanism implies that the residue composition and burning efficiency mainly depend on the highest achievable oil slick temperature. Based on this mechanism, predictions can then be made depending on the hydrocarbon composition of the fuel and the measured surface temperature.

General information
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Organisations: Department of Civil Engineering, Section for Building Design, University of Copenhagen
Authors: van Gelderen, L. (Intern), Malmquist, L. (Ekstern), Jomaas, G. (Intern)
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Description of the passive air supply system based on ventilation windows supported by chimneys

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Authors: Cox, R. A. (Intern)
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Publication: Research › Report – Annual report year: 2016

Determination of the moisture content of Nordic spruce wood through cone heater experiments and an integral model
The combination of cone heater experiments and an integral model was used to determine the moisture content of Nordic spruce with varying degree of drying. Nine specimens of Nordic spruce were pre-heated to 105°C in a convective oven for
durations ranging from 0 days (no drying) and up to 63 days in increments of 7 days. The fuel moisture content was measured by weighting the specimens before and after the pre-heating. A mass loss cone was used to determine the time for piloted ignition of each specimen. A high-flux asymptotic solution from an integral model permitted to determine that the ignition temperature (directly linked to the intercept heat flux) was constant for dry and wet wood pieces. Furthermore, from this result and the high-flux asymptotic solution, the fuel moisture content of the wet specimen was calculated and found to be very close to the measured value. As a result, one equation is developed that can be used to determine the time to ignition of a piece of wet spruce, and it is suggested that this method can be used for establishing similar equations for other types of moist wood.

**General information**

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Organisations: Department of Civil Engineering, Section for Building Design, University of Borås, Technical University of Denmark
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Determining the Optimal Capacities of Renewable-Energy-Based Energy Conversion Systems for Meeting the Demands of Low-Energy District Heating, Electricity, and District Cooling
This chapter presents a method for determining the optimal capacity of a renewable-energy-based energy conversion system for meeting the energy requirements of a given district as considered on a monthly basis, with use of a low-energy district heating system operating at a low temperature, as low as 55 °C for supply and 25 °C for return, and with additional considerations being directed to supply electricity and cooling. Several optimal solutions with various nominal capacities of the technologies involved were obtained in each of the two case studies, one being for the Greater Copenhagen Area, and the other for the Greater Toronto Area. Various climate conditions of the case areas in question caused different observations of nominal capacities for the energy conversion systems considered with single-production and multi-production based on different renewable energy sources.

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Development and Operation of Decentralized Ventilation for Indoor Climate and Energy Performance
The Danish government has targeted full reliance on renewable sources of energy for heating and electricity by 2035. Building renovations save energy and offset requirements for renewable supply. A Danish national action plan therefore expects to reduce heating consumption in existing buildings by at least 35% before 2050. Renovations improve airtightness and often require mechanical ventilation with heat recovery. The market will demand flexible cost-effective
Development of a hot water tank simulation program with improved prediction of thermal stratification in the tank

A simulation program SpiralSol was developed in previous investigations to calculate thermal performance of a solar domestic hot water (SDHW) system with a built-in heat exchanger spiral [1]. The simulation program is improved in the paper in terms of prediction of thermal stratification in the tank. The transient fluid flow and heat transfer in the hot water tank during cooling caused by standby heat loss are investigated by validated computational fluid dynamics (CFD) calculations. Detailed CFD investigations are carried out to determine the influence of thickness and material property of the tank wall on thermal stratification in the tank. It is elucidated how thermal stratification in the tank is influenced by the natural convection and how the heat loss from the tank sides will be distributed at different levels of the tank at different thermal conditions. The existing equation of the heat loss removal factor used in SpiralSol is evaluated by...
means of the detailed CFD calculations. A generalized new equation for the heat loss removal factor is obtained by regression. The new equation calculates the heat loss removal factor for a given temperature gradient in the tank, taking into account the influences of tank volume, height to diameter ratio, tank insulation, thickness and material property of the tank and initial thermal conditions of the tank. The equation is validated for a tank volume between 150 l and 500 l, a tank height to tank diameter ratio of 1-5, a tank wall thickness of 1.5 mm to 3 mm for a stainless steel tank and a tank wall thickness of between 3 mm to 5 mm for a normal steel tank. Accuracy and reliability of the SpiralSol program with the improved prediction of heat loss removal factor will be examined in future investigations.

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Development of a plastic rotary heat exchanger for room-based ventilation in existing apartments

The existing building stock will likely undergo widespread energy renovations to meet future emissions targets. Single-room ventilation may enable the process due to its simple installation, low fan power, and potential for local heat recovery. A short plastic rotary heat exchanger is developed for single-room ventilation based on thermal design theory. Performance is predicted from correlations of dimensionless groups for regenerative heat exchangers, and this guides the selection of a polycarbonate honeycomb with small circular channels. Experiments quantify flows and determine temperature efficiencies at several ventilation rates while accounting for heat gains from motors and air leakage. The measured and modelled temperature efficiencies show adequate agreement and exceed 80% for a balanced nominal ventilation rate of 28m$^3$/h. This result meets the development criteria but cannot validate the model due to the presence of unmeasurable bypass leakage. All leakages are slightly excessive and should be reduced with proper sealing. Experimental results demonstrate the potential to reduce heat recovery by slowing rotational speed, which is required to prevent frost accumulation. Overall, the development meets objectives and provides a novel and efficient option for ventilation heat recovery.

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Different effects of temperature and salinity on permeability reduction by fines migration in Berea sandstone
Hot water injection into geothermal aquifers is considered in order to store energy seasonally. Berea sandstone is often used as a reference formation to study mechanisms that affect permeability in reservoir sandstones. Both heating of the pore fluid and reduction of the pore fluid salinity can reduce permeability in Berea sandstone. These effects could be caused by mobilisation of fines by increasing the repulsive electrical double layer forces among sandstone grains and the fines. We investigated the reversibility and the dependence on flow velocity and flow direction of the permeability change by means of flow through experiments and examined thin sections of samples prior to and after tests. A permeability reduction at 20 degrees C with decreasing salinity was not reversed by restoring the salinity, whereas a permeability reduction due to heating to 80 degrees C was reversible by restoring the temperature to 20 degrees C. A reversible permeability increase with increasing flow rate was observed at 80 degrees C but not at 20 degrees C. We observed no difference in the distribution of kaolinite clay minerals in thin section of untested and tested samples. Dissolution of iron...
bearing carbonates and precipitation of iron hydroxides was observed but no effect on permeability was found. The experimental results suggest that different mechanisms are responsible for permeability reduction depending on temperature and salinity. (C) 2014 Elsevier Ltd. All rights reserved.

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Dilemmas and Solutions for a Sustainable Green Transition

Mitigation of global warming and transitioning to a green and sustainable world are counteracted by a number of barriers and dilemmas. The paper analyses a number of these barriers and dilemmas in order to highlight efficient strategies and solutions for a sustainable development. Most governments in industrial countries do not pay enough attention to concepts as limits to growth in a finite globe and the importance of economic and social equity. They also overlook in practice the need for keeping at least 50% of known fossil reserves under ground in order to avoid a critical increase in global temperature. On the contrary, a number of industrial countries are now promoting exploitation of new fossil sources like shale gas and oil from tar sand. Reversing population growth facilitates sustainable development, but most governments of industrial nations appear to be more concerned about decreases in their population. The central problem is that limits to growth are not taken seriously by finance ministers in most industrial countries. This paper will focus on the consequences of limits to growth and the need for an alternative concept of employment and work.
Dipole vortices in the Great Australian Bight

Shipboard measurements from late 2006 made by the Danish Galathea 3 Expedition and satellite sea surface temperature images revealed a chain of cool and warm mushroom-shaped dipole vortices that mixed warm, salty, oxygen-poor waters on and near the continental shelf of the Great Australian Bight (GAB) with cooler, fresher, oxygen-rich waters offshore. The alternating jets flowing into the mushrooms were directed mainly northwards and southwards and differed in temperature by only 1.5 degrees C; however, the salinity difference was as much as 0.5, and therefore quite large. The GAB waters were slightly denser than the cooler offshore waters. The field of dipoles evolved and distorted, but appeared to drift westwards at 5 km day\(^{-1}\) over two weeks, and one new mushroom carried GAB water southwards at 7 km day\(^{-1}\). Other features encountered between Cape Leeuwin and Tasmania included the Leeuwin Current, the South Australian Current, the Flinders Current and the waters of Bass Strait.
Direct current (DC) resistivity and induced polarization (IP) monitoring of active layer dynamics at high temporal resolution

With permafrost thawing and changes in active layer dynamics induced by climate change, interactions between biogeochemical and thermal processes in the ground are of great importance. Here, active layer dynamics have been monitored using direct current (DC) resistivity and induced polarization (IP) measurements at high temporal resolution and at a relatively large scale at a heath tundra site on Disko Island on the west coast of Greenland (69°N). At the field site, the active layer is disconnected from the deeper permafrost, due to isothermal springs in the region. Borehole sediment characteristics and subsurface temperatures supplemented the DC-IP measurements. A time-lapse DC-IP monitoring system has been acquiring at least six datasets per day on a 42-electrode profile with 0.5 m electrode spacing since July 2013. Remote control of the data acquisition system enables interactive adaptation of the measurement schedule, which is critically important to acquire data in the winter months, where extremely high contact resistances increase the demands on the resistivity meter. Data acquired during the freezing period of October 2013 to February 2014 clearly image the soil freezing as a strong increase in resistivity. While the freezing horizon generally moves deeper with time, some variations in the freezing depth are observed along the profile. Comparison with depth-specific soil temperature indicates an exponential relationship between resistivity and below-freezing temperature. Time-lapse inversions of the full-decay IP data indicate a decrease of normalized chargeability with freezing of the ground, which is the result of a decrease in the total unfrozen water and of the higher ion concentration in the pore-water. We conclude that DC-IP time-lapse measurements can non-intrusively and reliably image freezing patterns and their lateral variation on a 10-100 m scale that is difficult to sample by point measurements. In combination with laboratory experiments, the different patterns in resistivity and chargeability changes will enable the disentanglement of processes (e.g., fluid migration and freezing, advective and diffusive heat transport) occurring during freezing of the ground. The technology can be expanded to three dimensions and also to larger scale.

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With permafrost thawing and changes in active layer dynamics induced by climate change, interactions between biogeochemical and thermal processes in the ground are of great importance. Here, active layer dynamics have been monitored using direct current (DC) resistivity and induced polarization (IP) measurements at high temporal resolution at a heath tundra site on Disko Island on the west coast of Greenland (69°N). Borehole sediment characteristics and subsurface temperatures supplemented the DC-IP measurements. Data acquired during the freezing period of October 2013 – February 2014 clearly image the soil freezing as a strong increase in resistivity. While the freezing horizon generally moves deeper with time, some variations in the freezing depth are observed along the profile. Comparison with depth-specific soil temperature indicates an exponential relationship between resistivity and below-freezing temperature. Time-lapse inversions of the full-decay IP data indicate a decrease of normalized chargeability with freezing of the ground.
which can be the result of a decrease in the total unfrozen water and thus a higher ion concentration in the pore-water. We conclude that DC-IP time-lapse measurements can non-intrusively and reliably image freezing patterns and their lateral variation on a 10-100 m scale that is difficult to sample by point measurements.

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**District Heating in Areas with Low Energy Houses: Detailed Analysis of District Heating Systems based on Low Temperature Operation and Use of Renewable Energy**

This PhD thesis presents a summary of a three-year PhD project involving three case studies, each pertaining to a typical regional Danish energy planning scheme with regard to the extensive use of low-energy district heating systems, operating at temperatures as low as 55°C for supply and 25°C for return, and with the aim of intensive exploitation of renewable energy sources. The hypothesis is that a detailed analysis of energy performance and cost of construction and operation of low energy district heating systems can be used as a rational basis for planning use of district heating in areas with low energy houses. The first case study focused on developing a method for the designing of low-energy district heating systems for new settlements in which low-energy houses were to be built. The method involved primarily the development of a novel pipe dimensioning method based on optimization of the pipe diameters rather than use of rule-of-thumb methods, through consideration of a certain value of a maximum pressure gradient or a maximum velocity, or both. In addition, attention was directed at the assessment of (i) substation types considered for use in connection with the low-energy houses involved, together with the idea of utilizing booster pumps in the district heating network and (ii) use of network layouts of either a branched (tree-like) or a looped type. The methods developed were applied in a case study, the data of which was provided by the municipality of Roskilde in Denmark. The second case study was aimed at solving another regional energy planning scheme, one concerned with already existing houses, the heat requirements of which were currently being met by use of a natural gas grid or a conventional high-temperature district heating network. The idea considered for employing a low-energy district heating system here involved use of an operational control approach of boosting the supply temperature during the peak winter months due to their shorter durations when compared to a year period. This approach can be considered in two different respects: (i) in the municipal infrastructure, transforming the current heating systems into lowenergy district heating systems and (ii) in the operation of low-energy district heating systems. The building settlement in question, one located in the municipality of Gladsaxe, was chosen for the case study carried out, due to the existing houses there being considered for renovation to houses of a low-energy class, and due to the existing heat-supply energy infrastructure there being a natural gas grid. The third case study carried out aimed at developing energy conversion systems based on use of renewable energy sources that were available locally. This was carried out in an external stay at the University of Ontario Institute of Technology (UOIT) in Oshawa, ON, Canada under the supervision of Prof. Ibrahim Dincer. In this collaborative study, a novel method was developed to serve as the basis of a decision support tool in investigating the optimal use of renewable energy sources, particular consideration being given to the following:

(i) the monthly satisfaction of energy requirements of various types: heating (including the demands of space heating and of domestic hot water production), electricity, and cooling, in order to study the improvement in efficiency achieved by use of multi-generation systems,
(ii) various types of energy conversion systems, such as single-generation, cogeneration, and multi-generation systems,
(iii) the long-term storage of heat energy to cope with the mismatch between the energy production from renewable energy sources and the heat energy requirements, both in terms of the variations involved, such through the excessive production of heat by means of solar based systems, heat that cannot be used immediately but can be stored in borehole storage systems, to be used then in the cold winter period,
(iv) an extensive economic assessment of the technologies involved, taking several different parameters into account, each unique for the technology in question, such as the specific investnet costs based on an economy-of-scale, operation and maintenance costs, the lifetime of the technology, the capacity factor, and the salvage value of the energy conversion system at the end of its lifetime,
(v) seasonal variation in the generation of energy, in line with the availability of the renewable source in question,
(vi) on a limited scale, aimed at gaining as much insight as possible into the complexities of the questions involved, examining the environmental concerns possible to encounter during the operations of each conversion system, the security of supply being figured on the basis of the optimal solutions obtained. In summary, the methods developed in the
case studies concern the technical framework for establishing an integrated energy supply scheme involving the use of renewable energy sources for meeting the energy needs of low-energy houses by means of a city-wide low-energy district heating system.

**Drain Back Systems in Laboratory and in Practice**

Drain Back systems with ETC collectors are tested and analyzed in a Danish - Chinese cooperation project. Experiences from early work at DTU, with drain back, low flow systems, was used to design two systems:
1) One laboratory system at DTU. 2) One demonstration system in a single family house in Sorø Denmark. Detailed monitoring and modelling/validation of the system in the DTU lab is done, to be able to generalize the results, to other climates and loads by simulation and to make design optimizations. The advantage with drain back, low flow systems, is that the system can be made more simple with less components and that the performance can be enhanced. Also problems with long term degradation of glycol collector loops are totally avoided. A combination of the drain back and system expansion vessel was tested successfully. It is very important to achieve a continuous slope for the pipes in the collector loop to have a safe reliable operation. The components should also be designed and marked so that only one correct mounting option is possible, like forward and return pipes to/from the collector of slightly different sizes or color. Adapted installer education and training is a very important step to have success with drain back systems. Practices used in glycol systems may give serious failures.

**Key-words:** Drain Back, Low Flow, Solar Combi System, ETC collectors.
Dynamic behavior of radiant cooling system based on capillary tubes in walls made of high performance concrete

Rooms with a high density of occupants inevitably have high internal heat gains. It is possible to remove large sensible internal heat gains solely by radiant cooling systems if large areas of internal surface can be activated for radiant cooling. The ventilation system then only has to supply the small amount of fresh air required by standards to provide a healthy indoor environment. This paper reports on experimental analyses evaluating the dynamic behavior of a test room equipped...
with a radiant cooling system composed of plastic capillary tubes integrated into the inner layer of sandwich wall elements made of high performance concrete. The influence of the radiant cooling system on the indoor climate of the test room in terms of the air, surface and operative temperatures and velocities was investigated. The results show that the temperature of the room air can be kept in a comfortable range using cooling water for the radiant cooling system with a temperature only about 4K lower than the temperature of the room air. The relatively high speed reaction of the designed system is a result of the slim construction of the sandwich wall elements made of high performance concrete. (C) 2015 Elsevier B.V. All rights reserved.
Dynamic stiffness and damping of foundations for jacket structures

Foundation for offshore jacket structures may comprise of long floating piles. The dynamic response of floating piles to horizontal load is herein investigated. The analytical solution of horizontally vibrating end bearing piles by Novak & Nogami (1977) has been modified. At first the soil resistance as defined by Nogami & Novak (1977) is determined, considering 3D wave propagation within linear soil layer with hysteretic damping. Thereafter, the dynamic response of the pile is estimated assuming soil pressure equal to the soil resistance and imposing displacement compatibility. A parametric study clarifies the role of the parameters involved i.e. the depth of the soil layer, the pile diameter and the soil layer shear wave velocity. Results are presented in terms of dimensionless graphs which highlight the frequency dependency of the dynamic stiffness and damping.

Economic analysis of condition monitoring systems for offshore wind turbine sub-systems

The use of condition monitoring systems on offshore wind turbines has increased dramatically in recent times. However, their use is mostly restricted to vibration based monitoring systems for the gearbox, generator and drive train. A survey of commercially available condition monitoring systems and their associated costs has been completed for the blades, drive train, tower and foundation. This paper considers what value can be obtained from integrating these additional systems into the maintenance plan. This is achieved by running simulations on an operations and maintenance model for a wind farm over a 20 year life cycle. The model uses Hidden Markov Models to represent both the actual system state and the observed condition monitoring state. The CM systems are modelled to include reduced failure types, false alarms, detection rates and 6 month failure warnings. The costs for system failures are derived, as are possible reductions in costs due to early detection. The detection capabilities of the CM systems are investigated and the effects on operational costs are examined. Likewise, the number of failures detected 6 months in advance by the CM systems is modified and the costs reported.
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Authors: Wargocki, P. (Intern), Lai, A. (Ekstern)
Effectiveness of a personalized ventilation system in reducing personal exposure against directly released simulated cough droplets

The inhalation intake fraction was used as an indicator to compare effects of desktop personalized ventilation and mixing ventilation on personal exposure to directly released simulated cough droplets. A cough machine was used to simulate cough release from the front, back, and side of a thermal manikin at distances between 1 and 4m. Cough droplet concentration was measured with an aerosol spectrometer in the breathing zone of a thermal manikin. Particle image velocimetry was used to characterize the velocity field in the breathing zone. Desktop personalized ventilation substantially reduced the inhalation intake fraction compared to mixing ventilation for all investigated distances and orientations of the cough release. The results point out that the orientation between the cough source and the breathing zone of the exposed occupant is an important factor that substantially influences exposure. Exposure to cough droplets was reduced with increasing distance between cough source and exposed occupant.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Environment, University of Maryland, National University of Singapore
Authors: Pantelic, J. (Ekstern), Tham, K. W. (Ekstern), Licina, D. (Intern)
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BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.88
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 4.57
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.63
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Effect of crumb rubber gradation on a rubberized cold recycled mixture for road pavements

Cold recycling technique represents the most environmental friendly solution for pavement rehabilitation nowadays. In fact, this technique allows the use of the highest percentage of reclaimed asphalt avoiding the energy consumption related to aggregates heating required by the traditional hot mix asphalt design. The mix design represents a key phase of the cold mix production. The study of workability and compactability properties combined with a deep laboratory investigation is required. The idea of introducing crumb rubber in the cold mixtures was developed based on the concept of maximizing the valorization of recycled materials together with the goal of achieving high performance. In the present research project, two different gradations of crumb rubber, processed with the traditional grading method, have been adopted for the production of a cold recycled mixture stabilized with bitumen emulsion and cement. The spring-back effects of the rubber particles, which occur after compaction, together with the Indirect Tensile Strength and the Indirect Tensile Stiffness Modulus have been studied. The results show that the gradation of the adopted crumb rubber sensibly affects the compaction and mechanical properties of the cold recycled mixture.

General information
State: Published
Organisations: Department of Civil Engineering, University of Bologna
Authors: Pettinari, M. (Intern), Simone, A. (Ekstern)
Number of pages: 9
Pages: 598-606
Publication date: 2015
Main Research Area: Technical/natural sciences

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Journal: Materials & Design
Volume: 85
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Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Effect of relative pile's stiffness on lateral pile response under loading of large eccentricity

The wide application of monopiles as foundations for offshore wind turbines has raised the issue of the suitability of the p – y curves proposed by API for lateral pile loading, since the latter were developed after full-scale tests on flexible and slender piles. This study investigates the role of the relative pile’s stiffness, when it is subjected to lateral load of large eccentricity. Employing centrifuge experiments, a hollow steel pile well instrumented with strain gauge pairs has been subjected to lateral load. The bending moment distribution of the model pile embedded in uniform, dense, dry sand was obtained under two different stress levels and two different embedment depths. Hence, the p – y curves were obtained providing an insight into the effect of the relative pile’s stiffness on the soil – pile interaction, while the effect of the installation process could also be evaluated.
Effects of boosting the supply temperature on pipe dimensions of low-energy district heating networks: A case study in Gladsaxe, Denmark
This paper presents a method for the dimensioning of the low-energy District Heating (DH) piping networks operating with a control philosophy of supplying heat in low-temperature such as 55 °C in supply and 25°C in return regularly while the supply temperature levels are being boosted in cold winter periods. The performance of the existing radiators that were formerly sized with over-dimensions was analyzed, its results being used as input data for the performance evaluation of the piping network of the low-energy DH system operating with the control philosophy in question. The optimization method was performed under different mass flow limitations that were formed with various temperature configurations. The results showed that reduction in the mass flow rate requirement of a district is possible by increasing the supply temperature in cold periods with significant reduction in heat loss from the DH network. Sensitivity analysis was carried out in order to evaluate the area of applicability of the proposed method. Hence varied values of the original capacity and the current capacity of the existing radiators were evaluated with the design temperature values that were defined by two former radiator sizing standards.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Physics and Services
Authors: Tol, H. (Intern), Svendsen, S. (Intern)
Number of pages: 11
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Effects of convective motion in \textit{n}-octane pool fires in an ice cavity

The effects of convective flows in \textit{n}-octane pool fires in an ice cavity were investigated and it was found that a new set of parameters to the classical problem of bounded pool fires arises under these unique conditions. To systematically understand these parameters, two sets of experiments were performed by burning \textit{n}-octane in cylindrically shaped ice cavities of 5.7 cm diameter. The first set of experiments was intended to provide a clear understanding of the geometry change of the cavity and displacement of the fuel layer. The results of these experiments showed that the rate of melting of the ice walls were higher in areas where the fuel layer was in contact with ice than in places where the flame was present. Due to the melting of the ice walls, a ring-shaped void was formed around the perimeter of the cavity. In the second set of experiments, the change in the temperature of the fuel layer was measured by use of multiple thermocouples at different locations inside the ice cavity. The results of the temperature analysis showed that the lateral temperature gradient of the fuel layer was an increasing function of time, whereas the vertical temperature gradient was a decreasing function of time. Using these experimental results, two dimensionless numbers (Marangoni and Rayleigh) were calculated. The Marangoni number represents the surface tension driven flows in the fuel layer and the Rayleigh number represents the buoyancy driven flows in the fuel layer. The results of this study showed two major convective phases; in the first half of the burning time, the buoyancy driven flows (Rayleigh) were dominant, while Marangoni convection was dominant in the second half of the burning time. The role of these mechanisms in affecting the flow and melting the ice is
Effects of diffuser airflow minima on occupant comfort, air mixing, and building energy use (RP-1515)

There is great energy-saving potential in reducing variable air volume box minimum airflow set-points to about 10% of maximum. Typical savings are on the order of 10%-30% of total HVAC energy, remarkable for an inexpensive controls set-point change that properly maintains outside air ventilation. However, there has long been concern whether comfort and room air mixing are maintained under low flows through diffusers, and this concern has prompted variable air volume minima to be typically set at 20%-50% of maximum. RP 1515 evaluated occupants’ thermal comfort and air quality satisfaction in operating buildings under both conventional and reduced minimum variable air volume flow set-points, and measured the air diffusion performance index and air change effectiveness for typical diffuser types in the laboratory. The hypotheses were that lowered flow operation would not significantly reduce comfort or air quality and that HVAC energy savings would be substantial. The hypotheses were almost entirely confirmed for both warm and cool seasons. But beyond this, the reduction of excess airflow during low-load periods caused occupants’ cold discomfort in the warm season to be halved, a surprising improvement. It appears that today’s widespread overcooling of buildings can be corrected without risk of discomfort by lowering conventional variable air volume minimum flow set-points.

General information
State: Published
Organisations: Department of Civil Engineering, University of California at Berkeley, Taylor Engineering, Price Industries
Authors: Arens, E. (Ekstern), Zhang, H. (Ekstern), Hoyt, T. (Ekstern), Kaam, S. (Ekstern), Bauman, F. (Ekstern), Zhai, Y. (Ekstern), Paliaga, G. (Ekstern), Stein, J. (Ekstern), Seidl, R. (Ekstern), Tully, B. (Ekstern), Rimmer, J. (Ekstern), Toftum, J. (Intern)
Number of pages: 16
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Web of Science (2015): Indexed yes
Scopus rating (2014): SJR 0.578 SNIP 0.846
Web of Science (2014): Indexed yes
Scopus rating (2013): SJR 0.618 SNIP 0.89
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.587 SNIP 1.109
Effects of Exposure to Carbon Dioxide and Human Bioeffluents on Cognitive Performance

The purpose of this study was to examine whether exposures to CO2 in the range of 500 ppm to 3,000 ppm with and without bioeffluents influence cognitive performance. Twenty-five subjects were exposed in the climate chamber for 255 minutes. Cognitive performance was examined by multiple tasks including proof-reading, addition, subtraction, text typing, neurobehavioral tests, Tsai-Partington task, and d2 attention task. Subjective ratings of comfort and experienced acute health symptoms were collected, physiological responses of subjects were monitored and the saliva samples were collected to analyze stress biomarkers. The results show that during exposure to bioeffluents with CO2 reaching 3,000 ppm speed of addition was significantly reduced, subjects responded significantly quicker in redirection task and completed significantly less correct links in Tsai-partington test, which may imply that arousal (stress level) was an underlying mechanism. (C) 2015 Published by Elsevier Ltd.
Effects of ice accretion on the aerodynamics of bridge cables

Undesirable wind induced vibrations of bridge cables can occur when atmospheric conditions are such to generate ice accretion. This paper contains the results of an extensive investigation of the effects of ice accretion due to in-cloud icing, on the aerodynamic characteristics of bridge hangers and stay cables. The aim of this paper is twofold; first, it was investigated the ice accretion process and the final shape of the ice accreted; then the aerodynamics of the ice accreted bridge cables was characterized, and related to the ice shape. Different climatic conditions, i.e. combinations of temperature, wind speed and yaw angle of accretion, were reproduced in a climatic wind tunnel, giving rise to different types of accretion. These were chosen such to generate the most common natural ice formations expected to produce bridge cable vibrations. A description of the geometric characteristics of the ice accretions is given in the paper. Only for the bridge hanger case, a short description of the evolution of the ice accretions is given. The aerodynamic force coefficients were then measured with varying yaw angle, angle of attack and wind speed, and are presented and discussed in the paper; these are found to be significantly affected by the characteristics of the ice accretion.
Effects of surface roughness and cross-sectional distortion on the wind-induced response of bridge cables in dry conditions

Theoretical and experimental investigations to date have assumed that bridge stay cables can be modelled as ideal circular cylinders and that their aerodynamic coefficients are invariant with wind angle-of-attack. On the other hand it has been demonstrated that bridge cables are characterised by local alterations of their inherent surface roughness and shape. Small deviations from ideal circularity result in significant changes in the static drag and lift coefficients with Reynolds number. The present study focuses on the wind-induced response of a full-scale yawed bridge cable section model, for varying Reynolds numbers and wind angles-of-attack. Using passive-dynamic wind tunnel tests, it is shown that the in-plane aerodynamic damping of a bridge cable section, and the overall dynamic response, is strongly affected by changes in the wind angle-of-attack. Using the drag and lift coefficients, determined in static conditions for an identical cable model as the one used for passive-dynamic tests, the in-plane aerodynamic damping is evaluated by employing a one-degree-of-freedom (1 DOF) quasi-steady analytical model. Similarly, it is shown that regions of instability associated with the occurrence of negative aerodynamic damping are strongly dependent on the wind angle-of-attack.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Arup
Authors: Matteoni, G. (Ekstern), Georgakis, C. T. (Intern)
Pages: 89-100
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Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Wind Engineering & Industrial Aerodynamics
**Electrical tortuosity, Kozeny’s factor and cementation factor modelled for chalk**

Based on the electrical properties of chalk from the North Sea and Stevns Klint and on published data, we explore how klinkenberg corrected permeability from experimental data relate to porosity and electrical resistivity. In the current study we use electrical conductivity data of partially water saturated core plugs to determine the cementation factor, m. This value differs from the one Archie used to describe his equation and best describes the formation factor based on experimental data. Based on this m, we determine the formation factor, F, and the tortuosity, τ. We use this value of τ, to calculate permeability based on electrical resistivity data. We also calculate the permeability based on a simple porosity model. Finally, we redefine Kozeny’s factor, c, using Carman’s model based on tortuosity and the model based on porosity. This resulted in a third modelled permeability, which describes the experimental data in high accuracy.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Center for Energy Resources Engineering
Authors: Katika, K. (Intern), Fabricius, I. L. (Intern)
Number of pages: 4
Pages: 1-4
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Main Research Area: Technical/natural sciences
Conference: 3rd International Workshop on Rock Physics, Perth, Australia, 13/04/2015 - 13/04/2015
Source: Publication PreSubmission
Source-ID: 108589110
Publication: Research Article in proceedings – Annual report year: 2015

**Electrochemical desalination of bricks - Experimental and modeling**

Chlorides, nitrates and sulfates play an important role in the salt-decay of porous materials in buildings and monuments. Electrochemical desalination is a technology able to remove salts from such porous materials in order to stop or prevent the decay. In this paper, experimental and numerical results for ED treatments of red bricks contaminated with NaCl, NaNO₃, and Na₂SO₄ are presented and compared. The results show high removal efficiencies of ~99 % for Cl⁻ and NO₃⁻, and ~89 % for SO₄²⁻ in less than 8 days when applying 2.22Am⁻². The slightly slower removal rate in the sulfate-contaminated bricks with respect to the monovalent ions is discussed.

Comparison between the experimental and the simulation results showed that the proposed numerical model is able to predict electrochemical desalination treatments with remarkable accuracy, and it can be used as a predictive tool for the optimization and the design of the treatment.

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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
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- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 4.74 SJR 1.357 SNIP 1.167
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 1.349 SNIP 1.344 CiteScore 4.86
Electrochemical desalination of historic Portuguese tiles: Removal of chlorides, nitrates and sulfates

Soluble salts cause severe decay of historic Portuguese tiles. Treatment options for removal of the salts to stop the decay are few. The present paper deals with development of a method for electrochemical desalination, where an electric DC field is applied to the tiles. Laboratory experiments were conducted with single 18th century tiles from Palácio Centeno, Lisbon, Portugal. Large parts of the glaze and parts of the biscuit were lost from salt decay. The major aim of the investigation was to see if the method could offer sufficient salt removal in the biscuit and in the interface between biscuit and glaze, where salt crystals were clearly identified by SEM-EDX before desalination. The concentrations of chloride and especially nitrate were very high in the tiles (around 280 mmol Cl⁻/kg and 450 mmol NO₃⁻/kg respectively). Both anions
were successfully removed to below 6 mmol/kg during the electrochemical treatment. The removal rate was similar for the two anions so the chloride concentration reached the lowest concentration level first. At this point the electric resistance increased, but the removal of nitrate continued unaffected till similar low concentration. The sulfate concentration was initially very low, but nevertheless, sulfate removal started at the point where chloride and nitrate concentrations were very low in the tiles. Investigating the interface between biscuit and glaze after the treatment showed no signs of crystallized salts, so also in this important point, the desalination was successful. Based on the obtained results an important step is taken towards development of an electrochemical technique for desalination of tile panels.

**General information**

**State:** Published  
**Organisations:** Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Instituto Politecnico de Coimbra, Universidade Nova de Lisboa  
**Authors:** Ottosen, L. M. (Intern), Dias-Ferreira, C. (Ekstern), Ribeiro, A. B. (Ekstern)  
**Pages:** 712-718  
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Scopus rating (2016): SJR 0.548 SNIP 1.458 CiteScore 2.09  
BFI (2015): BFI-level 2  
Scopus rating (2015): SJR 0.635 SNIP 1.454 CiteScore 1.78  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): SJR 0.652 SNIP 1.497 CiteScore 1.64  
BFI (2013): BFI-level 2  
Scopus rating (2013): SJR 0.656 SNIP 1.827 CiteScore 1.55  
BFI (2012): BFI-level 2  
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Scopus rating (2011): SJR 0.599 SNIP 1.228 CiteScore 1.36  
BFI (2010): BFI-level 2  
Scopus rating (2010): SJR 0.628 SNIP 1.078  
BFI (2009): BFI-level 2  
Scopus rating (2009): SJR 0.568 SNIP 1.116  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.425 SNIP 0.772  
Scopus rating (2007): SJR 0.509 SNIP 1.034  
Scopus rating (2006): SJR 0.41 SNIP 0.769  
Scopus rating (2005): SJR 0.501 SNIP 1.004  
Scopus rating (2004): SJR 0.368 SNIP 0.772  
Scopus rating (2003): SJR 0.323 SNIP 1.281  
Scopus rating (2002): SJR 0.236 SNIP 0.498  
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Electrochemically enhanced reduction of hexavalent chromium in contaminated clay: Kinetics, energy consumption, and application of pulse current

Electrochemically enhanced reduction of Cr(VI) in clay medium is a technique based on inputting extra energy into the clay to drive the favorable redox reaction. In this study, the reducing reagent Fe(II) was transported into Cr(VI) spiked kaolinite clay by direct current to investigate the dependency of reaction rate on energy consumption. A modified electrophoresis cell with platinum wires as working electrodes was used to run experiments. Results showed that the reduction rate of Cr(VI) was significantly increased by application of current with the pseudo-first-order rate constant $k_{\text{pse}}$ from 0.002 min$^{-1}$ at current density of 0.1 mA/cm$^2$ to 0.016 min$^{-1}$ at current density of 0.6 mA/cm$^2$, and the corresponding reduction efficiency after 60 min experimental time was increased from 8.5% to 57.5%. Mass transport process of Fe(II) in clay pore fluid was determined as the rate controlling step. With the increasing rate of Cr(VI) reduction, both of the productive and non-productive energy consumption increased, from 0.53 and 0.15 mWh at current density of 0.1 mA/cm$^2$ to 18.9 and 12.6 mWh at current density of 0.6 mA/cm$^2$, respectively. The non-productive energy consumption was caused by the formation of [(Cr,Fe)(OH)$_3$] precipitates. XRD analysis suggested that the [(Cr,Fe)(OH)$_3$] formed at the clay surface and grew into the pore fluid. SEM-EDX results indicated that the overall Fe(III):Cr(III) ratio of the precipitates was approximately 1.26:1. Application of pulse current decreased the non-productive energy consumption by decreasing the polarization potential drop of each cycle. This effect was more significant in lower pulse frequency due to the better restoration of equilibrium state of clay medium during relaxation period.

General information
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Organisations: Department of Civil Engineering, Section for Construction Materials, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Lehigh University
Authors: Sun, T. R. (Intern), Pamukcu, S. (Ekstern), Ottosen, L. M. (Intern), Wang, F. (Ekstern)
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Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.92
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.96
Electrodialytic extraction of phosphorus from ash of low-temperature gasification of sewage sludge

Low-temperature gasification allows the production of energy from biomass with high contents of low melting point compounds, like sewage sludge, and the recycling of the nutrients as P from the resulting ashes as renewable fertiliser. Major drawbacks are, however, the presence of heavy metals and the low plant-availability of Al- and Fe- phosphate compounds in the gasification ashes. In the present research, the feasibility of a 2-compartment electrodialytic (ED) setup for P separation from Al, Fe and heavy metals in two different low-temperature gasification ashes was investigated. One ash was from gasification of sewage sludge where P was precipitated with Fe and Al salts, from which it was possible to extract up to 26% of the P. The other ash was from co-gasification of a mixture of biologically precipitated sewage sludge and wheat straw pellets. More promising results were obtained with this ash, as up to 90% of the P was extracted from the ashes. For both ashes, P was extracted by ED in acidic aqueous solutions with ratios of Fe, Al and each heavy metal to P considerably below the values found in the initial ashes. Therefore, the 2-compartment ED cell technology was proved as possible method to separate Al, Fe and heavy metals from P for low-temperature gasification ashes.
Electrodialytic remediation of fly ash from co-combustion of wood and straw
The heavy metal content in fly ash from biomass combustion, such as straw, wood and sludge, often needs reducing before the ash can be used as fertilizer for agricultural land or as a component in the production of construction materials. In this study, fly ash from a boiler fueled with wood chips and straw was treated either by electrodialytic remediation (EDR) directly or by a combination of EDR and pre-wash with distilled water to investigate the possibilities of reducing the heavy metal content and reusing nutrients as fertilizer and bulk material in construction materials. Different experimental set-ups...
were tested for EDR treatment primarily of Cd and Pb as well as of Cu and Zn. Elemental contents such as K, P and Ni were compared in ash samples before and after treatment. The results showed that pre-washing caused an increase in total concentrations of most heavy metals because the highly soluble fraction, mainly KCl and K2SO4, was removed. After EDR treatment, the Cd concentration was reduced to below 2mgkg⁻¹ in all ash samples with high and stable average removal of above 95%, no matter how high the initial concentration was. The amount of Pb removed varied from 12% to 67%. Even though Pb was extracted from the ash samples, its concentrations in the treated ash samples were elevated due to the ash dissolution, except in the case of pre-washed ash treated in a two-compartment EDR cell, where the mass of Pb removed was the highest with a final concentration of about 100mgkg⁻¹. The two-compartment EDR cell probably performed better due to a fast acidification process. In addition, this process was less energy-consuming. However, the fast acidification did in turn affect the leaching property of the treated ash, such as As and Ni, exceeding the limiting concentrations. The EDR/pre-wash-EDR treated ash mainly contained quartz, and the X-ray diffraction (XRD) peaks of K salts had disappeared. This shows that the potassium fertilizer potential was lost in the treated ashes, but the quartz mineral is beneficial in construction materials, such as ceramics. The K fertilizer could be recovered from the water after pre-washing and also from the catholyte through chemical operations, including a separation step.

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BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.391 SNIP 1.482 CiteScore 4.59
Web of Science (2014): Indexed yes
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BFI (2010): BFI-level 1
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BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.536 SNIP 1.625

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Electrodialytic removal of heavy metals and chloride from municipal solid waste incineration fly ash and air pollution control residue in suspension - test of a new two compartment experimental cell

Municipal solid waste incineration (MSWI) residues such as fly ash and air pollution control (APC) residues are classified as hazardous waste and disposed of, although they contain potential resources. The most problematic elements in MSWI residues are leachable heavy metals and salts. For reuse of MSWI residues in for instance concrete, the aim of remediation should be reduction of the heavy metal leaching, while at the same time keeping the alkaline pH, so the residue can replace cement. In this study a MSWI residues were subjected to electrodialytic remediation under various experimental conditions. Also a newly developed 2 compartment experimental cell was tested. The results show that the pH development in the MSWI residue suspension depended on the type of MSWI residue and the experimental cell type. The acidification of the suspension occurred earlier when using the 2 compartment setup and the acidification of the fly ash occurred earlier than for the APC residue but the highest removal was seen with the 3 compartment cell. The lowest final pH for the fly ash and APC residue was 6.4 and 10.9, respectively. The results showed that the leaching of Cd, Cu, Pb and Zn was reduced compared to the initial heavy metal leaching except when the pH was reduced to a level below 8 for the fly ash. On the other hand, Cr leaching increased by the electrodialytic treatment. Cl leaching from the MSWI residues was less dependent on experimental conditions and was reduced in all experiments compared to the initial levels.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Universidade Nova de Lisboa
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Electrodialytic separation of phosphorus and heavy metals from sewage sludge ash

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Electrodialytic treatment of municipal wastewater and sludge for the removal of heavy metals and recovery of phosphorus

Municipal wastewater and sewage sludge is an abundant source of phosphorus (P), but its usage is often limited due to wastewater treatment methods and contaminants, mostly heavy metals (HM's). Three compartment (3C) electrodialysis (ED) was used to simultaneously extract HM's (Cd, Cr, Cu, Ni, Pb and Zn) and recover P from municipal sludge samples obtained at different stages during wastewater treatment involving biological and chemical treatment as well as polymer addition for thickening of sludge and anaerobic digestion of excess sludge. Direct P recovery was investigated for high P reject water stream using the 3C ED cell setup and a two-compartment (2C) where the cathode in direct contact with the wastewater while P was extracted to and concentrated in the anolyte. Simultaneous extraction of HM's and recovery of P from wastewater or raw sludge using 3C ED was be most effective at a low pH using anaerobically digested sludge. The hydrolysis of OM during anaerobic digestion and the anaerobic conditions allowed for easier extraction of HM's such as Cd, Ni and Zn as they had fewer adsorption places, and improved P availability and extractability. Extraction of P from high concentration P streams was most effective using a 3C ED cell setup, with the electrodes separated from the sample by ion-exchange membranes. Extraction with the 2C ED cell setup was less effective due to a rise in pH, caused by half reactions at the cathode and subsequent precipitation of P. For either removal of heavy metals or recovery of phosphorus using ED, the end-products in wastewater treatment, like anaerobically digested sludge and reject-water streams, are therefore best to be treated.

General information
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Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Ebbers, B. (Intern), Ottosen, L. M. (Intern), Jensen, P. E. (Intern)
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Scopus rating (2016): CiteScore 4.74 SJR 1.357 SNIP 1.167
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.391 SNIP 1.482 CiteScore 4.59
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.435 SNIP 1.607 CiteScore 4.44
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Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.651 SNIP 1.592 CiteScore 3.99
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.621 SNIP 1.803 CiteScore 4.15
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Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
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Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.536 SNIP 1.625
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Scopus rating (2008): SJR 1.533 SNIP 1.47
Web of Science (2008): Indexed yes
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Web of Science (2006): Indexed yes
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Scopus rating (2004): SJR 1.365 SNIP 1.581
Scopus rating (2003): SJR 1.628 SNIP 1.526
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.644 SNIP 1.459
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.319 SNIP 1.408
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DOIs:
Electrodialytic upgrading of three different municipal solid waste incineration residue types with focus on Cr, Pb, Zn, Mn, Mo, Sb, Se, V, Cl and SO4

Handling of air pollution control (APC) residues from municipal solid waste incineration (MSWI) is a challenge due to its toxicity and high leaching of toxic elements and salts. Electrodialysis (ED) of the material has shown potential for reduction of leaching of toxic elements and salts to produce a material feasible for substitution of cement in mortar. In this work results of 23 pilot-scale experiments (5-8kg APC residue each) in electrodialysis stack designed to investigate the leaching properties as a function of time and current density for APC residue from semi-dry and wet flue-gas cleaning systems, as well as MSWI fly ash without flue-gas cleaning products are reported. Significant leaching reduction of the critical elements Pb, Zn and Cl was obtained. The final leaching, however, depended mostly on the initial leaching, thus as leaching from fly ash and residue of wet flue-gas cleaning was lower before treatment compared to residues from semidry flue-gas cleaning, both Pb and Zn leaching could be reduced to lower levels in those materials, and they therefore appear more suitable for use in construction materials. The leaching reduction of Zn and to some degree Pb decreased with longer retention times and higher current densities. Cr and SO4 leaching increased during ED treatment, with lower increase at higher current. Washing or carbonation in combination with ED significantly reduced leaching of Pb and Zn from semidry residue. An indication of a similar effect to carbonation by simultaneous aeration with ED was observed and should be investigated further. While Mn and Mo leaching did not, Se, V and Sb leaching exceeded threshold values in semidry residue. The leaching of V seemed to increase while Se and Sb remained more or less constant during ED treatment.
Electrokinetically Enhanced Delivery for ERD Remediation of Chlorinated Ethenes in a Fractured Limestone Aquifer

Leakage of the chlorinated solvents PCE and TCE into limestone aquifers from contaminated overburden and the long-lasting back diffusion from the secondary source in the limestone matrix pose a severe risk for contamination of drinking water resources. Dechlorination of PCE and TCE in limestone often accumulates cis-DCE due to incomplete dechlorination in the limestone aquifers, as observed downgradient of a PCE and TCE DNAPL source area at Naverland in Denmark. A microcosm study with limestone core material and groundwater from the Naverland site source area spiked with PCE showed that enhanced reductive dechlorination (ERD) by the addition of donor and specific degraders (KB1® culture) can lead to complete dechlorination of PCE and TCE in the limestone aquifer, provided sufficient contact between specific degraders, donor, and specific degraders, is obtained.

Advection-based delivery of donor and specific degraders is expected to result in spreading in fractures and other high permeability features only. Hence, contact between specific bacteria, donor, and contaminants in the contaminated matrix is expected to be limited by matrix diffusion and growth-based spreading of degraders causing very long remediation timeframes. Electrokinetics (EK) offers some unique transport processes, which can potentially overcome the diffusion limitations in the matrix. A novel technology combines ERD and EK for enhanced delivery. The combined technology (EK-BIO) has shown promising results in clay. Experimental work on EK-BIO in limestone was conducted in a laboratory setup with limestone cores. EK was demonstrated to be promising in establishing enhanced contact between the donor lactate, bacteria, and cis-DCE within the limestone matrix. Complete dechlorination is expected to take place in the matrix, since back diffusion limitations in the limestone matrix are overcome. This is essential for the overall time perspective of a remediation in limestone aquifers.
Electroremediation of PCB contaminated soil combined with iron nanoparticles: Effect of the soil type
Polychlorinated biphenyls (PCB) are carcinogenic and persistent organic pollutants that accumulate in soils and sediments. Currently, there is no cost-effective and sustainable remediation technology for these contaminants. In this work, a new combination of electrodialytic remediation and zero valent iron particles in a two-compartment cell is tested and compared to a more conventional combination of electrokinetic remediation and nZVI in a three-compartment cell. In the new two-compartment cell, the soil is suspended and stirred simultaneously with the addition of zero valent iron nanoparticles. Remediation experiments are made with two different historically PCB contaminated soils, which differ in both soil composition and contamination source. Soil 1 is a mix of soils with spills of transformer oils, while Soil 2 is a superficial soil from a decommissioned school where PCB were used as windows sealants. Saponin, a natural surfactant, was also tested to increase the PCB desorption from soils and enhance dechlorination. Remediation of Soil 1 (with highest pH, carbonate content, organic matter and PCB concentrations) obtained the maximum 83% and 60% PCB removal with the two-compartment and the three-compartment cell, respectively. The highest removal with Soil 2 were 58% and 45%, in the two-compartment and the three-compartment cell, respectively, in the experiments without direct current. The pH of the soil suspension in the two-compartment treatment appears to be a determining factor for the PCB dechlorination, and this cell allowed a uniform distribution of the nanoparticles in the soil, while there was iron accumulation in the injection reservoir in the three-compartment cell.
Energy-efficient Building in Greenland: Investigation of the Energy Consumption and Indoor Climate

Recently, a brand new single family home was built in Sisimiut, Greenland. The building was constructed as a wooden house typical for Greenland. However, some non-traditional measures were implemented in order to reduce the energy consumption and improve indoor air quality. Assessment of the influence of these measures is essential for their implementation on a wider scale. In particular, functionality of the state of the art ventilation system is of large concern as these systems have not been commonly used for their sensitivity towards the extremely cold climate. A detailed monitoring system was installed in the house. It enables the evaluation of the indoor air quality, as well as building's energy performance.

The aim of this investigation was to evaluate the performance of the newly constructed house by and compare it with the performance of identical house built in a traditional way by using a computer model. The data obtained from the measurements in the new house were used to verify the model.

Significant energy savings and improvements of indoor air quality were found in the new house when compared to the
traditional one. Moreover, all the extra measures have a feasible payback time despite high prices of labor and transportation to Greenland.

**General information**
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Luc, K. M. (Intern), Kotol, M. (Intern), Lading, T. (Intern)
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**Energy Efficient District Heating**

**General information**
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Organisations: Department of Civil Engineering, Section for Building Physics and Services
Authors: Li, H. (Intern)
Number of pages: 26
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Main Research Area: Technical/natural sciences
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Source-ID: 105090096
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**Energy Lab Nordhavn: Sustainability defined by certification**

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Organisations: Department of Civil Engineering, Section for Building Energy, DOMUS Architects, By og Havn
Authors: Ledgaard, K. (Ekstern), Ingemann Mogensen, J. (Ekstern), Heller, A. (Intern)
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Publication: Research › Sound/Visual production (digital) – Annual report year: 2015
A new dormitory for engineering students “Apisseq” was built in Sisimiut, Greenland in 2010. Its purpose is not only to provide accommodation for students, but thanks to its complex monitoring system, it enables researchers to evaluate the building’s energy performance and indoor air quality. Some of the installed technologies are not commonly used in the current Greenlandic building stock. Therefore, evaluation of their performance under local conditions is essential for further use and development. The first year of operation has disclosed some errors made during the design process and construction phase, which have negative effects on the energy performance and indoor air quality. The heat demand in 2011 was 26.5% higher than expected. One of the main causes of the extra heat demand is the fact that the ventilation system was over-dimensioned, and although it is running on the lowest fan power it maintains 1.1 ACH in the building. Reduction of the airflows and better frost protection of the heat exchangers are important issues to be dealt with in order to decrease the heat demand. This article describes the building and how it is evaluated after the first year of operation, and it explains some of the revealed problems.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Brno University of Technology
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Scopus rating (2014): SJR 0.578 SNIP 0.846
Web of Science (2014): Indexed yes
Scopus rating (2013): SJR 0.618 SNIP 0.89
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.587 SNIP 1.109
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.541 SNIP 0.74
Web of Science (2011): Indexed yes
Scopus rating (2010): SJR 1.027 SNIP 0.955
Web of Science (2010): Indexed yes
Scopus rating (2009): SJR 1.767 SNIP 1.187
Web of Science (2009): Indexed yes
Scopus rating (2008): SJR 0.866 SNIP 0.903
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.804 SNIP 1.625
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.907 SNIP 1.302
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.471 SNIP 1.257
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.209 SNIP 1.999
Scopus rating (2003): SJR 1.091 SNIP 1.28
Engineered cementitious composites for strengthening masonry infilled reinforced concrete frames
The results of the second part of a comprehensive experimental program, aimed at investigating the behavior of masonry infilled reinforced concrete (RC) frames strengthened with fiber reinforced engineered cementitious composites (ECC) used as an overlay on the masonry wall, are presented in this paper. The proposed strengthening technique aims at increasing the lateral strength of infilled RC frames and maintaining the integrity of masonry infills during loading, which is an important seismic parameter for these elements. Material tests were conducted first for ECC in order to assess its distinctive mechanical properties such as tensile stress-strain behavior and multiple cracking. Thereafter, three 1/2 scaled one bay, one story RC specimens were constructed and tested under quasi-static lateral loading. The obtained results are presented and discussed in terms of the strength, stiffness, and the cumulative absorption capacity of the tested specimens. Furthermore, the obtained backbone curves are idealized and the drift limits usually considered in seismic design are specified. The obtained results indicate that the proposed ECC-strengthening technique can effectively increase the lateral strength and energy absorption capacity of the infilled frame, prevent brittle failure modes in the infill wall, and provide a reasonable system overstrength.

General information
State: Published
Organisations: Department of Civil Engineering, International Institute of Earthquake Engineering and Seismology, Persian Gulf University
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Scopus rating (2016): CiteScore 2.93 SJR 1.578 SNIP 2.048
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.696 SNIP 2.195 CiteScore 2.59
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.756 SNIP 2.56 CiteScore 2.4
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 2.049 SNIP 2.853 CiteScore 2.69
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Enhance total heat recovery for ventilation with flash evaporative cooling

General information
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Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Fang, L. (Intern), Yuan, S. (Ekstern), Yang, J. (Ekstern)
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Evacuation characteristics of visually impaired people: a qualitative and quantitative study
Evacuation characteristics for blind and visually impaired people are presented in the current study. The study was carried out in 2011 and engaged 40 participants in the age from 10 to 69 years. The participants had impairments for all of the four Danish categories for visual impairments (A-D). The mean free walking speed descending stairs for category C and D were found to be comparable with values found in Danish and Swedish guidelines. The walking speed of people with visible impairments was not affected by an increasing density on stairs to the same extent as the walking speed of able-bodied adults. It was found that people with visual impairments were able to uphold a higher walking speed descending stairs than able-bodied adults for increasing person density. The initial walking speed on horizontal planes is lower than the value suggested by the N&M-model. The horizontal mean free walking speed depends on the degree of vision loss. The design of the building environment is important for the ability to orientation for people with reduced sight. Walls and handrails are important for the orientation possibilities for people with visual impairments. Furthermore, obstacles placed in the egress path were identified problematic for this group of people.

General information
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Organisations: Department of Civil Engineering, Section for Building Design
Authors: Sørensen, J. G. (Intern), Dederichs, A. (Intern)
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Evacuation, Visually impairment, Walking speed, Human behaviour, Stairs, Horizontal plane

Evaluation of damping estimates in the presence of closely spaced modes using operational modal analysis techniques

The Operational Modal Analysis (OMA) techniques provide in most cases reasonably accurate estimates of structural frequencies and mode shapes. They are however known to produce erroneous structural damping estimates, which are presumably thought to be due to inherent random- or bias errors that have varying significance for different techniques. This paper evaluates the sensitivity of damping estimates of closely spaced modes for two existing OMA techniques derived in the time and frequency domain; namely Eigensystem Realization Algorithm (ERA) and Frequency Domain Decomposition (FDD). The evaluation is based on identification using random response from white noise loading of a three degree-of-freedom (3DOF) system numerically established from specified modal parameters for a range of natural frequencies. The numerical model provides comparisons of the effectiveness of damping estimation for a variety of damping levels, signal noise and the sensitivity to closely spaced modes. It is shown that FDD has a tendency to overestimate damping due to leakage in the estimated spectral density function and it is a more sensitive technique to system changes than the ERA. The accuracy of damping estimates converges with increased frequency of the system, which is mainly a result of the problematic regions in the correlation function estimation. These regions cause amplification of the damping estimation errors at higher levels of damping. This emphasizes the importance of correctly estimating the correlation function and spectral density as bias will potentially result in large errors in the estimation of highly damped systems. It is concluded that damping estimated are sensitive to closely spaced modes. In addition, it is found that two closely spaced modes will also disturb the estimation of damping of the remaining modes in the system.

Evaluation of damping estimates in the presence of closely spaced modes using operational modal analysis techniques

The Operational Modal Analysis (OMA) techniques provide in most cases reasonably accurate estimates of structural frequencies and mode shapes. They are however known to produce erroneous structural damping estimates, which are presumably thought to be due to inherent random- or bias errors that have varying significance for different techniques. This paper evaluates the sensitivity of damping estimates of closely spaced modes for two existing OMA techniques derived in the time and frequency domain; namely Eigensystem Realization Algorithm (ERA) and Frequency Domain Decomposition (FDD). The evaluation is based on identification using random response from white noise loading of a three degree-of-freedom (3DOF) system numerically established from specified modal parameters for a range of natural frequencies. The numerical model provides comparisons of the effectiveness of damping estimation for a variety of damping levels, signal noise and the sensitivity to closely spaced modes. It is shown that FDD has a tendency to overestimate damping due to leakage in the estimated spectral density function and it is a more sensitive technique to system changes than the ERA. The accuracy of damping estimates converges with increased frequency of the system, which is mainly a result of the problematic regions in the correlation function estimation. These regions cause amplification of the damping estimation errors at higher levels of damping. This emphasizes the importance of correctly estimating the correlation function and spectral density as bias will potentially result in large errors in the estimation of highly damped systems. It is concluded that damping estimated are sensitive to closely spaced modes. In addition, it is found that two closely spaced modes will also disturb the estimation of damping of the remaining modes in the system.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aarhus University
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Evaluation of Damping Using Frequency Domain Operational Modal Analysis Techniques

Operational Modal Analysis (OMA) techniques provide in most cases reasonably accurate estimates of structural frequencies and mode shapes. In contrast though, they are known to often produce uncertain structural damping estimates, which is mainly due to inherent random and/or bias errors. In this paper a comparison is made of the effectiveness of two existing OMA techniques in providing accurate damping estimates for random stationary loading, varying levels of signal noise, number of added measurement channels and level of structural damping. The investigation is focusing on the two frequency domain techniques, the Frequency Domain Decomposition (FDD) and the Frequency Domain Polyreference (FDPR). The response of a two degree-of-freedom (2DOF) system is numerically established with specified modal parameters subjected to white noise loading. The system identification is evaluated with well separated and closely spaced modes. Finally, the results of the numerical study are presented, in which the error of the structural damping estimates obtained by each OMA technique is shown for a range of damping levels. From this, it is clear that there are notable differences in accuracy between the different techniques.

General information
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Organisations: Department of Civil Engineering, Section for Structural Engineering, Aarhus University
Authors: Bajric, A. (Intern), Georgakis, C. T. (Intern), Brincker, R. (Ekstern)
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Evaluation of ventilation solutions for retrofitting of schools

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Experiencing engineering field work in Greenland through summer courses in Arctic Technology

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Experimental and Numerical Investigation of the FRP Shear Mechanism for Concrete Sandwich Panels
This paper investigates the composite action of 46 segments representing precast concrete sandwich panels (PCSPs) using a fiber-reinforced polymer (FRP; specifically, a carbon fiber-reinforced polymer (CFRP)) grid/rigid foam as a shear mechanism. The experimental aspect of the research reported in this paper examined the effect of various parameters believed to affect the shear flow strength for this CFRP grid/foam system. The parameters that were considered are the spacing between vertical lines of CFRP grids and the thickness of the rigid foam. Results of the experimental aspect of the research reported in this paper indicated that increasing the spacing between vertical lines of CFRP grid increase the overall shear flow strengths due to the increase of the bonded contact area of the rigid foam to the concrete surface. However, the overall shear stresses were decreased due to the increase of this interface surface area. Test results also indicated that increasing the rigid foam thickness decreases the overall shear flow strength when compared with the same quantity of CFRP grid spacing. A nonlinear three-dimensional (3D) FEM analysis was performed to model the behavior of the tested segments and to study the behavior of PCSPs. Results of FEM analysis were in good agreement with the experimental results. A design equation was developed to determine the shear flow strengths for the given CFRP grid/foam systems. The parametric study of the research reported in this paper was performed to predict shear flow strength of different FRP materials, rigid foam thickness, and spacing between vertical lines of the grid.

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Organisations: Department of Civil Engineering, Section for Structural Engineering, Tower Engineering Professionals, Inc. & North Carolina State University
Authors: Hodicky, K. (Intern), Sopal, G. (Ekstern), Rizkalla, S. (Ekstern), Hulin, T. (Intern), Stang, H. (Intern)
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Scopus rating (2016): SJR 1.759 SNIP 1.834 CiteScore 2.78
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Experimental assessment of the suitability of monitors and tv-screens for placement in evacuation routes

**General information**

State: Published  
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark  
Authors: Leisted, R. R. (Intern), Ellerbæk Hinge, R. (Ekstern), Mindykowski, P. A. (Intern), Jomaas, G. (Intern)  
Number of pages: 1  
Publication date: 2015  
Main Research Area: Technical/natural sciences  
Electronic versions:  
Leisted_Mindykowski_Hinge_Jomaas_Abstract_FSD_2015.pdf

**Relations**

Activities:
Experimental design for assessment of electrokinetically enhanced delivery of lactate and bacteria in 1,2-cis-dichloroethylene contaminated limestone

Bacterial dechlorination of chlorinated solvents often causes accumulation of the intermediate cis-DCE. Back diffusion of e.g. cis-DCE, due to the dual porosity of limestone, often limits the remediation efficiency. A remediation scheme capable of establishing contact between contaminant, degrading bacteria and electron donor within the low permeable limestone matrix is required. The technology EK-BIO, which combines enhanced reductive dechlorination and electrokinetics (EK), was assessed. This novel technology has not previously been tested in limestone. An experimental set-up was designed to meet the requirements of anaerobic bacteria and to manage the volatile contaminants and extreme pH development prompted by electrolysis. The experimental set-up was tested and recommendations for design improvements presented. In this study, supplementary methods were developed for e.g. sampling of intact bryozoan limestone cores and for saturation and contamination of the cores with cis-DCE. EK induced transport processes for delivery of the donor lactate and mixed bacteria culture KB-1® were studied. EK was shown to enhance delivery of lactate and bacteria resulting in fermentation of lactate in the limestone. Lactate was delivered by electromigration causing an increase in electric conductivity. No indications of establishment of electro-osmotic flow in limestone were observed. Presence of specific cis-DCE degraders, Dehalococcoides, in the limestone could not be verified. However, the results indicated that fermentative bacteria were distributed by electrophoresis. This study suggests that EK application can establish the essential contact and overcome back diffusion. Thereby, EK-BIO may be superior to advection-based technologies for bioremediation of chlorinated solvent contaminated limestone matrices.

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Water Resources Engineering, Technical University of Denmark, NIRAS A/S
Authors: Hyldegaard, B. H. (Intern), Nedergaard, L. W. (Ekstern), Ottosen, L. (Ekstern), Riis, C. E. (Ekstern), Broholm, M. M. (Intern)
Pages: 73-81
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Experimental Design for Assessment of Electrokinetically Enhanced Delivery of Lactate and Bacteria in 1,2-cis-dichloroethylene - Contaminated Limestone

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions, Department of Environmental Engineering, Water Resources Engineering, Technical University of Denmark, NIRAS A/S
Authors: Hyldegaard, B. H. (Intern), With Nedergaard, L. (Ekstern), Ottosen, L. (Ekstern), Riis, C. (Ekstern)
Number of pages: 2
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Place of publication: Miami, Florida
Main Research Area: Technical/natural sciences
Conference: 3rd International Symposium on Bioremediation and Sustainable Remediation Technologies, Miami, Florida, United States, 18/05/2015 - 18/05/2015
Experimental evaluation of enthalpy efficiency and gas-phase contaminant transfer in an enthalpy recovery unit with polymer membrane foils

Experimental studies were conducted in a laboratory setting to investigate the enthalpy efficiency and gas-phase contaminant transfer in a polymer membrane enthalpy recovery unit. One commercially available polymer membrane enthalpy recovery unit was used as a reference unit. Simulated indoor air and outdoor air by twin chambers was connected to the unit. Three chemical gases were dosed to the indoor exhaust air to mimic indoor air contaminants. Based on the measurements of temperature, humidity ratio, and contaminant concentrations of the indoor exhaust air and outdoor air supply upstream and downstream of the unit, the temperature efficiencies, humidity efficiencies, enthalpy efficiencies, and contaminant transfer ratios were calculated. The results showed that over 60% of enthalpy recovery efficiency could be achieved and that the contaminant transfer ratios were in the range of 5.4% to 9.0%. The enthalpy efficiency in cold-dry climate conditions was slightly higher than in hot-humid climate conditions. The contaminant transfer ratio were independent of any hygrothermal difference between indoor and outdoor air and was unrelated to its molecule size or water solubility. The conclusion indicated that the polymer membrane enthalpy recovery unit may be a viable choice for energy recovery in ventilation systems.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Tianjin University, Shanghai Research Institute of Building Sciences
Authors: Nie, J. (Intern), Yang, J. (Ekstern), Fang, L. (Intern), Kong, X. (Ekstern)
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Scopus rating (2016): CiteScore 1.01
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Scopus rating (2015): SJR 0.644 SNIP 0.888
Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
Scopus rating (2013): SJR 0.618 SNIP 0.89
Web of Science (2013): Indexed yes
Scopus rating (2012): SJR 0.587 SNIP 1.109
Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.541 SNIP 0.74
Web of Science (2011): Indexed yes
Scopus rating (2010): SJR 1.027 SNIP 0.955
Web of Science (2010): Indexed yes
Scopus rating (2009): SJR 1.767 SNIP 1.187
Web of Science (2009): Indexed yes
Scopus rating (2008): SJR 0.866 SNIP 0.903
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.804 SNIP 1.625
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.907 SNIP 1.302
Web of Science (2006): Indexed yes
Experimental investigations of sandwich panels using high performance concrete thin plates exposed to fire

Structural sandwich panels using thin high performance concrete (HPC) plates offer a possibility to address the modern environmental challenges faced by the construction industry. Fire resistance is a major necessity in structures using HPC. This paper presents experimental studies at elevated temperatures for panels with 30 mm thick plates stiffened by structural ribs, thick insulation layers, and steel shear connecting systems. Parametric variation assessing the role of each component of the sandwich structure was performed on unloaded specimens of reduced size. Full size walls were tested with load. Tests were performed in standard furnaces, following the conditions of REI certification tests. Unloaded specimens successfully passed tests. Loaded specimens met the R and I requirements, failing E due to sustained flaming of the insulation. They exhibited multiple cracking of their exposed plate and one of them experienced heavy heat-induced spalling. Results highlighted insulation shear failure from differential thermal expansion at the interface with concrete. It suggests the existence of a high bond level between the two materials which might allow structural applications at early age. Cracks resulted from buckling and thermal bowing, present in the upper and lower parts of the panel. Shear connectors created stress concentrations leading to local failure. Only ribs were found to have a structural role, the plate being largely negligible and solely protecting the insulation from heat. Performance could be enhanced by using thicker plates (50 mm).

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Building Design
Authors: Hulin, T. (Intern), Hodicky, K. (Intern), Schmidt, J. W. (Intern), Stang, H. (Intern)
Number of pages: 13
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Publication date: 2015
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Journal: Materials and Structures
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 2.09 SJR 1.129 SNIP 1.533
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Scopus rating (2015): SJR 1.129 SNIP 1.586 CiteScore 1.59
Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 1.207 SNIP 1.524 CiteScore 1.55
Web of Science (2014): Indexed yes
Experimental Studies on Removal of Air-borne Haloanisoles by Photocatalytic Oxidation and Plasma Air Purifiers

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Fang, L. (Intern), Bermúdez, R. (Ekstern)
Publication date: 2015

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Main Research Area: Technical/natural sciences
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Publication: Research - peer-review › Article in proceedings – Annual report year: 2016
Experimental Studies on the Fire Behaviour of High Performance Concrete Thin Plates

In recent decades, the use of structural high performance concrete (HPC) sandwich panels made with thin plates has increased as a response to modern environmental challenges. Fire endurance is a requirement in structural HPC elements, as for most structural elements. This paper presents experimental investigations on the fire behaviour of HPC thin plates (20 or 30 mm thick) being used in lightweight structural sandwich elements. Tests were undertaken using a standard testing furnace and a novel heat-transfer rate inducing system (H-TRIS), recently developed at the University of Edinburgh. The parametric assessment of the specimen performance included: thickness of the specimen, testing apparatus, and concrete mix (both with and without polypropylene fibres). The results verified the ability of H-TRIS to impose an equivalent thermal boundary condition to that imposed during a standard furnace test, with good repeatability, and at comparatively low economic and temporal costs. The results demonstrated that heat induced concrete spalling occurred 1 to 5 min earlier, and in a more destructive manner, for thinner specimens. An analysis is presented combining the thermal material degradation, vapour pore pressure, stress concentrations, and thermo-mechanical energy accumulation in the tested specimens. Unexpectedly, spalling at the unexposed surface was observed during two of the tests, suggesting a potentially unusual, unwanted failure mode of very thin-plates during fire. On this basis it is recommended to favour 30 mm thick plates in these applications, since they appear to resist spalling better than those with 20 mm thickness.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Building Design, University of Edinburgh
Authors: Hulin, T. (Intern), Hodicky, K. (Intern), Schmidt, J. W. (Intern), Stang, H. (Intern), Maluk, C. (Ekstern), Bisby, L. (Ekstern)
Number of pages: 23
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Journal: Fire Technology
ISSN (Print): 0015-2684
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
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Scopus rating (2016): CiteScore 1.3 SJR 0.68 SNIP 1.41
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.465 SNIP 0.851 CiteScore 0.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.59 SNIP 1.466 CiteScore 1.06
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.413 SNIP 1.524 CiteScore 1.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.452 SNIP 1.404 CiteScore 0.83
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.207 SNIP 0.523 CiteScore 0.52
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.388 SNIP 1.004
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.245 SNIP 1.214
Experimental Study of a Low-Temperature Power Generation System in an Organic Rankine Cycle

This paper presents a new power generation system under the principle of organic Rankine cycle which can generate power with a low-temperature heat source. A prototype was built to investigate the proposed system. In the prototype, an air screw compressor was converted into an expander and used as the engine of the power generator. The style of the preheater was a shell and tube heat exchanger, which could provide a long path for the working fluid. A flooded heat exchanger with a high heat transfer coefficient was taken as the evaporator. R134a was used as working fluid for the Rankine cycle in the system. This study compared and analyzed the experimental performance of the prototype at different heat source temperatures. The results show that the preheater and flooded evaporator was used for sensible heating and latent heating of the working fluid, respectively, as expected. When the temperature of the heat source increased, the pressure at the inlet of the screw expander increased, and the mass flow rate of the working fluid increased as well. The fluid at the outlet of the expander is superheated with an average superheating of 2.6 degrees C. In the range of 55-65 degrees C of the heat source, the average isentropic efficiency of the screw expander was 68%, and the efficiency of power generation varies from 1.2 to 4.56%. The highest value of thermodynamical perfectness was 29.06%. It can be concluded that organic Rankine cycle could be competitive for recovering low-temperature heat source to electrical power. (C) 2014 American Society of Civil Engineers.

General information
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Organisations: Department of Civil Engineering, Tianjin University
Authors: Mu, Y. (Ekstern), Zhang, Y. (Ekstern), Deng, N. (Ekstern), Nie, J. (Intern)
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Scopus rating (2016): SJR 0.46 SNIP 0.654 CiteScore 1.37
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.759 SNIP 1.024 CiteScore 1.65
Web of Science (2015): Indexed yes
Experimental study of energy performance in low-temperature hydronic heating systems

Energy consumption, thermal environment and environmental impacts were analytically and experimentally studied for different types of heat emitters. The heat emitters studied were conventional radiator, ventilation radiator, and floor heating with medium-, low-, and very-low-temperature supply, respectively. The ventilation system in the lab room was a mechanical exhaust ventilation system that provided one air change per hour of fresh air through the opening in the external wall with a constant temperature of 5°C, which is the mean winter temperature in Copenhagen. The parameters studied in the climate chamber were supply and return water temperature from the heat emitters, indoor temperature, and heat emitter surface temperature. Experiments showed that the mean supply water temperature for floor heating was the lowest, i.e. 30°C, but it was close to the ventilation radiator, i.e. 33°C. The supply water temperature in all measurements for conventional radiator was significantly higher than ventilation radiator and floor heating; namely, 45°C. Experimental results indicated that the mean indoor temperature was close to the acceptable level of 22°C in all cases. For energy
calculations, it was assumed that all heat emitters were connected to a ground-source heat pump. Analytical calculations showed that using ventilation radiator and floor heating instead of conventional radiator resulted in a saving of 17% and 22% in heat pump's electricity consumption, respectively. This would reduce the CO₂ emission from the building's heating system by 21% for the floor heating and by 18% for the ventilation radiator compared to the conventional radiator.
Façade system for existing office buildings in Copenhagen
This study investigates solutions for facade renovation of general office buildings built between 1960 and 1980 in the Copenhagen Municipality. 44 buildings are used for the study. They share common structural and construction principles like the use of beams and columns and prefabricated elements. The problems that face these buildings are a high number of overheating hours and high heating consumption. Four strategies are tested for the renovation: external re-insulation, double-skin facade (existing inner facade), double-skin facade (new inner facade) and curtain wall. External re-insulation and curtain wall provide the best results for reducing the energy consumption for heating. [All rights reserved Elsevier].
boreholes, many with geophysical logging were executed prior to construction works. The bedrock consists of Paleogene “Copenhagen limestone” and face logs show a sub-horizontally layered structure, with alternate extremely weak to extremely strong beds of variable thickness. The rhythmicity is thought to be climatically controlled. Stronger beds represent reduced sedimentation rate related to climatic deterioration while weaker beds result from high sedimentation rate in a warmer climate. Large scale level differences are explained by post-depositional tectonic activity and glacial disturbance. Local physical and biological variations have affected diagenetic processes, causing minor lateral variations in strength and bed thickness. The induration degrees recorded in face logs and boreholes are compared and correlated. Distinct geophysical log markers are used to divide the limestone into three units. These marker horizons are correlated between face logs and geotechnical boreholes. A 3D model of the strength variations recorded within the limestone is presented along with a longsection showing the sub-horizontal layering. Knowledge of the lateral bed continuity can be used to predict challenging levels within the limestone and levels more favourable for tunnelling.

Feasibility of an integration of an electrodialytic process into soil remediation procedure for removal of copper, chromium and arsenic

This paper analyzes the feasibility of developing solar district heating (SDH) in China from the perspective of incentive policy, selections of technical route, regional adaptability and economic feasibility for clean heating. Based on the analyzation, this proposes a road map for the development of SDH in China, and predict the market potential.

Feasibility Study on Solar District Heating in China

This paper analyzes the feasibility of developing solar district heating (SDH) in China from the perspective of incentive policy, selections of technical route, regional adaptability and economic feasibility for clean heating. Based on the analyzation, this proposes a road map for the development of SDH in China, and predict the market potential.
Field evaluation of performance of radiant heating/cooling ceiling panel system

As in many other countries in the world, Japan has witnessed an increased focus on low-energy buildings. For testing different engineering solutions for energy-efficient buildings, a low-energy building was built at the University of Tokyo as an experimental pilot project. In this building, a radiant heating/cooling ceiling panel system is used. However, no standard exists for the in situ performance evaluation of radiant heating/cooling ceiling systems; furthermore, no published database is available for comparison. Thus, this study aims to not only clarify the system performance but also to share our experience and our results for them to serve as a reference for other similar projects. Here, the system performance in relation to its heating/cooling capacity and thermal comfort has been evaluated. The heat transfer coefficient from water to room was 3.7 W/(m²K) and 4.8 W/(m²K) for heating and cooling cases, respectively. The upward heat flux from the panels was found to be as large as 30–40% of the water heating/cooling capacity; this would translate into heat loss in certain operating modes. Several proposals for reducing the upward heat flux were discussed. The measurements also showed that a category B thermal environment was obtained using the radiant ceiling heating/cooling system. © 2014 Elsevier B.V. All rights reserved.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Environment, Technical University of Denmark, University of Tokyo
Authors: Li, R. (Ekstern), Yoshidomi, T. (Ekstern), Ooka, R. (Ekstern), Olesen, B. W. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.64 SJR 2.093 SNIP 1.965
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.088 SNIP 2.174 CiteScore 4.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.123 SNIP 2.936 CiteScore 4.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.897 SNIP 2.433 CiteScore 3.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.816 SNIP 2.737 CiteScore 3.36
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.506 SNIP 2.536 CiteScore 3.23
Field measurements of perceived air quality and concentration of volatile organic compounds in four offices of the university building

Field measurements of perceived air quality were conducted in four refurbished offices at the Czech Technical University in Prague. The offices were refurbished as part of the research project Clear-up to serve as a field test facility. The present paper describes measurements conducted to investigate the perceived air quality, sensory pollution load and concentration of Volatile Organic Compounds (VOCs) in the offices. As the refurbishment comprised also installation of demand controlled ventilation (DCV), its influence on the perceived air quality was also tested. Measurements comprised the assessments of perceived air quality and objective measurements of operative temperature, relative humidity, CO₂ and VOCs concentrations. Results showed that the mean sensory pollution load in unoccupied offices was 0.09±0.01 olf/m² (mean±SEM). This falls into the category of a low-polluting building according to CEN Report CR 1752. The acceptability of the air quality was worst in unoccupied offices ventilated with minimum air change rate (0.4 h⁻¹). Application of DCV decreased the CO₂ concentration, but did not result in statistically significant improvement of perceived air quality.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Physics and Services, Section for Indoor Environment, Czech Technical University, European Commission
Authors: Kolarik, J. (Intern), Toftum, J. (Intern), Kabrhel, M. (Ekstern), Jordan, F. (Ekstern), Geiss, O. (Ekstern), Kabele, K. (Ekstern)
Number of pages: 8
Pages: 24
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Field study of the indoor environment in a Danish prison

The indoor environment in a Danish prison was evaluated based on measurements made during the summer season of temperature, relative humidity and carbon dioxide, as well as through carefully conducted surveys among the inmates. The temperatures in the cells were high and well beyond common levels in Danish buildings. The mean CO₂ concentrations were generally low, but reached high maximum levels up to 5000 ppm. Thirty-one inmates responded to
the questionnaire. They spent on average 19 h in the cell per day (range 12–23 h). Sixty-nine percent of the inmates expressed dissatisfaction with their general indoor environment and all responding inmates expressed dissatisfaction with the thermal climate. Dissatisfaction was mostly caused by a lack of airflow and air movement in the space as well as excessive direct sunlight from the windows. Security is a leading factor in the design of prisons, so a compromise must be found to ensure that the building can comply with minimum health and comfort standards. The findings of this study can be used as background for recommendations for renovation of prison buildings.

**General information**
- **State**: Published
- **Organisations**: Department of Civil Engineering, Section for Building Design, Section for Indoor Environment, Technical University of Denmark
- **Authors**: Dogbeh, A. (Ekstern), Jomaas, G. (Intern), Bjarløv, S. P. (Intern), Toftum, J. (Intern)
- **Pages**: 20-26
- **Publication date**: 2015
- **Main Research Area**: Technical/natural sciences

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  - Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198
  - Web of Science (2016): Indexed yes
  - BFI (2015): BFI-level 1
  - Scopus rating (2015): SJR 2.093 SNIP 2.49 CiteScore 4.37
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 1
  - Scopus rating (2014): SJR 1.938 SNIP 2.797 CiteScore 4.14
  - Web of Science (2014): Indexed yes
  - BFI (2013): BFI-level 1
  - Scopus rating (2013): SJR 1.581 SNIP 2.602 CiteScore 3.57
  - ISI indexed (2013): ISI indexed yes
  - Web of Science (2013): Indexed yes
  - BFI (2012): BFI-level 1
  - Scopus rating (2012): SJR 1.331 SNIP 2.875 CiteScore 3.06
  - ISI indexed (2012): ISI indexed yes
  - Web of Science (2012): Indexed yes
  - BFI (2011): BFI-level 1
  - Scopus rating (2011): SJR 1.144 SNIP 2.255 CiteScore 2.76
  - ISI indexed (2011): ISI indexed yes
  - Web of Science (2011): Indexed yes
  - BFI (2010): BFI-level 1
  - Scopus rating (2010): SJR 1.235 SNIP 2.001
  - Web of Science (2010): Indexed yes
  - BFI (2009): BFI-level 1
  - Scopus rating (2009): SJR 1.028 SNIP 1.865
  - Web of Science (2009): Indexed yes
  - BFI (2008): BFI-level 1
  - Scopus rating (2008): SJR 0.924 SNIP 1.38
  - Web of Science (2008): Indexed yes
  - Scopus rating (2007): SJR 0.788 SNIP 1.778
  - Web of Science (2007): Indexed yes
Fire safety in space: Beyond flammability testing of small samples

An international research team has been assembled to reduce the uncertainty and risk in the design of spacecraft fire safety systems by testing material samples in a series of flight experiments (Saffire 1, 2, and-3) to be conducted in an Orbital Science Corporation Cygnus vehicle after it has undocked from the International Space Station (ISS). The tests will be fully automated with the data downlinked at the conclusion of the test before the Cygnus vehicle re-enters the atmosphere.

The unmanned, pressurized environment in the Saffire experiments allows for the largest sample sizes ever to be tested for material flammability in microgravity, which will be based on the characteristics of flame spread over the surface of the combustible material. Furthermore, the experiments will have a duration that is unmatched in scale compared to earth based microgravity research facilities such as drop towers (about 5 s) and parabolic flights (about 20 s). In contrast to sounding rockets, the experiments offer a much larger volume, and the reduction in the oxygen concentration during the Saffire experiments will be minimal.

The selection of the experimental settings for the first three Saffire experiments has been based on existing knowledge of scenarios that are relevant, yet challenging, for a spacecraft environment. Given that there is always airflow in the space station, all the experiments are conducted with flame spread in either concurrent or opposed flow, though with the flow being stopped in some tests, to simulate the alarm mode environment in the ISS and thereby also to study extinguishment. The materials have been selected based on their known performance in NASA STD-6001Test-1, and with different materials being classified as charring, thermally thin, and thermally thick. Furthermore, materials with non-uniform surfaces will be investigated.

General information

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Organisations: Department of Civil Engineering, Section for Building Design, NASA Glenn Research Center, University of Queensland, University of Bremen, Universities Space Research Association, Universite Pierre et Marie Curie, University of California at Berkeley, University of Edinburgh, Belisama R&D, Moscow Lomonosov State University, Hokkaido University, Case Western Reserve University
Number of pages: 9
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Publication date: 2015
Main Research Area: Technical/natural sciences

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ISSN (Print): 0094-5765
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
The present paper introduces a vulnerability modelling approach for residential buildings in flood. The modelling approach explicitly considers relevant damage processes, i.e. water infiltration into the building, mechanical failure of components in the building envelope and damage from water contact. Damage processes are modelled at a building component level, utilising engineering models where possible. The modelling approach is presented in general terms, which should be applicable to a large variety of building types. The paper illustrates the implementation of the approach for a 2-storey masonry building. Results are presented in terms of a parameter study for several building parameters and hazard characteristics, as well as, in terms of a comparison with damage data and literature vulnerability models. The parameter study indicates that hazard characteristics and building characteristics impact damage ratios as expected. Furthermore,
the results are comparable to vulnerability models in literature. Strengths and shortcomings of the model are discussed. The modelling approach is considered as a step towards the establishment of vulnerability models that can serve as a basis for engineering decision-making for flood risk management for residential buildings.

**General information**

State: Published  
Organisations: Department of Civil Engineering, Kyoto University  
Authors: Custer, R. (Intern), Nishijima, K. (Ekstern)  
Number of pages: 36  
Pages: 461-496  
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Fracture Mechanics Prediction of Fatigue Life of Aluminum Highway Bridges

Fracture mechanics prediction of the fatigue life of aluminum highway bridges under random loading is studied. The fatigue life of welded joints has been determined from fracture mechanics analyses and the results obtained have been compared with results from experimental investigations. The fatigue life of welded plate specimens has been investigated. Both the fracture mechanics analyses and the fatigue tests have been carried out using load histories, which correspond to one week's traffic loading, determined by means of strain gauge measurements on the deck structure of the Farø Bridges in Denmark. The results obtained from the fracture mechanics analyses show a significant difference between constant amplitude and variable amplitude results. Both the fracture mechanics analyses and the results of the fatigue tests carried out indicate that Miner's rule, which is normally used in the design against fatigue in aluminum bridges, may give results which are unconservative. Furthermore, it was in both investigations found that the validity of the results obtained from Miner's rule will depend on the distribution of the load history in tension and compression.

Fretting fatigue behavior of high-strength steel monostrands under bending load

In this paper, the fretting fatigue behavior of pretensioned high-strength steel monostrands is investigated. To measure the local deformations on the strands, a novel method based on the digital image correlation (DIC) technique was used to quantify the relative movement between individual wires along the length of the monostrand. Information about the monostrand bending stiffness and the extent of relative displacement between core and outer wires of a monostrand undergoing flexural deformations is provided. From the series of dynamic fatigue tests, a fretting fatigue spectrum is derived and compared with the localized bending fatigue spectrum. The presented spectra can be used for the estimation of monostrand bending fatigue life. The results presented herein form the basis for the development of a fretting failure criterion for monostrand cables experiencing transverse displacements and are of special interest for the fatigue analysis of modern stay cable assemblies where fretting constitutes a major mechanism of the fatigue life reduction.
Fri grundforskning skaber tekniske revolutioner

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Authors: Meyer, N. I. (Intern)
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Full Scale Measurements and CFD Simulations of Diffuse Ceiling Inlet for Ventilation and Cooling of Densely Occupied Rooms

Spaces with high occupant densities result in high heat gains and need for relatively high air change rate. By means of traditional mechanical ventilation diffusers it becomes a challenge to supply large amounts of fresh air into the space without creating a local discomfort for occupants. One solution to this problem is use of a diffuse ceiling inlet supplying a fresh air into the room through a large area of perforated ceiling. The aim of this paper was to report the research conducted on diffuse ceiling inlet installed in the fullscale test outdoor facility. The diffuse ceiling inlet based on gypsum boards with airtight connections was created utilizing the full potential of diffuse layer without undesirable crack flow reported by other authors. The measured values were used to validate the detailed Large Eddy Simulation model of testroom created in CFD software with aim to evaluate an indoor comfort numerically. Results of our investigations have shown that diffuse ceiling inlet is a suitable solution for the spaces with high density occupancy. The results have shown that transient calculations using Large Eddy Simulation models can predict well temperatures and velocity magnitude of air flow in the room.
Full-scale test of an old heritage multi-storey building undergoing energy retrofitting with focus on internal insulation and moisture

The hypothesis investigated in this article is: it is possible to carry out moisture safe energy renovations in the old existing multi-storey buildings with heritage value and still save 50% of the building's energy consumption by use of existing technologies. A holistic energy renovation on an old multi-storey building with heritage value was carried out. Focus was given to energy-saving measures that would preserve the original architectural expression of the building, such as internal insulation. Comprehensive measurements were performed on the energy consumption before and after the renovation to document the obtained savings. Numerical simulations were validated with the measurements in order to explain the savings and to carry out parameter variations on the energy saving measures. Since internal insulation was applied the durability and robustness were investigated and measurements of the temperature and relative humidity were performed in the wooden beams-ends embedded in the masonry brick wall. A solution where the insulation was stopped 200mm above the floor was investigated. This increased the heat flows through the wall compared to a fully insulated wall, and calculations showed that the difference in the space heating consumption was 3kWh/m2/yr. The measurements showed the proposed solution should have no risk of moisture problems. The measured energy consumption was reduced with 47% whereas the theoretical reduction could be reduced with 39-61% depending on the room set-point temperature (20-24°C).
Further developments of a poultice for electrochemical desalinization of porous building materials: minimization of side effects

Salt induced deterioration of buildings is a frequently present problem and is in connection with traditional buildings a source for increased maintenance and costs. Especially in connection with Cultural Heritage (e.g. murals) even surface deterioration of original materials is unacceptable and should be avoided. Previously, an electrochemical method has been adapted and optimized for desalinization of brick masonry and a high efficiency was obtained. Unfortunately, an accelerated weathering was seen among others in shape of crumbling of mortar below the cathode poultice and further developments were needed. The present paper reports further development of the cathode poultice from a single layer to a three layered poultice. The three layered poultice neutralized the produced hydroxides at the cathode and ensured precipitation of the buffering agent within the cathode poultice and still a high desalination was maintained. Possible side effects were examined with SEM-EDX, water saturation coefficient, saturation coefficient, open porosity, water and acid soluble calcium content, pH and electrical conductivity. © 2014 RILEM.
Buffering agent, Desalination, Electromigration, Layered cathode poultice, PH stability, Precipitation

Generalized Block Failure.
Block tearing is considered in several codes as a pure block tension or a pure block shear failure mechanism. However in many situations the load acts eccentrically and involves the transfer of a substantial moment in combination with the shear force and perhaps a normal force. A literature study shows that no readily available tests with a well-defined substantial eccentricity have been performed. This paper presents theoretical and experimental work leading towards generalized block failure capacity methods. Simple combination of normal force, shear force and moment stress distributions along yield lines around the block leads to simple interaction formulas similar to other interaction formulas in the codes.

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Authors: Jönsson, J. (Intern)
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Health effects of fine particulate matter in life cycle impact assessment: findings from the Basel Guidance Workshop

Purpose Fine particulate matter (PM$_{2.5}$) is considered to be one of the most important environmental factors contributing to the global human disease burden. However, due to the lack of broad consensus and harmonization in the life cycle assessment (LCA) community, there is no clear guidance on how to consistently include health effects from PM$_{2.5}$ exposure in LCA practice. As a consequence, different models are currently used to assess life cycle impacts for PM$_{2.5}$, sometimes leading to inconsistent results. In a global effort initiated by the United Nations Environment Programme (UNEP)/Society for Environmental Toxicology and Chemistry (SETAC) Life Cycle Initiative, respiratory inorganics’ impacts expressed as health effects from PM$_{2.5}$ exposure were selected as one of the initial impact categories to undergo review with the goal of providing global guidance for implementation in life cycle impact assessment (LCIA). The goal of this paper is to summarize the current knowledge and practice for assessing health effects from PM$_{2.5}$ exposure and to provide recommendations for their consistent integration into LCIA. Methods A task force on human health impacts was convened to build the framework for consistently quantifying health effects from PM$_{2.5}$ exposure and for recommending PM$_{2.5}$ characterization factors. In an initial Guidance Workshop, existing literature was reviewed and input from a broad range of internationally recognized experts was obtained and discussed. Workshop objectives were to identify the main scientific questions and challenges for quantifying health effects from PM$_{2.5}$ exposure and to provide initial guidance to the impact quantification process. Results and discussion A set of 10 recommendations was developed addressing (a) the general framework for assessing PM$_{2.5}$-related health effects, (b) approaches and data to estimate human exposure to PM$_{2.5}$ using intake fractions, and (c) approaches and data to characterize exposure-response functions (ERFs) for PM$_{2.5}$ and to quantify severity of the diseases attributed to PM$_{2.5}$ exposure. Despite these advances, a number of complex issues, such as those related to non-linearity of the ERF and the possible need to provide different ERFs for use in different geographical regions, require further analysis. Conclusions and outlook Questions of how to refine and improve the overall framework were analyzed. Data and models were proposed for harmonizing various elements of the health impact pathways for PM$_{2.5}$. Within the next two years, our goal is to build a global guidance framework and to determine characterization factors that are more reliable for incorporating the health effects from exposure to PM2.5 into LCIA. Ideally, this will allow quantification of the impacts of both indoor and outdoor exposures to PM$_{2.5}$. 

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Hierarchical Modelling of Flood Risk for Engineering Decision Analysis

Societies around the world are faced with flood risk, prompting authorities and decision makers to manage risk to protect population and assets. With climate change, urbanisation and population growth, flood risk changes constantly, requiring flood risk management strategies that are flexible and robust. Traditional risk management solutions, e.g. dike construction, are not particularly flexible, as they are difficult to adapt to changing risk. Conversely, the recent concept of integrated flood risk management, entailing a combination of several structural and non-structural risk management measures, allows identifying flexible and robust flood risk management strategies. Based on it, this thesis investigates hierarchical flood protection systems, which encompass two, or more, hierarchically integrated flood protection structures on different spatial scales (e.g. dikes, local flood barriers and dry-proofed buildings), which jointly reduce risk. Hierarchical flood protection systems offer several advantages compared to single-structure flood protection systems, since they can be precision tailored to fit risk reduction requirements and allow for flexible adaption of the protection system to changing flood risk.

In the presence of flood protection structures, flood development depends on the state of all protection structures in the
system. As such, hazard is a function not only of rainfall and river discharge, but also of protection structures’ fragility. A methodology for flood risk analysis and decision analysis for hierarchical flood protection systems is proposed, which allows for joint consideration of hazard models and fragility models of protection structures. In the implementation of the flood risk analysis methodology several challenges are identified, two of which are addressed in the present thesis. First, design and optimisation of a hierarchical flood protection system generally entails decisions about structures at different spatial scales, which, in turn, may require risk assessment at different spatial resolutions and levels of detail. Consistent risk modelling at different spatial scales may therefore require up- and downscaling of data and models under due consideration of uncertainties and dependencies. In this thesis, a methodology is proposed for spatially disaggregating an aggregated building portfolio considering disaggregation uncertainty and spatial correlation. The methodology is applied to the disaggregation of portfolios of buildings in two communes in Switzerland. The relevance of disaggregation uncertainty to natural hazard risk assessment is illustrated with a simple flood risk assessment example.

A second challenge - fragility and vulnerability modelling of all protection structures in the hierarchical flood protection system - is identified. To optimise the design of protection structures, fragility and vulnerability models must allow for consideration of decision alternatives. While such vulnerability models are available for large protection structures (e.g. dikes), engineering vulnerability models that allow considering the impact of flood proofing measures on residential building vulnerability seem to be lacking. Thus, a flood vulnerability modelling approach for residential buildings is proposed, which allows for detailed building and hazard characterisation and models damages though explicit consideration of damage processes. The modelling approach allows for describing the impact of flood proofing measures on building vulnerability and can be utilised as a basis for decision analysis. The concept and usefulness of hierarchical flood protection systems, as well as the implementation of the flood risk analysis methodology and the vulnerability modelling approach are illustrated with an example application.

In summary, the present thesis provides a characterisation of hierarchical flood protection systems as well as several methodologies to model such systems. It aims at increasing understanding of hierarchical flood protection systems and provides modelling approaches to facilitate further research and the implementation of hierarchical flood protection systems in practice.

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**Homogeneity and Strength of Mortar Joints in Pearl-Chain Bridges**
The load carrying mortar joints in Pearl-Chain Bridges are cast vertically which means that they have a placing depth of up to 2.40 m. In the present paper, the feasibility of casting 2.40 m high homogeneous vertical mortar joints is examined. Three high-strength, expansive, self-compacting, ready-to-mix mortar products are tested. To the authors’ knowledge, no previous published work has documented the homogeneity and properties of mortar joints of such a height. Hence, the present study documents a practical test procedure where the homogeneity of three mortar joints measuring 20 x 220 x 2400 mm has been tested and compared by measuring compressive strength, variation in rebound value, variation in density, and separation. In addition, the appearance of the surface texture has been visually assessed. The measurements indicate that, for all three mortars tested, it is possible to cast homogeneous 2.40 m high mortar joints. Moreover, the strength of the three mortars meets the requirements for the Pearl-Chain Bridge application. However, when inspected two of the mortars had many surface air bubbles which is a serious concern regarding durability of the mortar joints.

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Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark
Authors: Lund, M. S. M. (Intern), Arvidsson, M. (Ekstern), Hansen, K. K. (Intern)
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Horizontal temperature distribution in a plus-energy house: cooling season measurements
The present study is concerned with the air and operative temperatures at different locations in a detached, one-story, single family, plus-energy house. The house was located in Denmark and it has been used as a full-scale experimental facility with heated dummies to simulate occupants living in the house. The house had gone through a year-round measurement campaign from October 2013 to October 2014, where various physical parameters were measured. This study focuses on the cooling season (May to September 2014, both months included). The house was cooled by means of floor cooling (a dry radiant system) and was ventilated with a mechanical ventilation system (heat recovery on ventilation). Inside the house, there was a single space combining kitchen, living room and bedroom areas. The thermal comfort of the occupant(s) in this space could differ based on the location of the occupant, and control of indoor environment in this single space could be challenging. The measurement of horizontal temperature distribution could address these issues and provide a means of improvement, if necessary. The measurements showed that a uniform thermal indoor environment was achieved inside the house. The average operative temperature difference between the reference point (in the occupied zone) and other measurement points was 0.2 °C (0.4 °F) and the highest temperature difference compared to the reference point was 1.6 °C (2.9 °F) during the measurement period. It was observed that a thermostat on the East Wall would follow the temperature changes in the occupied zone closely and, thus, would provide a good indication of the thermal indoor environment to the control system.

Human body micro-environment: The benefits of controlling airflow interaction
This paper focuses on the micro-environment around a human body, and especially on its interaction with the surrounding environment. Research on the free convection flow generated by a human body (including the convective boundary layer around the body and the thermal plume above the body), its interaction with external invading flows and the resulting heat- and mass transfer, all of which are important for thermal comfort and inhaled air quality, is discussed. The benefit arising from control of the airflow interaction in the micro-environment, in terms of thermal comfort and inhaled air quality, is demonstrated by several methods that are applicable in practice.
Body heat and mass exchange, Control of airflow interactions, Human micro-environment, Thermal comfort and inhaled air quality

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Human convection flow in spaces with and without ventilation: personal exposure to floor-released particles and cough-released droplets

The effects of the human convective boundary layer (CBL), room airflow patterns, and their velocities on personal exposure are examined. Two pollutants are studied which simulate particles released from the feet and generated at distances of 2 and 3 m by a human cough. A thermal manikin whose body shape, size, and surface temperatures correspond to those of an average person is used to simulate the CBL. The findings of the study reveal that for accurate predictions of personal exposure, the CBL needs to be considered, as it can transport the pollution around the human body. The best way to control and reduce personal exposure when the pollution originates at the feet is to employ transverse flow from in front and from the side, relative to the exposed occupant. The flow from the above opposing the CBL create the most unfavorable velocity field that can increase personal exposure by 85%, which demonstrates a nonlinear dependence between the supplied flow rate and personal exposure. In the current ventilation design, it is commonly accepted that an increased amount of air supplied to the rooms reduces the exposure. The results of this study suggest that the understanding of air patterns should be prioritized.

General information
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Authors: Licina, D. (Intern), Melikov, A. K. (Intern), Pantelic, J. (Ekstern), Sekhar, C. (Ekstern), Tham, K. W. (Ekstern)
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People spend most of their time indoors and they are constantly exposed to pollution that affects their health, comfort and productivity. Due to strong economic and environmental pressures to reduce building energy consumption, low air velocity design is gaining popularity; hence buoyancy flows generated by heat sources are gaining more prominent influence in space airflow formation and on the indoor environment overall. In such spaces with low air supply velocity, air mixing is minimized and the pollution emitted from localized indoor sources is non-uniformly distributed. The large spatial differences in pollution concentration mean that personal exposure, rather than average space concentration, determines the risk of elevated exposure. Current room air distribution design practice does not take into account the air movement induced by the thermal flows from occupants, which often results in inaccurate exposure prediction. This highlights the importance of a detailed understanding of the complex air movements that take place in the vicinity of the human body and their impact on personal exposure.

The two objectives of the present work are: (i) to examine the extent to which the room air temperature, ventilation flow, body posture, clothing insulation/design, table positioning and chair design affect the airflow characteristics (velocity, turbulence and temperature) around the human body; and (ii) to examine the pollution distribution within the human convective boundary layer (CBL) and personal exposure to gaseous and particulate pollutants as a function of the factors that influence the human CBL, and of different locations of the pollution sources. In this work, the empirical results were obtained primarily by using a thermal manikin to simulate a human in the indoor environment.

In spaces with low air mixing, an increase of the ambient temperature from 20 to 26 °C widened the CBL flow in front of a seated manikin, but did not influence the shape of the CBL in front of a standing manikin. The same temperature increase caused a reduction of the peak velocity from 0.24 to 0.16 m/s in front of the seated manikin. Dressing the nude manikin in a thin-tight clothing ensemble reduced the peak velocity in the breathing zone by 17%, and by 40% for a thick-loose ensemble. A lack of hair on the head increased the peak velocity from 0.17 to 0.187 m/s. Apart from their thermal insulation, clothing and chair design had a minor influence on the velocity profile beyond 5 cm distance from the body. Closing the gap between the table and the manikin reduced the peak velocity from 0.17 to 0.111 m/s. At a room air temperature of 23 °C, with the manikin leaning backwards the peak velocity was 0.185 m/s, which is 45% above the case with the manikin leaning forward.

The direction and magnitude of the surrounding airflows considerably influence the airflow distribution around the human body. Downward flow with a velocity of 0.175 m/s at a room air temperature of 23 °C did not influence the convective flow in the breathing zone, while the flow at 0.30 m/s affected the CBL at the nose level, reducing the peak velocity from 0.185 to 0.10 m/s. In order to completely break away the human CBL, downward flow had to be supplied with a velocity of 0.425 m/s. Transverse horizontal flow disturbed the CBL at the breathing zone even at 0.175 m/s. With a seated manikin exposed to airflow from below with a velocity of 0.30 and 0.425 m/s assisting the CBL, the peak velocity in the breathing zone was reduced and the flow pattern around the body was affected, compared to the assisting flow of 0.175 m/s or quiescent conditions. In this case, the airflow interaction was strongly affected by the presence of the chair. The results also show that Particle Image Velocimetry (PIV) and Pseudo Color Visualization (PCV) techniques can be adequately employed for the human CBL investigation.
The results show that reducing the room air temperature from 23 to 20 °C increased the fluctuations of air temperature close to the surface of the body. Large standard deviation of air temperature fluctuations, up to 1.2 °C, was measured in the region of the chest, and up to 2.9 °C when the exhalation was applied. Leaning the manikin backwards increased the air temperature and standard deviation of air temperature fluctuations in the breathing zone, while a forward body inclination had the opposite effect. Exhalation through the mouth created a steady temperature drop with increasing distance from the mouth, without disturbing conditions in the region of the chest. Exhalation through the nose did not affect the air temperature in front of the chest due to the physics of the jets flow from the nose. Only very small discrepancies between the results obtained with the breathing thermal manikin and a real human subject were found. This suggests that the thermal manikin can be used for accurate measurements of an occupant’s thermal microenvironment.

The results also suggest that a detailed understanding of the distribution of pollutants in the vicinity of a human body is essential for understanding exposure in spaces with low air mixing. The pollution source location had a considerable influence on the pollution concentrations measured in the breathing zone and on the extent to which the pollution spread to the surroundings. The highest breathing zone concentrations were measured when the pollution source was located at the chest, while there was negligible exposure to any pollution emitted from the upper back or behind the chair. Based on the results obtained in a single plane, it was shown that a decrease in personal exposure to pollutants released from or around the human body increased the extent to which the pollution spread to the surroundings. Reduced room air temperature and backward body inclination both intensified the transport of pollution to the breathing zone and increased personal exposure. The front edge of a table positioned at zero distance from the human body reduced pollution/clean air transport to the breathing zone, but when it was positioned 10 cm from the body it increased the transport of pollution/clean air from beneath.

For accurate predictions of personal exposure, the characteristics of the CBL must be considered, as it can transport pollution around the human body. The best way to control and reduce personal exposure when the pollution originates at the feet is to employ transverse flow from in front and from the side, relative to the exposed occupant. Airflows from above opposing the CBL and from behind transverse to the CBL, create the most unfavourable velocity field that exhibits a non-linear dependence between the supply airflow rate and personal exposure. Without a better understanding of the airflow patterns in a room the ventilation rate may therefore be increased in vain.

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Hunting and fishing settlements in Upernavik district of Northern Greenland: challenged by climate, centralization and globalization

Inuit in the Upernavik district of Northern Greenland has in generations used the winter sea ice as the basis for the essential hunting of seals, white- and narwhales. Since the late 1980’ies hunting has been combined with increasing fishery of Greenland halibut during summer from dinghies and in the winter from the sea ice serving the subsistence of 400 families.

These living conditions are now under heavy pressures from a set of interacting rapid changes in the natural environment and socio-economic institutions resulting from climate changes, modernization and globalization, where the Greenlandic government intent to allocate a larger part of the halibut quota to larger vessels not located in the district and at the same time reduce quota for dinghy and dog sledge based fishing due to limited or even misleading data of the local subsistence and money economy.
Hygrothermal evaluation of a museum storage building based on actual measurements and simulations

Museum storage buildings should be able to provide a considerable stable indoor environment in terms of temperature and relative humidity (RH). To obtain such stable conditions with the lowest possible energy consumption, passive air conditioning is one-way solution. In this paper, indoor environment facilities of a passive museum storage building in Vejle region in Denmark, are investigated. Results demonstrate that the weather conditions of the previous year significantly affect the indoor environment of the storage. What is more, concentrated dehumidification is a sufficient technique to maintain RH within acceptable levels. Therefore, renewable energy such us excess wind energy during the night can be utilized. [All rights reserved Elsevier].
IEA EBC Annex 59 - Possibilities, limitations and capacities of indoor terminal units

Indoor terminal units can be defined as the building elements that use different heat transfer mechanisms and media to emit and remove heat or moisture from indoor spaces (e.g., hydronic radiant heating and cooling systems, fan-coil units,
active beams. Indoor temperature and humidity fields depend on the chosen terminal units. Terminal units differ in their capabilities of addressing sensible and latent loads, methods of heat emission or removal, maximum heating and cooling capacities, medium of energy distribution, and local or total volume conditioning. In the present study, operation characteristics, possibilities and limitations of different terminal units were specified. Considered terminal units were radiant heating and cooling systems, all-air systems (mixing, displacement, and personalized ventilation), passive and active beams. The results were summarized in a table, which aims at providing a reference for terminal unit selection during the design phases of HVAC systems.

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Impact of Cabin Ozone Concentrations on Passenger Reported Symptoms in Commercial Aircraft
Due to elevated ozone concentrations at high altitudes, the adverse effect of ozone on air quality, human perception and health may be more pronounced in aircraft cabins. The association between ozone and passenger-reported symptoms has not been investigated under real conditions since smoking was banned on aircraft and ozone converters became more common. Indoor environmental parameters were measured at cruising altitude on 83 US domestic and international flights. Passengers completed a questionnaire about symptoms and satisfaction with the indoor air quality. Average ozone concentrations were relatively low (median: 9.5 ppb). On thirteen flights (16%) ozone levels exceeded 60 ppb, while the highest peak level reached 256 ppb for a single flight. The most commonly reported symptoms were dry mouth or lips
(26%), dry eyes (22.1%) and nasal stuffiness (18.9%). 46% of passengers reported at least one symptom related to the eyes or mouth. A third of the passengers reported at least one upper respiratory symptom. Using multivariate logistic (individual symptoms) and linear (aggregated continuous symptom variables) regression, ozone was consistently associated with symptoms related to the eyes and certain upper respiratory endpoints. A concentration-response relationship was observed for nasal stuffiness and eye and upper respiratory symptom indicators. Average ozone levels, as opposed to peak concentrations, exhibited slightly weaker associations. Medium and long duration flights were significantly associated with more symptoms compared to short flights. The relationship between ultrafine particles and ozone on flights without meal service was indicative of ozone-initiated chemistry.
Impact of cold temperatures on the shear strength of Norway spruce joints glued with different adhesives

As wood construction increasingly uses engineered wood products worldwide, concerns arise about the integrity of the wood and adhesives used. Bondline strength is a crucial issue for engineered wood applications, especially in cold climates. In this study, Norway spruce (Picea abies) joints (150 mm × 20 mm × 10 mm) were bonded with seven commercially available adhesives: polyurethane (PUR), polyvinyl acetate (PVAc), emulsion-polymer-isocyanate (EPI), melamine-formaldehyde (MF), phenol-resorcinol-formaldehyde (PRF), melamine-urea-formaldehyde1 (MUF1), and melamine-urea-formaldehyde2 (MUF2). Each adhesive was tested at six temperatures: 20, −20, −30, −40, −50 and −60 °C. Generally, within the temperature test range, temperature changes significantly affected the shear strength of solid wood and wood joints. As the temperature decreased, the shear strength decreased. PUR adhesive in most cases resulted in the strongest shear strength and MUF adhesive resulted in the weakest. MF and PRF adhesives responded to temperature changes in a similar manner to that of the PUR adhesive. The shear strengths of wood joints with PVAc and EPI adhesives were more sensitive to temperature change. At low temperatures, the variability of shear strengths increased with all adhesives. Percent wood failures of joints bonded with different adhesives in most cases were not sensitive to temperature changes.
Impact of façade window design on energy, daylighting and thermal comfort in nearly zero-energy houses

Appropriate window solutions are decisive for the design of ‘nearly zero-energy’ buildings with healthy and comfortable indoor environment. This paper focuses on the relationship between size, orientation and glazing properties of façade windows for different side-lit room geometries in Danish ‘nearly zero-energy’ houses. The effect of these parameters on space heating demand, daylighting and thermal environment is evaluated by means of EnergyPlus and DAYSIM and presented in charts illustrating how combinations of design parameters with minimum space heating demand can be selected within a solution space defined by targets for daylighting and thermal comfort. In contrast with existing guidelines, the results show an upper limit for energy savings and utilisation of solar gains in south-oriented rooms. Instead, low U-values are needed in both north- and south oriented rooms before large window areas lead to reductions in space heating demand. Furthermore, windows in south-oriented rooms have to be carefully designed to prevent overheating. Design options for prevention of overheating, however, correspond well with options for low space heating demand. Glazings with solar control coating are therefore obvious alternatives to dynamic solar shadings. Regarding room geometry, deep or narrow south-oriented rooms show difficulties in reaching sufficient daylight levels without overheating.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy
Authors: Vanhoutteghem, L. (Intern), Skarning, G. C. J. (Intern), Hviid, C. A. (Intern), Svendsen, S. (Intern)
Number of pages: 8
Pages: 149-156
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy and Buildings
Volume: 102
Importance of the slick thickness for effective in-situ burning of crude oil

In order to improve the potential of in-situ burning (ISB), the importance of the oil slick thickness on two pure oils (n-octane and dodecane) and two fresh crude oils (Grane and REBCO) was studied in relation to the regression rate, boilover tendency, mass loss rate, burning efficiency and flame height. The experiments were performed in a new experimental apparatus, the Crude Oil Flammability Apparatus (COFA), which has been developed to study ISB of oil on water in a controlled laboratory environment with large water-to-oil ratios. The regression rate, average mass loss rate and burning efficiency reached a constant maximum value for all oils at slick thicknesses exceeding 10–20 mm. For thinner initial slick thicknesses, these values were greatly reduced, most likely due to heat losses to the water. A further increase in the initial slick thickness could not improve the burning efficiency above 75% for the crude oils, showing that it only has a limited effect on the burning efficiency as higher burning efficiencies have been reported for larger scales. Furthermore, the results showed that the burning mechanisms differ for pure and crude oil, indicating that the hydrocarbon mixture in crude oils changes as the burning progresses. This observation merits further research.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design, Technical University of Denmark, Aarhus University, Worcester Polytechnic Institute
Authors: van Gelderen, L. (Intern), Brogaard, N. L. (Ekstern), Sørensen, M. X. (Ekstern), Fritt-Rasmussen, J. (Ekstern), Rangwala, A. S. (Ekstern), Jomaas, G. (Intern)
Pages: 1-9
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Fire Safety Journal
Volume: 78
ISSN (Print): 0379-7112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.03 SJR 0.932 SNIP 1.627
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.887 SNIP 1.518 CiteScore 1.69
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.904 SNIP 1.937 CiteScore 1.49
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.878 SNIP 2.845 CiteScore 2.05
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.986 SNIP 2.707 CiteScore 2.21
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.224 SNIP 2.712 CiteScore 2.47
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.963 SNIP 1.612
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.806 SNIP 2.137
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.627 SNIP 1.617
Scopus rating (2007): SJR 0.53 SNIP 1.629
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.781 SNIP 2.278
Scopus rating (2005): SJR 0.986 SNIP 1.917
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.479 SNIP 1.837
Scopus rating (2003): SJR 0.781 SNIP 1.059
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.69 SNIP 1.295
Scopus rating (2001): SJR 0.954 SNIP 1.077
Scopus rating (2000): SJR 0.685 SNIP 1.064
Scopus rating (1999): SJR 0.577 SNIP 1.163
Original language: English
In-situ burning, Oil slick thickness, Mass loss, Burning efficiency
Electronic versions:
DOIs:
10.1016/j.firesaf.2015.07.005
Publication: Research - peer-review › Journal article – Annual report year: 2015

Incorporating waste materials in the production of Greenlandic bricks

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology
Authors: Belmonte, L. J. (Intern)
Publication date: 2015
Event:
Main Research Area: Technical/natural sciences
Electronic versions:
Abstracts_juni_2014.pdf

Relations
Activities:
Dansk Keramisk selskab temamøde: Fra Affald til ressource
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2015

Indeklimaet i danske skoler er fortsat udfordret

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Toftum, J. (Intern), Clausen, G. (Intern)
Publication date: 2015
Pages: 18-20
Main Research Area: Technical/natural sciences

Publication information
Journal: H V A C Magasinet
Volume: 51
Issue number: 2
ISSN (Print): 1603-6913
Ratings:
Indlæg om BIM i et internationalt perspektiv

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Karlshøj, J. (Intern)
Number of pages: 14
Publication date: 2015

Publication information
Media of output: PowerPoint
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions: BimInternationaltPerspektiv.pdf

Relations
Activities:
BIM som produktionsværktøj
Publication: Research › Sound/Visual production (digital) – Annual report year: 2015

Indoor air quality in passive and conventional new houses in Sweden
The indoor environment was evaluated in 20 new passive houses and 21 new conventionally built houses during the 2012/2013 and 2013/2014 heating seasons. Temperature, relative humidity (RH), the concentrations of NO₂, ozone, formaldehyde, volatile organic compounds (VOC) and viable microbiological flora were measured. Air exchange rates (AER) were estimated from the CO₂ concentrations measured in the bedrooms. The median AER was slightly higher in the passive houses than in the conventional ones (0.68h⁻¹ vs. 0.60h⁻¹). The median concentrations in the passive and the conventional buildings were 10 and 12µg/m³ for NO₂, 9.7 and 11µg/m³ for ozone, 11 and 16µg/m³ for formaldehyde, and 270 and 150µg/m³ for TVOC, respectively. Significant differences in the TVOC and formaldehyde concentrations between the two groups of buildings indicated substantial sources of TVOC present in the passive houses, while sources of formaldehyde may have been more pronounced in the conventional houses. In contrast to the passive houses, the indoor microbiological flora indicated possible mould or moisture problems in six (29%) of the conventionally built houses. When compared with the results previously reported for the Swedish housing stock, AERs and NO₂ concentrations were significantly higher in both groups of newly built buildings, while formaldehyde concentrations were significantly lower in the passive houses. TVOC concentrations were not significantly different from those reported for the housing stock, although the most abundant individual VOCs were present mostly at higher concentrations in the new buildings.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, University of Gothenburg, Swedish Environmental Research Institute, Chalmers University of Technology
Authors: Langer, S. (Ekstern), Bekö, G. (Intern), Bloom, E. (Ekstern), Widheden, A. (Ekstern), Ekberg, L. (Ekstern)
Pages: 92-100
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Building and Environment
Volume: 93
ISSN (Print): 0360-1323
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Air exchange rate, Energy efficient houses, Formaldehyde, Indoor air quality, NO2, VOC

DOIs:
10.1016/j.buildenv.2015.02.004

Source: FindIt
Source-ID: 274234137
Publication: Research - peer-review › Journal article – Annual report year: 2015
Indoor environmental input parameters for the design and assessment of energy performance of buildings
The first international standard that dealt with all indoor environmental parameters (thermal comfort, air quality, lighting and acoustic) was published in 2007 as EN 15251. This standard prescribed input parameters for design and assessment of energy performance of buildings and was apart of the set of standards developed to support the implementation of the Energy Performance of Buildings Directive in Europe. The standard has now been revised and issued for public comments with a new number: prEN16798-1.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Environment
Authors: Olesen, B. W. (Intern)
Pages: 17-23
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: REHVA Journal
ISSN (Print): 1307-3729

Indoor environment and energy consumption optimization using field measurements and building energy simulation
Modern buildings are usually equipped with advanced climate conditioning systems to ensure comfort of their occupants. However, analysis of their actual operation usually identifies large potential for improvements with respect to their efficiency. Present study investigated potential for improvements in an existing office building – a Town Hall of Viborg, Denmark. Thorough field measurements of indoor environment and occupant satisfaction survey were conducted to identify and describe indoor environmental quality problems. Collected data were also used to calibrate computer simulation model, which was used for optimization of building’s performance. Proposed optimization scenarios bring 21-37% reduction on heating consumption and thermal comfort improvement by 7-12%. The approach (procedure) can help to optimize building operation and shorten the adjustment period.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Technical University of Denmark
Authors: Christensen, J. E. (Intern), Chasapis, K. (Ekstern), Gazovic, L. (Ekstern), Kolarik, J. (Intern)
Pages: 2118-2123
Publication date: 2015
Conference: 6th International Building Physics Conference (IBPC 2015), Torino, Italy, 14/06/2015 - 14/06/2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Energy Procedia
Volume: 78
ISSN (Print): 1876-6102

Web of Science (2014): Indexed yes
Scopus rating (2014): SJR 0.433 SNIP 0.81 CiteScore 1.09
Inelastic spectra to predict period elongation of structures under earthquake loading

Period lengthening, exhibited by structures when subjected to strong ground motions, constitutes an implicit proxy of structural inelasticity and associated damage. However, the reliable prediction of the inelastic period is tedious and a multi-parametric task, which is related to both epistemic and aleatory uncertainty. Along these lines, the objective of this paper is to investigate and quantify the elongated fundamental period of reinforced concrete structures using inelastic response spectra defined on the basis of the period shift ratio \( (T_{in}/T_{el}) \). Nonlinear oscillators of varying yield strength (expressed by the force reduction factor, \( R_y \)), post-yield stiffness (\( a_y \)) and hysteretic laws are examined for a large number of strong motions. Constant-strength, inelastic spectra in terms of \( T_{in}/T_{el} \) are calculated to assess the extent of period elongation for various levels of structural inelasticity. Moreover, the influence that structural characteristics (\( R_y \), \( a_y \) and degrading level) and strong-motion parameters (epicentral distance, frequency content and duration) exert on period lengthening are studied. Determined by regression analyses of the data obtained, simplified equations are proposed for period lengthening as a function of \( R_y \) and \( T_{el} \). These equations may be used in the framework of the earthquake record selection and scaling.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Aristotle University of Thessaloniki
Authors: Katsanos, E. (Intern), Sextos, A. (Ekstern)
Pages: 1765-1782
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Earthquake Engineering and Structural Dynamics
ISSN (Print): 0098-8847
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.91 SJR 2.293 SNIP 2.265
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.771 SNIP 2.824 CiteScore 3.08
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.046 SNIP 2.99 CiteScore 3.25
Influence of Basalt FRP Mesh Reinforcement on High-Performance Concrete Thin Plates at High Temperatures

A basalt fiber–reinforced polymer (BFRP) mesh was introduced as reinforcement in high-performance concrete (HPC) thin plates (20–30 mm) for implementation in precast sandwich panels. An experimental program studied the BFRP mesh influence on HPC exposed to high temperature. A set of standard furnace tests compared performances of HPC with and without BFRP mesh, assessing material behavior; another set including polypropylene (PP) fibers to avoid spalling compared the performance of BFRP mesh reinforcement to that of regular steel reinforcement, assessing mechanical properties. Stereomicroscope observations before and after fire testing focused on the interface between HPC and BFRP mesh and its change with temperature exposure. BFRP mesh showed tendency to reduce the probability of HPC spalling without solving this issue. BFRP mesh alone leads to mechanical failure of concrete elements, requiring the use of steel. Microscope observations highlighted degradation of the HPC-BFRP mesh interface with temperature due to the melting polymer matrix of the mesh. These observations call for caution when using fiber-reinforced polymer (FRP) reinforcement in elements exposed to fire hazard.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Section for Building Design, Dansk Brand- og Sikringsteknis Institut
Publication date: 2015
Main Research Area: Technical/natural sciences
Influence of frost damage and sample preconditioning on the porosity characterization of cement based materials using low temperature calorimetry

Low temperature calorimetry (LTC) can be used to study the meso-porosity of cement based materials. The influence of frost damage on the meso-porosity determination by LTC was explored on a model material MCM-41 and two cement pastes by conducting repeated cycles of freezing and melting measurements. The results indicate that the pressure generated during freezing and melting measurements has little impact on the pore structure of the powder MCM-41 samples. As for the studied cylinder samples of cement pastes, frost damage probably took place and it changed the pore connectivity while it had limited effect on changing the interior size distribution of the meso-pores. The analysis of the freezing and melting behavior of the pore liquid of cement based materials is complicated by the presence of ions. The freezing and melting behavior of the pore solution of cement paste samples preconditioned in either a small amount or a big amount of saturated limewater was compared. The results suggest that either the preconditioning in a big amount of limewater does not change the ionic concentration of the pore solution very much or the possible leaching of ions from cement hydrates during the preconditioning has limited influence on the freezing and melting behavior of the pore solution in the studied cement paste samples.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Geotechnics and Geology, Lund University, Norwegian University of Science and Technology
Authors: Wu, M. (Intern), Fridh, K. (Ekstern), Johannesson, B. (Intern), Geiker, M. R. (Ekstern)
Number of pages: 9
Pages: 30-38
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Thermochimica Acta
Volume: 607
ISSN (Print): 0040-6031
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.683 SNIP 1.17 CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.706 SNIP 1.125 CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.916 SNIP 1.489 CiteScore 2.56
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.628 SNIP 1.513 CiteScore 2.33
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.75 SNIP 1.424 CiteScore 2.1
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.588 SNIP 1.286 CiteScore 1.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.572 SNIP 1.246
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.778 SNIP 1.289
In 2012 Køge Boligselskab built 9 building blocks totalling 126 passive house apartments. Their monitored space heating demand (SHD) has been a lot higher than the passive house requirements. The aim of this study was to identify why, and how it relates to indoor environment and occupant behaviour. The SHD and indoor environment was analysed and corrected and by performing a statistical analysis, different parameters’ influence on SHD was determined. By simulating an apartment block, the effect of internal heat transfers between the apartments was determined. Furthermore, simulations were used to evaluate how the SHD was affected by different patterns of occupant behaviour. The monitoring indicated problems with overheating. However, the analysis suggested that the occupants actively chose these high temperatures. Simulations showed that internal heat flows could be up to 11.7 kWh/(m²a) per apartment. Furthermore, the results suggested that the indoor temperatures, weather conditions and occupants’ window opening could explain the higher SHD.

**General information**

**State:** Published

**Organisations:** Department of Civil Engineering, Section for Indoor Climate and Building Physics, Danish Technological Institute, Technical University of Denmark

**Authors:** Skød Søvsø, A. (Ekstern), Peuhkuri, R. (Intern), Andersen, R. K. (Intern)

**Number of pages:** 10

**Publication date:** 2015

**Host publication information**

**Title of host publication:** Proceedings of 7PHN Sustainable Cities and Buildings

**Main Research Area:** Technical/natural sciences

**Conference:** 7PHN Sustainable Cities and Buildings, Copenhagen, Denmark, 20/08/2015 - 20/08/2015

**Space heating demand, Passive houses, Indoor environment, Occupant behaviour**

**Source:** PublicationPreSubmission

**Source-ID:** 119457926

**Publication:** Research - peer-review › Article in proceedings – Annual report year: 2015

**Influence of measurement uncertainty on classification of thermal environment in buildings according to European Standard EN 15251**

European Standard EN 15 251 in its current version does not provide any guidance on how to handle uncertainty of long term measurements of indoor environmental parameters used for classification of buildings. The objective of the study was to analyse the uncertainty for field measurements of operative temperature and evaluate its effect on categorization of thermal environment according to EN 15251. A data-set of field measurements of operative temperature four office buildings situated in Denmark, Italy and Spain was used. Data for each building included approx. one year of continuous measurements of operative temperature at two measuring points (south/south-west and north/northeast orientation).

Results of the present study suggest that measurement uncertainty needs to be considered during assessment of thermal environment in existing buildings. When expanded standard uncertainty was taken into account in categorization of
thermal environment according to EN 15251, the difference in prevalence of exceeded category limits were up to 17.3%, 8.3% and 2% of occupied hours for category I, II and III respectively.

Influence of the properties of granite and sandstone in the desalination process by electrokinetic technique
Soluble salts are considered a main cause of damage of porous building materials such as rocks, bricks or granites, which were commonly used in the building constructions of the architectural and archaeological heritage. Soluble salts are also responsible for various forms of deterioration such as sand disaggregation and superficial detachments. These problems can be solved by conservation technologies, which are aimed to decrease the salt concentration in rocks (desalination). The present study aimed to investigate the efficiency of electrokinetic techniques for desalination of two different kinds of rocks: granite and sandstone. These rocks were contaminated with NaCl solution, and samples with a thickness of 6 cm were used in the tests. This study compared the percentage of salt removal at different depths (efficacy) and the time needed to get the same percentage removal (effectiveness) achieved in both stones. From the results obtained, it was possible to find those inherent factors to each stone which could have an influence on the efficacy of the treatment. With this technique it was possible to reduce the salt concentration in the granite almost to 100%. However, in the sandstone samples the decreases were not equally high, mainly at the intermediate levels where slight enrichments were observed. The results indicate that although the used technique is efficient for salt removal regardless of the porosimetric distribution of the rock, the better interconnection between the pores in the granite samples (favored a faster desalination process).
Integrated smart infrastructures

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy system operation and management, Department of Civil Engineering, Section for Indoor Climate and Building Physics, Zhejiang University
Authors: Østergaard, J. (Intern), Nørgård, P. B. (Intern), Wen, F. (Ekstern), Rode, C. (Intern)
Pages: 15-22
Publication date: 2015
Integrating structural health and condition monitoring: a cost benefit analysis for offshore wind energy

There is a large financial incentive to minimise operations and maintenance (O&M) costs for offshore wind power by optimising the maintenance plan. The integration of condition monitoring (CM) and structural health monitoring (SHM) may help realise this. There is limited work on the integration of both CM and SHM for offshore wind power or the use of imperfectly operating monitoring equipment. In order to investigate this, a dynamic Bayesian network and limit state equations are coupled with Monte Carlo simulations to deteriorate components in a wind farm. The CM system has a ‘deterioration window’ allowing for the possible detection of faults up to 6 months in advance. The SHM system model uses a reduction in the probability of failure factor to account for lower modelling uncertainties. A case study is produced that shows a reduction in operating costs and also a reduction in risk. The lifetime levelised costs are reduced by approximately 6%.

Intelligente Bauwerke: Prototyp zur Ermittlung der Schadens- und Zustandsentwicklung für Elemente des Brückenmodells

This report describes a system model for assessing and updating the condition state and reliability of bridge structures utilizing inspection and monitoring data. The system model was developed on the basis of an existing continuous single-cell prestressed concrete box girder. The system model consists of two integrated sub-models: a condition model for predicting the deterioration state of the box girder and a structural model for evaluating the overall system reliability. To model the stochastic deterioration state of bridge structures, we utilize dynamic Bayesian networks (DBN). DBN are a computational framework suitable for modeling all relevant stochastic deterioration processes and their stochastic dependencies. Bayesian updating of stochastic deterioration models with monitoring and inspections data can be performed robustly and efficiently on the basis of DBN. The DBN framework is therefore ideally suited for developing software for the management of deteriorating structures that can be applied by engineers who are not experts in reliability analysis. We adopt a simplified approach which considers global bending failure of the box girder to determine the system failure probability of an aging box girder. The ultimate capacity of a box girder conditional on a certain system deterioration state is estimated on the basis of plastic hinge theory. System failure occurs if sufficient plastic hinges develop under the applied loads such that a kinematic collapse mechanism of the continuous box girder is formed. This approach accounts for structural redundancies of the continuous box girder with respect to its plastic cross-sectional capacity and its static indeterminacy. To prove the concept, a software prototype has been developed which couples an easy-to-use graphical user interface (front-end) with a computational engine (back-end). The current version of the prototype implements a model of chloride-induced reinforcement corrosion and a structural model which performs the plastic limit analysis for
determining the ultimate capacity of the box girder on the basis of a finite element model. The prototype implements the
likelihood weighting algorithm to perform Bayesian updating of the deterioration state on the basis of the DBN model. The
developed software architecture allows an extension of the software to include further deterioration process. The
developed software prototype provides the functionality for quantifying the effect of inspection and monitoring data on the
condition state and reliability of a single-cell prestressed concrete box girder. It can be applied by engineers who are not
experts in reliability analysis. It can be concluded that the current prototype provides the basis for identifying efficient
inspection and monitoring strategies and optimizing the management of aging structures.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Bundesanstalt für Materialforschung
und Prüfung, Technische Universität München
Authors: Schneider, R. (Ekstern), Fischer, J. (Ekstern), Straub, D. (Ekstern), Thöns, S. (Intern), Bügler, M. (Ekstern),
Bormann, A. (Ekstern)
Number of pages: 74
Publication date: 2015

Publication information
Publisher: Bundesanstalt für Materialforschung und –prüfung
Volume: Heft B 117
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Original language: German

Series: Berichte der Bundesanstalt für Straßenwesen
Main Research Area: Technical/natural sciences
Electronic versions:
BAST_B_117_barrierefreies_ELBA_PDF_1.pdf
Source: PublicationPreSubmission
Source-ID: 118891667
Publication: Research - peer-review › Report – Annual report year: 2015

Introducing a new framework for generic Information Delivery Manuals

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Treldal, N. (Intern), Mondrup, T. F. (Intern), Karlshøj, J. (Intern), Vestergaard, F. (Intern)
Number of pages: 14
Publication date: 2015

Publication information
Media of output: PowerPoint
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
ECPPM_2014_NLST_TFMO_Presentation.pdf

Relations
Activities:
Powerpoint - Introducing a new framework for using generic information delivery manuals
Publication: Research › Sound/Visual production (digital) – Annual report year: 2015

Island Operations in Greenland: Challenged by the Sectorialisation of Infrastructure

General information
State: Published
Organisations: Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Authors: Hendriksen, K. (Intern)
Number of pages: 1
Publication date: 2015
Main Research Area: Technical/natural sciences
Electronic versions:
150810_Abstract_2.pdf
Joint and column behaviour of slotted cold-formed steel studs
Slotted cold-formed steel studs are used in loadbearing external plasterboard walls. The cold-formed steel studs in these walls are supported by and joined to track sections at the top and the bottom. This paper describes the compression testing of the loadbearing studs in order to observe the behaviour of the studs and the track joints. The experiments included a joint design with a special web stiffener used in practice. The studs were C-sections and the tracks were U-sections. Eight different test series were performed. Each test series had different column lengths and thicknesses, both with and without web stiffeners, in order to establish the influence of these on the joint behaviour and loadbearing capacity of the slotted cold-formed steel studs.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Andreassen, M. J. (Intern), Jönsson, J. (Intern)
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Source-ID: 115671338
Publication: Research - peer-review › Journal article – Annual report year: 2015

Joint and column behaviour of slotted cold-formed steel studs
Slotted cold-formed steel studs are used in load bearing external plasterboard walls. The cold-formed steel studs in these walls are supported by and joined to track profiles at the bottom and top level. In this paper the load bearing studs are tested in compression in order to observe the behaviour of the studs and the track joints. The experiments include a joint design with a special web stiffener used in practice. The studs are made of C-profiles and the tracks of U-profiles. Eight different test series are performed. The test series each have different column lengths, thicknesses, and are both with and without web stiffeners to see the influence of these on the joint behaviour and load bearing capacity of the slotted coldformed steel studs.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Andreassen, M. J. (Intern), Jönsson, J. (Intern)
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Publication date: 2015

Host publication information
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Main Research Area: Technical/natural sciences
Electronic versions:
Contribution330.pdf
Source: PublicationPreSubmission
Source-ID: 116742842
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015
Laboratory test of a prototype heat storage module based on stable supercooling of sodium acetate trihydrate

Laboratory test of a long term heat storage module utilizing the principle of stable supercooling of 199.5 kg of sodium acetate water mixture has been carried out. Avoiding phase separation of the incongruently melting salt hydrate by using the extra water principle increased the heat storage capacity. An external expansion vessel minimized the pressure built up in the module while heating and reduced the risk of instable supercooling. The module was stable supercooled at indoor ambient temperature for up to two months after which it was discharged. The energy discharged after activating the supercooled sodium acetate water mixture was 194 kJ/kg of sodium acetate water mixture in the first test cycles dropping to 179 kJ/kg in the later test cycles. Instability of the supercooling occurred when the charging periods were short and in the last test cycles where the tube connecting the module to the expansion vessel had been blocked by the salt hydrate.
Learn from the Masters: Architectural History and History of Technology and Architectural Engineering in Relation to Structural Design Education

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Authors: Jensen, L. B. (Intern)
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 4th International Workshop on Design in Civil and Environmental Engineering
Main Research Area: Technical/natural sciences
Conference: 4th International Workshop on Design in Civil and Environmental Engineering, Taipei, Taiwan, Province of China, 30/10/2015 - 30/10/2015
Source: PublicationPreSubmission
Source-ID: 115644851
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015

Laminar airflow significantly reduced microbial air contamination during simulated total hip arthroplasty surgery in comparison to turbulent airflow

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Odense University Hospital, University Hospital Herlev, Fournais Energi APS, JRV A/S
Authors: Ravn, C. (Ekstern), Overgaard, A. (Ekstern), Knudsen, N. (Ekstern), Olsen, M. (Ekstern), Toftum, J. (Intern), Kemp, M. (Ekstern), Frich, L. (Ekstern), Overgaard, S. (Ekstern)
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 34th Annual Meeting of the European Bone and Joint Infection Society
Article number: 261
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 119503284
Publication: Research - peer-review › Conference article – Annual report year: 2015

Letbetonkonstruktioner

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering
Authors: Goltermann, P. (Intern)
Pages: 345-358
Load calculations of radiant cooling systems for sizing the plant
The aim of this study was, by using a building simulation software, to prove that a radiant cooling system should not be sized based on the maximum cooling load but at a lower value. For that reason six radiant cooling models were simulated with two control principles using 100%, 70% and 50% of the maximum cooling load. It was concluded that all tested systems were able to provide an acceptable thermal environment even when the 50% of the maximum cooling load was used. From all the simulated systems the one that performed the best under both control principles was the ESCS ceiling system. Finally it was proved that ventilation systems should be sized based on the maximum cooling load.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Bourdakis, E. (Intern), Kazanci, O. B. (Intern), Olesen, B. W. (Intern)
Pages: 2639-2644
Publication date: 2015
Conference: 6th International Building Physics Conference (IBPC 2015), Torino, Italy, 14/06/2015 - 14/06/2015
Main Research Area: Technical/natural sciences

Publication information
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.16 SJR 0.467 SNIP 0.586
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.365 SNIP 0.561 CiteScore 0.92
BFI (2014): BFI-level 1
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.425 SNIP 0.785 CiteScore 1.02
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
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Web of Science (2012): Indexed yes
Scopus rating (2011): SJR 0.918 SNIP 1.505 CiteScore 2.42
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.433 SNIP 0.957
Web of Science (2009): Indexed yes
Original language: English
Radiant cooling systems, TABS, ESCS, Thermal environment, Cooling plant, Sizing, High temperature cooling
Electronic versions:
Load_calculations_of_radiant_cooling_systems.pdf
DOIs:
Load carrying capacity of keyed joints reinforced with high strength wire rope loops

Vertical shear connections between precast concrete wall elements are usually made as keyed joints reinforced with overlapping U-bars. The overlapping U-bars form a cylindrical core in which the locking bar is placed and the connection is subsequently grouted with mortar. A more construction friendly shear connection can be obtained by replacing the U-bars with high strength looped wire ropes. The wire ropes have the advantage of being flexible (they have virtually no bending stiffness) which makes installation of wall elements much easier. The looped wire ropes are usually pre-installed in so-called wire boxes which are embedded in the precast wall elements. Once the joint is grouted with mortar, the boxes will function as shear keys and the overlapping wire loops will function as transverse reinforcement that replaces the U-bars.

This paper presents a rigid-plastic upper bound model to determine the shear capacity of wire loop connections. Tests have shown that the shear capacity of such joints – due to the relatively high tensile strength of the wire ropes - is more prone to be governed by fracture of the joint mortar in combination with yielding of the locking bar. To model this type of failure, so-called multi-body mechanisms have to be considered. It is shown that calculations based on multi-body mechanisms lead to results that agree well with experiments.

Load Management in District Heating Operation

Smooth operation of district heating system will avoid installation of expensive peak heat boilers, improve plant partial load performance, increase the system redundancy for further network expansion and improve its resilience to ensure security of supply during severe heating seasons. The peak heating load can be reduced through building demand side management. The building thermal mass can be used to shift the heating supply under the circumstance without jeopardizing the consumer thermal comfort. In this paper, the multi-agent framework is applied to a simplified building dynamic model to regulate the heating supply to a cluster of buildings. The aim is to level out the total heating supply under a reference temperature and meanwhile maintain the consumer thermal comfort.
Two Photovoltaic (PV) modules have been manufactured by Swemodule. One with Sunarc antireflective coated glass and one without glass surface treatment. The modules have been tested at DTU during 16 months under realistic outdoor conditions. Exactly the same polycrystalline cells were used in the modules. No cleaning of the glass has been made except for removal of bird droppings and leaves on single cells that could give a very wrong comparison. The PV modules were mounted due south at 45 degree tilt angle. They were connected to the electric grid with small 250W module inverters from Involar that also realized the MPP tracking to give the maximum output of each module. The electric power output was measured both on the AC and DC side and with different measurement equipment to be sure about the accuracy in improvement. The results indicate a potential long term improvement in a system from 3% up to 6%. The improvement is best in facade and off south tilted orientations, where the better incidence angle modifier, has a larger influence. In the PV application only one side of the glass treatment is active. This reduces the possible improvement compared to solar thermal and greenhouse applications. In PV applications the slightly higher cell temperature, due to the higher transmittance of the glass for all solar wavelengths, reduces the potential electrical performance improvement.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Building Energy, Section for Building Physics and Services, Technical University of Denmark
Authors: Perers, B. (Intern), Furbo, S. (Intern), Han, J. (Intern), Kong, W. (Intern), Stergiakis, S. (Ekstern)
Number of pages: 7
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BFI conference series: International Conference on Solar Heating and Cooling for Buildings and Industry (5020045)
Main Research Area: Technical/natural sciences

**Publication information**

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Long term thermal energy storage with stable supercooled sodium acetate trihydrate

Utilizing stable supercooling of sodium acetate trihydrate makes it possible to store thermal energy partly loss free. This principle makes seasonal heat storage in compact systems possible. To keep high and stable energy content and cycling stability phase separation of the storage material must be avoided. This can be done by the use of the thickening agents carboxymethyl cellulose or xanthan rubber. Stable supercooling requires that the sodium acetate trihydrate is heated to a temperature somewhat higher than the melting temperature of 58 °C before it cools down. As the phase change material melts it expands and will cause a pressure built up in a closed chamber which might compromise stability of the supercooling. This can be avoided by having an air volume above the phase change material connected to an external pressure less expansion tank. Supercooled sodium acetate trihydrate at 20 °C stores up to 230 kJ/kg. TRNSYS simulations of a solar combi system including a storage with four heat storage modules of each 200 kg of sodium acetate trihydrate utilizing stable supercooling achieved a solar fraction of 80% for a low energy house in Danish climatic conditions.

General information
State: Published
Organisations: Department of Civil Engineering, Steensen Varming
Authors: Dannemand, M. (Intern), Schultz, J. M. (Ekstern), Johansen, J. B. (Intern), Furbo, S. (Intern)
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Publication date: 2015
Main Research Area: Technical/natural sciences
Compact seasonal heat storage, Long term thermal energy storage, PCM, Phase change material, Sodium acetate trihydrate, Supercooling

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Publication: Research - peer-review › Journal article – Annual report year: 2015
Lower bound element and submodel for modelling of joints between precast concrete panels
In practice, precast concrete structures are designed using either analytical methods or linear finite element tools, and the in-situ cast joints between the precast panels are assessed using conservative empirical design formulas. This often leads to a suboptimal design, and local mechanisms inside the joint are not taken into account. This paper presents an equilibrium element representing in-situ cast joints and an advanced submodel yield criterion is developed. The element and submodel are verified by comparison to a detailed numerical model as well as experimental results. The computational time and problem size of the joint element and detailed model will be discussed.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, ALECTIA A/S
Authors: Herfelt, M. A. (Intern), Poulsen, P. N. (Intern), Hoang, L. C. (Intern), Jensen, J. F. (Ekstern)
Number of pages: 12
Publication date: 2015

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Title of host publication: Proceedings of the XIII International Conference on Computational Plasticity : Fundamentals and Applications
Main Research Area: Technical/natural sciences
Conference: XIII International Conference on Computational Plasticity, Barcelona, Spain, 01/09/2015 - 01/09/2015
Finite Element, In-situ Cast Joins, Limit Analysis, Precast Concrete Panels, Rigid Plasticity, Yield Criterion
Electronic versions:
Lower_bound_element_and_submodel_for_modelling_of_joints_between_precast_concrete_panels.pdf
Source: PublicationPreSubmission
Source-ID: 115389597
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015

Mathematical modelling of unglazed solar collectors under extreme operating conditions
Combined heat pumps and solar collectors got a renewed interest on the heating system market worldwide. Connected to the heat pump evaporator, unglazed solar collectors can considerably increase their efficiency, but they also raise the coefficient of performance of the heat pump with higher average temperature levels at the evaporator. Simulation of these systems requires a collector model that can take into account operation at very low temperatures (below freezing) and under various weather conditions, particularly operation without solar irradiation. A solar collector mathematical model is developed and evaluated considering, the condensation/frost effect and rain heat gains or losses. Also wind speed and long wave irradiation on both sides of the collector are treated. Results show important heat gains for unglazed solar collectors without solar irradiation. Up to 50% of additional heat gain was found due to the condensation phenomenon and up to 40% due to frost under no solar irradiation. This work also points out the influence of the operating conditions on the collector’s characteristics. Based on experiments carried out at a test facility, every heat flux on the absorber was separately evaluated so that this model can represent a valuable tool in optimising the design or the thermal efficiency of the collector. It also enables the prediction of the total energy yield for solar thermal collectors under extreme operating conditions.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Building Energy , LESBAT
Authors: Bunea, M. (Ekstern), Perers, B. (Intern), Eicher, S. (Ekstern), Hildbrand, C. (Ekstern), Bony, J. (Ekstern), Citherlet, S. (Ekstern)
Number of pages: 15
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Main Research Area: Technical/natural sciences

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Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Measurements of Capture Efficiency of Range Hoods in Homes

A major source of pollutants in homes is cooking and as homes get tighter in the pursuit of lower energy use (particularly near zero energy), the concentration of cooking pollutants increases. The best way to remove cooking pollutants is to use
a range hood above the cooking surface. Ideally, we want a range hood to use little energy and have high capture efficiency to minimize the required air flow to capture the cooking pollutants. Currently there are no standards for rating range hoods for capture efficiency. In this study, measurements of range hood capture efficiency were made in a tight kitchen-room built in a laboratory chamber, and a methodology for standardizing measurement of capture efficiency was developed. The results for a wall mounted range hood showed that up to half of the cooking pollutants were not captured at a flow rate of 230 m³/h. A more detailed set of measurements mapped the pollution distribution in the room, and showed that the pollutants escape more at the sides of the cooktop. These preliminary results suggest that more measurements should be conducted investigating the capture efficiency at different pollutant source temperature, size and location, and for different range hood type and mounting height.

General information
State: Published
Organizations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Lawrence Berkeley National Laboratory
Authors: Simone, A. (Intern), Sherman, M. H. (Ekstern), Walker, I. S. (Ekstern), Singer, B. C. (Ekstern), Delp, W. (Ekstern), Stratton, J. C. (Ekstern)
Number of pages: 5
Publication date: 2015

Measurements of the angular distribution of diffuse irradiance
Advanced solar resource assessment and forecasting is necessary for optimal solar energy utilization. In order to investigate the short-term resource variability, for instance caused by clouds it is necessary to investigate how clouds affect the solar irradiance, including the angular distribution of the solar irradiance. The investigation is part of the Danish contribution to the taskforce 46 within the International Energy Agency and financed by the Danish Energy Agency. The investigation focuses on the distribution of the diffuse solar irradiance and is based on horizontal measurements of the solar irradiance from 8 different parts of the sky as well as horizontal measurements of the total beam and total diffuse irradiance.

General information
State: Published
Organizations: Department of Civil Engineering, Section for Building Energy, Danish Meteorological Institute
Authors: Andersen, E. (Intern), Nielsen, K. P. (Ekstern), Dragsted, J. (Intern), Furbo, S. (Intern)
Number of pages: 8
Pages: 729-736
Publication date: 2015
BFI conference series: International Conference on Solar Heating and Cooling for Buildings and Industry (5020045)
Main Research Area: Technical/natural sciences
Modelling of composite concrete block pavement systems applying a cohesive zone model

This paper presents a numerical analysis of the fracture behaviour of the cement bound base material in composite concrete block pavement systems, using a cohesive zone model. The functionality of the proposed model is tested on experimental and numerical investigations of beam bending tests. The pavement is modelled as a simple slab on grade structure and parameters influencing the response, such as analysis technique, geometry and material parameters are studied. Moreover, the analysis is extended to a real scale example, modelling the pavement as a three-layered structure. It is found that the cohesive model is suitable for simulation of crack propagation in cement bound materials subjected to monotonic loading. The methodology implemented gives a new understanding of the mechanical behaviour of cement bound materials which can be used in further refinements of mechanical models for composite block pavements. It is envisaged that the methodology implemented in this study can be extended and thereby contribute to the ongoing development of rational failure criteria that can replace the empirical formulas currently used in pavement engineering.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, COWI A/S
Authors: Skar, A. (Intern), Poulsen, P. N. (Intern)
Number of pages: 14
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Main Research Area: Technical/natural sciences
Cement bound material fracture, Cohesive zone model, Composite block pavements, Pavement analysis, Finite element modelling

Modelling of Fire in an Open Car Park

Steel car parks exhibit high vulnerability to fire, as a consequence of the degradation of the steel mechanical properties at high temperatures and of the combustible type and amount. Real fire accidents in open car parks demonstrated a much faster and extended fire spread than predictions, assuming that a fire spread rate of 12 min and consider at most 3-4 vehicles on fire at the same time. Fire Dynamic Simulator (FDS) is applied in this current paper to study fire spread between cars. The outcomes of the investigations show that the fire spread is strongly influenced by the geometrical layout and that the distance between cars plays a determinant role on the fire spread rate and ignition of adjacent cars. In particular it was found that the fire spread can be faster than 12 minutes in the case of the cars parked 40 and 60 cm from each other.
Models for flexible operation of buildings in district energy system Nordhavn

Modification of poly(styrene-block-butadiene-block-styrene) [SBS] with phosphorus containing fire retardants

An elaborate survey of the chemical modification methods for endowing highly flammable SBS with increased fire resistant properties by means of chemical modification of the polymer backbone with phosphorus containing fire retardant species is presented. Optimal conditions for free radical addition of the P single bond H containing fire retardants to a double bond of poly(butadiene) block of SBS were found, affording varied degree of the modification (0.2–21 mol%). Alternatively, a two-step procedure based on an epoxidation step followed by hydrolysis of the epoxides with phosphoric acid was developed resulting in 20 mol% of poly(butadiene) block modification. Based on TGA results, organophosphorus-modified SBS was found to be amenable to charring – a property which correlated directly with the reduced flammability of the modified polymer observed in Cone Calorimetry tests. Furthermore, conceptually novel application of the H3PO4 modified SBS as a fire retardant additive for bitumen material, in combination with synergetic melamine species, offered 25% better self-extinguishing properties of such formulation already at a low loading level of the fire retardant components (3.5 wt.%).
Mud-filtrate correction of sonic logs by fluid substitution: Modulus and pore-fluid coupling by pore-filling clay

The world's hydrocarbons reserves have been exploited for over a century, and the amount of undiscovered reserves is dwindling, while the world's need for energy is increasing (Owen et al., 2010). This pushes hydrocarbon exploration into unconventional reservoirs, often in complex geological structures. Making reliable discoveries in challenging conditions requires an increasing level of detail in seismic interpretation. Advanced seismic processing as Amplitude-Versus-Offset (AVO) analysis, have become commonplace in seismic interpretation. These techniques involve comparison with synthetic seismograms generated from velocity versus depth trends recorded as a sonic log in a borehole. Such a comparison is referred to as a well-tie. A high-quality well-tie requires a high-quality sonic log, but shallow depth of penetration makes sonic logs sensitive to invasion of mud-filtrate from the borehole. The pressure in the borehole is kept higher than in the surrounding formation to control fluid production from the borehole. The over pressure in the borehole drives fluid from the borehole into the formation, whereby a sonic log measures velocities at a different saturation than the formation saturation, which the seismic data probes. For a proper well-tie sonic logs therefore require correction. Gassmann (1951) fluid substitution relates elastic velocities of a porous medium at one saturation to the elastic velocities at another saturation. Fluid substitution can then predict a sonic log at the undisturbed formation saturation from the invaded saturation. Fluid substitution is exact for a uniform, high-permeable porous medium saturated by a single fluid. Rocks does not necessarily conform to these requirements, and both the formation saturation and invaded saturation involve two fluids. Sonic log correction therefore requires extension of Gassmann fluid substitution to the complex nature of an invaded rock formation.

Only sandstones are considered in the thesis. Measurements and model for fully saturated sandstones quantify divergences from fluid substitution arising from the first few percent of wetting phase saturation, and the clay content. When the water saturation is at the irreducible water saturation or higher only the effect of clay on the elastic velocities have a differential effect on the elastic velocities. Mixed saturations are fluid substituted using effective fluid moduli formulated as a set of bounds by Mavko and Mukerji (1998). Ultrasonic velocity data from the literature shows that these bounds applies most accurately to sandstones with a simple pore-space, as reflected in a high permeability and low clay fraction.

Multi-physical and multi-scale deterioration modelling of reinforced concrete part II: Coupling corrosion and damage at the structural scale

Deterioration of reinforced concrete infrastructure such as bridges, tunnels, and buildings represents one of the major challenges currently facing developed countries. This deterioration leads to economic costs for maintenance and replacement, environmental impacts such increased global warming potential as a result of cement production and traffic emissions, and social costs related to traffic congestion and human health concerns. While engineering tools and methods for structural modelling and design of new reinforced concrete infrastructure are mature, the methods and tools for modelling decades-long deterioration and maintenance are much less developed. An approach for modelling structural deterioration of reinforced concrete components due to reinforcement corrosion is presented and a procedure is introduced to estimate the time-dependent structural response, described using time-dependent seismic fragility curves. The approach is part of a multi-disciplinary framework which includes physical, chemical, and electrochemical processes at the meso-scale coupled with mechanical deterioration processes, which are modelled using finite element methods, at the macro-scale. While not detailed in this paper, when the time-dependent assessment of structures is integrated with life cycle assessment models that quantify the economic, environmental, and social impacts of infrastructure, the result is a comprehensive assessment methodology for the sustainability of deteriorating reinforced concrete infrastructure.
Multi-physics and multi-scale deterioration modelling of reinforced concrete part I: Coupling transport and corrosion at the material scale

In this paper, a cross disciplinary modelling framework is presented that combines physical, chemical, electrochemical, and fracture mechanical processes on different length and time scales in reinforced concrete. The theoretical background and application of finite element method (FEM) based models are sketched to describe (i) transport of heat and matter in porous media as well as phase assemblage in hardened Portland cement, (ii) corrosion of reinforcement, and (iii) material performance including corrosion-induced damages on the meso and macro scale. The presented modelling framework is fully coupled, i.e. information, such as temperature and moisture distribution, phase assemblage, corrosion current density, damage state of concrete cover, etc., are continuously exchanged between the models. Although not explicitly outlined in this paper, such an analysis may be further integrated within structural performance modelling and a full life cycle assessment to support comprehensive decision-making in order to minimize environmental, social, and economic impacts associated with the decades-long service life of reinforced concrete elements and structures.

Multivariate methods for evaluating the efficiency of electrodialytic removal of heavy metals from polluted harbour sediments

Chemometrics was used to develop a multivariate model based on 46 previously reported electrodialytic remediation experiments (EDR) of five different harbour sediments. The model predicted final concentrations of Cd, Cu, Pb and Zn as a function of current density, remediation time, stirring rate, dry/wet sediment, cell set-up as well as sediment properties. Evaluation of the model showed that remediation time and current density had the highest comparative influence on the clean-up levels. Individual models for each heavy metal showed variance in the variable importance, indicating that the targeted heavy metals were bound to different sediment fractions. Based on the results, a PLS model was used to design five new EDR experiments of a sixth sediment to achieve specified clean-up levels of Cu and Pb. The removal efficiencies were up to 82% for Cu and 87% for Pb and the targeted clean-up levels were met in four out of five experiments. The clean-up levels were better than predicted by the model, which could hence be used for predicting an approximate remediation strategy; the modelling power will however improve with more data included. (C) 2014 Elsevier B.V. All rights reserved.
New Harbor in Kangerlussuaq, Western Greenland: Field Investigations and Utilization of Existing Materials

The international airport of Greenland is located in Kangerlussuaq, making it an important connection point for tourists and transportation of goods. However, the existing harbor in Kangerlussuaq experiences major challenges in the form of extensive sedimentation of glaciofluvial sediments transported by rivers from the inland ice to the inner parts of the fjord. These sediment layers reduce the water depth and prevent container- and cruiseships to dock, imposing large additional maintenance costs, and inefficient operability. Through engineering geological field and lab investigations, a possible new harbor location around 10 km further out the fjord near Hancock Pynt, has been investigated. The onshore area was found to be highly suitable for a harbor support area, where a sub-base thickness of 1.8 m with gravel cover-layer was found adequate for the calculated design loads. Existing sediment deposits at the location are reusable as construction material and may reduce construction costs. Bathymetry investigations indicate however that measures must be taken to increase the water depth, and the offshore sediments were found not suitable as support for foundations.

Night time cooling by ventilation or night sky radiation combined with in-room radiant cooling panels including phase change materials

Night sky radiative cooling technology using PhotoVoltaic/Thermal panels (PVT) and night time ventilation have been studied both by means of simulations and experiments to evaluate their potential and to validate the created simulation model used to describe it. An experimental setup has been constructed at the Technical University of Denmark, where the outside PVT panels are connected through a storage tank to in-room radiant ceiling panels. The radiant ceiling panels include phase change material (PCM) and embedded pipes for circulating water. Due to the phase change material it is possible to store the heat generated during the day from internal sources. Then during the night the panels can be cooled down again and regenerated. The possibility of cooling down the panels during the night with outside air was also studied. The night cooling power of the PVT panels ranged from 92 to 119 W/m² depending on the sky clearness. This cooling power was enough to remove the stored heat and regenerate the ceiling panels. The validation simulation model results related to PCM were close to the corresponding results extracted from the experiment, while the results related to the production of cold water through the night sky radiative cooling differed significantly. The possibility of night time ventilation was studied through simulations for three different latitudes. It was concluded that for Danish climatic conditions night time
ventilation would also be able to regenerate the panels while its contribution is not sufficient in warmer South-European climates.

**General information**
- State: Published
- Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
- Authors: Bourdakis, E. (Intern), Olesen, B. W. (Intern), Grossule, F. (Ekstern)
- Number of pages: 10
- Publication date: 2015
- Main Research Area: Technical/natural sciences
- Night Time Ventilation, Night Sky Radiative Cooling, Phase Change Materials, Thermal Comfort, Renovation
- Electronic versions: [Conference_Night_time_cooling_by_ventilation_or_night_sky_radiation_combined_with_in_room_radiant_cooling_panels_including_phase_change_materials.pdf](#)
- Source: PublicationPreSubmission
- Source-ID: 127118908
- Publication: Research - peer-review › Paper – Annual report year: 2016

**Nighttime radiative cooling potential of unglazed and PV/T solar collectors: parametric and experimental analyses**

Nighttime radiative cooling technology has been studied both by means of simulations and experiments, to evaluate its potential and to validate the existing theoretical models used to describe it. Photovoltaic/thermal panels (PV/T) and unglazed solar collectors have been chosen as case studies. An experimental setup has been constructed and tested during summer of 2014, at the Technical University of Denmark. The cooling performance (heat loss) has been measured simultaneously for both types of panels, installed side-by-side. The experimental results have been compared with the results from a commercial building simulation software and from theoretical calculations. All three methods showed good consistency in the cooling output. The cooling power ranged between 20 to 75 W/m² without a noticeable difference between the PV/Ts and the unglazed collectors, the outcome depending mainly on the sky clearness. The obtained values showed a good agreement with the ones found in the literature about solar panels or other kinds of heat sinks used for radiative cooling applications. The panels provided a cooling performance per night ranging between 0.2 and 0.9 kWh/m² of panel. The COP values (defined as the ratio between the obtained cooling and the energy used by the circulation pump) reached very high values, ranging from 19 to 59, which highlights the potential of this technology for energy savings for cooling purposes. Possible applications include cooling production for non-residential buildings such as offices under the Scandinavian climate, and, in addition, for residential buildings under Southern climates.

**General information**
- State: Published
- Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Technical University of Denmark
- Authors: Pean, T. Q. (Intern), Gennari, L. (Ekstern), Olesen, B. W. (Intern), Kazanci, O. B. (Intern)
- Number of pages: 8
- Publication date: 2015

**Host publication information**
- Main Research Area: Technical/natural sciences
- Nighttime radiative cooling, Photovoltaic/thermal panel (PV/T), Unglazed solar collector, Energy efficiency, TRNSYS, Simulation, Experimental validation
- Electronic versions: [Nighttime_radiative_cooling.pdf](#)
- Source: PublicationPreSubmission
- Source-ID: 115679192
- Publication: Research - peer-review › Article in proceedings – Annual report year: 2015

**Numerical Investigations into the Value of Information in Lifecycle Analysis of Structural Systems**

Preposterior analysis can be used to assess the potential of an experiment to enhance decision-making by providing information on parameters of the decision problem that are surrounded by epistemic uncertainties. The present paper describes a framework for preposterior analysis for support of decisions related to maintenance of structural systems. In this context, experiments may refer to inspections or structural health monitoring. The value-of-information concept comprises a powerful tool for determining whether the experimental cost is justified by the expected gained benefit during the lifecycle of a structural system and for identifying the optimal among different possible experimental schemes. This
concept is herein elaborated through case studies that involve individual structural components subject to deterioration as well as systems with interdependencies. Extensive numerical investigations demonstrate how the decision problem is influenced by the assumed probabilistic models, including the type of probability distribution and the degree of uncertainty reflected in the coefficient of variation, the degradation law, the quantity and quality of information, and the probabilistic dependencies between the components of a system. Furthermore, challenges and potentials in value-of-information analysis for structural systems are discussed.

Numerical modelling of offshore pile driving

Keyed shear joints are currently designed using simple and conservative design formulas, yet these formulas do not take the local mechanisms in the concrete core of the joint into account. To investigate this phenomenon a rigid, perfectly plastic finite element model of keyed joints is used. The model is formulated for second-order conic optimisation as a lower bound problem, which yields a statically admissible stress field that satisfies the yield condition in every point. The dual solution to the problem can be interpreted as the collapse mode and will be used to analyse the properties of the different joints. This approach makes it possible to investigate both global and local failure mechanisms in keyed joints. The results of the model will be compared to experiments found in the literature as well as the current design rules of the Eurocode.
Occupant behaviour and robustness of building design

Occupant behaviour can cause major discrepancies between the designed and the real total energy use in buildings. A possible solution to reduce the differences between predictions and actual performances is designing robust buildings, i.e. buildings whose performances show little variations with alternating occupant behaviour patterns. The aim of this work was to investigate how alternating occupant behaviour patterns impact the performance of different envelope design solutions in terms of building robustness. Probabilistic models of occupants’ window opening and use of shading were implemented in a dynamic building energy simulation tool (IDA ICE). The analysis was carried out by simulating 15 building envelope designs in different thermal zones of an Office Reference Building in 3 climates: Stockholm, Frankfurt and Athens. In general, robustness towards changes in occupants’ behaviour increased with increasing thermal mass and with decreasing transparent area of the envelope. The importance of the robustness’ evaluation is highlighted in this paper, in order to obtain optimized buildings’ designs for more accurate and realistic energy predictions.
On finite volume method implementation of poro-elasto-plasticity soil model

Accurate prediction of the interactions between the nonlinear soil skeleton and the pore fluid under loading plays a vital role in many geotechnical applications. It is therefore important to develop a numerical method that can effectively capture this nonlinear soil-pore fluid coupling effect. This paper presents the implementation of a new finite volume method code of poro-elasto-plasticity soil model. The model is formulated on the basis of Biot's consolidation theory and combined with a perfect plasticity Mohr-Coulomb constitutive relation. The governing equation system is discretized in a segregated manner, namely, those conventional linear and uncoupled terms are treated implicitly, while those nonlinear and coupled terms are treated explicitly by using any available values from previous time or iteration step. The implicit-explicit discretization leads to a linearized and decoupled algebraic system, which is solved using the fixed-point iteration method. Upon the convergence of the iterative method, fully nonlinear coupled solutions are obtained. Also explored in this paper is the special way of treating traction boundary in finite volume method compared with FEM. Finally, three numerical test cases are simulated to verify the implementation procedure. It is shown in the simulation results that the implemented solver is capable of and efficient at predicting reasonable soil responses with pore pressure coupling under different loading situations.

General information
State: Published
Organisations: Department of Civil Engineering, University College Dublin
Authors: Tang, T. (Intern), Hededal, O. (Intern), Cardiff, P. (Ekstern)
Number of pages: 21
Pages: 1410-1430
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
On the use of Bio-based Building Products in Denmark - Fire safety regulations, research and future challenges

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group, Implementation and Performance Management, Department of Civil Engineering, Section for Building Design, Danish Fire and Safety Institute, Danish Technological Institute
On the value of SHM in the context of service life integrity management

This paper addresses the optimization of structural health monitoring (SHM) before its implementation on the basis of its Value of Information (VoI). The approach for the quantification of the value of SHM builds upon a service life cost assessment and generic structural performance model in conjunction with the observation, i.e. monitoring, of deterioration increments. The structural performance is described with a generic deterioration model to be calibrated to the relevant structural deterioration mechanism, such as e.g. fatigue and corrosion. The generic deterioration model allows for the incorporation of monitored damage increments and accounts for the precision of the data by considering the statistical uncertainties, i.e. the amount of monitoring data due to the monitoring period, and by considering the measurement uncertainty. The value of structural health monitoring is then quantified in the framework of the Bayesian pre-posterior decision theory as the difference between the expected service-life costs considering an optimal structural integrity management and the service life costs utilizing an optimal SHM system and structural integrity management. With an example the application of the approach is shown and the value of the monitoring period optimized SHM information is determined.

Operative temperature drifts and occupant satisfaction with thermal environment in three office buildings using radiant heating/cooling system

The objective of this study was to analyse operative temperature drifts and occupant satisfaction with thermal environment in office buildings utilizing embedded radiant heating/cooling systems. Three office buildings were investigated: Town Hall in Viborg, Denmark (floor area 19400 m²), IDOM, Madrid, Spain (16000 m²), TIFS, Padua, Italy (2200 m²). Continuous measurements of operative temperature were conducted at four workplaces in each building for one year. Occupants’ satisfaction was assessed by internet based questionnaire. Results showed that mostly exceeded limits were those for 4-hour drift (0.8 K/h), which were exceeded at least in 2% and up to 52% of occupied time in investigated buildings. Limits for hourly and 2-hour drifts were exceeded in max. 2% of occupied time. Median values were in ranges of 0.12-0.29 K/h, 0.18-0.52 K/h and 0.27-0.84 K/h for 1, 2 and 4-hour drifts respectively. Occupants’ in all buildings were rather satisfied with temperature conditions. Median temperature satisfaction (0="Clearly satisfied" - 5="Clearly dissatisfied") was 2, 1 and 1 for Viborg, Madrid and Padua respectively. Temperature satisfaction slightly decreased when rate of temperature change increased, thus higher temperature drifts seemed to lead to higher dissatisfaction, however the collected data did not allow for robust statistical analysis.
Optimization of municipal energy strategies: Are community energy profiles the key to a higher implementation rate of renewable energies?

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics
Authors: Petersen, J. (Intern)
Number of pages: 1
Publication date: 2015

Host publication information
Title of host publication: Book of Abstracts. DTU's Sustain Conference 2015
Place of publication: Lyngby
Publisher: Technical University of Denmark (DTU)
Article number: L-16
Main Research Area: Technical/natural sciences
Conference: DTU Sustain Conference 2015, Lyngby, Denmark, 17/12/2015 - 17/12/2015
Electronic versions:
L16_DTU_Sustain_2015.pdf

Bibliographical note
Poster presentation
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2015

OPVent projektrapport – 2015: Resultater af OP Vent projektet

General information
State: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Odense University Hospital, JRV A/S, Fournais Energi APS, Technical University of Denmark
Authors: Overgaard, A. (Ekstern), Overgaard, S. (Ekstern), Frich, L. H. (Ekstern), Ravn, C. (Ekstern), Olsen, M. (Ekstern), Knudsen, N. B. (Ekstern), Nielsen, J. (Ekstern), Toftum, J. (Intern), Clausen, G. (Intern), Nielsen, L. (Ekstern), Rosenbeck, K. (Ekstern)
Number of pages: 42
Publication date: 2015

Publication information
Publisher: Energiteknologisk Udvikling og Demonstration
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:
OP_vent_rapport_051015_FINAL.pdf
Source: PublicationPreSubmission
Source-ID: 119503424
Publication: Research - peer-review › Report – Annual report year: 2015
Smart Cities Accellerator
European Interreg Project with 6 municipality implementing the research findings of the CITIES project in cooperation with other universities in the area Copenhagen, Southern Sweden.

Centre for IT-Intelligent Energy Systems in Cities
Department of Civil Engineering
Department of Applied Mathematics and Computer Science
Department of Management Engineering
Period: 20/04/2018 → 20/07/2018
Number of participants: 3
Acronym: SCA
Project participant:
Heller, Alfred (Intern)
Nielsen, Per Siev representation (Intern)
Project Manager, academic:
Madsen, Henrik (Intern)

Concrete frost resistance - modelling frost attack
Department of Civil Engineering
Period: 01/02/2018 → 20/03/2018
Number of participants: 3
Phd Student:
Zaben, Abdulrahman Hasan (Intern)
Supervisor:
Jensen, Ole Mejlhede (Intern)
Main Supervisor:
Hasholt, Marianne Tange (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Pozzolanic Reaction of Supplementary Cementitious Materials
Department of Civil Engineering
Period: 15/01/2018 → 14/01/2021
Number of participants: 4
Phd Student:
Canul Polanco, Jennifer Anette (Intern)
Supervisor:
Durán-Herrera, Alejandro (Ekstern)
Skibsted, Jørgen (Ekstern)
Main Supervisor:
Jensen, Ole Mejlhede (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Synthesis, characterization and application of composite phase change humidity control materials
Department of Civil Engineering
Period: 01/01/2018 → 31/12/2020
Number of participants: 3
Phd Student:
Feng, Xiaoxiao (Intern)
Supervisor: Rode, Carsten (Intern)
Main Supervisor: Qin, Menghao (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

LOCRETA - Consortium for Lower Cretaceous reservoir analysis
Department of Civil Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
Phd Student: Storebø, Einar Madsen (Intern)
Supervisor: Andreassen, Katrine Alling (Intern)
Main Supervisor: Fabricius, Ida Lykke (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Multiscale assessment of Swelling and Compressibility of Fine Grained Geomaterials
Department of Civil Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 4
Phd Student: Di Remigio, Giorgia (Intern)
Supervisor: Andreassen, Katrine Alling (Intern)
Main Supervisor: Rocchi, Irene (Intern)
Zania, Varvara (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Valorization of particulate waste materials in construction materials in cold climates
Department of Civil Engineering
Period: 01/12/2017 → 30/11/2020
Number of participants: 4
Phd Student: Ebert, Benjamin Alexander Regaard (Intern)
Supervisor: Geiker, Mette Rica (Intern)
Steenari, Britt-Marie (Ekstern)
Main Supervisor: Kirkelund, Gunvor Marie (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
**Villum Center for Advanced Structural and Material Testing**

Department of Civil Engineering  
Department of Wind Energy  
Composites and Materials Mechanics  
Section for Structural Engineering  
Department of Mechanical Engineering  
Solid Mechanics  
Wind Turbine Structures and Component Design  

**Period:** 07/11/2017 → …  
**Number of participants:** 17  
**Acronym:** CASMaT  
**Project participant:**  
Kleis, Camilla (Intern)  
Mikkelsen, Lars Pilgaard (Intern)  
Sørensen, Bent F. (Intern)  
Toftegaard, Helmuth Langmaack (Intern)  
Berggreen, Christian (Intern)  
Branner, Kim (Intern)  
Michel, Alexander (Intern)  
Andreasen, Michael Joachim (Intern)  
Luczak, Marcin (Intern)  
Chen, Xiao (Intern)  
Bjørnbak-Hansen, Jørgen (Intern)  
Legarth, Brian Nyvang (Intern)  
Waldbjørn, Jacob Paamand (Intern)  

**Project Manager, organisational:**  
Stang, Henrik (Intern)  

**Phd Student:**  
Bangaru, Ashish Kumar (Intern)  
Moncy, Aakash (Intern)  
Quinlan, Alex (Intern)  

**Relations**  
**Related projects:**  
Fatigue behaviour of polymer matrix at the microstructural scale  
Multi-axial fatigue damage laws for composite materials at the macro-scale  
Fatigue behaviour of polymer composite materials at the sub-structural and structural scale  

**Publications:**  
Uncovering the fatigue damage initiation and progression in uni-directional non-crimp fabric reinforced polyester composite  
Statistical validation of individual fibre segmentation from tomograms and microscopy  
Fatigue Damage Evolution in Fibre Composites for Wind Turbine Blades  
Micromechanical Investigation of Fatigue Damage in Uni-Directional Fibre Composites  
Three dimensional fatigue damage evolution in non-crimp glass fibre fabric based composites used for wind turbine blades  
Individual fibre segmentation from 3D X-ray computed tomography for characterising the fibre orientation in unidirectional composite materials  
Micromechanical Time-Lapse X-ray CT Study of Fatigue Damage in Uni-Directional Fibre Composites  
Fatigue damage observed non-destructively in fibre composite coupon test specimens by X-ray CT  
Ex-situ X-ray computed tomography data for a non-crimp fabric based glass fibre composite under fatigue loading
Strength of cracked concrete - Shear behaviour of arch-shaped members

Department of Civil Engineering
Period: 01/11/2017 → 31/10/2020
Number of participants: 6
PhD Student:
Kragh-Poulsen, Jens-Christian (Intern)
Supervisor:
Fisker, Jakob (Ekstern)
Frederiksen, Jens Mejer (Ekstern)
Frettlöhr, Björn (Ekstern)
Hagsten, Lars German (Intern)
Main Supervisor:
Hoang, Linh Cao (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

The effect of aging on fire safety of composite materials

Department of Civil Engineering
Period: 01/11/2017 → 29/01/2021
Number of participants: 4
PhD Student:
Sandinge, Anna (Intern)
Supervisor:
Blomqvist, Per (Ekstern)
Markert, Frank (Intern)
Main Supervisor:
Dederichs, Anne Simone (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Supporting sustainable mini-grid development and local production of wind turbines using the case of Kenya

With the long-term objective to reduce poverty, stimulate economic growth and increased sustainable energy supply, the project aims to develop a market for low-cost, partly locally produced kW wind turbines for rural electrification. The project will demonstrate the technical, social and economic feasibility of integrating a kW wind turbine into a smart solar-powered mini-grid in Kenya, and aims to develop this concept into a viable business for the private companies involved, having the technical, economic and management capacity to exploit it. The expected long term impact of the project are (i) local jobs in production, installation, O&M of low cost kW turbines in mini-grids; and (ii) reduced cost of electricity provided by mini-grids, benefitting disadvantaged communities. The project will bring together communities, public institutions and commercial companies.

Department of Management Engineering
UNEP DTU Partnership
Department of Wind Energy
Integration & Planning
Department of Civil Engineering
Section for Building Energy
Sustainable energy
Kenya Climate Innovation Centre
Period: 01/09/2017 → 01/09/2022
Number of participants: 5
Acronym: Kenya Miniwind
Project participant:
Hansen, Ulrich Elmer (Intern)
Cronin, Tom (Intern)
Nørgaard, Jørgen (Intern)
Other:
Hansen, Jens Carsten (Intern)
Project Coordinator:
Nygaard, Ivan (Intern)

REBUS
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Period: 01/08/2017 → ...
Number of participants: 1
Project participant:
Elarga, Hagar (Intern)

Fatigue behaviour of polymer composite materials at the sub-structural and structural scale
Department of Civil Engineering
Period: 01/08/2017 → 31/07/2020
Number of participants: 5
Phd Student:
Quinlan, Alex (Intern)
Supervisor:
Berggreen, Christian (Intern)
Branner, Kim (Intern)
Waldbjørn, Jacob Paamand (Intern)
Main Supervisor:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Robust Identification
Department of Civil Engineering
Period: 01/07/2017 → 31/07/2020
Number of participants: 3
Phd Student:
Friis, Tobias (Intern)
Supervisor:
Katsanos, Evangelos (Intern)
Main Supervisor:
Brincker, Rune (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
Utilization of Wood Ash in Mortar and Concrete
Department of Civil Engineering
Period: 01/07/2017 → 30/06/2020
Number of participants: 5
Phd Student:
Sigvardsen, Nina Marie (Intern)
Supervisor:
Geiker, Mette Rica (Intern)
Jensen, Pernille Erland (Intern)
Kirkelund, Gunvor Marie (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Greenland seaweeds for human consumption
PhD project
National Food Institute
Research Group for Analytical and Predictive Microbiology
Research Group for Bioactives – Analysis and Application
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Period: 01/05/2017 → 30/04/2020
Number of participants: 5
Number of related Ph.D. students: 1
Phd Student:
Kreissig, Katharina Johanna (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Holdt, Susan Levstad (Intern)
Jacobsen, Charlotte (Intern)
Main Supervisor:
Hansen, Lisbeth Truelstrup (Intern)
Project

Barrierer for og potentialer ved at etablere en ræklingeproduktion i Qeqertat i Qaanaaq distrikt
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Period: 01/05/2017 → …
Number of participants: 2
Project participant:
Hoffmann, Birgitte (Ekstern)
Project Manager, academic:
Hendriksen, Kåre (Intern)
Project

Determination and assessment of critical material parameters for severely cracked alkali-silica reaction damaged concrete structures' function and load bearing capacity
Department of Civil Engineering
Period: 01/05/2017 → 10/03/2021
Number of participants: 5
Phd Student:
Innovations in Interdisciplinary Research in Built Environment within the Baltic Sea Region
Funded by Federal Ministry of Education and Research (BMBF) of Germany / Inno-BSR. Project owner prof. Annette Boegle, HCU
Department of Civil Engineering
Section for Building Design
Period: 30/04/2017 → 01/02/2019
Number of participants: 1
Project participant:
Jensen, Lotte Bjerregaard (Intern)

Reduction of Fatigue Damage Estimation based on Actual Fatigue Stress
Department of Civil Engineering
Period: 01/04/2017 → 31/03/2020
Number of participants: 3
PhD Student:
Silva Nabuco, Bruna (Intern)
Supervisor:
Georgakis, Christos T. (Intern)
Main Supervisor:
Brincker, Rune (Intern)

Robust solutions of design of internal insulation in historic buildings with regards to hygrothermal performance
Department of Civil Engineering
Period: 01/03/2017 → 29/02/2020
Number of participants: 3
PhD Student:
Jensen, Nicolaj Feldt (Ekstern)
Supervisor:
Nielsen, Peter Rode (Intern)
Main Supervisor:
Bjarlev, Søren Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansierede - Virksomhed
Project: PhD

Financing sources
Source: Internal funding (public)
Name of research programme: Fonde
Project: PhD
Robust solutions of design of internal insulation in historic buildings with regards to hygrothermal performance

Department of Civil Engineering
Period: 01/03/2017 → 29/02/2020
Number of participants: 3
Phd Student:
Jensen, Nickolaj Feldt (Intern)
Supervisor:
Nielsen, Peter Rode (Intern)
Main Supervisor:
Bjarlev, Søren Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Fonde
Project: PhD

Reduktion af risiko for overtemperatur i etageboliger i forbindelse med facadenrenovering

Department of Civil Engineering

Section for Building Energy
Period: 01/01/2017 → 01/01/2018
Number of participants: 4
Number of related Ph.D. students: 0
Project participant:
Zukowska-Tejsen, Daria (Intern)
Kolarik, Jakub (Intern)
Sarey Khanie, Mandana (Intern)
Project Coordinator:
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Private funding (private)
Name of research programme: Grundejernes Investeringsfond
Web address: http://www.gi.dk
Amount: 990,000.00 Danish Kroner
Year of approval: 2016
Project

IEA Task Material and component development for thermal storage systems

The aims of the project are within the IEA (International Energy Agency) SHC (Solar Heating & Cooling) Programme Task project "Material and component development for thermal storage systems" to develop economically attractive compact long term heat storages and to elucidate the suitability of the heat storages for different applications. The project is the Danish part of the IEA Task project "Material and component development for thermal storage systems". Work will be carried out in the following fields: Component development Application areas Numerical simulation methods The expert meetings of the project will be attended so that knowledge on the results of the international partners is achieved. The Danish activities is focused on development of inexpensive compact heat storage based on salt hydrates, on optimization of energy systems based on these heat storages and on the interplay between the systems and the future energy system. In cooperation with interested companies development work is carried out. Among other things a heat storage module based on sodium acetate trihydrate from Nilan A/S will be investigated by means of experiments. Further, a combined solar heating/heat pump system with a PCM heat storage will be investigated.

Department of Civil Engineering

Section for Building Energy

Department of Applied Mathematics and Computer Science

Nilan A/S
Period: 01/01/2017 → 31/12/2019
Number of participants: 4
PCM heat storage, supercooling, applications
Project participant:
Furbo, Simon (Intern)
Demonstration of energy savings and indoor climate with sustainable adiabatic cooling using rainwater

Public buildings in Denmark do not have cooling systems, which often leads to uncomfortable high indoor temperatures in spring and summertime. The project will demonstrate that cooling by adiabatic cooling system using rainwater is a simple and cheap method for improving the indoor environment in public buildings without increasing the energy consumption.

Department of Civil Engineering
Section for Building Energy
Systemair A/S
Period: 01/01/2017 → 30/06/2019
Number of participants: 3
energy, cooling, buildings, sustainability
Project participant:
Hviid, Christian Anker (Intern)
Zukowska-Tejsen, Daria (Intern)
Nielsen, Vilhjálmur (Intern)

Financing sources
Source: Public research programme (public)
Name of research programme: Elforsk
Web address: http://www.elforsk.dk
Amount: 390,000.00 Danish Kroner
Year of approval: 2016

Innovativt design af ståldragere til kabelbårne broer

Department of Civil Engineering
Period: 01/01/2017 → 31/12/2019
Number of participants: 5
Phd Student:
Baandrup, Mads Jacob (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Sigmund, Ole (Intern)
Sigmund, Ole (Intern)
Main Supervisor:
Poulsen, Peter Noe (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD

Feasibility of geothermal energy extraction from medium depth Danish limestone aquifers

Department of Civil Engineering
Period: 15/12/2016 → 14/12/2019
Number of participants: 4
Phd Student:
Paci, Laura (Intern)
Supervisor:
Niemi Sørensen, Stig (Ekstern)
Rocchi, Irene (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Financing sources  
Source: Internal funding (public)  
Name of research programme: Offentlig finansiering  
Project: PhD

Thermal performance of tracking concentrating solar collectors  
theoretical calculations of thermal performance of tracking concentrating solar collectors. Different locations and temperature levels are considered.

Department of Civil Engineering  
Section for Building Energy  
Absolicon Solar Concentrator AB  
Period: 01/11/2016 → 31/12/2016  
Number of participants: 2  
Concentrating solar collectors, tracking  
Acronym: ABSOLICON  
Project participant:  
Furbo, Simon (Intern)  
Perers, Bengt (Intern)  

Risk-based inspection Planning and Value of Information  
Department of Civil Engineering  
Period: 15/10/2016 → 14/10/2019  
Number of participants: 4  
Phd Student:  
Agusta, Arifian (Ekstern)  
Supervisor:  
Faber, Michael Havbro (Intern)  
Sørensen, John Dalsgaard (Intern)  
Main Supervisor:  
Thöns, Sebastian (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

Risk-based inspection Planning and Value of Information  
Department of Civil Engineering  
Period: 15/10/2016 → 14/10/2019  
Number of participants: 4  
Phd Student:  
Irman, Arifian Agusta (Intern)  
Supervisor:  
Faber, Michael Havbro (Intern)  
Sørensen, John Dalsgaard (Intern)  
Main Supervisor:  
Thöns, Sebastian (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

Self-reulating integrated ceiling solutions for heating, cooling, ventilation and acoustics in buildings based on renewable energy sources
System solutions for demand-control and continuous-commissioning of room-based ventilation in dwellings

The objective of the project is to develop solutions for demand-control and continuous-commissioning of room-based ventilation in dwellings. The system will extend ventilation units with various sensors and wireless communication. The project will synergize monitoring and control of indoor climate to enable new investment models. Online monitoring will ensure that systems work as intended throughout their lifetime. The project will enable broad deployment by removing financial and structural barriers and will ensure optimal performance.

The project will target building owners, administrators, tenants and energy-service companies that seek a model for investment, installation and operation of effective ventilation systems. The system will add the most value for the tenant, who will experience personal controls, reduce or maintain their energy bill, improve sleep quality, avoid moisture issues, minimize pollutants and reduce discomfort due to over-heating. These items would address common issues in renovated buildings. The added value for the tenant implies a better product for building owners and administrators through higher rent and lower tenant turnover. Continuous commissioning would ensure greater longevity of the ventilation systems and building constructions, which would add future value for building owners.

Department of Civil Engineering
Section for Building Energy

IEA Task 55 Large scale solar district heating and cooling systems
Investigations on large solar heating plants

Department of Civil Engineering
Section for Building Energy
Solar Key Int.
Aalborg CSP

Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)
Tian, Zhiyong (Intern)
Huang, Junpeng (Intern)
Building clusters and their impact on flexibility when including the prosumer aspect

Department of Civil Engineering
Period: 01/10/2016 → 30/09/2019
Number of participants: 2
Phd Student:
Larma, Marijana (Ekstern)
Main Supervisor:
Heller, Alfred (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Building clusters and their impact on flexibility when including the prosumer aspect

Department of Civil Engineering
Period: 01/10/2016 → 12/01/2020
Number of participants: 5
Phd Student:
Larma, Marijana (Intern)
Supervisor:
Heller, Alfred (Intern)
Li, Rongling (Intern)
Pedersen, Allan Schrøder (Intern)
Main Supervisor:
Rode, Carsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Cool PVT
The aim is to develop PVT panels which can be used for heat and electricity production during daytime and for cooling during night time.

Differently designed PVT panels will be tested experimentally in laboratory test facilities

Department of Civil Engineering
Section for Building Energy
Department of Applied Mathematics and Computer Science
RACELL SAPHIRE Technologies ApS
COWI A/S
Period: 01/09/2016 → 31/12/2016
Number of participants: 2
PVT panels, heating cooling
Project participant:
Furbo, Simon (Intern)
Dannemand, Mark (Intern)

Science Cloud for Cities
A Deic/Def project developing a science cloud for research (in cities).

Centre for IT-Intelligent Energy Systems in Cities
Digital tools for landscape architects: A case study of digital tools used for analyzing and screening climate adaptation challenges in the early design phase

Danish Title: Undersøgelse af digitale værktøjer hos arkitekttegnestuer til beregning og screening af regnvand i den tidlige designfase

DTU Environment/European Regional Development Fund.

Department of Civil Engineering
Section for Building Design
Department of Environmental Engineering

Urban Water Systems

Railway substructure system based on asphalt

Arktisk vandforsyning II

Financing sources

Source: Internal funding (public)
Name of research programme: Fonde
Project: PhD

Arktisk vandforsyning II

Department of Civil Engineering

ARTEK, Section for Arctic Engineering and Sustainable Solutions
Determination of wind load on high-rise buildings by applying Computational Fluid Dynamics

Department of Civil Engineering
Period: 15/06/2016 → 20/03/2020
Number of participants: 4
PhD Student:
Skytte Thordal, Marie (Intern)
Supervisor:
Bennetsen, Jens Christian (Intern)
Gudmand-Høyer, Tim (Intern)
Main Supervisor:
Koss, Holger (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Application of solar district heating systems in urban buildings

Department of Civil Engineering
Period: 01/06/2016 → 31/05/2019
Number of participants: 4
PhD Student:
Huang, Junpeng (Intern)
Supervisor:
Furbo, Simon (Intern)
Li, Jing (Ekstern)
Main Supervisor:
Fan, Jianhua (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Mechanics of steel beams and joints - Advanced modelling of beams and connection components

Department of Civil Engineering
Period: 01/06/2016 → 31/05/2019
Number of participants: 5
PhD Student:
Hansen, Anders Bau (Intern)
Supervisor:
Andreassen, Michael Joachim (Intern)
Hansen, Thomas (Intern)
P. Hansen, Johannes (Ekstern)
Main Supervisor:
Jönsson, Jeppe (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Modelling of the load carrying capacity of concrete bridges in conjunction with in-situ monitoring

Department of Civil Engineering
Development of a high-speed pavement evaluation tool based on modern sensing technologies
This project deals with building a new moving measurement platform for non-destructive pavement evaluation while traveling at highway speeds. The work includes theoretical advances, numerical implementation, and execution of both forward and inverse analyses. The work are geared towards interpretation of collected data for supporting development decisions (e.g., sensitivity, calibration, sensing) and for generating knowledge of engineering worth.

Department of Civil Engineering
Section for Geotechnics and Geology

Thermal Smart Grid - Innovation project under INNO-SE
First investigation on the development of a thermal smart grid for the company GeoDrilling. Innovation project under INNO-SE, CLEAN.

Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities
GeoDrilling

PVT/heat pump system
Measurements on a PVT/heat pump system are carried out in a laboratory test facility.

Department of Civil Engineering
Section for Building Energy
Department of Applied Mathematics and Computer Science
RACELL SAPHIRE Technologies ApS
COWI A/S
Period: 01/04/2016 → 31/07/2017
Number of participants: 3
PVT panels, heat pump, measurements

Project participant:
Furbo, Simon (Intern)
Dannemand, Mark (Intern)
Perers, Bengt (Intern)

Promoting cost-optimal energy retrofits through improved energy labelling

Department of Civil Engineering
Period: 01/04/2016 → 30/03/2020
Number of participants: 3
Phd Student:
Cáceres, Alex Arnoldo González (Intern)
Supervisor:
Vik, Tor Arvid (Ekstern)
Main Supervisor:
Karlshøj, Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat ekstern
Project: PhD

Seasonal heat storages in Denmark
Analyses of measurements and experience from operation of water pit heat storage in Gram solar heating plant

Department of Civil Engineering
Section for Building Energy
PlanEnergi
Period: 04/03/2016 → 31/07/2018
Number of participants: 1
water pit, seasonal heat storage
Project participant:
Furbo, Simon (Intern)

Warm or Cold, Lights influence on thermal comfort
Various indicators point out that a connection exists between the ambient temperature and the correlated color temperature that users prefer for the lit environment. In warm climate the use of cooler lighting is much more common than in a colder climate where people use much warmer light sources. Presumably the use of different colored light sources is due to the experience of cooler climate at cooler light sources and the impression of warmth follows a warmer looking light source. With new LED technology the correlated color temperature (warm white to cool white) is easily controllable.

The goal of the project is to demonstrate how controllable LED lighting can be used to expand the temperature interval that users find comfortable. The project is founded on previous research on colored light. It will lead to a decrease in the energy consumption of buildings.

Department of Photonics Engineering
Diode Lasers and LED Systems
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Period: 01/03/2016 → 31/12/2018
Number of participants: 5
Project ID: 70963
Project participant:
Markvart, Jakob (Ekstern)
Thorseth, Anders (Intern)
Dam-Hansen, Carsten (Intern)
Toftum, Jørn (Intern)

Project Manager, organisational:
Logadóttir, Ásta (Ekstern)

Financing sources
Source: Public research council
Name of research programme: ELFORSK
Web address: http://www.elforsk.dk/
Year of approval: 2015

Relations
Related projects:
Combined daylight and Intelligent LED lighting : Getting the daylight into the buildings
Energibesparende LED farveblandings belysningssystem med høj lyskvalitet

Activities:
DALI Designer 5 programming
Danish national CIE committee (External organisation)
LED possibilities and challenges

Press / Media items:
Koldt LED-lys truer nordisk hygge

Project

Forundersøgelser i Qaanaaq
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Section for Geotechnics and Geology
Period: 01/02/2016 → 01/05/2018
Number of participants: 3
Project participant:
Ingeman-Nielsen, Thomas (Intern)
Foged, Niels Nielsen (Intern)
Project Manager, academic:
Hendriksen, Kåre (Intern)

Advanced Waterflooding -rock mechanics and fluid saturation
Department of Civil Engineering
Period: 01/02/2016 → 31/01/2019
Number of participants: 3
Phd Student:
Meireles, Leonardo Teixeira Pinto (Intern)
Supervisor:
Welch, Michael (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Electrochemical Zone for Degradation of Chlorinated Solvents in Aquifers
Department of Civil Engineering
Period: 01/02/2016 → 31/01/2019  
Number of participants: 4  
Phd Student:  
Hyldegaard, Bente Højlund (Intern)  
Supervisor:  
Jakobsen, Rasmus (Intern)  
Jakobsen, Rasmus (Intern)  
Main Supervisor:  
Ottosen, Lisbeth M. (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  
Project: PhD  

Digital infrastructure and Building Information Models in the design and planning of building services  
Department of Civil Engineering  
Period: 15/01/2016 → 14/01/2019  
Number of participants: 4  
Phd Student:  
Rasmussen, Mads Holten (Intern)  
Supervisor:  
Hvid, Christian Anker (Intern)  
Vendelboe, Morten Vammen (Intern)  
Main Supervisor:  
Karlishøj, Jan (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  

Relations  
Activities:  
11th European Conference on Product and Process Modelling  
The Future of Lean Design Management  
Participation in workshop with two presentations  
Ghent University  
Gæsteforelæsning ved Technion  
BIM in the industry  
LDAC2016 – 4th Linked Data in Architecture and Construction Workshop  
Vidensmodeller - BIM er meget mere end 3D-geometri  
The 34th CIB W78 Information Technology for Construction Conference  
Linked Building Data  
Technion-Israel Institute of Technology  
Ecole des Mines de Saint-Etienne  
Guest lecture at Ecole des Mines de Saint-Etienne  
Proposing a Central AEC Ontology That Allows for Domain Specific Extensions  
Project: PhD  

CSP (Concentrated Solar Power) plant with biomass heat and power plant and ORC system  
Preparation and validation of a simulation model of the CSP (Concentrated Solar Power) plant with biomass heat and power plant and ORC system in Brønderslev. Analyses of measurements from the system in Brønderslev, and calculations with the developed model with the aim to optimize the system design and the control strategy of the plant.  
Department of Civil Engineering  
Section for Building Energy  
Brønderslev Forsyning A/S
Right operation of buildings with respect to indoor climate and energy consumption
The ambition of the project is to reduce the gap between the possible low energy consumption together with a good indoor climate and the actual state in buildings. The project will continue and follow up on previous projects concerning “EiSE”. Commissioning will be addressed with focus on the collaboration between project and operation departments. Concepts from Facility management will be included. However, both Commissioning and Facility management are mostly kept at a clarification and description level. Best practice of current technology will be described together with system interactions and building dynamics and general more intelligent use of online data. The cases are in the sectors of shopping centers, office buildings and to some extent municipality buildings. In the latter case the focus will be on the people who actually on a daily basis are operating and monitoring the systems. The knowhow obtained will be included in the education of civil engineers and marine engineers (maskinmestre). Furthermore vocational training of “ground floor personal” will be included. In the cases the present situation is described, actions are undertaken and the impact on energy consumption and indoor climate are registered and analysed.

Department of Civil Engineering
Section for Building Energy
PlanEnergi
Period: 01/01/2016 → 31/12/2017
Number of participants: 2
Acronym: EnDRIn
Number of related Ph.D. students: 0
Project participant:
Kolarik, Jakub (Intern)
Christensen, Jørgen Erik (Intern)

seasonal heat storage in Denmark
Measurements and experience from water pits and borehole heat storages are gained

Department of Civil Engineering
Section for Building Energy
PlanEnergi
Period: 01/01/2016 → 31/07/2018
Number of participants: 1
seasonal heat storage, water pit, borehole heat storage
Project participant:
Furbo, Simon (Intern)

IEA Task 46 Solar resource assessment and forecasting
Solar radiation in a solar collector field in Høje Tåstrup is measured and analysed. Thermal performances of solar collector fields are calculated with solar radiation measured in the period 2001-2010 for different locations in Denmark. Detailed solar radiation models for the diffuse radiation are developed.

Department of Civil Engineering
Section for Building Energy
Danish Meteorological Institute
Period: 01/01/2016 → 31/12/2016
Number of participants: 2
solar radiation, diffuse radiation
Pilot installation of hybrid solar collectors in district heating plants
A combined tracking concentrating and flat plate collector will be developed and tested experimentally. A solar collector row with the developed solar collector will be installed in Sæby solar heating plant. The thermal performance of the collector row will be measured and compared to the thermal performance of normal flat plate collectors.

Department of Civil Engineering
Section for Building Energy
PolyCSP ApS
Sæby Varmeværk amba
Period: 01/01/2016 → 31/12/2017
Number of participants: 3
Solar collector, solar heating plant
Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)
Kong, Weiqiang (Intern)

IEA Task 54 Price reduction of solar thermal systems
Investigations on solar heating systems with the aim to reduce the price of the systems. Both solar domestic hot water systems and combined systems for space heating and domestic hot water supply are considered.

Department of Civil Engineering
Section for Building Energy
SolarKey Int.
Period: 01/01/2016 → 31/12/2017
Number of participants: 3
Solar heating systems, low flow systems, SDHW systems, Solar combi systems
Acronym: IEA Task 54
Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)
Dragsted, Janne (Intern)

Implementation of flexible operational schemes for buildings in a district with smart energy systems
Department of Civil Engineering
Period: 01/11/2015 → 31/10/2018
Number of participants: 4
PhD Student:
Luc, Katarzyna Marta (Intern)
Supervisor:
Heller, Alfred (Intern)
Li, Rongling (Intern)
Main Supervisor:
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
Quantitative analysis of firn permeability and melt water refreezing of the Greenland ice sheet

Department of Civil Engineering  
Period: 01/11/2015 → 31/12/2018  
Number of participants: 3  
Phd Student:  
Vandecrux, Baptiste Robert Marcel (Intern)  
Supervisor:  
Fausto, Robert Schjøtt (Ekstern)  
Main Supervisor:  
Ingeman-Nielsen, Thomas (Intern)  

Financing sources
Source: Internal funding (public)  
Name of research programme: Forskningsrådsfinansiering  
Project: PhD

Concentration solar collectors for solar heating plants

Department of Civil Engineering  
Period: 15/10/2015 → 14/10/2018  
Number of participants: 3  
Phd Student:  
Tian, Zhiyong (Intern)  
Supervisor:  
Fan, Jianhua (Intern)  
Main Supervisor:  
Furbo, Simon (Intern)  

Financing sources
Source: Internal funding (public)  
Name of research programme: Stipendie fra udlandet  
Project: PhD

Industrial PhD Development of method for Integrated sustainability design  
Supervision of industrial phd. Mathilde Landgren (JJW architects)

Department of Civil Engineering  
Section for Building Design  
Period: 01/10/2015 → 01/10/2018  
Number of participants: 1  
Number of related Ph.D. students: 1  
Supervisor:  
Jensen, Lotte Bjerregaard (Intern)  
Project

Circular Ocean

Department of Civil Engineering  
Period: 01/10/2015 → 30/12/2018  
Number of participants: 4  
Phd Student:  
Bertelsen, Ida Maria Gieysztor (Intern)  
Supervisor:  
Belmonte, Louise Josefine (Intern)  
Schmidt, Jacob Wittrup (Intern)  
Main Supervisor:  
Ottosen, Lisbeth M. (Intern)  

Financing sources
SUB 0 *snow and wind - a dimension in arctic built environment*

Department of Civil Engineering  
Period: 01/10/2015 → 30/09/2018  
Number of participants: 5  
Phd Student:  
Fiebig, Jennifer (Intern)  
Supervisor:  
Bøggild, Carl Egede (Intern)  
Garcia, David A. (Ekstern)  
Lading, Tove (Intern)  
Main Supervisor:  
Koss, Holger (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

The architectural transition between stations and urban spaces, seen from a safety point of view

Department of Civil Engineering  
Period: 01/10/2015 → 06/07/2019  
Number of participants: 5  
Phd Student:  
Strandbygaard, Sofie Kirt (Intern)  
Supervisor:  
Gründlund, Bo (Ekstern)  
Nielsen, Otto Anker (Intern)  
Nielsen, Otto Anker (Intern)  
Main Supervisor:  
Jensen, Lotte Bjerregaard (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

Udvikling af metode til integreret bæredygtigt design

Department of Civil Engineering  
Period: 01/10/2015 → 30/09/2018  
Number of participants: 4  
Phd Student:  
Landgren, Mathilde (Intern)  
Supervisor:  
Jensen, Lotte Bjerregaard (Intern)  
Kiesslinger, Jørn (Ekstern)  
Main Supervisor:  
Heller, Alfred (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Industrial PhD  
Project: PhD
Models for flexible operation of buildings in district energy system Nordhavn
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Section for Building Energy
Period: 15/09/2015 → …
Number of participants: 3
Phd Student:
Foteinaki, Kyriaki (Intern)
Supervisor:
Heller, Alfred (Intern)
Main Supervisor:
Rode, Carsten (Intern)

Relations
Parent project:
EnergyLab Nordhavn - New Urban Energy Infrastructures

Models for flexible operation of buildings in district energy system Nordhavn
Department of Civil Engineering
Period: 15/09/2015 → 14/09/2018
Number of participants: 4
Phd Student:
Foteinaki, Kyriaki (Intern)
Supervisor:
Andersen, Rune Korsholm (Intern)
Heller, Alfred (Intern)
Main Supervisor:
Rode, Carsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Erasmus - BeInterBaltic
A 3 year project about interdisciplinary design Projects in the curriculum of Universities in Germany, Sweden, Finland, Denmark, Poland and Estonia.

Department of Civil Engineering
Section for Building Design
Period: 01/09/2015 → 01/09/2018
Number of participants: 1
Project participant:
Jensen, Lotte Bjerregaard (Intern)

Air collector for dehumidification
The aim is to develop an advanced air collector which can be used for dehumidification of buildings. The collector is equipped with a layer of silica gel. The silica gel can contain more or less water. During sunny days solar radiation is used to dry out the silica gel. During nights outdoor air is, by passing through the collector, dehumidified by the silica gel. An air collector is tested in a laboratory test facility.

Department of Civil Engineering
Section for Building Energy
Solar Venti A/S
Cenergia
Aros teknik ApS
Period: 01/09/2015 → 31/03/2017
Number of participants: 2
Project participant:
Furbo, Simon (Intern)
Andersen, Elsa (Intern)

Corrosion resistance of steel fibre reinforced concrete structures
Department of Civil Engineering
Period: 01/09/2015 → 20/07/2019
Number of participants: 5
Phd Student:
Marcos Meson, Victor (Intern)
Supervisor:
Edvardsen, Carola (Ekstern)
Michel, Alexander (Intern)
Solgaard, Anders Ole Stubbe (Intern)
Main Supervisor:
Fischer, Gregor (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Nordic Built STED - Sustainable Transformation and Environmental Design
This project targets innovation of the analysis and the design processes for the Nordic building stock.
The main aims are:
1) To develop design methods and solutions for renovation and new buildings combining energy efficiency, environmental
design and lifecycle thinking
2) To create a Nordic research and innovation platform for design, renovation and transformation in architecture
3) To create innovative ICT services and tools for performance modeling and resource management for design and
renovation
Department of Civil Engineering
Section for Building Design
Royal Danish Academy of Fine Arts
Chalmers University of Technology
Norwegian University of Science and Technology
White Arkitekter AB
Vandkunsten Arkitekter
Helen & Hard
Studio Granda
OOPEAA
Danske Arkitektvirkomheder
Period: 01/08/2015 → 01/08/2018
Number of participants: 2
Sustainability, LCA, Integrated dynamic models, Computational design, LCC, Building information Modeling, Building
Performance Simulation
Acronym: STED
Project Manager, academic:
Jensen, Lotte Bjerregaard (Intern)
Project Coordinator:
Negendahl, Kristoffer (Intern)

Relations
Parent project:
Nordic Built STED - Sustainable Transformation and Environmental Design

Arktisk vandforsyning
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Period: 01/06/2015 → 01/06/2016
Number of participants: 1
Project Manager, academic:
Hendriksen, Kåre (Intern)

Hygrothermal performance of internal insulation in historic buildings
Department of Civil Engineering
Period: 01/06/2015 → 31/05/2018
Number of participants: 3
Phd Student:
Hansen, Tessa Kvist (Intern)
Supervisor:
Peuhkuri, Ruut Hannele (Intern)
Main Supervisor:
Bjarløv, Søren Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

*Sino Danish Corporation
Department of Civil Engineering
Section for Building Energy
Sino-Danish Center for Education and Research
Period: 01/05/2015 → …
Number of participants: 1
Project participant:
Englmair, Gerald (Intern)

Seasonal PCM heat storage for a solar space heating and domestic hot water combisystem
Department of Civil Engineering
Period: 01/05/2015 → 19/09/2018
Number of participants: 4
Phd Student:
Englmair, Gerald (Intern)
Supervisor:
Furbo, Simon (Intern)
wang, Zhifeng (Ekstern)
Main Supervisor:
Fan, Jianhua (Intern)

Financing sources
Seismic geomorphology and reservoir characteristics of the Danish Chalk fields

Department of Civil Engineering
Period: 01/05/2015 → 30/04/2018
Number of participants: 3
Phd Student:
Smit, Florian Walther Harald (Intern)
Supervisor:
von Buchem, Frans (Ekstern)
Main Supervisor:
Anderskouv, Kresten (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Definition of a generic decision making framework and design of an Open Decision Support Platform
The research activity is addressing the definition of the overall decision theoretical and methodical framework to structure and facilitate decision processes when different decision alternatives are available and when the available information are subject to uncertainty and/or are incomplete, thus providing a robust tool to rank those alternatives in accordance with their consequences on sustainability, benefits and risks. Moreover, the framework shall facilitate the introduction of new information, changes in preferences and models and expert opinions with associated uncertainties. Based on the developed theoretical framework integrating quantitative assessment of risk and sustainability, the architecture of an Open Platform for the storage of information and models, the organisation of an analysis of models as well as the presentation of results of decision analyses shall be developed.
The research activity is part of the joint GDSI project aiming at supporting decision makers from industry and public authorities.

Department of Civil Engineering
Section for Structural Engineering
Department of Management Engineering
Quantitative Sustainability Assessment
Period: 01/04/2015 → 01/03/2017
Number of participants: 2
Risk Analysis, sustainability, Decision making, decision support tool, LCA, climate change, Uncertainty Quantification, Reliability Engineering
Project participant:
Miraglia, Simona (Intern)
Main Supervisor:
Faber, Michael Havbro (Intern)

EnergyLab Nordhavn - New Urban Energy Infrastructures
Department of Electrical Engineering
Center for Electric Power and Energy
Energy resources, services and control
Energy Analytics and Markets
Energy system operation and management
Department of Applied Mathematics and Computer Science
Department of Civil Engineering
Section for Building Energy
Section for Indoor Climate and Building Physics
Department of Mechanical Engineering
Thermal Energy
HOFOR A/S
Balslev Consulting Engineers A/S
METRO THERM A/S
ABB Group
Københavns Kommune
By og Havn
Radius Elnet

CleanCharge Solutions
Period: 01/04/2015 → 31/03/2019
Number of participants: 20
Acronym: ELN
Number of related Ph.D. students: 9
Project participant:
Hashemi Toghroljerdi, Seyedmostafa (Intern)
Østergaard, Jacob (Intern)
Træholt, Chresten (Intern)
Pinson, Pierre (Intern)
Mitridati, Lesia Marie-Jeanne Mariane (Intern)
Klyapovskiy, Sergey (Intern)
Le Ray, Guillaume (Intern)
Gjelaj, Marjan (Intern)
You, Shi (Intern)
Harrestrup, Maria (Intern)
Rode, Carsten (Intern)
Ommen, Torben Schmidt (Intern)
Foteinaki, Kyriaki (Intern)
Luc, Katarzyna Marta (Intern)
Pieper, Henrik (Intern)
Meessenburg, Wiebke (Intern)
Mitridati, Lesia Marie-Jeanne Mariane (Intern)
Le Ray, Guillaume (Intern)
Project Manager, organisational:
Greisen, Christoffer (Intern)

Relations
Activities:
Performance analysis of heat pumps utilizing different low temperature heat sources to supply district heating
Publications:
Optimal usage of low temperature heat sources to supply district heating by heat pumps
Cost-Benefit Analysis of a Novel DC Fast-Charging Station with a Local Battery Storage for EVs
DC Fast-Charging Stations for EVs Controlled by a Local Battery Storage in Low Voltage Grids
Optimal Design of DC Fast-Charging Stations for EVs in Low Voltage Grids
Active and reactive power support of MV distribution systems using battery energy storage
Methods and Strategies for Overvoltage Prevention in Low Voltage Distribution Systems with PV
Efficient Control of Energy Storage for Increasing the PV Hosting Capacity of LV Grids
Efficient Control of Active Transformers for Increasing the PV Hosting Capacity of LV Grids
Spatial Adaptable Rapidly Erectable Building Systems
Application for call of the International Network Programme, Danish Agency for Science, Technology and Innovation 'Spatial Adaptable Rapidly Erectable Building Systems'
Funding period 1 March 2015-31 December 2015

Department of Civil Engineering
Section for Building Design
Period: 01/03/2015 → 31/12/2015
Number of participants: 1
Project participant:
Jensen, Lotte Bjerregaard (Intern)

Assessment and Optimization Methods for Implementation of Energy Strategies in Communities

Department of Civil Engineering
Period: 15/02/2015 → 17/03/2018
Number of participants: 7
Phd Student:
Petersen, Jens-Phillip (Intern)
Supervisor:
Heller, Alfred (Intern)
Kolarik, Jakub (Intern)
Main Supervisor:
Rode, Carsten (Intern)
Examiner:
Nielsen, Per Sieverts (Intern)
Nielsen, Susanne Balslev (Intern)
Pahl-Weber, Elke (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet PhD

Digitale kompetencer i byggeriet

Department of Civil Engineering
Section for Building Design
Period: 01/01/2015 → 28/02/2015
Number of participants: 3
Project participant:
Karlshøj, Jan (Intern)
Jørgensen, Erik Falck (Intern)
Project Manager, academic:
Vestergaard, Flemming (Intern)

Cuneco merbevillingsprojekt

Department of Civil Engineering
Section for Building Design
Period: 01/01/2015 → 31/08/2015
Number of participants: 1
Project participant:
Karlshøj, Jan (Intern)
**Solar heating plant with tracking concentrating solar collectors and flat plate solar collectors**
A simulation model of the solar heating plant in Tårn is developed and validated by means of measurements. Measurements from the solar heating plant in Tårn are analysed.

Simulations are carried out with the validated model with the aim to optimize future solar heating plants.

Department of Civil Engineering
Section for Building Energy

Aalborg CSP
Period: 01/01/2015 → 30/11/2017
Number of participants: 3
CSP collectors, flat plate collectors, solar heating plants
Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)
Tian, Zhiyong (Intern)

**Improving phosphorus recovery by supplementing existing Danish wastewater treatment using electrodialysis.**
MUDP-project.

Department of Civil Engineering
Arctic Technology Centre, ARTEK
Department of Environmental Engineering
Urban Water Engineering

Naturstyrelsen
Period: 01/01/2015 → 31/07/2015
Number of participants: 4
biological, wastewater treatment, electrodialysis, phosphorus
Project ID: 26452
Project participant:
Andersen, Henrik Rasmus (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Project Coordinator:
Ebbers, Benjamin (Intern)

**EnergyLab Nordhavn**
The objective of this project it to develop new methods and solutions for design and dimensioning of the future cost-effective multi-carrier energy system (electricity, thermal, transport) based on Nordhavn as a globally visible real-life laboratory.

Department of Civil Engineering
Section for Indoor Climate and Building Physics
Period: 01/01/2015 → 31/12/2019
Number of participants: 1
energy flexible buildings, flexible users, living lab, urban energy infrastructure, Renewable energy
Project participant:
Li, Rongling (Intern)

**RIBuild**
RIBuild will strengthen the knowledge on how and under what conditions internal thermal insulation is to be implemented in historic buildings, without compromising their architectural and cultural values, with an acceptable
safety level against deterioration and collapse of heavy external wall structures. The general objective of RIBuild is to develop effective, comprehensive decision guidelines to optimise the design and implementation of internal thermal insulation in historic buildings across the EU. RIBuild focuses on heavy external walls made of stone, brick and timber framing, as most historic buildings are made of these materials. The general objective is achieved through three main activities:

• To obtain a thorough knowledge level to characterise the eligibility of the building for a deep internal thermal insulation renovation. This knowledge is obtained through screening of historic buildings, investigation of material properties and threshold values for failure.

• To determine the conditions under which different internal insulation measures are reliable and affordable measures based on probabilistic modelling of the hygrothermal performance, the environmental impact and the cost/benefit.

• To develop a set of comprehensive decision guidelines, which are demonstrated in a number of buildings. RIBuild addresses the most difficult retrofitting measure of historic buildings: internal thermal insulation. The adaptation of knowledge developed by RIBuild contributes to sustainable historic buildings with improved energy efficiency implying an easier conversion of energy supply from inefficient fossil fuels to efficient renewable energy sources. RIBuild also assesses the hygrothermal performance of the building construction, thus no collateral damage occurs; in case of failure an easy roll back of the measures is possible. The guidelines developed in RIBuild strongly support the deep and holistic retrofitting approach which historic buildings face in the coming years.

Work packages

The RIBuild research programme is divided into eight inter-correlated work packages (WPs). For a short description of each work package, please see the following.

WP1: Pre-renovation assessment
Examines common structural elements of historic buildings, determines their physical properties and classifies them according to type. The objective is to observe and describe the main symptoms of a deteriorating building envelope and study their possible causes.

WP leader: RTU
Participants: AAU, TUD, KUL, UNIVPM, DTU, SP, HES-SO

WP2: Material characterisation
Provides data for material properties and threshold values for historic building materials and existing insulation materials as a background for material characterisation models and guidelines for safe retrofitting measures.

WP leader: AAU
Participants: RTU, TUD, KUL, UNIVPM, DTU, SP, HES-SO, INTROFLEX

WP3: Case studies and laboratory measurements
Supports the research with high quality measurement data from both laboratory experiments on components and on-site monitoring of test buildings.

WP leader: TUD
Participants: AAU, RTU, KUL, UNIVPM, DTU, SP, INTROFLEX

WP4: Probabilistic assessment of internal insulation solutions
Develops an efficient strategy for the probabilistic hygrothermal assessment of internal solutions.

WP leader: KUL
Participants: AAU, TUD, HES-SO

WP5: Development of cost/benefit analysis and environmental impact assessment methodologies
Develops a probabilistic assessment methodology for assessing the environmental impact and cost/benefit of internal insulation solutions. The methodologies are based on Life Cycle Impact Assessment (LCA), Life Cycle Cost (LCC) and Cost-Optimal (CO) analysis.

WP Leader: UNIVPM
Participants: AAU, RTU, DTU, HES-SO

WP6: Application and evaluation of guidelines
Develops and assesses the methodology for internal insulation of historic buildings, based on the methodologies developed in WP4 and WP5.

WP Leader: DTU
Participants: AAU, RTU, TUD, KUL, UNIVPM, SP, HES-SO, INTROFLEX, EMA

WP7: Communication and dissemination
Coordinates the overall communication and network partners of RIBuild.
WP Leader: AAU
Participants: RTU, TUD, KUL, UNIVPM, DTU, SP, HES-SO, INTROFLEX, EMA

WP8: Project management
WP 8 is in charge of the overall management of RiBuild.

WP leader: AAU

Department of Civil Engineering
Section for Building Design
Section for Indoor Climate and Building Physics

Campus Service
Period: 01/01/2015 → 31/12/2019
Number of participants: 5
Internal insulation
Project ID: RiBuild
Project participant:
Hansen, Tessa Kvist (Intern)
Rode, Carsten (Intern)
Perkov, Thomas Holmer (Intern)
Nielsen, Ole Christian Kongsgaard (Intern)
Project Manager, academic:
Bjarløv, Søren Peter (Intern)

Relations
Related projects:
Hygrothermal performance of internal insulation in historic buildings
Interior insulation of buildings from 1850 to 1930 with massive external masonry walls and embedded wooden beam floor structure
Activities:
TEMAMØDE FOR ANVENDELSE AF INDVENDIG EFTERISOLERING
PROJEKTKONFERENCE
Documents:
Annex 1 - Description of the action (part A)
Annex 1 - Description Of Action (part B)
Timing of the different work packages

Cost actionFP1404 - Fire safe use of bio-based building products

Department of Management Engineering
Production and Service Management
Risk Research Group
Implementation and Performance Management
Department of Civil Engineering
Section for Building Design
Period: 05/12/2014 → 04/12/2018
Number of participants: 2
Acronym: FP1404
Project participant:
Markert, Frank (Intern)
Jomaas, Grunde (Intern)
Structural Health Monitoring Systems Design

Structural Health Monitoring (SHM) allows for triggering timely and cost efficient remedial actions to structures to counter deterioration, damage, peak loads and unintended use if effective systems are applied. Monitoring systems can be of support in maintaining safety for people, protecting the environment and minimising asset life-cycle costs. All potential benefits are in fact not always realised. Poorly designed SHM systems can incur increased life-cycle costs and lead to production losses or other disturbances through triggering unnecessary or inappropriate rehabilitation actions. The concept of Value of Information (VoI) for the pre-posterior Bayesian decision analysis can be used to predict if a SHM strategy is beneficial prior to its implementation and provides thus the basis for SHM systems design. The VoI is calculated with probabilistic structural models accounting for uncertainties of the structural performance, the relationship between monitored performance indicators and life-cycle costs, reliability and safety as well as uncertainties in the precision of the applied monitoring techniques.

In this project approaches, model and tools are developed to facilitate an efficient and VoI based design of SHM systems.

Department of Civil Engineering

Section for Structural Engineering
Period: 02/11/2014 → 31/10/2017
Number of participants: 2
Project ID: 26442
Phd Student: 
Brüske, Henning (Intern)
Main Supervisor: 
Thöns, Sebastian (Intern)
Project

Structural Health Monitoring Systems Design

Department of Civil Engineering
Period: 01/11/2014 → 31/01/2018
Number of participants: 2
Phd Student: 
Brüske, Henning (Intern)
Main Supervisor: 
Thöns, Sebastian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Superior inlet stratifier
Development of polymer stratification device, which can establish thermal stratification in hot water stores.

Department of Civil Engineering
Section for Building Physics and Services
Period: 27/10/2014 → 30/06/2015
Number of participants: 4
Thermal stratification, Stratifier, Hot water tank
Project ID: 26407
Project participant:
Furbo, Simon (Intern)
Dragsted, Janne (Intern)
Aagaard, Claus (Intern)
Dandanell, Jens Martin (Intern)

Aerodynamics and icing of bridge cables with concave fillets

Department of Civil Engineering
Period: 15/10/2014 → 13/02/2018
Number of participants: 7
Phd Student: 
Burlina, Celeste (Intern)
Critical Infrastructures (CIs), being extensively interrelated with modern communities, constitute the vital lifeline to keep both society and economy functioning in a steady and prosperous rate. Thus, a protective grid of elaborate techniques and policies should be applied in order to provide safety and security for the CIs against the devastating effects of either natural or man-made threats. Along these lines, the proposed research work aims at developing a comprehensive and systematic approach for the risk assessment-management of critical civil infrastructures threatened by a multi-hazard environment during their entire life span. A holistic methodology will be carried out in order to perform a risk-based decision analysis, estimating both the direct and the indirect natural hazard consequences for a CI. At the same time, an additional sustainability-based evaluation will be implemented regarding the expected life-cycle environmental impacts from losses and recovery of the CI after adverse natural events.

Risk analysis: hazardous goods and freight train restrictions in the Danish fixed links
The Danish Transport Authority and operators of the Danish fixed links (Øresund, Storebælt and Femern) have requested DTU to assess the risk of freight trains, possibly carrying hazardous goods (i.e. RID-classified goods), using the fixed links.
in close distance to passenger trains. At present, restrictions are in place, which prohibit freight trains and passenger trains to be in tunnel tubes simultaneously, which leads to a decrease of the transport capacity. The risk analysis focusses on the risk to passengers in passenger trains due to freight trains being in the tunnels simultaneously, and will not address the risk to disruption of the transport due to damage to the infrastructure, because this is already an accepted risk for freight trains passing the fixed links. The purpose of the risk assessment is to provide insights into the changes in risk when restrictions for simultaneous presence of freight trains and passenger trains in the same tunnel tube are changed (and where several options are possible) and what safety measures might be beneficial for reducing risks ALARP (As Low As Reasonably Practicable) when restrictions are relaxed.

Department of Management Engineering
Production and Service Management
Engineering Systems Group
Risk Research Group
Implementation and Performance Management
Department of Civil Engineering
Section for Building Design
Department of Transport
Traffic modelling and planning
Period: 01/10/2014 → 31/03/2015
Number of participants: 5
Risk analysis, hazardous goods, railway, tunnel
Acronym: RATT
Project ID: 81469
Project participant:
Markert, Frank (Intern)
Dederichs, Anne Simone (Intern)
Alva, Wilson Ulises Rojas (Intern)
Prato, Carlo Giacomo (Intern)
Project Manager, academic:
Duijm, Nijs Jan (Intern)

Financing sources
Source: Other public support (public)
Name of research programme: Danish Transport Authority, framework agreement with DTU
Amount: 600,000.00 Danish Kroner
Year of approval: 2014

Data and knowledge flow in the construction sector: a research study of infrastructural social and technical networks
Department of Civil Engineering
Period: 01/10/2014 → 31/01/2018
Number of participants: 3
Phd Student:
Jørgensen, Erik Falck (Intern)
Supervisor:
Thuesen, Christian (Intern)
Main Supervisor:
Karlshøj, Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Fire Performance of Assemblies Incorporating Insulation Products
Low temperature heating and high temperature cooling systems using Phase Change Materials for new buildings and energy renovation of existing buildings

Effective Design and Intelligent Control and Operation District Heating and Cooling System

Buildings for Smart Energy Cities
AERODYNAMICS AND ICING OF BRIDGE CABLES WITH CONCAVE FILLETS
An understanding of the exact mechanisms behind the drag retention or reduction of taller concave sharp-edged fillets will allow for further reductions in drag of cables and other similar structures. The reductions can be achieved without reducing the ability of the fillets to stop the formation of vibration-inducing rain rivulets. Furthermore, intelligent positioning of the
fillets can lead to a surface configuration that will help to mitigate the effects of falling ice or snow on vehicles and persons traversing a bridge. This can be done e.g. by positioning the fillets in a way that they will retain the snow or ice longer and then subsequently allow the melted accretions to fall from the cable in smaller, less hazardous pieces

Department of Civil Engineering
Section for Structural Engineering

FORCE Technology
Period: 14/09/2014 → 14/09/2017
Number of participants: 1
Project participant:
Burlina, Celeste (Intern)

Temperature and poroelasticity of sedimentary rocks
Department of Civil Engineering
Period: 01/09/2014 → 28/02/2018
Number of participants: 3
Phd Student:
Orlander, Tobias (Intern)
Supervisor:
Andreassen, Katrine Alling (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Innovations network Smart Energy (CLEAN)
Innovation network under CLEAN for smart energy innovation activities.

Department of Civil Engineering
Section for Building Physics and Services
Department of Applied Mathematics and Computer Science
Centre for IT-Intelligent Energy Systems in Cities
Period: 15/08/2014 → 31/12/2017
Number of participants: 2
Acronym: Inno-SE
Project participant:
Heller, Alfred (Intern)
Madsen, Henrik (Intern)

Temperature and poroelasticity of sedimentary rocks
The project is centered on development of rock mechanics related to high pressure and high temperature (HP/HT) conditions in the subsurface. The issue will be addressed experimentally and theoretically including numerical modeling.

Hydrocarbon reservoirs deeply buried under the central North Sea are not only subjected to high temperatures and a stress-field corresponding to depths of 5 km or more. They are also situated at a depth with high regional overpressure. This gives rise to three key challenges, which apply not only in the North Sea but world-wide: 1. Safety during drilling operations due to the extreme pressure and stresses. 2. Well life – the danger of well collapse under extreme stress conditions. 3. Controlling the drilling operation due to narrow drilling windows, in particular during infill drilling. This latter challenge must be met in order to maximize recovery.

In order to address these challenges we must develop methods to determine how the effective stress field responds to changes in pore pressure under these extreme conditions. The effective stress field is primarily a function of the weight of the overburden
and how much of the load, the fluids in the rock carry. It also depends on the elastic properties of the rock at a given depth.

Supervisor: Prof. Ida Lykke Fabricius, ilfa@byg.dtu.dk

co-supervisor: Ass. Prof. Katrine Alling Andreassen, kall@byg.dtu.dk

Department of Civil Engineering
Center for Energy Resources Engineering
Department of Chemical and Biochemical Engineering
CERE – Center for Energy Resources Engineering

Department of Geology and Geotechnical Engineering

Period: 01/08/2014 → 01/08/2017
Number of participants: 1
Project participant:
Orlander, Tobias (Intern)

Relations
Related projects:

Heat Storage in Hot Aquifers

Qaanaaq Distrikt – infrastruktur og erhvervssgrundlag

Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Period: 01/08/2014 → …
Number of participants: 2
Project participant:
Hoffmann, Birgitte (Intern)
Project Manager, academic:
Hendriksen, Kåre (Intern)
Documents:
160314 Qaanaaq rapport MASTERny reduceret

Numerical modelling of offshore foundations for jacket structures
Background
Nowadays, the offshore wind market is moving towards wind farms with higher capacity generators and in deeper waters to increase energy production, with the consequence of deploying deep offshore designs. In the years to come, the offshore wind market will require advanced models to reduce the cost of jacket foundations for offshore wind turbines. Therefore, it is required to improve the investigation of the dynamic response of jacket foundations.

Project
The main goal of this project is to develop a numerical model to capture the dynamic response of jacket foundations of offshore wind turbines, accounting for the soil-pile interaction, soil properties and pile geometry.

Perspective
It is supposed to implement soil-elasto-plastic constitutive model in a numerical finite element code. Developing a lumped parameter model to represent the soil and the foundation is also attempted.

Department of Civil Engineering

Section for Geotechnics and Geology

Period: 01/08/2014 → 01/07/2017
Number of participants: 1
Soil-foundation interaction, Offshore wind turbine, Dynamic stiffness, Damping, Numerical modelling
Number of related Ph.D. students: 1
Project participant:
Latini, Chiara (Intern)
Numerical modelling of Offshore Foundations for Jacket Structures

Department of Civil Engineering
Period: 01/08/2014 → 01/02/2018
Number of participants: 6
Phd Student:
Latini, Chiara (Intern)
Supervisor:
Johannesson, Björn (Intern)
Main Supervisor:
Zania, Varvara (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Kouretzis, George P. (Ekstern)
Vabbersgaard Andersen, Lars (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Development of seasonal compact heat storage
Cooperation with H.M. Heizkörper GmbH & Co. KG on development of PCM heat storage.

Cooperation with H.M. Heizkörper GmbH & Co. KG.

Department of Civil Engineering
Section for Building Physics and Services
Heizkörper GmbH & Co. KG
Period: 03/07/2014 → 30/09/2015
Number of participants: 5
PCM heat storage, Sodium acetate
Project participant:
Furbo, Simon (Intern)
Dannemand, Mark (Intern)
Kong, Weiqiang (Intern)
Fan, Jianhua (Intern)
Berg, Jakob Brinke (Intern)

Design and Modeling of Structural Joints in Precast Concrete Structures

Department of Civil Engineering
Period: 15/06/2014 → 01/02/2018
Number of participants: 7
Phd Student:
Sørensen, Jesper Harrild (Intern)
Supervisor:
Fischer, Gregor (Intern)
Olesen, John Forbes (Intern)
Main Supervisor:
Hoang, Linh Cao (Intern)
Examiner:
Brincker, Rune (Intern)
Hegger, Josef (Ekstern)
Ruiz, Miguel Fernández Ruiz (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Heating of existing buildings by low-temperature district heating

Department of Civil Engineering
Period: 01/06/2014 → 04/08/2018
Number of participants: 3
Phd Student:
Østergaard, Dorte Skaarup (Intern)
Supervisor:
Li, Hongwei (Intern)
Main Supervisor:
Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

IEA EBC Annex 67 - Energy Flexible Buildings

Energy flexibility in buildings will play an important role in facilitating energy systems based entirely on renewable energy sources. Flexibility is necessary to control the energy consumption to match the actual energy generation from various energy sources such as solar and wind power. However, there is lack of comprehensive knowledge about how much energy flexibility different building types and their usage may be able to offer to the future energy systems.

The aim of this project is to demonstrate how energy flexibility in buildings can provide generating capacity for energy grids, and to identify critical aspects and possible solutions to manage such flexibility. This knowledge is important in order to incorporate energy flexibility of buildings into future smart energy systems and to better accommodate renewable sources in energy systems. It is also important when developing the business case for using building energy flexibility within future systems to potentially reduce costly upgrades of energy distribution grids.

The project objectives are:
– development of common terminology, a definition of 'energy flexibility in buildings' and a classification method,
– investigation of user comfort, motivation and acceptance associated with the introduction of energy flexibility in buildings,
– investigation of the energy flexibility potential in different buildings and contexts, and development of design guidelines, control strategies and algorithms
– investigation of the aggregated energy flexibility of buildings and the potential effect on energy grids, and
– demonstration of energy flexibility through experimental and field studies.

Participants: Austria, Belgium, Denmark, France, Italy, the Netherlands, Norway, Portugal, Spain, Switzerland, United Kingdom

Centre for IT-Intelligent Energy Systems in Cities

Department of Civil Engineering
Department of Applied Mathematics and Computer Science
Period: 01/06/2014 → 01/06/2019
Number of participants: 4
Project ID: 26461
Project participant:
Heller, Alfred (Intern)
Madsen, Henrik (Intern)
Gianniou, Panagiota (Intern)
Foteinaki, Kyriaki (Intern)

Transport i beton med nye CO2-reducerede cementer

Department of Civil Engineering
Period: 01/06/2014 → 18/02/2018
Number of participants: 3
Phd Student:
Addassi, Mouadh (Intern)  
Supervisor:  
Johannesson, Björn (Intern)  
Main Supervisor:  
Fabricius, Ida Lykke (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Forskningsrådsfinansiering  
Project: PhD

Solvarme og energiforsyningens samfundsøkonomi, IEA SHC Task 52  
Department of Civil Engineering  
Section for Building Physics and Services  
PlanEnergi  
Aalborg University  
Period: 01/04/2014 → 31/12/2017  
Number of participants: 2  
Project participant:  
Furbo, Simon (Intern)  
Perers, Bengt (Intern)  

Novel ventilation for hospital beds to reduce airborne cross-contamination with bacteria and other microorganisms in old and new hospitals  
Department of Civil Engineering  
Section for Indoor Environment  
Period: 01/04/2014 → 30/12/2014  
Number of participants: 2  
invention, hospital ventilation  
Project ID: 26938  
Project participant:  
Melikov, Arsen Krikor (Intern)  
Bolashikov, Zhecho Dimitrov (Intern)  

Renew school - Sustainable school building renovation promoting timber prefabrication, indoor environment quality and active use of renewables  
Department of Civil Engineering  
Section for Building Physics and Services  
Section for Indoor Environment  
Period: 01/03/2014 → 28/02/2017  
Number of participants: 2  
Acronym: RENEW school  
Project participant:  
Hviid, Christian Anker (Intern)  
Wargocki, Pawel (Intern)  

COMposite Super-structures for large PASSenger ships  
Department of Civil Engineering  
Section for Building Design
Facilitating open science to European research (FOSTER, GA 612 425)(39146)

FOSTER is a coordination initiative that aims to support the full range of stakeholders in the research lifecycle, but especially young researchers, in adopting Open Science principles (Open Access, Open Data, Open Note Book, Open Educational Resources, Social Media for dissemination of research results) in the context of the European Research Area (ERA) and in complying with the open access policies and rules of participation set out for Horizon 2020 (H2020).

FOSTER will focus on integrating Open Science principles and practice in the current research workflow by targeting the young researchers training environment. In addition, FOSTER will strengthen the institutional training capacity to maintain compliance with the open access policies in the ERA and H2020, and will facilitate the adoption, reinforcement and implementation of open access policies from other European funders, in line with the European Commission’s recommendation.

The project is coordinated by University of Minho.

The project is funded by EU, Horizon 2020.

Department of Civil Engineering
National Institute of Aquatic Resources
Research Secretariat
Office for Innovation & Sector Services
University of Minho
Georg-August-Universität Göttingen
Stichting Eifl.Net
Stichting Sparc Europe
Stichting Liber
University of Glasgow
Delft University of Technology
The Open University
Uniwersytet Warszawski
Consejo Universitario de Publications Numeriques (COUPERIN)
Consejo Superior de Investigaciones Científicas
University of Edinburgh

Period: 01/02/2014 → 31/07/2016
Number of participants: 4
open science, visibility, citations, reuse of research, impact, open access, open data, open notebook science, open code
Acronym: FOSTER
Project participant:
Grigorov, Ivo (Intern)
Elbæk, Mikael Karstensen (Intern)
Thomsen, Kirsten (Intern)
Qvistgaard, Nina (Intern)

Relations
Activities:
Euroscience Open Forum 2014
TOL2015: Transatlantic Ocean Literacy in support of Galway Declaration
40th CIESM Mediterranean Science Commission Congress: Mediterranean Science Commission, Annual Congress
LEARN-TEACH: a pilot to boost Ocean Literacy in High Schools
EGU2017-18355 Passive vs Active Knowledge Transfer: boosting grant proposal impact
Winning Horizon2020 with Open Science: How to incorporate Open Science in competitive grant proposals
RIO Research Idea &amp; Outcomes (Journal)
Publications:
An open science peer review oath
Open Marine Science
Data Science Training for Librarians
Press / Media items:
The journal of proposals, ideas, data and more: New journal aims to publish from ‘all stages of the research cycle’.
Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.

Project

Off peaking of electricity use for electrical heated energy storages
Investigations on how to establish temperature stratification in electrical heated tanks with vertical electric heating elements installed at the bottom of the tanks and with a stratification device.

Department of Civil Engineering
Section for Building Physics and Services
METRO THERM A/S

EyeCular Technologies ApS
Period: 30/01/2014 → 31/12/2014
Number of participants: 4
Thermal stratification, Stratifier, Hot water tank
Project participant:
Furbo, Simon (Intern)
Dragsted, Janne (Intern)
Aagaard, Claus (Intern)
Dandanell, Jens Martin (Intern)

Project

Solar collector fields for solar heating plants in district heating systems

Department of Civil Engineering
Period: 15/01/2014 → 07/09/2017
Number of participants: 7
Phd Student:
Bava, Federico (Intern)
Supervisor:
Fan, Jianhua (Intern)
Fan, Jianhua (Intern)
Main Supervisor:
Furbo, Simon (Intern)
Examiner:
Nielsen, Toke Rammer (Intern)
Karlsson, Björn Olof Harry (Ekstern)
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)

Relations
Publications:
Modeling of solar collector fields for solar heating plants in district heating systems
Project: PhD
Urbanisation and Infrastructure in the Arctic - Challenges from a Sustainable Perspective
Organizing Committee.

Department of Civil Engineering
Section for Building Design
Period: 02/01/2014 → 30/04/2014
Number of participants: 1
Project ID: 26242
Project Manager, organisational:
Jensen, Lotte Bjerregaard (Intern)

Experimental and Numerical Study of the Thermal Resistance of Intumescent Coatings
Funded by COWI Fonden

Department of Civil Engineering
Section for Building Design
Period: 01/01/2014 → 30/04/2015
Number of participants: 2
Intumescent paint, Fire test, Thermal resistance
Acronym: Intumescent Paint
Project participant:
Jomaas, Grunde (Intern)
Project Coordinator:
Giuliani, Luisa (Intern)

Byggeriets Begreber

Department of Civil Engineering
Section for Building Design
Period: 01/01/2014 → …
Number of participants: 1
Acronym: BB
Project participant:
Karlshøj, Jan (Intern)

Development of PVT module for multiapartment buildings
Development of PVT module, which both can produce heat and electricity from solar radiation.

Department of Civil Engineering
Section for Building Physics and Services
RACELL SAPHIRE Technologies ApS
STO Danmark A/S
MAP Architects

PVT module, Efficiency, Measurements
Project ID: 26395
Project participant:
Furbo, Simon (Intern)
Berg, Jakob Brinkø (Intern)
Perers, Bengt (Intern)

Project
CITIES
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Period: 01/01/2014 → 31/12/2019
Number of participants: 1
smart cities, smart buildings, intelligent energy systems, demand flexibility
Project participant:
Li, Rongling (Intern)

ABYSS: Advancing BeYond Shallow waterS - Optimal design of offshore wind turbine support structures
ABYSS is a four year research project funded by the Danish Council for Strategic Research. ABYSS develops novel mathematical models, reliable numerical optimization techniques and software for optimal design of cost effective bottom-fixed offshore wind turbine support structures for all relevant water depths including deep waters in excess of 50m.

Department of Wind Energy
Wind Turbines
Fluid Mechanics
Department of Civil Engineering
Section for Geotechnics and Geology
FE-Design GmbH
Norwegian University of Science and Technology
Aalborg University
SINTEF
Universal Foundation A/S
DONG Energy A/S
Period: 01/01/2014 → 31/12/2017
Number of participants: 7
structural optimization, wind energy, offshore support structures
Acronym: ABYSS
Number of related Ph.D. students: 6
Project participant:
Buhl, Thomas (Intern)
Bredmose, Henrik (Intern)
Zania, Varvara (Intern)
Natarajan, Anand (Intern)
Schlöer, Signe (Intern)
Sørensen, John Dalsgaard (Intern)
Project Coordinator:
Stolpe, Mathias (Intern)

Financing sources
Source: Public research council
Name of research programme: Det Strategiske Forskningsråd, Programkomiteen for Bæredygtig Energi og Miljø
Amount: 21,600,000.00 Danish Kroner
Year of approval: 2013

Center for IT-Intelligent Energy Systems for Cities
A wide range of research activities have arisen to support the Danish target of a 100% renewable energy system by 2050. Projects focused on individual aspects of the energy system, such as zero emissions buildings or intelligent power systems provide valuable insight, that facilitates flexibility throughout the energy system. CITIES will address this deficiency by establishing an integrated research centre covering all aspects of the energy system, including gas, power, district heating/cooling and biomass, and most importantly methods to forecast, control and optimize their interactions.
through the use of advanced ICT solutions. The high densities of population, energy consumption, and energy and communications networks in cities offer the greatest potential for flexibility at the last cost, and the fact that cities account for 80% of global energy consumption and emissions [1] make the urban environment an ideal setting for energy systems integration research. CITIES will pioneer research into fully integrated city energy systems, building short-term operational models that feed longer term planning models, considering the spatiotemporal variations, interactions, dynamics and stochastics in the energy system. Low level models of system components will inform higher-level aggregate models employed in market and control framework design. The leading position of European academia and industry and the rapidly growing market for smart energy solutions indicates substantial scope for increased competitiveness and job creation within this field. CITIES will, in collaboration with its industrial and academic partners, conduct research with a view to developing tools for the implementation of integrated energy system solutions.

Center granted by Strategic Research Council.

To be a sustainable organisation.

Department of Applied Mathematics and Computer Science
Department of Civil Engineering
Department of Management Engineering
Department of Energy Conversion and Storage
Department of Informatics and Mathematical Modeling
Centre for IT-Intelligent Energy Systems in Cities

Aalborg University
Period: 01/01/2014 → 31/12/2019
Number of participants: 8
Strategic
Acronym: CITIES
Number of related Ph.D. students: 12
Project participant:
Madsen, Henrik (Intern)
Heller, Alfred (Intern)
Nielsen, Per Sieverts (Intern)
Pedersen, Allan Schrøder (Intern)
Rode, Carsten (Intern)
Pinson, Pierre (Intern)
Jørgensen, John Bagterp (Intern)
Project Manager, organisational:
Herrmann, Ivan Tengbjerg (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Energy Programme
Amount: 44.00 Danish Kroner
Year of approval: 2013

Relations
Activities:
Blockchain Summer School 2017
Climate-KIC PhD Summer School Urban Transition Amsterdam-Bologna 2017
CITIES Annual Conference
3rd International Workshop on Design in Civil and Environmental Engineering
Executive Development Programme with Technical University of Denmark
12th International SDEWES Conference
Energy Supply Modelling in Cities: Illustrated Using Data from the Danish Municipality of Sønderborg
Energy Supply Modelling in Cities: Illustrated Using Data from the Case of Sønderborg
Big Data som værktøj til at styre byens energi
The 40th International IAEE Conference
Big Data as a tool for controlling the cities energy: Data aspects and data management
Xella – Indvendig Efterisolering

Department of Civil Engineering

Section for Building Design

Section for Building Physics and Services
Period: 01/01/2014 → 31/12/2016
Number of participants: 6

Multipor Vapour open Impregnation Moisture transport Mould
Project participant:
- Svendsen, Svend (Intern)
- Pallesen, Niels-Jørgen (Ekstern)
- Lauridsen, Jens (Ekstern)
Phd Student:
- Odgaard, Tommy Riviere (Intern)

Anvendeligheden og robustheden af indvendig isolering

Department of Civil Engineering

Section for Building Design
Period: 01/01/2014 → 31/12/2016
Number of participants: 6

Interior Insulation Moisture transport Mould Impregnation
Number of related Ph.D. students: 1
Project participant:
- Vesterløkke, Per Michael (Ekstern)
- Johansen, Carsten (Ekstern)
- Pedersen, Anne (Ekstern)
- Hansen, Thor (Ekstern)
Phd Student:
- Odgaard, Tommy Riviere (Intern)

External Master in Fire Safety courses Fire Risk management, Fire Chemistry & Environmental Chemistry

Department of Management Engineering

Production and Service Management

Risk Research Group

Implementation and Performance Management

Department of Civil Engineering
Period: 01/01/2014 → ...
Number of participants: 1
Acronym: MiB
Project participant:
- Markert, Frank (Intern)
In-Situ Burning of Crude Oils under arctic Conditions
Department of Civil Engineering
Period: 01/01/2014 → 20/04/2017
Number of participants: 7
Phd Student:
von Gelderen, Laurens (Intern)
Supervisor:
Fritt-Rasmussen, Janne (Intern)
Rangwala, Ali (Ekstern)
Main Supervisor:
Jomaas, Grunde (Intern)
Examiner:
Kirkelund, Gunvor Marie (Intern)
Brandvik, Per Johan (Ekstern)
Torero, José L. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Decision support for sustainable municipal development in Greenland
Department of Civil Engineering
Period: 15/12/2013 → 31/12/2016
Number of participants: 4
Phd Student:
Hauch Kaufmann, Laura Rebecca (Intern)
Supervisor:
Halsnæs, Kirsten (Intern)
Hendriksen, Kåre (Intern)
Main Supervisor:
Ingeman-Nielsen, Thomas (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Interior insulation of buildings from 1850 to 1930 with massive external masonry walls and embedded wooden beam floor structure
Department of Civil Engineering
Period: 15/12/2013 → 05/02/2018
Number of participants: 10
Phd Student:
Odgaard, Tommy Riviere (Intern)
Supervisor:
Brendstrup, Jens (Ekstern)
Rasmussen, Merete Hjorth (Ekstern)
Rode, Carsten (Intern)
Thorsen, Peter Schjørrmann (Ekstern)
Vesterløkke, Michael (Ekstern)
Main Supervisor:
Bjarlev, Søren Peter (Intern)
Examiner:
Svendsen, Svend (Intern)
Hansen, Ernst Jan De Place (Intern)
Harderup, Lars-Erik (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Numerisk Modellering af betonelementkonstruktioners idealplastiske bæreevne
Department of Civil Engineering
Period: 15/12/2013 → 29/09/2017
Number of participants: 7
Phd Student:
Herfelt, Morten Andersen (Intern)
Supervisor:
Hoang, Linh Cao (Intern)
Jensen, Jesper Frøbert (Intern)
Main Supervisor:
Poulsen, Peter Noe (Intern)
 Examiner:
Stang, Henrik (Intern)
Andreasen, Bent Steen (Ekstern)
Bleyer, Jérémy (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD

Relations
Publications:
Numerical Limit Analysis of Precast Concrete Structures
Project: PhD

Third International Workshop on Design in Civil and Environmental Engineering
Workshop 22-23 August 2014 on Design Methods in Civil and Environmental Engineering.
Department of Civil Engineering
Section for Building Design
Period: 01/12/2013 → 01/12/2014
Number of participants: 1
Project ID: 26363
Approving authority:
Jensen, Lotte Bjerregaard (Intern)

Financing sources
Source: Private funding (private)
Name of research programme: Cowi fonden
Amount: 50,000.00 Danish Kroner
Year of approval: 2013

Ventilationsforhold i kolde tagrum som skunkrum og hanebåndslofter i konstruktioner med diffusionsåbne undertage – Etape 2.
Department of Civil Engineering
Section for Building Design
Section for Building Physics and Services
Section for Indoor Environment
Period: 01/11/2013 → 31/12/2015
Number of participants: 4
Project ID: Projekt nr. 26390
Project participant:
Bjarlev, Søren Peter (Intern)
Johnston, Christopher Just (Intern)
Peuhkuri, Ruut Hannele (Intern)
Hjorslev Hansen, Morten (Intern)

**Relations**
Related projects:
Ventilationsforhold i skunke og hanebåndslofter i konstruktioner med diffusionsåbne undertage.

Documents:
Ansøgning om midler til forskningsprojekt om ventilation af uisolerede tagrum - etape 2

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**Cooling ceiling combined with personalized ventilation – occupant response and energy consumption**

Department of Civil Engineering
Section for Indoor Environment
Silesian University of Technology
Period: 01/11/2013 → 31/12/2015
Number of participants: 2
innovation, individually controlled micro-environment, energy reduction
Project ID: 26324
Number of related Ph.D. students: 1
Project participant:
Lipczynska, Aleksandra (Ekstern)
Project Manager, academic:
Melikov, Arsen Krikor (Intern)

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**Wireless sensor networks applied in the building sector**
Can we improve the building industry by introducing wireless sensor networks in the building life cycle? What requirements does the technology meets? What are the limitation of the technology?

Department of Civil Engineering
Section for Building Physics and Services
Period: 01/10/2013 → 31/12/2014
Number of participants: 3
Project participant:
Heller, Alfred (Intern)
Kotol, Martin (Intern)
Torbensen, Rune (Ekstern)

**Financing sources**
Source: Private funding (private)
Name of research programme: Bjarne Saxhof Fond
Amount: 504.00 Danish Kroner
Year of approval: 2013

**Relations**
Activities:
Introduction of flexible monitoring equipment into the Greenlandic building sector

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**Fremtidens Glasarkitektur**
Department of Civil Engineering
Aluminiumsolfangere til fjernvarmen

Department of Civil Engineering
Section for Building Physics and Services
PlanEnergi
Period: 18/09/2013 → 31/12/2015
Number of participants: 2
Project ID: 26349
Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)

Green BIM

Department of Civil Engineering
Section for Building Design
Berner Fachhohschule Architektur Holz und Bau
Period: 05/09/2013 → 06/09/2013
Number of participants: 1
Project participant:
Sattrup, Peter Andreas (Intern)

Measuring profit by using Open BIM
Measuring the profit from Open BIM at the SJKE construction project in Norway. The SJKE was the first Open BIM at the Norwegian Defence Estates Agency (NDEA).

Department of Civil Engineering
Section for Building Design
Lambrecht Consulting
Period: 02/09/2013 → 31/12/2013
Number of participants: 2
BIM, buildingSMART, measuring profit
Project ID: 26319
Project participant:
Karlshøj, Jan (Intern)
Vestergaard, Flemming (Intern)

Deterioration Models for Cement Bound Materials in Structural Design an Evaluation of Heavy Duty Pavements

Department of Civil Engineering
Period: 01/09/2013 → 20/04/2017
Number of participants: 6
Phd Student:
Skar, Asmus (Intern)
Supervisor:
Zania, Varvara (Intern)
Deterioration Models for Cement Bound Materials in Structural Design and Evaluation of Heavy Duty Pavements

Project: PhD

Digitalisering som driver for standardiseret specificering og projektering af byggeri

Department of Civil Engineering
Period: 01/09/2013 → 02/11/2017
Number of participants: 7
Phd Student:
Treldal, Niels (Intern)
Supervisor:
Dam, Ronni Holm (Ekstern)
Fischer, Martin (Ekstern)
Main Supervisor:
Karlshøj, Jan (Intern)
Examiner:
Nielsen, Toke Rammer (Intern)
Hjelseth, Eilif (Ekstern)
Kiviniemi, Arto (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD

Relations
Publications:

Impact of human convective boundary layer on inhaled air quality and its protective role under different ventilation strategies

Department of Civil Engineering
Period: 01/09/2013 → 30/09/2015
Number of participants: 7
Phd Student:
Licina, Dusan (Intern)
Supervisor:
Sekhar, Chandra (Ekstern)
Tham, Kwok-Wai (Ekstern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)
Examiner:
Toftum, Jørn (Intern)
Novoselac, Atila (Ekstern)
Poh, Hee Joo (Ekstern)
Mechanical Ventilation Solutions for Optimisation of Energy Efficiency an Indoor Environments in Danish Homes

Department of Civil Engineering
Period: 01/09/2013 → 28/04/2018
Number of participants: 4
Phd Student:
Johnston, Christopher Just (Intern)
Supervisor:
Noyé, Peter Anders (Intern)
Toftum, Jørn (Intern)
Main Supervisor:
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Joint degree
Project: PhD

Experimental and theoretical investigations of combined solar heating/heat pump systems for single Family houses

Renewable energy systems based on the combination of solar heating systems and electrical driven auxiliary energy supply systems such as heat pumps are becoming very attractive solutions as the heating and cooling systems in single family houses. The combined solar heating/heat pump systems provide all the needed yearly heating and cooling demand in single family houses. The most widely used energy sources for the heat pumps are the ambient air, ground source heat exchangers or borehole heat exchangers. Heat pumps that use of ambient air as heat source need fans and these can create disturbing noise. Further, heat pumps that use ambient air as heat source run with low efficiency in cold winter periods. The heat source temperature is more stable with ground source heat exchanger or borehole heat exchanger. In systems with ground source heat exchangers or borehole heat exchangers, excess energy production from the solar collectors is also sometimes lead into the ground for recharging the ground heat source. Produced energy that cannot be directly used is usually lead into the ground in order to protect the system from overheating.

The aim of this project is to increase the knowledge of the heat and mass transfer in combined solar heating/heat pump systems that uses of a ground source heat exchanger. Such a system is installed and tested at DTU Byg.

Department of Civil Engineering
Section for Building Physics and Services
Period: 01/07/2013 → 30/06/2016
Number of participants: 5
Project ID: 26309
Project participant:
Andersen, Elsa (Intern)
Perers, Bengt (Intern)
Furbo, Simon (Intern)
Dandanell, Jens Martin (Intern)
Aagaard, Claus (Intern)

Project

Nordic Built STED - Sustainable Transformation and Environmental Design

Department of Civil Engineering
Section for Building Design
Department of Management Engineering
Royal Danish Academy of Fine Arts
Chalmers University of Technology
Norwegian University of Science and Technology
White Arkitekter AB
JJW Arkitekter
Helen & Hard
Studio Granda
Lassila Hirvilammi Arkkitehdit
Novitas Innovation
Period: 01/07/2013 → 31/12/2013
Number of participants: 1
Project Manager, organisational:
Sattrup, Peter Andreas (Intern)

**Relations**
Activities:
Daylight & Sustainable Transformation Conference
Documents:
Sattrup_Nordic Built Expression of Interest

**Control of Indoor Airflows for Reduction of Human Exposure to Aerosol Contaminants**
Department of Civil Engineering
Period: 01/07/2013 → 26/09/2017
Number of participants: 6
Phd Student:
Bivolarova, Mariya Petrova (Intern)
Supervisor:
Bolashikov, Zhecho Dimitrov (Intern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)
Examiner:
Wargocki, Pawel (Intern)
Cao, Guangyu (Ekstern)
Kosonen, Risto (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)

**Relations**
Publications:
Control of Indoor Airflows for Reduction of Human Exposure to Aerosol Contaminants
Project: PhD

**Human response to non-uniform environment generated by “nested” chilled beams**
Department of Civil Engineering
Section for Indoor Environment
Halton OY
Uponor Corporation
Period: 01/06/2013 → 31/12/2015
Number of participants: 2
individual control, Human response, physical environment
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)
IEA EBC Annex 63 - Implementation of Energy Strategies in Communities
The outcomes from previously completed projects on energy optimization at a community scale showed that the transformation of approaches suitable for buildings to communities needs more than simply an up-scaling of individual building solutions. This newly approved project will therefore focus on development of standards for implementation of optimized energy strategies at the scale of communities. The project objectives will be

- Development of a methodology for the effective translation of a city’s energy / CO2 reduction goals to the community scale
- Optimization of policy instruments for the integration of energy / CO2 reduction goals into ordinary urban planning,
- Development of new techniques for stakeholder cooperation along with holistic business models, and
- Creation of methods for the monitoring and evaluation of both energy-related criteria, as well as the effectiveness of policy instruments.

The target audiences will primarily be government and urban decision makers and urban planning departments.

Participants: Austria, Belgium, Canada, Denmark, France, Ireland, Japan, the Netherlands, Switzerland, USA

Centre for IT-Intelligent Energy Systems in Cities
Department of Civil Engineering
Section for Building Energy
Period: 01/06/2013 → 01/06/2018
Number of participants: 3
Project participant:
Heller, Alfred (Intern)
Petersen, Jens-Phillip (Intern)
Rode, Carsten (Intern)

Human response to radiant and convective non-uniform cooling
Department of Civil Engineering
Section for Indoor Environment
Halton OY
Uponor Corporation
Rettig
Period: 01/05/2013 → 31/07/2015
Number of participants: 2
Human response, Physical environment
Project participant:
Melikov, Arsen Krikor (Intern)
Bolashikov, Zhecho Dimitrov (Intern)

VELUX visiting professor on solar heating
The visiting Professor Jiangong Han is doing experimental investigations on advantages gained by anti reflection treatment of PV panels and solar collectors.
Department of Civil Engineering
Section for Building Physics and Services
Period: 01/05/2013 → 12/12/2014
Number of participants: 7
Anti reflection treatment, PV panel, Solar collector
Project ID: 26296
Project participant:
Furbo, Simon (Intern)
Upgrading and recovery of fertilizer value of ash from PYRONEER gasification of low-value an difficult biomass feedstock

Department of Civil Engineering
Period: 01/05/2013 → 20/04/2017
Number of participants: 8
Phd Student: Pares Viader, Raimon (Intern)
Supervisor: Ahrenfeldt, Jesper (Intern)
Hauggaard-Nielsen, Henrik (Intern)
Ottosen, Lisbeth M. (Intern)
Main Supervisor: Jensen, Pernille Erland (Intern)
Examiner: Laursen, Søren (Intern)
Bundgaard, Erik (Ekstern)
Rodriguez-Maroto, José Miguel (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Upgrading and recovery of fertilizer value of ash from PYRONEER gasification
Project: PhD

Improvement calculation and test methods for twin-pipe

Department of Civil Engineering
Section for Building Physics and Services
Danish Technological Institute
Logstor A/S
Period: 01/04/2013 → 20/12/2013
Number of participants: 1
Project participant: Li, Hongwei (Intern)

Financing sources
Source: Public research council
Name of research programme: Dansk Fjernvarmes
Amount: 169,950.00 Danish Kroner

Testing, development and demonstration of large scale solar district heating system
The aim of the project is to bring advanced Danish experiences on demonstration project of solar district heating system and advanced testing technology into China, to promote the application of the large-scale solar district heating systems in China and to enhance the testing capabilities of collectors and large scale solar district heating systems. The project will promote Danish - Chinese cooperation in the RE area and stimulate future international cooperation.

Department of Civil Engineering
Section for Building Physics and Services
PlanEnergi
China National Solar Thermal Testing Centre, China Academy of Building Research
Chinese Academy of Sciences
Beijing Solar Energy Research Institute Co. Ltd
Sunda Solar Energy Technology Co., Ltd.

Period: 01/03/2013 → 30/09/2014
Number of participants: 8
RED, large scale solar heating, testing, development and demonstration
Project ID: 26293

Project participant:
Kong, Weiqiang (Intern)
Perers, Bengt (Intern)
He, Tao (Ekstern)
Wang, Zhifeng (Ekstern)
Zhu, Dunzhi (Ekstern)
Liu, Jun (Ekstern)

Project Manager, organisational:
Furbo, Simon (Intern)
Project Manager, academic:
Fan, Jianhua (Intern)

Financing sources
Source: Public research council
Name of research programme: the Sino-Danish Renewable Energy Development Programme (RED)
Amount: 3,950,000.00 Danish Kroner
Year of approval: 2012

Relations
Activities:
International Conference on Solar Heating and Cooling for Buildings and Industry

Use of deodorant material and advanced air distribution for reduction of exposure to indoor pollution

Department of Civil Engineering
Section for Indoor Environment
Otsuma Women’s University
Period: 01/03/2013 → 31/12/2014
Number of participants: 4
air cleaning, Indoor emissions/exposure, advanced air distribution
Project ID: 26342
Number of related Ph.D. students: 1
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)
Bivolarova, Mariya Petrova (Intern)
Mizutani, Chiyomi (Ekstern)

Project Manager, academic:
Melikov, Arsen Krikor (Intern)

Compact seasonal PCM heat storage for solar heating systems

Department of Civil Engineering
Period: 01/03/2013 → 30/09/2016
Number of participants: 6
Phd Student:
Numerical Multi-scale Modelling in Real Time Simulations for Hybrid Testing

Department of Civil Engineering
Period: 01/03/2013 → 30/09/2016
Number of participants: 6
Phd Student: Andersen, Sebastian (Intern)
Supervisor: Stang, Henrik (Intern)
Main Supervisor: Poulsen, Peter Noe (Intern)
Examiner: Brincker, Rune (Intern)
Blakeborough, Anthony (Ekstern)
Svensson, Eilif (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Relations
Publications:
Reduction Methods for Real-time Simulations in Hybrid Testing
Project: PhD

Holdbarhed og Materialer for perle-kæde Broer

Department of Civil Engineering
Period: 15/02/2013 → 04/07/2016
Number of participants: 6
Phd Student: Lund, Mia Schou Møller (Intern)
Supervisor: Hertz, Kristian Dahl (Intern)
Main Supervisor: Hansen, Kurt Kielsgaard (Intern)
Examiner: Hasholt, Marianne Tange (Intern)
Luping, Tang (Ekstern)
Utgenannt, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet

Relations
Publications:
Reduction Methods for Real-time Simulations in Hybrid Testing
Project: PhD

Holdbarhed og Materialer for perle-kæde Broer
Publications:
Durability of Materials in Pearl-Chain Bridges
Project: PhD

Construction of Pearl-Chain Bridges
Department of Civil Engineering
Period: 01/02/2013 → 04/07/2016
Number of participants: 7
Phd Student:
Halding, Philip Skov (Intern)
Supervisor:
Goltermann, Per (Intern)
Schmidt, Jacob Witrup (Intern)
Main Supervisor:
Hertz, Kristian Dahl (Intern)
Examiner:
Goltermann, Per (Intern)
Gilbert, Matthew (Ekstern)
Larsen, Olga Popovic (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Strength- and deformation properties of Palaeogene clay
Department of Civil Engineering
Period: 01/02/2013 → 31/12/2015
Number of participants: 3
Phd Student:
Pedersen, René Bøgelund (Intern)
Supervisor:
Nordal, Steinar (Ekstern)
Main Supervisor:
Krogsbøll, Anette (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Energy-efficient ventilation with optimized damper control of flow and pressure
With LeanVent's newly invented DropDamper it is possible to reduce pressure and energy losses in ventilation plants by over 50% - and at the same time improve indoor climate and comply with future Building Codes. The aim of the project is to further develop the DropDamper to an international product for the European ventilation market with regard to user-interface and price.

Department of Civil Engineering
Section for Building Physics and Services
Period: 22/01/2013 → 31/12/2015
Number of participants: 2
Ventilation, Energy savings, Dampers, Regulation
Project participant:
Terkildsen, Søren (Intern)
Project Manager, academic:
Hviid, Christian Anker (Intern)
Financing sources
Source: Public research programme (public)
Name of research programme: EUDP
Web address: http://www.ens.dk/da-DK/NyTeknologi/om-eudp/Sider/Forside.aspx
Amount: 888,505.00 Danish Kroner
Year of approval: 2012

Low temperature Heating and High Temperature Cooling in Buildings
Department of Civil Engineering
Period: 15/01/2013 → 29/09/2016
Number of participants: 6
Phd Student:
Kazanci, Ongun Berk (Intern)
Supervisor:
Kolarik, Jakub (Intern)
Main Supervisor:
Olesen, Bjarne W. (Intern)
Examiner:
Fan, Jianhua (Intern)
Heiselberg, Per (Ekstern)
Perino, Marco (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering

Relations
Publications:
Low Temperature Heating and High Temperature Cooling in Buildings
Project: PhD

Model Predictive Control and Continuous Commissioning of Decentralized Ventilation and Heating Systems of Renovated Buildings
Department of Civil Engineering
Period: 15/01/2013 → 31/08/2013
Number of participants: 3
Phd Student:
Vega, Esther Estevez (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

IEA DHC Annex TS1: Low-temperature district heating for future energy system
Department of Civil Engineering
Section for Building Physics and Services
Period: 10/01/2013 → 30/01/2016
Number of participants: 2
Project participant:
Li, Hongwei (Intern)
Project Manager, academic:
Svendsen, Svend (Intern)

Financing sources
**EUDP 12-II, IEA Task 42 Compact Thermal Energy Storage 2. period**
The project is the Danish contribution to the IEA SHC Programme Task 42 project "Compact Energy storage: Material Development and System Integration, 2nd period".

A seasonal heat storage based on sodium acetate trihydrate with stable supercooling marketed by the German company H.M. Heizkörper GmbH & Co. KG will be evaluated in terms of thermal performance and economy by means of detailed experimental and theoretical investigations.

A seasonal heat storage based on a salt water mixture consisting of sodium acetate and water is currently being developed by Technical University of Denmark, Graz University of Technology, Nilan A/S and Velux A/S in the COMTES project supported by EU. This storage will be compared to the German heat storage.

Calculations of the thermal performance of solar heating systems with the two above mentioned heat stores will be carried out with validated simulation models. The calculations will show how the designs of the solar heating systems including the seasonal heat stores will influence the size of the systems needed to fully cover the yearly heat demand of new buildings.

Based on the calculations and on evaluation of the economic conditions the optimum design and the suitability of the two heat stores will be elucidated.

Department of Civil Engineering

Section for Building Physics and Services

**Period:** 02/01/2013 → 31/12/2015

**Number of participants:** 5

**Acronym:** Task 42

**Number of related Ph.D. students:** 1

**Project participant:**

- Furbo, Simon (Intern)
- Dannemand, Mark (Intern)
- Fan, Jianhua (Intern)
- Dragsted, Janne (Intern)
- Andersen, Elsa (Intern)

**Financing sources**

**Source:** Forskningsprojekter - Miljø- og Energiministeriet

**Name of research programme:** EUDP

**Amount:** 2,799,000.00 Danish Kroner

**Year of approval:** 2012

**Relations**

**Activities:**

- IEA Task 42 / Annex 29, 12th expert meeting

**Energy performance of combined radiant and convective systems for energy efficient indoor environment**

In Denmark, EU and other countries directives for energy savings are outlined. Substantial part of the energy used in public buildings is for ventilation and air conditioning. Indoor environment becomes important for occupants' health, comfort and performance. It is a result of ventilation and air conditioning of occupied spaces. At present ventilation systems have poor performance (draught discomfort, poor air quality, etc. are often reported in buildings). Furthermore they are energy inefficient. The reduction of energy consumption in buildings requires development and use of new, energy efficient ventilation and air conditioning systems that create high quality indoor environment.

The proposed research will focus on the energy performance of two new systems for generating high quality indoor environment: 1) chilled beam with radiant panels and 2) chilled ceiling (i.e. radiant cooling) combined with ceiling supply ventilation to distribute air over the chilled ceiling and cool before it flows into the occupied zone. The new systems perform on combined radiant and convective cooling unlike the present available systems based only on the use of convective heat and mass exchange in spaces. It is expected that the use of water based radiant cooling in addition to convective cooling to remove part of the heat generated in spaces will reduce the needed ventilation flow rate and thus to potential energy saving.
The author of this application is involved in an ongoing research at DTU BYG on human response to the non-uniform thermal environment generated by the two systems as a result of the combined radiant and convective cooling. Investigation of the new systems with regard to energy use is also important and is needed to access the system performance. However this research is not included in the limited budget of the human subject study in progress. This proposal focuses on the missing and needed research related to the energy performance of the two systems. In this research the performance of the chilled beam with radiant panels (CBR) and chilled ceiling combined with mixing ventilation (CCMV) with regard to their energy consumption and resulting indoor climate will be studied and compared with the performance of the chilled beam (CB) without radiant panels which is widely used today. The research will include physical measurements and energy analysis. Test room equipped with the systems and with realistic simulator of solar heat load from windows will be used. The same test room is used in the mentioned above ongoing study to collect human response. Indoor parameters affecting the thermal and air quality performance of the two systems (CBR and CCMV) will be measured and compared to that achieved with conventional ventilation and conditioning systems. The indoor environment generated by the systems will be identified in comprehensive parametric measurements in the occupied zone of the room. Heated dummies, lighting and other heat load will be simulated. Thermal manikins will be used to assess the thermal environment. Energy performance of the systems will be simulated. The results of the measurements will be used for the simulations. The obtained experimental and simulation results will be analyzed in cluster with the human subject response collected in the ongoing project in order to draw conclusions and recommendations. Important practical implications of this study is that it will define a way for possible savings following the EU directive on energy efficiency through decreased energy consumption in the building sector, help improve the overall indoor environment and last but not least provide the ventilation engineers and consultants with necessary design recommendations.

Department of Civil Engineering
Section for Indoor Environment
Period: 01/01/2013 → 28/02/2015
Number of participants: 1
Project ID: 26269
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)

Documents:
Total Project and Appendixes Bjarne Saxhof 2012 for Carsten

Powerpipe hybrid solar panel
A solar collector panel both producing electricity and heat will be developed and tested.

Department of Civil Engineering
Section for Building Physics and Services
Department of Energy Conversion and Storage
PowerPipe ApS
Batec Solvarme A/S
LOKE Lolland Energi

Solar collector, Hybrid, Electricity, Heat

Project participant:
Furbo, Simon (Intern)
Fan, Jianhua (Intern)
Perers, Bengt (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: EUDP programme
Amount: 489,600.00 Danish Kroner
Year of approval: 2012

Integrering af digitale simuleringsværktøjer - Case: Klimaskærm i Hyldestpælæd
Department of Civil Engineering
Human Exposure to Aerosol Contaminants in Modern Microenvironments

Department of Civil Engineering
Section for Indoor Environment
Period: 01/01/2013 → 31/12/2016
Number of participants: 3
advanced air distribution, indoor aerosols, energy efficiency
Project ID: 26198
Number of related Ph.D. students: 1
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)
Bivolarova, Mariya Petrova (Intern)
Project Manager, academic:
Melikov, Arsen Krikor (Intern)

Hygro-thermal conditions and pollutant emissions from zero waste materials and their effects on humans

Department of Civil Engineering
Period: 01/01/2013 → 31/07/2017
Number of participants: 8
Phd Student:
Krejcírková, Barbora (Intern)
Supervisor:
Kolarik, Jakub (Intern)
Peuhkuri, Ruut Hannele (Intern)
Wargocki, Pawel (Intern)
Main Supervisor:
Rode, Carsten (Intern)
Examiner:
Qin, Menghao (Intern)
Knudsen, Henrik Nellemose (Intern)
Wadsö, Lars (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Supply of domestic hot water at comfort temperatures without Legionella

Department of Civil Engineering
Period: 01/01/2013 → 04/07/2016
Number of participants: 6
Phd Student:
Yang, Xiaochen (Intern)
Supervisor:
Li, Hongwei (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Nielsen, Toke Rammer (Intern)
Buhl, Leon Sten (Ekstern)
Schmidt, Dietrich (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Alkali-silica reactions in reinforced concrete structures
Department of Civil Engineering
Period: 15/12/2012 → 20/04/2017
Number of participants: 9
Phd Student:
Barbosa, Ricardo Antonio (Intern)
Supervisor:
Grelk, Bent (Intern)
Hoang, Linh Cao (Intern)
Larsen, Erik Stoklund (Ekstern)
Pedersen, Claus (Ekstern)
Main Supervisor:
Hansen, Kurt Kielsgaard (Intern)
Examiner:
Hasholt, Marianne Tange (Intern)
Fournier, Benoit (Ekstern)
Wigum, Børge Johannes (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Influence of alkali-silica reaction on the physical, mechanical, and structural behaviour of reinforced concrete
Project: PhD

Electrochemical upgrading of different fly ases for use in production of bricks and lightweight aggregates
Department of Civil Engineering
Period: 15/12/2012 → 07/09/2017
Number of participants: 8
Phd Student:
Chen, Wan (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Kirkelund, Gunvor Marie (Intern)
Schmidt, Jacob Wittrup (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Dame, Anne Juul (Intern)
Laursen, Søren (Intern)
Steenari, Britt-Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
**Relations**

**Publications:**

Electrochemical upgrading of different ashes for use in production of bricks

**Project:** PhD

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**Fremtidens ovenlysvinduer- Konceptstudier med henblik på energirigtig og helhedsmæssig produktudvikling**

Department of Civil Engineering

**Period:** 15/12/2012 → 26/09/2017

**Number of participants:** 8

**Phd Student:**

Skarning, Gunnlaug Cecilie Jensen (Intern)

**Supervisor:**

Duer, Karsten (Intern)

Hviid, Christian Anker (Intern)

Mogensen, Morten Møller (Intern)

**Main Supervisor:**

Svendsen, Svend (Intern)

**Examiner:**

Nielsen, Toke Rammer (Intern)

Gustavsen, Arild (Ekstern)

Petersen, Steffen (Intern)

**Financing sources**

**Source:** Internal funding (public)

**Name of research programme:** Institut, samfinansiering

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**Alternative Asker i Beton - Ny Æstetisk og Byggeteknisk Performance**

Department of Civil Engineering

**Period:** 01/12/2012 → 06/03/2018

**Number of participants:** 8

**Phd Student:**

Kappel, Annemette (Intern)

**Supervisor:**

Goltermann, Per (Intern)

Kirkelund, Gunvor Marie (Intern)

**Main Supervisor:**

Ottosen, Lisbeth M. (Intern)

**Examiner:**

Jensen, Lotte Bjerregaard (Intern)

**Financing sources**

**Source:** Internal funding (public)

**Name of research programme:** Institut/centerfinansieret

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**Urban Environment - Development of Comfort Criteria for Urban Planning**

Department of Civil Engineering

**Period:** 01/12/2012 → 11/08/2016

**Number of participants:** 4
Phd Student:
Nielsen, Alf Lassen (Intern)
Supervisor:
Kongebro, Signe (Ekstern)
Strømann-Andersen, Jakob Bjørn (Intern)
Main Supervisor:
Koss, Holger (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Innovative Insulation Materials with Hygric Properties

Department of Civil Engineering
Period: 01/11/2012 → 28/02/2014
Number of participants: 3
Phd Student:
Juhl, Lasse (Intern)
Supervisor:
Heller, Alfred (Intern)
Main Supervisor:
Rode, Carsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Rock Physics of Reservoir Rocks With Varying Pore Water Saturation and Pore Water Salinity

Department of Civil Engineering
Period: 01/11/2012 → 07/04/2016
Number of participants: 6
Phd Student:
Katika, Konstantina (Intern)
Supervisor:
Alam, Mohammad Monzurul (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Zania, Varvara (Intern)
Nadeau, Paul H. (Ekstern)
Vadla Madland, Merete (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Can the interaction between occupant behavior and the indoor environment in residences be influenced?

Department of Civil Engineering
Period: 01/10/2012 → 30/09/2016
Number of participants: 6
Phd Student:
Andersen, Søren (Intern)
Supervisor:
Andersen, Rune Korsholm (Intern)
Main Supervisor:
Olesen, Bjarne W. (Intern)  
Examiner:  
Wargocki, Pawel (Intern)  
Gram-Hanssen, Kirsten (Intern)  
Wagner, Andreas (Ekstern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Institut/centerfinansieret

Relations  
Publications:  
Can the interaction between occupant behaviour and the indoor environment in residences be influenced?  
Project: PhD

Advanced Solar Resource Assessment and Forecasting  
Detailed measurements and solar radiation models on diffuse radiation from different parts of the sky.  
Department of Civil Engineering  
Section for Building Physics and Services  
Danish Meteorological Institute  
Period: 01/09/2012 → 30/09/2015  
Number of participants: 3  
Acronym: IEA Task 46  
Project participant:  
Furbo, Simon (Intern)  
Dragsted, Janne (Intern)  
Andersen, Elsa (Intern)  
Project

Mesoscale Modeling of Asphalt  
Department of Civil Engineering  
Period: 01/09/2012 → 30/11/2015  
Number of participants: 7  
Phd Student:  
Feng, Huan (Intern)  
Supervisor:  
Hededal, Ole (Intern)  
Pettinari, Matteo (Intern)  
Main Supervisor:  
Stang, Henrik (Intern)  
Examiner:  
Johannesson, Björn (Intern)  
Airey, Gordon (Ekstern)  
Hoff, Inge (Ekstern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Eksternt finansieret virksomhed  
Project: PhD

IEA Task 44 Systems Using Solar Thermal Energy in Combination with Heat Pumps  
The Task aims at optimizing combinations of solar thermal energy and heat pump, primarily for one family houses.  
Department of Civil Engineering  
Section for Building Physics and Services  
Danish Technological Institute
Cenergia

Nilan A/S

Ekolab
Period: 13/08/2012 → 31/05/2013
Number of participants: 3
Solar heating, Heat pumps, Combined systems
Acronym: Task 44
Project participant:
Furbo, Simon (Intern)
Perers, Bengt (Intern)
Andersen, Elsa (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: EUDP programme
Amount: 257,760.00 Danish Kroner
Year of approval: 2012
Project

Upgrade and extension of the Climate station at DTU Byg
In the period 2013-2014 the project "Upgrade and Extension of the Climate Station at DTU Byg" is carried out at DTU Byg. The aim of the project is to renew the hardware and the software for data acquisition and monitoring, exchange cables and cable connections in order to avoid interference of electrical noise from the surroundings and exchange worn out equipment. Further, the aim is to make measured data from the climate station easily available for the users.

Department of Civil Engineering
Section for Building Physics and Services
Period: 01/08/2012 → 31/10/2014
Number of participants: 4
Project ID: 26270
Project participant:
Andersen, Elsa (Intern)
Dragsted, Janne (Intern)
Andersen, Lars Kokholm (Intern)
Kristensen, Troels V. (Intern)

Financing sources
Source: Private funding (private)
Name of research programme: Bjarne Saxhofs Fond
Amount: 565,200.00 Danish Kroner
Year of approval: 2012
Project

Relations
Publications:
Upgrade and extension of the climate station at DTU Byg
Project

Fate and distribution of mine tailings in marine sediments – a pilot study on the effects of geochemistry and organisms
Due to future increase of mining activity in Greenland, the problem of handling mine tailings (contaminated waste material) will occur. One solution, which is often used elsewhere, is to deposit the waste material in the sea. Negative environmental impacts are expected. Therefore a pilot experiment should be initiated, which should examine how deposited waste materials from mine tailings might react with the marine environment. Sediment, pore water and seawater will be analysed for heavy metal concentrations and other geochemical parameters as a function of time and other variables.

Department of Civil Engineering
Section for Geotechnics and Geology

Section for Arctic Technology
Period: 01/08/2012 → 31/10/2013
Number of participants: 3
Project participant:
Computational Geoscience - HeHo
Department of Civil Engineering
Period: 01/08/2012 → 31/01/2016
Number of participants: 6
Phd Student:
Pasquinelli, Lisa (Intern)
Supervisor:
Mosegaard, Klaus (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Zania, Varvara (Intern)
Kjøller, Claus (Intern)
Mondol, Nazmul Haque (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Skimmelsvampe i Grønland
Department of Systems Biology
Center for Microbial Biotechnology
Department of Civil Engineering
Section for Building Physics and Services
Period: 29/07/2012 → 04/08/2012
Number of participants: 2
Project participant:
Andersen, Birgitte (Intern)
Rode, Carsten (Intern)
Project

Fabric inlet stratification device
Product development of fabric inlet stratification device for hot water stores with focus on creating thermal stratification in the heat store during operation. Both technological and commercial objectives are considered.
Department of Civil Engineering
Section for Building Physics and Services
Period: 02/07/2012 → 31/01/2013
Number of participants: 4
Fabric inlet stratifier, Hot water storage, Thermal stratification
Project participant:
Furbo, Simon (Intern)
Dannemand, Mark (Intern)
Spanggaard, Martin (Ekstern)
Andersen, Elsa (Intern)
Project

Techno-Environmental-Economical Evaluation of Implementation High Efficient District Heating System in China
Department of Civil Engineering
Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU

Relations
Publications:
Technical-Environmental-Economical Evaluation of the Implementation of a Highly Efficient District Heating System in China
Project: PhD

Combined development of compact thermal energy storage technologies
The aim of the project is to develop a seasonal heat storage consisting of heat storage modules with a salt water mixture of sodium acetate and water. The heat storage concept is based on the advantage of stable supercooling. By using this concept the heat storage module will have no heat loss for a long period making seasonal heat storage possible. If a sodium acetate water mixture, which has a melting point of 58°C, has been fully melted during the sunny summer, it can cool down in its liquid phase to the surrounding temperature and still preserve the latent heat related to the heat of fusion. The heat storage module can be left in this state with no heat loss until a heat demand occurs in the house in the winter, in which case solidification is activated, the heat of fusion is released, and the heat storage temperature increases almost immediately to the melting point.
The developed heat storage will be a part of a demonstration solar heating system which is intended to cover the total yearly heat demand and hot water consumption of a low energy one family house.

Department of Civil Engineering
Section for Building Physics and Services
Technische Universität Graz
Nilan A/S
Velux A/S

Project participant:
Furbo, Simon (Intern)
Fan, Jianhua (Intern)
Dragsted, Janne (Intern)
Chen, Ziqian (Intern)
Dannemand, Mark (Intern)
Andersen, Elsa (Intern)
Perers, Bengt (Intern)
Berg, Jakob Brinkø (Intern)

Financing sources
Source: EU research programme (public)
Name of research programme: seventh framework programme

Department of Civil Engineering
Section for Building Physics and Services
Building Research Establishment Ltd.
Halmstad University
Dresden University of Technology
Scottish & Southern Energy, UK
Period: 01/04/2012 → 28/02/2014
Number of participants: 3
Project participant:
Li, Hongwei (Intern)
Dalla Rosa, Alessandro (Intern)
Project Manager, academic:
Svendsen, Svend (Intern)

Financing sources
Source: Other public support (public)
Name of research programme: IEA DHC
Amount: 728,492.00 Danish Kroner
Project

Belysningssystemer baseret på LED og OLED til bygninger med avanceret dagslysstyring

Department of Civil Engineering
Period: 01/04/2012 → 22/02/2017
Number of participants: 4
Phd Student:
Skaaning, Christina Charlotte (Intern)
Supervisor:
Hviid, Christian Anker (Intern)
Svendsen, Svend (Intern)
Main Supervisor:
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Hybrid testing for composite structures

Department of Civil Engineering
Period: 01/04/2012 → 30/09/2016
Number of participants: 7
Phd Student:
Waldbjørn, Jacob Paamand (Intern)
Supervisor:
Berggreen, Christian (Intern)
Stang, Henrik (Intern)
Main Supervisor:
Schmidt, Jacob Wittrup (Intern)
Examiner:
Hertz, Kristian Dahl (Intern)
Al-Mahaidi, Riadh (Ekstern)
You, Shawn (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

**Solarmapping as part of a refurbishment design process**
Department of Civil Engineering
Section for Building Design
Period: 12/03/2012 → 11/02/2013
Number of participants: 1
Project ID: 26271
Approving authority:
Jensen, Lotte Bjerregaard (Intern)

**Human convective boundary layer and its impact on human exposure**
Project: PhD (PhD Theses)
Dusan Licina, Human convective boundary layer and its impact on human exposure, 2012 – 2015, PhD theses, Technical University of Denmark, Department of Civil Engineering, Supervisor: Arsen Melikov

Department of Civil Engineering
Section for Indoor Environment
Period: 01/02/2012 → 31/01/2015
Number of participants: 1
Project participant:
Melikov, Arsen Krikor (Intern)

**Building certification schemes and the quality of indoor environment**
Department of Civil Engineering
Period: 01/01/2012 → 30/11/2015
Number of participants: 6
Phd Student:
Da Silva, Nuno Alexandre Faria (Intern)
Supervisor:
Tham, Kwok-Wai (Ekstern)
Main Supervisor:
Wargocki, Pawel (Intern)
Examiner:
Toftum, Jørn (Intern)
Cheong Kok Wai, David (Ekstern)
Newsham, Guy (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

**Greenlandic Government basis funding of ARTEK**
Department of Civil Engineering
Period: 01/01/2012 → 07/12/2017
Number of participants: 5
Phd Student:
Tomaskovicova, Sona (Intern)
Main Supervisor:
Ingeman-Nielsen, Thomas (Intern)
Examiner:
Nielsen, Toke Rammer (Intern)
Hauck, Christian (Ekstern)
Krautblatter, Michael (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut/centerfinansieret

Relations
Publications:
Coupled thermo-geophysical inversion for permafrost monitoring
Project: PhD

Heat Storage in Hot Aquifers
Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Department of Informatics and Mathematical Modeling
Scientific Computing
Period: 01/01/2012 → 28/02/2015
Number of participants: 3
Number of related Ph.D. students: 1
Project participant:
Rosenbrand, Esther (Intern)
Mosegaard, Klaus (Intern)
Fabricius, Ida Lykke (Intern)

Strategic research centre for 4th Generation district heating technologies and systems
Department of Civil Engineering
Section for Building Physics and Services
Department of Management Engineering
Aalborg University
University of Southern Denmark
Chalmers University of Technology
Halmstad University
Linnaeus University
Tsinghua University
University of Zagreb
Period: 01/01/2012 → 31/12/2017
Number of participants: 4
Fjernvarme
Acronym: 4DH
Project participant:
Svendsen, Svend (Intern)
Karlsson, Kenneth Bernad (Intern)
Münster, Marie (Intern)
Li, Hongwei (Intern)
**Financing sources**
Source: Public research council
Name of research programme: Det Strategiske Forskningsråd
Amount: 37,000,000.00 Danish Kroner

**Project**
Active Indoor air cleaning and heat recovery technology for energy saving of building ventilation

Department of Civil Engineering
Period: 15/12/2011 → 24/08/2015
Number of participants: 6
Phd Student:
Nie, Jinzhe (Intern)
Supervisor:
Olesen, Bjarne W. (Intern)
Main Supervisor:
Fang, Lei (Intern)
Examiner:
Melikov, Arsen Krikor (Intern)
Afshari, Alireza (Ekstern)
Zhang, Xu (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Consequence Based Design. An approach for integrating computational collaborative models (Integrated Dynamic Models) in the building design phase

Department of Civil Engineering
Period: 15/12/2011 → 01/09/2016
Number of participants: 6
Phd Student:
Negendahl, Kristoffer (Intern)
Supervisor:
Schrøder, Ole (Ekstern)
Main Supervisor:
Nielsen, Toke Rammer (Intern)
Examiner:
Karlshøj, Jan (Intern)
Davis, Daniel (Ekstern)
Petersen, Steffen (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU

**Relations**
Publications:
Consequence Based Design. An approach for integrating computational collaborative models (Integrated Dynamic Models) in the building design phase
Project: PhD

Intelligent styresystem til fremtidens solvarmeanlæg

Section for Building Physics and Services
Department of Civil Engineering
Period: 14/12/2011 → 31/12/2012
Number of participants: 2
Project participant:
Andersen, Elsa (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 317,693.00 Danish Kroner

**Nanotechnology Enhanced Extruded Fibre Reinforced Foam Cement Based Environmentally Friendly Sandwich Material for Building Applications**

Department of Civil Engineering
Section for Construction Materials
Period: 01/12/2011 → 30/11/2014
Number of participants: 2
Acronym: FIBCEM
Project ID: 262954
Project participant:
Esteves, Luis Pedro (Intern)
Project Manager, organisational:
Jensen, Ole Mejlhede (Intern)

**Stiffness and Damping Properties of Monopile Support Structures for Offshore Wind Turbines - Analysis of Full-Scale Measurements**

Department of Civil Engineering
Period: 01/12/2011 → 29/09/2016
Number of participants: 6
Phd Student:
Kallehave, Dan (Intern)
Supervisor:
Thilsted, Christian LeBlanc (Ekstern)
Main Supervisor:
Poulsen, Peter Noe (Intern)
Examiner:
Brincker, Rune (Intern)
Augustesen, Anders Hust (Ekstern)
Eiksund, Gudmund (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

**Modeling of Soil-Structure-Water Interaction**

Department of Civil Engineering
Period: 15/11/2011 → 23/02/2015
Number of participants: 6
Phd Student:
Tang, Tian (Intern)
Supervisor:
Pedersen, Johan Rønby (Intern)
Main Supervisor:
Johannesson, Björn (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Electrodialytic extraction of cadmium from raw, wet oxidized, composted and thermally gasified sludge products

Department of Civil Engineering
Period: 01/11/2011 → 30/06/2017
Number of participants: 4
Phd Student: Ebbers, Benjamin (Intern)
Supervisor: Andersen, Henrik Rasmus (Intern)
Jensen, Pernille Erland (Intern)
Main Supervisor: Ottosen, Lisbeth M. (Intern)

Energirenovering af Etagebyggerier med vidtgående Energibesparelser

Department of Civil Engineering
Period: 01/11/2011 → 19/03/2015
Number of participants: 5
Phd Student: Harrestrup, Maria (Intern)
Main Supervisor: Svendsen, Svend (Intern)
Examiner: Rode, Carsten (Intern)
Björk, Folke (Ekstern)
Rudbeck, Claus Christian (Intern)

Evacuation of people with visual impairments

Department of Civil Engineering
Period: 01/10/2011 → 26/01/2015
Number of participants: 5
Phd Student: Sørensen, Janne Gress (Intern)
Main Supervisor: Dederichs, Anne Simone (Intern)
Examiner: Clausen, Geo (Intern)
Boyce, Karen Evelyn (Ekstern)
McLinden, Michael (Ekstern)
**Metode til planlægning af vidtgående energirenovering af enfamiliehuse**

Department of Civil Engineering  
Period: 01/10/2011 → 07/09/2017  
Number of participants: 6  
Phd Student:  
Grøn Bjørneboe, Matilde (Intern)  
Supervisor:  
Heller, Alfred (Intern)  
Main Supervisor:  
Svendsen, Svend (Intern)  
Examiner:  
Nielsen, Toke Rammer (Intern)  
Gustavsson, Leif (Ekstern)  
Varming, Niels (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut, samfinansiering

**Relations**  
Publications:  
Method for planning extensive energy renovation of detached single-family houses  
Project: PhD

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**Model Predictive Control of a Decentralized Unit for Indoor Climate, Energy Performance, and Continuous Commissioning**

Department of Civil Engineering  
Period: 01/10/2011 → 28/01/2016  
Number of participants: 5  
Phd Student:  
Smith, Kevin Michael (Intern)  
Main Supervisor:  
Svendsen, Svend (Intern)  
Examiner:  
Nielsen, Toke Rammer (Intern)  
Drivsholm, Christian (Ekstern)  
Johansson, Dennis (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut, samfinansiering  
Project: PhD

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**Hvad med dagslys? Designmanual med forslag til helhedsrenovering**

Department of Civil Engineering  
Section for Building Design  
Royal Danish Academy of Fine Arts  
Henning Larsen Architects A/S  
Algreen Arkitekter  
Arkitekt MAA Peter Andreas Sattrup  
Period: 01/09/2011 → 01/09/2012  
Number of participants: 1

Project participant:
Sattrup, Peter Andreas (Intern)

Relations
Activities:
Velux Daylight Symposium
Daylight & Sustainable Transformation Conference
Boligfonden Kuben Masterclass 2012

Publications:
Hvad med dagslys?

Stabilitet af tynde skalkonstruktioner i metal
Department of Civil Engineering
Period: 01/09/2011 → 28/04/2016
Number of participants: 6
Phd Student:
Laustsen, Bjarke (Intern)
Supervisor:
Gath, Jesper (Intern)
Main Supervisor:
Jönsson, Jeppe (Intern)
Examiner:
Hoang, Linh Cao (Intern)
Aalberg, Arne (Ekstern)
Bræstrup, Mikael Wimpffen (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU

Relations
Publications:
Stabilitet af tynde skalkonstruktioner
Project: PhD

Stagnation temperatures for solar collectors
Section for Building Physics and Services
Department of Civil Engineering
PowerPipe ApS
Period: 01/09/2011 → 30/11/2011
Number of participants: 2
Project participant:
Chen, Ziqian (Intern)
Project Manager, organisational: Furbo, Simon (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 13,500.00 Danish Kroner
Project

Energy-efficient bedroom ventilation that may improve sleep and next-day well-being
The objective of the project was to investigate the effect of ventilation on sleep quality and next-day well-being. The uniqueness of the study was that the subjects slept in their own beds. The results show positive effects of a higher ventilation rate on the subjectively assessed freshness of the air, on the subjects’ mental state and their feeling of being rested. There was also a positive effect on performance and on sleep efficiency measured by actigraphs. It is the first time that it has been proved that higher air quality has a positive effect on sleep and next-day performance.
Department of Civil Engineering
Section for Indoor Environment
Period: 15/08/2011 → 31/07/2014
Number of participants: 1
Acronym: EESE
Project participant:
Strøm-Tejsen, Peter (Intern)

Financing sources
Source: Public research council
Name of research programme: The Danish Council for Independent Research | Technology and Production
Amount: 2,054,880.00 Danish Kroner
Year of approval: 2010

Relations
Activities:
Clima 2013
13th SCANVAC International Conference on Air Distribution in Rooms
13th International Conference on Indoor Air Quality and Climate

Publications:
The effect of air quality on sleep

Advanced Sandwich Elements for Sustainable Buildings - Integrated Structural and Materials Modelling
Department of Civil Engineering
Period: 15/08/2011 → 30/10/2015
Number of participants: 6
Phd Student:
Hulin, Thomas (Intern)
Supervisor:
Schmidt, Jacob Wittrup (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Hertz, Kristian Dahl (Intern)
Fontana, Mario (Ekstern)
Jirásek, Milan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut/centerfinansieret
Project: PhD

Climate Change and its Impact on Lifetime and Maintenance of Buildings
Department of Civil Engineering
Period: 15/08/2011 → 09/12/2015
Number of participants: 6
Phd Student:
Cox, Rimante Andrasjunaita (Intern)
Supervisor:
Nielsen, Susanne Balslev (Intern)
Main Supervisor:
Rode, Carsten (Intern)
Examiner:
Heller, Alfred (Intern)
Jones, Keith (Ekstern)
Kalagasidis, Angela Sasic (Ekstern)

Financial sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Optimal designs for hot water tanks for solar domestic hot water systems
The simulation program MANTLSIM was modified in such a way that the yearly thermal performance of small solar
domestic hot water systems based on mantle tanks was calculated for typical weather conditions for Klagenfurt, Austria.
Calculations of yearly thermal performances for this location were carried out for a solar domestic hot water system with
differently designed mantle tanks. A report with the results of the calculations was worked out.

Section for Building Physics and Services
Department of Civil Engineering
GREENoneTEC Solarindustrie GmbH
Period: 01/08/2011 → 31/12/2011
Number of participants: 4
Project participant:
Andersen, Elsa (Intern)
Dragsted, Janne (Intern)
Chen, Ziqian (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financial sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 30,800.00 Danish Kroner
Project

A Coupled Transport and Chemical Model for Durability Predictions of Cement Based Materials
Department of Civil Engineering
Period: 01/07/2011 → 30/09/2014
Number of participants: 8
Phd Student:
Jensen, Mads Mønster (Intern)
Supervisor:
Geiker, Mette Rica (Intern)
Poulsen, Søren Lundsted (Ekstern)
Stang, Henrik (Intern)
Main Supervisor:
Johannesson, Björn (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Bennethum, Lynn S. (Ekstern)
Wadsø, Lars (Ekstern)

Financial sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Analysis and development of Advanced Sandwich Elements for Sustainable Buildings
Department of Civil Engineering
Period: 01/07/2011 → 30/09/2015
Number of participants: 6
Phd Student:
The overall aim of the project is to prepare new solar Design Reference Years, DRYs for different parts of Denmark. The reference years will be based on measured global radiation from DMI's climate stations. Department of Civil Engineering will analyse the global and diffuse radiation on horizontal measured for the period 2001-2010 at DTU's climate station at Kgs. Lyngby. Normal used solar radiation models will be fitted in such a way, that the diffuse radiation on horizontal can be determined with a good accuracy. These models will be used to determine the diffuse radiation on horizontal for DMI's climate stations, where only global radiation on horizontal is measured. The developed DRY's will be used to determine the yearly thermal performance for differently designed solar heating plants. In this way, it will be elucidated how the yearly thermal performance of solar heating plants is influenced by the design and location of the solar heating plants.

Section for Building Physics and Services
Department of Civil Engineering
Danish Meteorological Institute
Period: 01/07/2011 → 30/09/2012
Number of participants: 2
Project participant:
Dragsted, Janne (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 177,840.00 Danish Kroner
Project
Sustainable energy
The aim of the project is to carry out research and education activities on Sustainable Energy within the SDC Center. The SDC Center is a joint project on education and research between the eight Danish universities, the Danish Ministry of Science, Technology and Innovation, the University of the Chinese Academy of Sciences (UCAS) and the Chinese Academy of Sciences (CAS). The overall aim of SDC is to promote and strengthen collaboration between Danish and Chinese research and learning environments for the benefit of both countries.

Department of Civil Engineering
Section for Building Physics and Services
Period: 01/07/2011 → 31/12/2013
Number of participants: 5
Sustainable Energy, Sino-Danish Research and Education Center, Solar Energy
Project ID: 26192
Project participant:
Fan, Jianhua (Intern)
Furbo, Simon (Intern)
Andersen, Elsa (Intern)
Perers, Bengt (Intern)
Chen, Ziqian (Intern)

Human response to exposed chilled beams with incorporated radiant panel
Department of Civil Engineering
Section for Indoor Environment
Halton OY
Period: 01/06/2011 → 31/07/2015
Number of participants: 2
HVAC system, indoor environment, human response, energy use
Project ID: 26215
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)
Project Manager, academic:
Melikov, Arsen Krikor (Intern)

Heat Storage in Hot aquifers
Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Department of Environmental Engineering
Period: 01/06/2011 → 31/05/2014
Number of participants: 3
Phd Student:
Rosenbrand, Esther (Intern)
Supervisor:
Kjøller, Claus (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)

Heat Storage in Hot aquifers
Department of Civil Engineering
Period: 01/06/2011 → 26/09/2014
Number of participants: 6
Phd Student:
Room velocities and person perception for room conditions with chilled beam systems

Department of Civil Engineering
Section for Indoor Environment
Halton OY
Uponor Corporation
Rettig

Period: 01/06/2011 → 31/12/2015
Number of participants: 2
air distribution, human response
Project ID: 25908
Project participant:
Bolashikov, Zhecho Dimitrov (Intern)

Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Smart Water

Water flooding is a standard method to extract extra oil from mature fields. International research suggests that the impact may be increased by modifying salinity or other features of the injected water. Involving industrial partners the Smart Water project led by CERE is focussed on both theoretical understanding and practical applications.

Funded by Energistyrelsen, DONG Energy and Maersk Oil

Center for Energy Resources Engineering
Department of Chemistry
Department of Civil Engineering
Section for Geotechnics and Geology

Period: 01/06/2011 → 30/09/2014
Number of participants: 2
Project ID: 50845
Project Manager, academic:
Stenby, Erling Halfdan (Intern)

Project Coordinator:
Fabricius, Ida Lykke (Intern)

Natural Energy Efficiency and Sustainability

Department of Civil Engineering
Section for Geotechnics and Geology
Period: 01/05/2011 → 24/08/2015
Number of participants: 6
Phd Student:
Mikeska, Tomás (Intern)
Supervisor:
Hvild, Christian Anker (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Mathisen, Hans Martin (Ekstern)
Schmidt, Dietrich (Ekstern)
Weitzmann, Peter (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

**Methods for Implementing Information and Communication Technology in Sustainable Building Processes**

Department of Civil Engineering
Period: 01/05/2011 → 19/03/2015
Number of participants: 6
Phd Student:
Mondrup, Thomas Fænø (Intern)
Supervisor:
Vestergaard, Flemming (Intern)
Main Supervisor:
Karlshøj, Jan (Intern)
Examiner:
Nielsen, Toke Rammer (Intern)
Hjelseth, Ellif (Ekstern)
Scherer, Raimar J. (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

**Numerical modeling of reinforcement corrosion in cracked concrete**

Department of Civil Engineering
Period: 01/05/2011 → 30/11/2016
Number of participants: 8
Phd Student:
Thybo, Anna Emilie Anusha (Intern)
Supervisor:
Geiker, Mette Rica (Intern)
Michel, Alexander (Intern)
Betingelser for skimmelsvampevækst på byggematerialer

A preliminary investigation of sediments along two large western Greenland glacio-fluvial rivers

The aim of this study is to look at the coupling between glaciated environments, glacio-fluvial rivers and valleys and coastal deltaic areas with respect to minerals, their size and properties i.e. the change a mineral undertakes during transport from a glacier to the ocean. This includes the mapping of sediments along two river systems in the Kangerlussuaq region of West Greenland. This poster presents the most recent results, including induction-coupled plasma mass spectrometry (ICP-MS) determining the water chemistry and microscopic analysis of the collected sediments. Grain size and shapes are expected to be similar to those encountered in other glacio-fluvial rivers of the high arctic. Understanding (the processes involving) the coupling between glacial erosion, transport and deposition in arctic environments, may enable us to locate interesting deposits of specific sediments along rivers, just by looking at the sediments from the delta. 17 sites were investigated, 5 along the Watson River Valley ((lat/long) WRV), 7 along the Ørkendalen River Valley ((lat/long) ØRV) and 5 along the near delta in the Kangerlussuaq fjord. For each location, a sample of the water in the river, including sediments was taken in 2-3 places across the river at different depths and at different flow rates, to study changes in flow rate with depth, along a cross section of the river. Samples were taken in the delta at different depths of known flow rate, and will reflect further knowledge of glacio-marine sedimentation. The sediments will be determined using microscope and, where the grain size is too small, by x-ray diffraction and scanning electron microscopy (XRD and SEM). After the identification is complete, samples will be dissolved and taken through an ICP-MS again, to determine percentages.
IEA Task 45 Large Solar Heating & Cooling Systems

Large Solar thermal Systems (> 0.5MW) have enormous potential for fossils and CO2 reduction. International large solar thermal plants are getting more importance in heat production for feeding district heat networks, industrial processes and thermal driven chillers. Numerous projects in Europe (especially in Denmark), China and Arabic area emphasize this trend impressively. Beneath the large potential large solar thermal installations have been proven to be economical and sustainable. Feeding the local district heat network with exceeding energy is reasonable and has been demonstrated extensively in Denmark and also Austria very effective. The central problem of solar thermal plants is that there is selective know-how available for different system parts, but most important issues like overall system concepts, collector fields, storages, heat pumps for lowering temperature and more storage density, monitoring concepts and efficient operating control, financing models etc. have no proven and harmonized standards. So potential for economics of scale and cost reduction for large scale solar thermal plants could not build advantages so far. Also a structured technology development on international level is not given until now. Central aim of Task 45 is to connect the most substantial players through analysis, discussion of implemented and future projects and simulation based optimization of components and systems, as well as the development of components and systems standards beneath considerable cost reduction potential at coincidental increased system efficiency to reach the next generation of large solar thermal installations. The planned transfer to central players and stakeholders is essential for sustainable impact the current market development. Facing the increasing demand and the enormous potential of large solar thermal plants the need for competent and independent answering of these questions is given and will be handled in Task 45. Department of Civil Engineering is the subtask A leader of the project. SUBTASK A “Collectors and collector loop” serves the need for research, development and/or optimization on: •Components for solar collector fields •Design of solar collectors for different applications •Thermal performance of solar collectors for different volume flow rates, collector tilts and solar collector fluids •Control strategy for solar collector fields •Requirements and test methods for solar collector loop pipes •Requirements on hydraulic design of solar collector fields •Precautions for safety and expansion •Guaranteed performance of solar collector fields •Description of further needed research on solar collector fields •Contribution on planning and installation of solar collector fields for design handbook

Section for Building Physics and Services
Department of Civil Engineering
PlanEnergi
Marstal Fjernvarme A/S
Brædstrup Fjernvarme
Period: 01/04/2011 → 31/12/2013
Number of participants: 3
Project participant:
Perers, Bengt (Intern)
Chen, Ziqian (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimæningsrjet
Name of research programme: Forskningsprojekter - Miljø- og Energimæningsrjet
Amount: 727,963.00 Danish Kroner
Project
Heat Storage in Hot Aquifers
In this project, we will develop new technology to improve planning of energy storage in geothermal reservoirs through high-quality experiments and modelling. Geothermal reservoirs have high temperature, so energy may be stored in these geological layers with minimal heat loss. The technology will be based on a multidisciplinary approach combining small scale geochemistry/rock physics with large scale seismic inversion and history matching of production data. The focus will be on Danish geothermal reservoirs, because heat storage is likely to be the missing link in planning sustainable energy production in Denmark, where several sources of energy should interplay. Energy sources as waste incineration and wind are not controlled by immediate energy demands. By storing energy at low heat loss in hot aquifers, we obtain an effective interplay between different sources of energy. Thereby, the degree of coverage with sustainable energy can increase at an acceptable cost. It is the right time to do this, because geothermal plants are presently being installed in Denmark. Thus, the cost of establishing heat storage in geothermal reservoirs is relatively small. The imminent question with respect to establishing heat storage in geothermal reservoirs is how the reservoirs will react to the introduction of water with a higher temperature than the natural as compared to effects of injecting cold water: How will the reservoir rock react chemically and mechanically, how will the heat and fluid distribute in the reservoir, what is the energy loss related to this storage method, and how will a potential change in water chemistry influence the operation abilities of the geothermal plant? We will evaluate the technology in an international context by collaborating with researchers working with geothermal reservoirs in other European countries.

Center for Energy Resources Engineering
Center
Department of Civil Engineering
Heat Storage in Hot Aquifers

Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Department of Informatics and Mathematical Modeling
Scientific Computing
Department of Environmental Engineering

Period: 01/03/2011 → 28/02/2012
Number of participants: 4

Project participant:
Mosegaard, Klaus (Intern)
Kjøller, Claus (Intern)
Phd Student:
Rosenbrand, Esther (Intern)
Project Manager, academic:
Fabricius, Ida Lykke (Intern)
Project

Real Time Decision Support in the Face of Evolving Natural Hazards
Department of Civil Engineering
Period: 01/03/2011 → 28/04/2014
Number of participants: 6
Phd Student:
Anders, Annett (Intern)
Supervisor:
Faber, Michael Havbro (Intern)
Main Supervisor:
Nishijima, Kazuyoshi (Intern)
Examiner:
Nielsen, Bo Friis (Intern)
Chatzi, Eleni (Ekstern)
Kroon, Inger Birgitte (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Risk Assessment of Stay Cable Fatigue
Department of Civil Engineering
Period: 01/02/2011 → 23/02/2015
Number of participants: 6
Phd Student:
Roldsgaard, Joan Hee (Intern)
Supervisor:
Faber, Michael Havbro (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Koss, Holger (Intern)
Chryssanthopoulos, Marios (Ekstern)
Sørensen, John Dalsgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Development of a natural hazard risk model framework with application to flood risk
Department of Civil Engineering
Period: 15/01/2011 → 24/08/2015
Number of participants: 6
Phd Student:
Custer, Rocco (Intern)
Supervisor:
Nishijima, Kazuyoshi (Intern)
Main Supervisor:
Faber, Michael Havbro (Intern)
Examiner:
Thöns, Sebastian (Intern)
Baubion, Charles (Ekstern)
Jonkman, S. N. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Elektrodialytisk opgravering af røggasaffald fra farligt affald til sekundær ressource
Department of Civil Engineering
Arctic Technology Centre
Jurag Separation A/S
I/S Refa
Period: 01/01/2011 → 31/12/2013
Number of participants: 4
Project ID: 26141
Project participant:
Ottosen, Lisbeth M. (Intern)
Kirkelund, Gunvor Marie (Intern)
Villumsen, Arne (Intern)
Project Manager, organisational:
Jensen, Pernille Erland (Intern)

Financing sources
Source: Program. Andre statslige danske - Miljø
Name of research programme: Program. Andre statslige danske - Miljø
Amount: 1,875,097.00 Danish Kroner

Helhedsorienteret energirenovering
Section for Building Design
Department of Civil Engineering
ALECTIA A/S
BSAA Architects
Period: 01/01/2011 → 31/12/2013
Number of participants: 6
Project participant:
Bjarlav, Søren Peter (Intern)
Rode, Carsten (Intern)
Eriksen, Marlene Stenberg Hagen (Intern)
Løgberg, Ejvind (Ekstern)
Simonsen, Gert (Ekstern)
Project Manager, organisational:
Stang, Birgitte Friis Dela (Ekstern)

Solar decathlon 2012 : Team DTU Denmark
Department of Civil Engineering
Technical University of Denmark
**The window system of the future - Basis for the development and the evaluation of the overall performance**

Department of Civil Engineering  
Period: 15/11/2010 → 31/08/2012  
Number of participants: 3  
Phd Student:  
Szameitat, Jeppe Egelund (Intern)  
Supervisor:  
Andersen, Carsten Hald (Ekstern)  
Main Supervisor:  
Svendsen, Svend (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: ErhvervsPhD-ordningen VTU  
Project: PhD

**Bæredygtighed ved renovering af eksisterende byggeri**

Department of Civil Engineering  
Period: 01/11/2010 → 04/07/2016  
Number of participants: 6  
Phd Student:  
Eriksen, Marlene Stenberg Hagen (Intern)  
Supervisor:  
Bjarløv, Søren Peter (Intern)  
Main Supervisor:  
Rode, Carsten (Intern)  
Examiner:  
Jensen, Lotte Bjerregaard (Intern)  
Hansen, Hanne Tine Ring (Ekstern)  
Thuvander, Liane (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut stipendie (DTU) Samf.  
Project: PhD

**Energy use and indoor environment in new and exiting dwellings in arctic climates**

Department of Civil Engineering  
Period: 01/11/2010 → 24/04/2014  
Number of participants: 7  
Phd Student:  
Kotol, Martin (Intern)  
Supervisor:  
Clausen, Geo (Intern)  
Nielsen, Toke Rammer (Intern)  
Main Supervisor:
Rode, Carsten (Intern)
Examiner:
Svendsen, Svend (Intern)
Nielsen, Anker Frank (Ekstern)
Simonson, Carey (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Udvikling af ny teknik til fosfor-indvinding fra aske fra forbrænding af spildevandsslam
Section for Construction Materials
Department of Civil Engineering
Department of Chemical and Biochemical Engineering
Period: 15/10/2010 → 15/10/2011
Number of participants: 5
Project ID: 26132
Project participant:
Jensen, Pernille Erland (Intern)
Kirkelund, Gunvor Marie (Intern)
Christensen, Iben Vernegren (Intern)
Dame, Anne Juul (Intern)
Project Manager, organisational:
Ottosen, Lisbeth M. (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 390,000.00 Danish Kroner
Project

Assessment of dynamic flow, pressure and geo-mechanical behaviour of a CO2 storage complex
Department of Civil Engineering
Period: 01/10/2010 → 27/05/2014
Number of participants: 5
Phd Student:
Mbia, Ernest Ncha (Intern)
Supervisor:
Frykman, Peter (Intern)
Examiner:
Ingeman-Nielsen, Thomas (Intern)
Prasad, Manika (Ekstern)
Wessel-Berg, Dag (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Beregning af effektivitet af luftsolfangere
Department of Civil Engineering
Period: 01/10/2010 → 31/01/2011
Number of participants: 2
Project participant:
Andersen, Elsa (Intern)
Climate change and its impact on lifetime and maintenance of buildings

Department of Civil Engineering
Period: 01/09/2010 → 30/11/2010
Number of participants: 3
Phd Student:
Hørmann, Philip (Intern)
Supervisor:
Nielsen, Susanne Balslev (Intern)
Main Supervisor:
Rode, Carsten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Connovate - optimized building system using High Performance Concrete

Vision The parties will develop a new sustainable building system using High Performance Concrete (HPC) for sandwich elements. The system meets the visions of low energy use, low material consumption, material recycling and low CO2 emission throughout the entire life cycle, contributing to Denmark fulfilling its international obligations as well as expanding Denmark's international position through export of an innovative building technology. The system will represent the next step in the construction industry's increasing use of prefabricated elements, making it possible to offer the end user better solutions for insulation, increased living space and better indoor air quality at a competitive price. As a result of the superior performance compared to current refurbishment methods, the system is expected to play a central role in the foreseen energy refurbishment of the existing building stock. Focused on global warming, this allows for legislation on the issue to be further tightened. Objective The aims are to develop and certify the basic elements for a new HPC building system and launch it on the Danish market prior to introducing the system to further markets. We will establish Connovate as a joint IPR holder and a company to develop business models for future development of products, markets and systems globally. IPR will be shared between Connovate, DTU and IPU and continuously strengthened throughout the development period supporting the core business. Success criterion The overall success criterion is to develop the basic HPC building elements and to create an effective production layout. A further criterion is the establishment of a company (Connovate) that on the basis of innovation and strong IPR’s will secure the continuity of developing the HPC system. A third criterion is to create jobs in a broad range of companies in Denmark and gain increased market share in export markets. Finally, we expect a measurable positive impact on the environmental challenges.

Department of Management Engineering

Department of Civil Engineering
Arkitema K/S
Contec ApS
Smith Innovation
DELTA
Dansk Brand- og Sikringsteknisk Institut

Institute for Product Development
Period: 01/09/2010 → 31/08/2013
Number of participants: 10
Project ID: 81148
Project participant:
Hvam, Lars (Intern)
Mortensen, Niels Henrik (Intern)
Serwin, Bo (Ekstern)
Nieport, Christian (Ekstern)
Svendsen, Svend (Intern)
Stang, Henrik (Intern)
Olesen, Henrik (Ekstern)
Bertelsen, Ib (Ekstern)
Gregersen, Johan (Ekstern)
Project Manager, organisational:
Bro, Karsten (Ekstern)

Financing sources
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Forsk. Andre statslige danske i øvrigt
Project

Ductless Personalised Ventilation - Human Response and Energy Performance
Department of Civil Engineering
Period: 01/09/2010 → 18/09/2014
Number of participants: 2
Phd Student:
Dalewski, Mariusz (Intern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Remediation of industrially contaminated sediments and soils with mixed contaminations in the Arctic
Department of Civil Engineering
Arctic Technology Centre
University of Tromsø
Period: 01/09/2010 → 31/12/2014
Number of participants: 4
Project participant:
Jensen, Pernille Erland (Intern)
Ottosen, Lisbeth M. (Intern)
Lejon, Tore (Ekstern)
Project Manager, organisational:
Bondo Pedersen, Kristine (Ekstern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Project

Acoustic properties of two-phase saturated porous rocks in the context of mud-filtrate invasion correction
Department of Civil Engineering
Period: 15/08/2010 → 22/06/2015
Number of participants: 5
Phd Student:
Sørensen, Morten Kanne (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Johannesson, Björn (Intern)
Holt, Rune M. (Ekstern)
Rasolofosan, Patrick N. J. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Mud-filtrate correction of sonic logs by fluid substitution
Project: PhD

Architectural Engineering til superlette konstruktioner
Department of Civil Engineering
Period: 15/08/2010 → 22/11/2013
Number of participants: 5
Phd Student:
Castberg, Niels Andreas (Intern)
Main Supervisor:
Hertz, Kristian Dahl (Intern)
Examiner:
Jensen, Lotte Bjerregaard (Intern)
Bontempi, Franco (Ekstern)
Larsen, Olga Popovic (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Ductless personalized ventilation* – a novel method of air distribution in spaces (human response and energy performance)
Department of Civil Engineering
Section for Indoor Environment
Period: 01/08/2010 → 31/07/2014
Number of participants: 2
personalized ventilation , human response
Project ID: 26098
Number of related Ph.D. students: 1
Project participant:
Dalewski, Mariusz (Intern)
Project Manager, academic:
Melikov, Arsen Krikor (Intern)

Test facility for air collectors
1. Objective of the project Renewable energy systems based on air solar collectors are used for dehumidification of buildings and heating of ventilation air for buildings. The aim of the project is to increase the knowledge of the heat and mass transfer in air solar collectors. This knowledge is the basis for improved marketed air solar collectors. 2. Background Air solar collectors are in Denmark installed in large numbers in summer houses with the aim to improve the indoor climate by dehumidification. The air solar collectors have integrated PV modules which provide electricity for integrated ventilation fans. In this way outdoor air is in sunny cold periods heated in the solar collector and by means of the fan blown into the houses. This kind of systems can also be used for heating of ventilation air. The system can also be extended with an additional ventilation fan which is placed on the north and shaded side of the building. When the temperature inside the building gets too high, a control system turns off the ventilation fan on the south and sunny side and turns on the ventilation fan on the north side. In this way cold air from the shaded part of the building can be used to cool down the building. Marketed air solar collectors are today designed based on manufacturer’s practical experience with special focus on the manufacturing process, the installation process and the operation of the system. Detailed knowledge of the thermal behaviour inclusive details on the heat and mass transfer in the air solar collector during operation is only to a small extent
the basis for the design of the air solar collectors. Several companies in Denmark manufacture this kind of solar collectors, for instance Solar Venti A/S, Ans Solvarme and Dansolar and consumers must rely on product information given by manufactures. There is a lack of detailed knowledge in this field, and there are no impartial institutes with test facilities for air collectors in Denmark. Further, there are no international standard test methods available for air solar collectors. 3. Project activities This project will establish the first part of the basis for development of air solar collector systems for dehumidification of buildings and heating of ventilation air for buildings. The first part contains the following activities: Establishing of a test facility for side-by-side tests of air solar collectors, Testing the efficiency of a marketed air solar collector and Contribute to development of test methods for air solar collectors within the international energy agency framework program, Task 43

Department of Civil Engineering
Period: 29/07/2010 → 31/12/2011
Number of participants: 3
Project ID: 26119
Contact person:
Andersen, Elsa (Intern)
Perers, Bengt (Intern)
Furbo, Simon (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 4,990,769.00 Danish Kroner

Durability of buildings and energy renovation

Department of Civil Engineering
Period: 01/07/2010 → 26/08/2014
Number of participants: 5
Phd Student:
Lauritsen, Diana (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Rode, Carsten (Intern)
Björk, Folke (Ekstern)
Rudbeck, Claus Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Udvikling af profileret tagintegreret solfanger

Department of Civil Engineering
Nordic Energy Group ApS
Period: 08/06/2010 → 31/12/2012
Number of participants: 3
Project participant:
Chen, Ziqian (Intern)
Andersen, Elsa (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 418,997.00 Danish Kroner
Building Thermal Energy Storage

Department of Civil Engineering
Period: 01/06/2010 → 26/08/2014
Number of participants: 6
Phd Student:
Pavlov, Georgi Krasimiroy (Intern)
Supervisor:
Svendsen, Svend (Intern)
Main Supervisor:
Olesen, Bjarne W. (Intern)
Examiner:
Melikov, Arsen Krikor (Intern)
Hensen, Jan (Intern)
Muller, Dirk (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Elektrodialytisk opgradering af grønlandske flyveasker fra farligt affald til sekundære ressourcer

Arctic Technology Centre, ARTEK

Department of Civil Engineering

Arctic Technology Centre
Period: 01/06/2010 → 31/12/2011
Number of participants: 4
Project participant:
Jensen, Pernille Erland (Intern)
Ottosen, Lisbeth M. (Intern)
Villumsen, Arne (Intern)
Villumsen, Arne (Intern)
Project Manager, organisational:
Kirkelund, Gunvor Marie (Intern)
Project

Innovation network for energy efficient and sustainable construction

The innovation network for energy efficient and sustainable construction - InnoBYG - is the innovation network of the construction industry in Denmark. The Danish Agency for Science, Technology and Innovation has granted a co-financing of 20 million DKK to the network.

InnoBYG brings the industry together across professional competency. The network has focus on knowledge sharing, networking and development of the industry among its members, both domestically and internationally.

Between 2010-2014 InnoBYG will facilitate the development of the construction industry by addressing a number of societal and technical challenges, all of which are related to energy efficiency and sustainability in the construction industry.

DTU Management Engineering is responsible for the subproject on development of sustainable business models in construction.

Department of Management Engineering
Production and Service Management
Department of Civil Engineering
Danish Technological Institute
Danish Construction Association
Dansk Industri

Aalborg University

BAT-Kartellet

Dansk Brand- og Sikringsteknisk Institut

Tekniq
Period: 01/06/2010 → 31/05/2014
Number of participants: 3
Acronym: InnoBYG
Project participant:
Maslesa, Esmir (Intern)
Arnklit, Signe Raymond (Intern)
Project Manager, academic:
Thuesen, Christian (Intern)

Innovationsnetværket for energieffektivt og bæredygtigt byggeri

Department of Civil Engineering
Period: 01/06/2010 → 31/05/2014
Number of participants: 3
Acronym: InnoBYG
Project ID: 26128
Project participant:
Bjarløv, Søren Peter (Intern)
Eriksen, Marlene Stenberg Hagen (Intern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 1,440,000.00 Danish Kroner

Erosion, transport og aflejring af glaciale sedimenter ved Kangerlussuaq, Grønland

Department of Civil Engineering
Period: 01/05/2010 → 05/03/2014
Number of participants: 4
Phd Student:
Ploug, Johan (Intern)
Supervisor:
Andersen, Thorbjørn Joest (Ekstern)
Villumsen, Arne (Intern)
Main Supervisor:
Nielsen, Morten Holtegaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)

Stochastic Modeling of Structural Performance of Steel Fiber Reinforced Concrete Structures

Department of Civil Engineering
Period: 01/05/2010 → 24/04/2014
Number of participants: 7
Phd Student:
Svec, Oldrich (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Poulsen, Peter Noe (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Koss, Holger (Intern)
Chanvillard, Gilles (Ekstern)
Karhaloo, Bhushan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Understanding of bridge cable vibration mechanisms under varying meteorological conditions
Department of Civil Engineering
Period: 01/05/2010 → 23/06/2014
Number of participants: 8
Phd Student:
Matteoni, Giulia (Intern)
Supervisor:
Arentoft, Mogens (Intern)
Koss, Holger (Intern)
Ricciardelli, Francesco (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Fischer, Gregor (Intern)
Jakobsen, Jasna Bogunovic (Ekstern)
Macdonald, John Hugh George (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Ventilationsforhold i skunke og hanebåndslofter i konstruktioner med diffusionsåbne undertage
Section for Building Design
Department of Civil Engineering
Period: 01/05/2010 → 31/12/2011
Number of participants: 1
Project ID: 26077
Project participant:
Hjorslev Hansen, Morten (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 588,900.00 Danish Kroner
Project

Danish Centre for Composites Structures and Materials for Wind Turbines
Some of the most critical components of a wind turbine are the rotor blades, which are usually made of polymer matrix composites and are the largest rotating components of a wind turbine.
Different types of damage can develop at different length scales in wind turbine rotor blades. Therefore, the Danish Centre for Composite Structures and Materials for Wind Turbines (DCCSM) aims to develop a coherent, multiscale-based understanding of the mechanical behaviour of composite materials and structures for wind turbine blades. The length scale goes from nano- and microscale (materials) to product scale (the whole blade, which currently can be more than 60
meters in length), and covers manufacturing, materials design, damage detection, modelling and prediction of damage evolution in wind turbine blades. A coherent multiscale understanding of composite materials and structures will enable full optimisation, viz., optimisation at all length scales.

The Centre aims for the creation of new knowledge (e.g. material models), new experimental methods and new modeling methods. The Centre spans wide thematically and disciplinarily. The specific PhD, Post Doc and research projects funded by DCCSM (Core and Shell activities) are focused at smaller, well-defined topics. Therefore, the Centre will coordinate the research activities in Denmark in the area of composite structures and materials for wind turbines. That includes the Core and Shell activities of DCCSM and research projects that are not funded by the DSF funds but are thematically covered by the Centre. Such projects are called "Crust" projects.

DSF Strategic Research Centre (sags. nr. 09-067212).

Department of Wind Energy
Composites and Materials Mechanics
Department of Micro- and Nanotechnology
Amphiphilic Polymers in Biological Sensing
Wind Turbines
Solid Mechanics
Department of Mechanical Engineering
Department of Civil Engineering
Section for Structural Engineering
Period: 01/04/2010 → 31/03/2017
Number of participants: 11
Acronym: DCCSM
Project participant:
Almdal, Kristoffer (Intern)
Mikkelsen, Lars Pilgaard (Intern)
Branner, Kim (Intern)
Mishnaevsky, Leon (Intern)
Legarth, Brian Nyvang (Intern)
Berggreen, Christian (Intern)
Stang, Henrik (Intern)
PhD Student:
Zike, Sanita (Intern)
Hansen, Jens Zangenberg (Intern)
Ashouri Vajari, Danial (Intern)
Approving authority:
Sørensen, Bent F. (Intern)

Relations
Publications:
From Measurements Errors to a New Strain Gauge Design
Micro-Scale Experiments and Models for Composite Materials with Materials Research
Correction of Gauge Factor for Strain Gauges Used in Polymer Composite Testing
Fatigue damage propagation in unidirectional glass fibre reinforced composites made of a non-crimp fabric
Determination of the minimum size of a statistical representative volume element from a fibre-reinforced composite based on point pattern statistics
Quantitative study on the statistical properties of fibre architecture of genuine and numerical composite microstructures
Methodology for characterisation of glass fibre composite architecture
Design of a fibrous composite preform for wind turbine rotor blades
The effects of fibre architecture on fatigue life-time of composite materials
A numerical study of the influence of microvoids in the transverse mechanical response of unidirectional composites

Project
Possibilities and limitations of embedded radiant cooling systems

Department of Civil Engineering
Period: 15/03/2010 → 16/02/2017
Number of participants: 6
Phd Student: Behrendt, Benjamin (Intern)
Supervisor: Olesen, Bjarne W. (Intern)
Main Supervisor: Christensen, Jørgen Erik (Intern)
Examiner: Fan, Jianhua (Intern)
Hensen, Jan (Intern)
Kolsaker, Kjell (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet

Relations
Publications:
Possibilities and Limitations of Thermally Activated Building Systems
Project: PhD

Ventilationsforhold i skunke og hanebåndslofter i konstruktioner med diffusionsåbne undertage.

Department of Civil Engineering
Section for Building Design
Section for Building Physics and Services
Period: 01/03/2010 → 01/10/2012
Number of participants: 3
beskrivelse af projektet, Kort Ventilationsforhold i skunke og hanebåndslofter i konstruktioner med diffusionsåbne undertage.
Project ID: 26077
Project participant:
Bjarløv, Søren Peter (Intern)
Hjorslev Hansen, Morten (Ekstern)
Johnston, Christopher Just (Intern)
Documents:
Kolde_tagrum_Kort_projetbeskrivelse.pdf
Fugt_i_skunkrum.pdf
Project

Method for design of low energy type houses based on simulations of indoor environment and energy use

Department of Civil Engineering
Period: 01/03/2010 → 20/03/2014
Number of participants: 5
Phd Student: Vanhoutteghem, Lies (Intern)
Main Supervisor: Svendsen, Svend (Intern)
Examiner: Nielsen, Toke Rammer (Intern)
Duer, Karsten (Intern)
Wall, Maria (Ekstern)

Financing sources
Source: Internal funding (public)
Optimization of solar heating and water heating combisystems applied in buildings

The project will be carried out by Beijing Solar Energy Research Institute Co. Ltd, China and Department of Civil Engineering, Technical University of Denmark. The Chinese partner will focus investigations on flat plate solar collectors and the Danish partner will focus on evacuated tubular solar collectors. The thermal performance of the different collectors will be compared both for Danish and Chinese climate. The Chinese partner will focus on traditional designed heat stores without a high degree of thermal stratification. The Danish partner will focus on highly stratified heat stores with built in inlet stratification devices. It will be elucidated how much the thermal performance will be improved for solar combi systems with advanced stratified heat storages instead of normal heat storages with limited thermal stratification both with Danish and Chinese weather data. Laboratory tests of solar combi systems, development of TRNSYS simulation models for solar combi systems and validation of the simulation models will be carried out. Solar combi systems will be developed based on TRNSYS calculations both for Danish and Chinese weather data and one family houses. The long term thermal performance of solar combi systems installed in demonstration houses in China and in Denmark will be measured.

Section for Building Physics and Services

Department of Civil Engineering
Period: 01/03/2010 → 31/12/2013
Number of participants: 5
Project participant:
Chen, Ziqian (Intern)
Fan, Jianhua (Intern)
Andersen, Elsa (Intern)
Perers, Bengt (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 3,965.378 Danish Kroner

Dansk deltagelse i IEA Task 44: Systems using solar thermal energy in combination with heat pumps

Section for Building Physics and Services

Department of Civil Engineering
Danish Technological Institute
Ellehauge og Kildemoes ApS
Nilan A/S
Period: 12/02/2010 → 31/03/2011
Number of participants: 3
Project participant:
Perers, Bengt (Intern)
Furbo, Simon (Intern)
Project Manager, organisational:
Andersen, Elsa (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 231,984.00 Danish Kroner

Strength and deformation properties of permafrost soils in Greenland

Department of Civil Engineering
Period: 01/02/2010 → 03/11/2014  
Number of participants: 6  
Phd Student:  
Agergaard, Frederik Ancker (Intern)  
Supervisor:  
Villumsen, Arne (Intern)  
Main Supervisor:  
Ingeman-Nielsen, Thomas (Intern)  
Examiner:  
Jensen, Pernille Erland (Intern)  
Instanes, Arne (Ekstern)  
allard, michel (Ekstern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: Institut/centerfinansieret  
Project: PhD

Udvikling og 1:1 demonstration af koncepter til renovering af ældre etageboliger til lavenergiklasse 1  
Department of Civil Engineering  
COWI A/S  
Period: 10/01/2010 → 18/08/2012  
Number of participants: 3  
Project ID: 26099  
Project participant:  
Tommerup, Henrik M. (Intern)  
Project Manager, organisational:  
Mikkelsen, Svend Erik (Ekstern)  
Svendsen, Svend (Intern)  

Financing sources  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 506,000.00 Danish Kroner  
Project

Member of Research and Evaluation Committee commissioned by Municipality of Copenhagen: Noise Screen Tagensvej  
Contact person: Birgitte Kortegaard  
Department of Civil Engineering  
Section for Building Design  
Period: 01/01/2010 → 31/12/2010  
Number of participants: 1  
Project participant:  
Jensen, Lotte Bjerregaard (Intern)  

Flow of electric current through interphase between metal and pore solution  
Department of Civil Engineering  
Period: 01/01/2010 → 27/08/2013  
Number of participants: 7  
Phd Student:  
Sun, Tian Ran (Intern)  
Supervisor:  
Geiker, Mette Rica (Intern)  
Mortensen, John (Ekstern)  
Main Supervisor:  
Ottosen, Lisbeth M. (Intern)
Examiner:
Johannesson, Björn (Intern)
Armero, Marta María Castellote (Ekstern)
Laursen, Søren (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Indeklima i danske boliger og dets indflydelse på menneskers helbred og velbefindende
Department of Civil Engineering
Period: 01/01/2010 → 30/09/2013
Number of participants: 3
Phd Student:
Gustavsen, Sine (Intern)
Supervisor:
Toftum, Jørn (Intern)
Main Supervisor:
Clausen, Geo (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Revision af DS418
Department of Civil Engineering
Dansk Standard
Period: 01/01/2010 → 31/03/2011
Number of participants: 3
Project ID: 26113
Project participant:
Tommerup, Henrik M. (Intern)
Svendsen, Svend (Intern)
Project Manager, organisational:
Ravn-Jensen, Lars (Ekstern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 36,500.00 Danish Kroner
Project

Successful Sustainable Renovation Business for Single-Family Houses
The main objective of the project is to chance the business environment in order to speed up the implementation of sustainable renovation of single-family houses. The resulting new service concepts will combine both the technical solutions, financing services as well as other promoting issues to overcome the behavioural, organizational, legal and social barriers that exist in sustainable renovation.

Department of Civil Engineering
VTT - Technical Research Centre of Finland
Mid Sweden University
Segel A/S
Period: 01/01/2010 → 31/12/2012
Number of participants: 8
Acronym: SuccessFamilies
Project ID: 26017
Project participant:
Svendsen, Svend (Intern)
Tommerup, Henrik M. (Intern)
Ala-Juusela, Mia (Ekstern)
Paiho, Satu (Ekstern)
Gustavsson, Leif (Ekstern)
Mahapatra, Krushna (Ekstern)
Haavik, Trond (Ekstern)
Aabrekk, Synnøve Elisabeth (Ekstern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 900,000.00 Danish Kroner

Department of Civil Engineering
Period: 01/01/2010 → 01/10/2012
Number of participants: 3
Project ID: 26076
Project participant:
Tommerup, Henrik M. (Intern)
Bjarløv, Søren Peter (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 863,000.00 Danish Kroner

Relations
Publications:
Tekniske systemløsninger til energirenovering – Demonstration på typiske parcelhuse fra perioden 1960-80

Akustisk design af super-lette konstruktioner
Department of Civil Engineering
Period: 01/12/2009 → 27/05/2013
Number of participants: 7
Phd Student:
Christensen, Jacob Ellehauge (Intern)
Supervisor:
Brunskog, Jonas (Intern)
Kjær, Martin V. (Ekstern)
Main Supervisor:
Hertz, Kristian Dahl (Intern)
Examiner:
Hoang, Linh Cao (Intern)
Virdi, Kuldeep S. (Ekstern)
Ågren, Anders (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD
District Heating in Areas with Low-Energy Houses

Department of Civil Engineering
Period: 01/12/2009 → 19/03/2015
Number of participants: 6
Phd Student:
Tol, Hakan (Intern)
Supervisor:
Nielsen, Susanne Balslev (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Elmegaard, Brian (Intern)
Vestergaard, Jens Brusgaard (Ekstern)
Wollerstrand, Janusz (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Ny type lavtryksventilation med lavt varme- og elforbrug til energirenovering af bygninger

Department of Civil Engineering
Period: 01/12/2009 → 20/09/2013
Number of participants: 6
Phd Student:
Terkildsen, Søren (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Christensen, Jørgen Erik (Intern)
Christoffersen, Lars D. (Intern)
Geoffrey Schild, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Oprensning af bundsediment fra forurenede søer og damme

Arctic Technology Centre
Period: 01/12/2009 → 01/12/2010
Number of participants: 4
Project ID: 26078
Project participant:
Kirkelund, Gunvor Marie (Intern)
Ottosen, Lisbeth M. (Intern)
Villumsen, Arne (Intern)
Project Manager, organisational:
Jensen, Pernille Erland (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Understanding of bridge cable vibrations and the associated flow-field through the full-scale monitoring of vibrations and wind

Department of Civil Engineering
Period: 01/12/2009 → 12/12/2013
Number of participants: 7
PhD Student: Acampora, Antonio (Intern)
Supervisor: Arentoft, Mogens (Intern)
Ricciardelli, Francesco (Intern)
Main Supervisor: Georgakis, Christos T. (Intern)
Examiner: Fischer, Gregor (Intern)
Brincker, Rune (Intern)
Jakobsen, Jasna Bogunovic (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU

Relations
Publications:
Understanding of bridge cable vibrations and the associate flow-field through the full-scale monitoring of vibrations and Wind
Project: PhD

Integration of CFD in Structural and Architectural Wind Engineering

Department of Civil Engineering
Period: 01/11/2009 → 30/09/2015
Number of participants: 8
PhD Student: Jørgensen, Nina Gall (Intern)
Supervisor: Bennetsen, Jens Christian (Intern)
Georgakis, Christos T. (Intern)
Jensen, Lotte Bjerregaard (Intern)
Main Supervisor: Koss, Holger (Intern)
Examiner: Fischer, Gregor (Intern)
Franke, Jörg (Ekstern)
Höffer, Rüdiger (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Optimisation of thermal and hygric buffering in a museum storage center - Vejle

Department of Civil Engineering
Conservation Centre Vejle
Period: 01/11/2009 → 31/12/2010
Number of participants: 2
Project participant:
Christensen, Jørgen Erik (Intern)
Project Manager, organisational:
Janssen, Hans (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 120,000.00 Danish Kroner

Project Ydelser for stationære og trackinge solfangere
Section for Building Physics and Services
Department of Civil Engineering
Period: 09/10/2009 → 31/12/2009
Number of participants: 2
Project participant:
Andersen, Elsa (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 15,000.00 Danish Kroner

Project Cable Aerodynamic Control
Department of Civil Engineering
Period: 01/10/2009 → 27/08/2013
Number of participants: 6
Phd Student:
Kleissl, Kenneth (Intern)
Supervisor:
Koss, Holger (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Fischer, Gregor (Intern)
Larose, Guy (Intern)
Larsen, Allan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Project Coupled flow and matrix changes during electrokinetic treatment of porous and particulate materials
Department of Civil Engineering
Period: 01/10/2009 → 28/04/2014
Number of participants: 7
Phd Student:
Skibsted, Gry (Intern)
Supervisor:
Elektorowicz, Maria (Ekstern)
Jensen, Pernille Erland (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Laursen, Søren (Intern)
Armero, Marta Maria Castellote (Ekstern)
Geiker, Mette Rica (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Evacuation of children
Department of Civil Engineering
Period: 01/10/2009 → 24/01/2014
Number of participants: 6
Phd Student:
Larusdottir, Aldis Run (Intern)
Supervisor:
Nilsson, Daniel (Ekstern)
Main Supervisor:
Dederichs, Anne Simone (Intern)
Examiner:
Hjorth, Poul G. (Intern)
Boyce, Karen Evelyn (Ekstern)
Gwynne, Steven M. V. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Ny viden til Byggefagene: Introducere byggerhvervet til DTU BYGs BIM-Laboratorium
Section for Building Design
Department of Civil Engineering
Period: 01/10/2009 → 31/01/2011
Number of participants: 4
Project ID: 26063
Project participant:
Lampe, Markus (Intern)
Vestergaard, Flemming (Intern)
Bak, Helle Juul (Intern)
Project Manager, organisational:
Karlshøj, Jan (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 1,800,000.00 Danish Kroner
Project

Optimal Building Integration of district Heating Units
Department of Civil Engineering
Period: 01/10/2009 → 28/04/2014
Number of participants: 7
Phd Student:
Brand, Marek (Intern)
Supervisor:
Olesen, Bjarne W. (Intern)
The purpose of this project is to enhance the market and cooperation in the construction sector across the Øresund Region. Every year more than 80 billion SEK are invested in new buildings and construction in the Øresund region. There are many similarities between the Danish and Swedish construction sector and many actors are working on both sides of the Øresund. Despite this fact, it is not possible for the sector to benefit from the Øresund Region as one market. This is due to differences in traditions, structures, and differences in the national codes. Today this means that there is not a common market in this sector why regional initiatives are needed to open up this. There is an immediate need for a regional network and for common "interpreters" of the national systems if actors in the construction sector should be able to work together and be able to work across the Øresund. The project focuses on removing obstacles and uncertainties which limit the possibilities of both public and private actors. This will be done by: Creating a network for discussions Creating regional understanding and strive for transformation, of national manuals Influencing the harmonisation of national codes The activities will be related to topics that are recognised as being of relevance in creating a coherent market in the Øresund Region. The project revolves around the topics BIM and Classification. 8 pilot cases around this will be done. A strong network that involves both public and private actors needs to be established. And the networks need to discuss and find the necessary solutions. To do this communicative activities are necessary as well as a high knowledge and a broad composition of competences. Partners are all from institutes and institutions that have the above mentioned competences. The partners are from: Lund University (LTH), Technical University of Denmark (DTU), and Danish Building Research Institute (SBi).

Department of Civil Engineering
Number of participants: 2
Project ID: 26044
Project participant:
Vestergaard, Flemming (Intern)
Project Manager, organisational:
Karlshøj, Jan (Intern)

Reusing materials and resources in the Greenlandic construction industry
Department of Civil Engineering
Period: 01/09/2009 → 24/04/2015
Number of participants: 8
Phd Student:
Belmonte, Louise Josefine (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Kirkelund, Gunvor Marie (Intern)
Villumsen, Arne (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Burns, Susan (Ekstern)
Hjorslev Hansen, Morten (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering

Relations
Publications:
Use of Greenlandic resources for the production of bricks
Project: PhD

Structural design of Light Weight Composite Floor and Roof Panels
Department of Civil Engineering
Period: 01/09/2009 → 30/11/2015
Number of participants: 6
Phd Student:
Paegle, Ieva (Intern)
Supervisor:
Jönsson, Jeppe (Intern)
Main Supervisor:
Fischer, Gregor (Intern)
Examiner:
Hoang, Linh Cao (Intern)
Kabele, Petr (Ekstern)
Plizzari, Giovanni (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering

Relations
Publications:
Characterization and modeling of fiber reinforced concrete for structural applications in beams and plates
Project: PhD

Chemical and Numerical Modeling of Electrokinetics in In-Homogenous Matrices
Department of Civil Engineering
Period: 01/08/2009 → 23/11/2012
Number of participants: 8
Phd Student:
Paz-Garcia, Juan Manuel (Intern)
Supervisor:
Johannesson, Björn (Intern)
Ribeiro, Alexandra B. (Ekstern)
Rodríguez-Maroto, José Miguel (Ekstern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Mortensen, John (Ekstern)
Cameselle-Fernández, Claudio (Ekstern)
Neretnieks, Ivars (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD
Cyclic Laterally Response of Wind Turbine Monopile Foundation in Saturated Sand

Department of Civil Engineering
Period: 01/07/2009 → 04/04/2013
Number of participants: 6
Phd Student:
Klinkvort, Rasmus Tofte (Intern)

Supervisor:
Springman, Sarah (Ekstern)

Main Supervisor:
Hededal, Ole (Intern)

Examiner:
Krogsbøll, Anette (Intern)
Byrne, Byron (Ekstern)
Grabe, Jürgen (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Trackende solfanger
Section for Building Physics and Services

Department of Civil Engineering
Period: 02/06/2009 → 30/06/2010
Number of participants: 3
Project participant:
Chen, Ziqian (Intern)
Fan, Jianhua (Intern)

Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 100,000.00 Danish Kroner
Project

Måling af økonomiske gevinster ved Det Digitale Byggeri

Department of Civil Engineering
Period: 01/06/2009 → 31/05/2011
Number of participants: 5
Measuring the benefits of Digital Construction
Acronym: ØG-DDB
Project ID: 26043
Project participant:
Karlshej, Jan (Intern)
Mouritsen, Jan (Ekstern)
Hauch, Peter (Ekstern)
Andresen, Jan L (Ekstern)

Project Manager, organisational:
Vestergaard, Flemming (Intern)

Financing sources
Source: Forskningsprojekter - Erhvervsministeriet
Name of research programme: Forskningsprojekter - Erhvervsministeriet
Amount: 1,097,731.00 Danish Kroner

Relations
Publications:
Case01

Project

Performance Modeling for Product Development of Advanced Window Systems

Department of Civil Engineering
Period: 01/06/2009 → 28/09/2012
Number of participants: 6
Phd Student:
Appelfeld, David (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Rode, Carsten (Intern)
Duer, Karsten (Intern)
Hellström, Bengt (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Nord Stream Gas Pipe Line : Hydrographic Impacts on the Baltic Sea
Expert Consultancy for Nord Stream's EIA consultant: Rambøll AS.

Department of Civil Engineering
Period: 01/05/2009 → 01/10/2009
Number of participants: 1
Project ID: 25000
Project Manager, organisational:
Møller, Jacob Steen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 50,000.00 Danish Kroner
Project

Opbygning af en Bygnings Informations Model (BIM) i design- og udførelsesfasen

Department of Civil Engineering
Period: 01/05/2009 → 31/10/2012
Number of participants: 7
Phd Student:
Berard, Ole Bengt (Intern)
Supervisor:
Karlshøj, Jan (Intern)
Pedersen, Lars Fuhr (Ekstern)
Main Supervisor:
Vestergaard, Flemming (Intern)
Examiner:
Andersson, Niclas (Intern)
Kiviniemi, Arto (Ekstern)
Kreiner, Kristian (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Performance Indicators for Health, Comfort and Safety of the Indoor Environment
Department of Civil Engineering
Section for Indoor Environment
Period: 01/04/2009 → 31/03/2011
Number of participants: 1
indoor environment, prediction, modeling
Acronym: PERFECTION
Project participant:
Melikov, Arsen Krikor (Intern)

Kvalitetssikring af solvarme, fase 3
Department of Civil Engineering
Period: 01/04/2009 → 31/03/2010
Number of participants: 4
Project participant:
Dragsted, Janne (Intern)
Chen, Ziqian (Intern)
Perers, Bengt (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energim ministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energim ministeriet
Amount: 218,000.00 Danish Kroner
Project

low energy buildings and heat supply systems based on renewable energy
Department of Civil Engineering
Period: 01/03/2009 → 24/08/2012
Number of participants: 7
Phd Student:
Dalla Rosa, Alessandro (Intern)
Supervisor:
Christensen, Jørgen Erik (Intern)
Li, Hongwei (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Heller, Alfred (Intern)
Wiltshire, Robin (Ekstern)
Wollerstrand, Janusz (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Deformation and strength properties of highly plastic, fissured Palaeogene clay
Department of Civil Engineering
IEA Task 42: Compact Thermal Energy Storage: Material development and System Integration

The project is the Danish part of the first 3 years of the IEA project, International Energy Agency Solar & Cooling Programme Task 42 project “Compact Thermal Energy Storage: Material Development and System Integration”. The duration of the IEA project is 4 years. The objective of the project is to develop and demonstrate a compact seasonal heat storage based on a salt hydrate with a stable supercooling. The heat storage can be used as a part of a solar heating system which can fully cover the yearly heat demand of new buildings in Denmark. A seasonal heat storage based on sodium acetate trihydrate will be developed and tested in a laboratory test facility during the IEA project. The development will be divided in a number of separate experimental and theoretical investigations which will elucidate how best to design the heat storage: Among other things answers to the following questions must be found: •Which container materials, container designs and container volumes will result in a stable supercooling of the heat storage material? •Which heat storage temperature level is needed during charge periods in order to achieve a stable supercooling of the heat storage material? •How does the heat storage design influence the heat exchange capacity rate during charge and discharge of the heat storage? Among other things CFD calculations will be applied. •How are large quantities of sodium acetate trihydrate best filled into the containers of a heat storage? •How is the supercooled salt solution activated in the most reliable way? •What is the optimum size of each module consisting of one separate container of the heat storage? •Which control system is most suitable for the heat storage? The operation of the developed heat storage will be simulated as if the heat storage is a part of a solar heating system. A simulation model simulating the thermal performance of the heat storage will be developed and validated by means of the measurements. With the validated model calculations of the thermal performance of solar heating systems with seasonal heat stores will be carried out in order to determine optimum designs of solar heating systems inclusive seasonal heat stores.

Section for Building Physics and Services

Department of Civil Engineering

Period: 01/01/2009 → 31/12/2011
Number of participants: 4
Project participant:
Fan, Jianhua (Intern)
Andersen, Elsa (Intern)
Chen, Ziqian (Intern)

Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 2,664,000.00 Danish Kroner

Long-span, light-weight composite floor and roof panels

Development of light-weight cementitious composite panels for long-span roof and floor structures

Department of Civil Engineering

Period: 01/01/2009 → 31/12/2012
Number of participants: 2
Project Manager, organisational:
Fischer, Gregor (Intern)
Jönsson, Jeppe (Intern)

Financing sources
Monaco Extension into the Sea: Marine Environmental Impact, Expert Commission

Department of Civil Engineering

Government of Monaco
Period: 01/01/2009 → 01/10/2009
Number of participants: 1
Project Manager, organisational:
Møller, Jacob Steen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 100,000.00 Danish Kroner

Integriert energidesign af klimaskærmen

Department of Civil Engineering
Period: 15/12/2008 → 28/09/2012
Number of participants: 6
Phd Student:
Nielsen, Martin Vraa (Intern)
Supervisor:
Jensen, Lotte Bjerregaard (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Olesen, Bjarne W. (Intern)
Christoffersen, Lars D. (Intern)
Hestness, Anne Grethe (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Energirenovering af bygninger til lavenerginiveau

Department of Civil Engineering
Period: 01/12/2008 → 27/08/2013
Number of participants: 6
Phd Student:
Morelli, Martin (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Rode, Carsten (Intern)
Björk, Folke (Ekstern)
Rudbeck, Claus Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD
Generaliseret bjælketeori med tværsnitsdeformation
Department of Civil Engineering
Period: 01/12/2008 → 28/09/2012
Number of participants: 6
Phd Student:
Andreasen, Michael Joachim (Intern)
Supervisor:
Nielsen, Leif Otto (Intern)
Main Supervisor:
Jönsson, Jeppe (Intern)
Examiner:
Stang, Henrik (Intern)
Schneider, Jens (Ekstern)
Silvestre, Nuno (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Studying early age reactions of cementitious pastes by an in-situ combination of isothermal calorimetry with other methods: NanoCem Collaborative Project
Section for Construction Materials
Department of Civil Engineering
Swiss Federal Laboratories for Materials Testing and Research
Lund University
Period: 01/12/2008 → 01/12/2010
Number of participants: 4
Project ID: 25825/MGE-02
Project participant:
Lura, Pietro (Ekstern)
Wadsö, Lars (Ekstern)
Geiker, Mette Rica (Intern)
Project Manager, organisational:
Winnefeld, Frank (Ekstern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 86,000.00 Danish Kroner
Project

Thermal/moisture-related distortion and fracture behavior of wood products during forced drying - Modeling and experimental study
Department of Civil Engineering
Period: 01/12/2008 → 31/01/2013
Number of participants: 6
Phd Student:
Larsen, Finn (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Main Supervisor:
Omarsson, Sigurdur (Intern)
Examiner:
Svensson, Staffan (Intern)
Gustafsson, Per Johan (Ekstern)  
Sandland, Knut Magnar (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut, samfinansiering  
Project: PhD

**Forskningsamarbejde mellem forskningsinstitutioner og små og mellemstore virksomheder: Solar/electric heating systems in the future energy system**  
Section for Building Physics and Services  
Department of Civil Engineering  
Period: 06/11/2008 → 30/09/2010  
Number of participants: 3  
Project participant:  
Andersen, Elsa (Intern)  
Perers, Bengt (Intern)  
Project Manager, organisational:  
Furbo, Simon (Intern)

**Financing sources**  
Source: Forskningsrådene - Andre  
Name of research programme: Forskningsrådene - Andre  
Amount: 406,236.00 Danish Kroner  
Project

**Nanotechnology for Civil Engineering Structures: Resistance to Reinforcement Corrosion in Concrete Structures**  
Department of Civil Engineering  
Period: 01/11/2008 → 26/02/2013  
Number of participants: 7  
Phd Student:  
Michel, Alexander (Intern)  
Supervisor:  
Olesen, John Forbes (Intern)  
Stang, Henrik (Intern)  
Main Supervisor:  
Geiker, Mette Rica (Intern)  
Examiner:  
Ottosen, Lisbeth M. (Intern)  
Baroghel-Bouny, Veronique (Ekstern)  
Hendriks, Max A. N. (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet  
Project: PhD

**Prediction of flow induced inhomogeneities in self compacting concrete**  
The main objective of the project is to improve the basic understanding of the flow behaviour of SCC. The research will produce tools allowing for the prediction of the casting process itself (formwork filling and formwork pressure) along with the prediction of the occurrence of hidden defects such as heterogeneities and weak interfaces. The project will result in a modelling framework for numerical simulation of full scale casting of SCC. The framework will be established through a cross disciplinary collaboration. A project sponsored by the Danish Research Council

Section for Construction Materials  
Department of Civil Engineering  
Department of Mechanical Engineering
The Danish Polymer Centre
Department of Chemical and Biochemical Engineering
Period: 01/11/2008 → 31/10/2012
Number of participants: 6
Project ID: 25990
Project participant:
Stang, Henrik (Intern)
Roussel, Nicolas (Ekstern)
Thorborg, Jesper (Intern)
Szabo, Peter (Intern)
Project Manager, organisational:
Geiker, Mette Rica (Intern)
Hattel, Jesper Henri (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 4,179,427.00 Danish Kroner

Petrophysics of Paleogene sediments
Department of Civil Engineering
Period: 15/10/2008 → 27/05/2014
Number of participants: 5
Phd Student:
Awedalkarim, Ahmed (Intern)
Main Supervisor:
Fabricius, Ida Lykke (Intern)
Examiner:
Johannesson, Björn (Intern)
Huuse, Mads (Ekstern)
Springer, Niels (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Development of flexible concrete joints for deck structures with deteriorated mechanical joints and corrosion damage
Department of Civil Engineering
Period: 01/10/2008 → 27/05/2013
Number of participants: 6
Phd Student:
Lárusson, Lárus Helgi (Intern)
Supervisor:
Stang, Henrik (Intern)
Main Supervisor:
Fischer, Gregor (Intern)
Examiner:
Georgakis, Christos T. (Intern)
Lepech, Michael (Ekstern)
Plizzari, Giovanni A. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD
**Integret energidesign i masterplanning**
Department of Civil Engineering  
Period: 01/10/2008 → 25/06/2012  
Number of participants: 6  
Phd Student:  
Strømann-Andersen, Jakob Bjørn (Intern)  
Supervisor:  
Jensen, Lotte Bjerregaard (Intern)  
Kongebro, Signe (Ekstern)  
Main Supervisor:  
Svendsen, Svend (Intern)  
Examiner:  
Nielsen, Susanne Balslev (Intern)  
Pedersen, Poul Bæk (Ekstern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: ErhvervsPhD-ordningen VTU  
Project: PhD

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**Rødsand II**  
Evaluation of field and laboratory data  
Department of Civil Engineering  
Grontmij A/S  
Period: 15/09/2008 → 19/11/2008  
Number of participants: 2  
Project ID: 25000  
Project Manager, organisational: Haahr, Frands (Ekstern)  
Foged, Niels Nielsen (Intern)  

**Financing sources**  
Source: Indtægtsdækket virksomhed UK 90  
Name of research programme: Indtægtsdækket virksomhed UK 90  
Amount: 30,000.00 Danish Kroner  
Project

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**Human comfort and self-estimated performance in relation to indoor environmental parameters and building features**  
Department of Civil Engineering  
Period: 01/09/2008 → 25/01/2012  
Number of participants: 5  
Phd Student:  
Frontczak, Monika Joanna (Intern)  
Main Supervisor:  
Wargocki, Pawel (Intern)  
Examiner:  
Toftum, Jørn (Intern)  
Boerstra, Atze Christiaan (Ekstern)  
Corgnati, Stefano Paolo (Ekstern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut stipendie (DTU) Samf.  
Project: PhD
Hydro Power Potentials in Southern Greenland

Department of Civil Engineering
Period: 01/09/2008 → 13/07/2010
Number of participants: 4
Phd Student: Choma, Mojmir (Intern)
Supervisor: Hardenberg, Svend (Ekstern)
Nielsen, Morten Holtegaard (Intern)
Main Supervisor: Villumsen, Arne (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Integreter energidesign af større bygninger

Department of Civil Engineering
Period: 01/09/2008 → 11/10/2012
Number of participants: 3
Phd Student: Jørgensen, Michael (Intern)
Supervisor: Jensen, Lotte Bjerregaard (Intern)
Main Supervisor: Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Konstitutiv modellering af revner i beton

Department of Civil Engineering
Period: 01/09/2008 → 23/11/2012
Number of participants: 6
Phd Student: Jacobsen, Jonas Sejersbøl (Intern)
Supervisor: Olesen, John Forbes (Intern)
Main Supervisor: Poulsen, Peter Noe (Intern)
Examiner: Stang, Henrik (Intern)
Carol, Ignacio (Ekstern)
Hoang, Linh Cao (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Understanding and Controlling Wind-Induced Vibrations of Bridge Cables

Examination of the wind-induced vibrations of bridge cables and their control through sophisticated climatic wind-tunnel testing, full-scale monitoring and extensive analytical and numerical work.

Department of Civil Engineering
Arkitektur og landskap: seminar om store konstruksjoners kontekst
2008: Chair, Seminar co-organized by AHO (Oslo) together with professor Arne Eggen and DTU: De store infrastruktur konstruktioners møde med landskab og byrum
Large scale structures in the context of landscape architecture.

Department of Civil Engineering
Section for Building Design
The Oslo School of Architecture and Design
Fondet for Dansk Norsk Samarbeid
Period: 15/08/2008 → 17/08/2008
Number of participants: 1
Project ID: 25826
Project Manager, academic:
Jensen, Lotte Bjerregaard (Intern)

Integrated Geoscience Study of Extend and Effects of Permafrost Change In Greenland
Department of Civil Engineering
Period: 01/08/2008 → 18/09/2014
Number of participants: 3
Phd Student:
Brandt, Inooraq (Intern)
Supervisor:
Foged, Niels Nielsen (Intern)
Main Supervisor:
Ingeman-Nielsen, Thomas (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Shear Strengthening of Concrete Walls
Department of Civil Engineering
Period: 01/08/2008 → 28/09/2012
Number of participants: 6
Phd Student:
Hansen, Christian Skodborg (Intern)
Supervisor:
Goltermann, Per (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Levetid for solfangere i solvarmecentraler
The aim of the project is to measure the collector efficiency and investigate the state of a few old solar collectors for solar heating plants. The collectors, which will be investigated, have been in operation for many years. The efficiency of the first HT solar collector which was tested at Vattenfall’s research institute in Sweden in 1983, will be measured. Further, solar collectors from the solar heating plants in Ottrupgaard and in Marstal will be investigated in the solar collector test facility at the Technical University of Denmark. Both the collector efficiencies and the incidence angle modifiers will be determined. The state of the collectors will also be investigated. The focus will be on corrosion in the absorber tubes. Based on the investigations the life time of the collectors, both for solar heating plants with constant flow rates as in Ry and with variable flow rates as in Marstal, will be estimated.

Section for Building Physics and Services
Department of Civil Engineering
Arcon Solvarme A/S
Period: 04/07/2008 → 03/07/2010
Number of participants: 3
Project participant:
Fan, Jianhua (Intern)
Runager, Jan (Ekstern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimænisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimænisteriet
Amount: 190,000.00 Danish Kroner

Reparation of betonkonstruktioner: Kursusudvikling, efteruddannelse
Section for Construction Materials
Department of Civil Engineering
Period: 01/07/2008 → 28/02/2009
Number of participants: 1
Project ID: 25825/MGE-DKBI
Contact person:
Geiker, Mette Rica (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 87,000.00 Danish Kroner

Design of energy renovation of typical buildings: Elaboration of collection of examples
The energy saving potential by energy renovating the existing building stock in Denmark is very large but the implementation of energy savings is only carried out to a small extent. In order to encourage the completion of energy savings in existing buildings to reach "low energy class 1" level. The development of the method will be based on detailed analysis on the effect of the partial energy saving measures carried out in buildings. The analyses will be made for typical building types and the results will make up an example collection of buildings that represent the total building stock in Denmark. The developed method including examples will constitute a strong and
reliable foundation for implementation of the best energy saving solutions in different building types. If done correctly it will also be possible to improve the indoor environment by energy renovations. This important additional benefit will also be evaluated in the form of improved comfort, less health risk and increased productivity.

Department of Civil Engineering
Aalborg University

Statens Byggeforskningsinstitut
Teknologisk Institut

Period: 01/06/2008 → 31/03/2010
Number of participants: 6
Project ID: 25958
Project participant:
Tommerup, Henrik M. (Intern)
Olesen, Bjarne W. (Intern)
Heiselberg, Per (Ekstern)
Aggerholm, Søren (Ekstern)
Østergaard Jensen, Søren (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 400,000.00 Danish Kroner

Forslag til nye energikrav til eksisterende bygningers klimakær

Section for Building Physics and Services
Department of Civil Engineering

Erhvervs- og Byggestyrelsen

Period: 01/06/2008 → 01/11/2008
Number of participants: 3
Project ID: 25956
Contact person:
Jerking, Ejner (Ekstern)
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 498,750.00 Danish Kroner

Naturlig ventilation med bygningsintegreret varmegenvinding og nattekøling

Department of Civil Engineering

ALECTIA A/S
Dantherm Air Handling, R&D,

Period: 01/06/2008 → 31/12/2009
Number of participants: 4
Project ID: 25810
Project participant:
Hviid, Christian Anker (Intern)
Hviid, Christian (Ekstern)
Wood Water Interactions. Linking molecular level mechanisms with macroscopic wood performance

Department of Civil Engineering
Period: 01/06/2008 → 21/12/2011
Number of participants: 7
Phd Student:
Thybring, Emil Engelund (Intern)
Supervisor:
Morsing, Niels (Intern)
Thygesen, Lisbeth Garbrecht (Intern)
Main Supervisor:
Svensson, Staffan (Intern)
Examiner:
Ormarsson, Sigurdur (Intern)
Burgert, Ingo (Ekstern)
Hill, Callum (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Application of Fiber Reinforced Concrete in Civil Infrastructure

Department of Civil Engineering
Period: 01/05/2008 → 24/01/2014
Number of participants: 6
Phd Student:
Solgaard, Anders Ole Stubbe (Intern)
Supervisor:
Geiker, Mette Rica (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Fischer, Gregor (Intern)
Gehlen, Christoph (Ekstern)
Polder, Rob B. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Application of thermodynamic modelling for prediction of phases in Portland cement systems with chloride: NanoCem Collaborative project

Background: Prediction of chloride ingress is central for the cement and concrete industry. Thermodynamic modelling provides a tool making such predictions more scientifically sound. At present data on chloride containing phases is not included in GEMS thermodynamic data used in other NanoCem projects. Objectives: A: Expansion of the thermodynamic data base to include chloride containing solids based on available data. B: Documentation of the data available for thermodynamic modelling for prediction of phases in Portland cement systems with chloride and identification of possible needs for further studies
Section for Construction Materials
Department of Civil Engineering
Swiss Federal Laboratories for Materials Testing and Research
University of Aberdeen
Period: 01/05/2008 → 31/10/2011
Number of participants: 4
Project ID: 25825/MGE-01
Project participant:
Johannesson, Björn (Intern)
Lothenbach, Barbara (Ekstern)
Glasser, Fred (Ekstern)
Project Manager, organisational:
Geiker, Mette Rica (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 74,500.00 Danish Kroner

Dynamic effects in porous media flow in the built environment
Department of Civil Engineering
Period: 01/05/2008 → 30/04/2010
Number of participants: 4
Project participant:
Scheffler, Gregor Albrecht (Intern)
Janssen, Hans (Intern)
Rode, Carsten (Intern)
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 1,800,000.00 Danish Kroner

Vidensystem om vinduer
Department of Civil Engineering
Period: 01/05/2008 → 31/12/2008
Number of participants: 3
Project participant:
Laustsen, Jacob Birck (Intern)
Svendsen, Svend (Intern)
Project Manager, organisational:
Kragh, Jesper (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 382,000.00 Danish Kroner

Solar/electric heating systems in the future energy system
The two most powerful renewable energy sources are solar and wind energy. It is expected that an increasing part of our electricity consumption in the future will be covered by wind farms. This will result in an increased number of windy periods with a surplus of electricity and thereby a low electricity price. A concept where individual solar heating systems optimised for making use of electricity produced by wind turbines in these periods can facilitate the introduction of wind energy in large scale into the energy system and thereby contribute to increasing the part of our energy consumption covered by...
renewable energy sources. The heat is produced by the solar heating system and by the electric heating element(s)/heat pump, which, if possible, only should be in operation in periods where the solar heating system cannot fully cover the heat demand and where the electricity price is low, e.g. in windy periods with a high electricity production from wind turbines. The unit is equipped with a smart heat storage (variable auxiliary volume) and a smart control system based on prognosis for the electricity price, the heat demand of the house, the solar heat production of the solar heating system and weather forecasts. The project will elucidate how best to design an individual heating unit for one family houses based on the above principles. It is also elucidated how suitable the heating unit is for the home owner and for our future energy system. Different designs of the heating unit and the control system will be investigated and the most promising solutions tested experimentally. It is expected that the heating unit is more cost efficient than traditional solar heating systems and that it can be an attractive alternative to oil- and natural gas boilers, both from an economy and environmental point of view.

Section for Building Physics and Services

Department of Civil Engineering

Department of Informatics and Mathematical Modeling

Department of Mathematics

ENFOR A/S

Danish Meteorological Institute

AllSun A/S

COWI A/S

Period: 01/04/2008 → 31/12/2011

Number of participants: 5

Project ID: 25869

Project participant:

Perers, Bengt (Intern)

Andersen, Elsa (Intern)

Fan, Jianhua (Intern)

Bacher, Peder (Intern)

Project Manager, organisational:

Furbo, Simon (Intern)

Financing sources

Source: Forskningsrådene - Andre

Name of research programme: Forskningsrådene - Andre

Amount: 7,406,236 Danish Kroner

Climate Change : Adapting to The Impacts, by Communities in Northern Peripheral Regions

Aim The overall objective of the project is to establish a sustainable advice and training service for community climate change adaptation across the whole of the Northern Periphery. The project, and the eventual information, training, and advice service, will have a particular emphasis on identifying how climate change may bring opportunities for fostering the sustainability of communities in the Northern Periphery through local employment opportunities, social benefits, and environmental management. Participating regions: Scotland - Cairngorms National Park and Glen Urquhart Sweden - Lycksele and Åre Finland - City of Rovaniemi, Kittilä and Kolari Norway - County of Sogn og Fjordane and Flora Greenland - Sisimiut, Ilulissat and Uummanaq Objectives The project will undertake a number of key activities over a three-year period, with communities and community sector stakeholders across five regions of the Northern Periphery, to build the necessary knowledge: Investigation, collation and communication of relevant information on potential direct and indirect impacts of climate change to small peripheral rural communities; Development of adaptation strategies by these communities to avoid or reduce the negative impacts of climate change, while taking advantage of opportunities; Implementation of adaptation demonstration projects with a focus on trans-national activities; Establishment of a formal mechanism to disseminate knowledge for community adaptation. Five work packages will jointly contribute to the overall objective. Work packages 2 and 3 will develop the capacity for adaptation, work package 4 will evaluate the realities of delivering adaptation actions, and work package 5 will bring all the lessons together and create a sustainable service, providing information, training and advice relating to community climate change adaptation. Outcomes The knowledge gained will initially be made available to all those participating, and then to non-participating communities and stakeholders, through a variety of regional and international dissemination events throughout the project and, in the long term, through the establishment of a formal service. This will ensure a high quality in the content and delivery of information, and the capacity to remain abreast of emerging knowledge relating to climate change, likely impacts, and opportunities for adaptation.

Department of Civil Engineering
Arctic Technology Centre
Period: 01/03/2008 → 28/02/2011
Number of participants: 7
Acronym: Clim-ATIC
Project ID: 25943
Contact person:
Villumsen, Arne (Intern)
Project participant:
Nielsen, Morten Holtegaard (Intern)
Jensen, Pernille Erland (Intern)
Thrane, Helle Wingaard (Intern)
Gunnarsdottir, Ragnhildur (Intern)
Jørgensen, Marianne Willemoes (Intern)
Dragsted, Janne (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 18,000,000.00 Danish Kroner

Project
Fire Models and design Fires
Department of Civil Engineering
Period: 01/03/2008 → 24/08/2012
Number of participants: 6
Phd Student:
Poulsen, Annemarie (Intern)
Supervisor:
Jomaas, Grunde (Intern)
Munk, Kurt (Ekstern)
Main Supervisor:
Hertz, Kristian Dahl (Intern)
Examiner:
Karlsson, Björn (Ekstern)
Bontempi, Franco (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Optimering af anlæg til rensning af flyveaske fra affaldsforbrænding
Arctic Technology Centre, ARTEK
Department of Civil Engineering
Arctic Technology Centre
Period: 01/03/2008 → 31/05/2009
Number of participants: 2
Project participant:
Villumsen, Arne (Intern)
Project Manager, organisational:
Jensen, Pernille Erland (Intern)

Financing sources
Source: Program. Andre statslige danske - Andre prog.midler
Name of research programme: Program. Andre statslige danske - Andre prog.midler
Amount: 1,000,000.00 Danish Kroner
Project
BIPS's Fundamentsudvalg
Department of Civil Engineering
Erhvervs- og Byggestyrelsen
Period: 09/01/2008 → 01/01/2009
Number of participants: 1
Project participant:
Vestergaard, Flemming (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner

DTU Climate Change Technologies programme : Workshop on Sustainable Buildings
Department of Civil Engineering
Department of Management Engineering
Period: 01/01/2008 → 31/12/2008
Number of participants: 3
Project ID: 25887
Project participant:
Elle, Morten (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)
Tommerup, Henrik M. (Intern)

Financing sources
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 120,000.00 Danish Kroner

Femern Belt Link Hydrographic Investigations
Specialist consultancy for the Femern Baelt Link owner.
Department of Civil Engineering
Femern A/S
Period: 01/01/2008 → 31/12/2010
Number of participants: 1
Project Manager, organisational:
Møller, Jacob Steen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90

Lavenerghuse i DS 418: Beregning af bygningers Varmetab
Department of Civil Engineering
Dansk Standard
Statens Byggeforskningsinstitut
Teknologisk Institut
Builddesk Ltd.
Period: 01/01/2008 → 31/12/2009
Number of participants: 5
Project ID: 25944
Project participant:
Tommerup, Henrik M. (Intern)
Olsen, Lars (Ekstern)
Mazin, Mariana (Ekstern)
Project Manager, organisational:
Ravn Jensen, Lars (Ekstern)
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 356,000.00 Danish Kroner

Project

Solvarmeanlægs energibesparelser, fase 2

Department of Civil Engineering
Period: 17/12/2007 → 31/12/2009
Number of participants: 4
Project ID: 25880
Project participant:
Fan, Jianhua (Intern)
Andersen, Elsa (Intern)
Schultz, Jørgen Munthe (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 800,000.00 Danish Kroner

Project

Spildevandsrensning i Grønland

Department of Civil Engineering
Period: 01/12/2007 → 20/09/2012
Number of participants: 7
Phd Student:
Gunnarsdottir, Ragnhildur (Intern)
Supervisor:
Jensen, Pernille Erland (Intern)
Jenssen, Petter Deinboll (Ekstern)
Main Supervisor:
Villumsen, Arne (Intern)
Examiner:
Schmidt, Jens Ejbye (Intern)
Dave, Göran (Ekstern)
Hanæus, Jörgen (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

External Strengthening of Building Structures with Prestressed CFRP

Department of Civil Engineering
Period: 01/11/2007 → 02/03/2011
Number of participants: 8
Phd Student: Schmidt, Jacob Wittrup (Intern)
Supervisor: Georgakis, Christos T. (Intern)
Pedersen, Henning (Ekstern)
Ravn, Dorthe Lund (Ekstern)
Main Supervisor: Goltermann, Per (Intern)
Examiner: Hertz, Kristian Dahl (Intern)
Carolin, Nils Anders (Ekstern)
Neale, Kenneth W. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Fehmarn Belt Fixed Link: Geotechnological Expert Group
Department of Civil Engineering
Femern A/S
Period: 01/11/2007 → 31/12/2012
Number of participants: 3
Project ID: 25877
Project participant:
Foged, Niels Nielsen (Intern)
Hededal, Ole (Intern)
Project Manager, organisational:
Kammer, Jens (Ekstern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 150,000.00 Danish Kroner
Project

Oliespil i Arktis
Department of Civil Engineering
Period: 01/11/2007 → 08/12/2010
Number of participants: 7
Phd Student: Fritt-Rasmussen, Janne (Intern)
Supervisor: Brandvik, Per Johan (Ekstern)
Stenby, Erling Halfdan (Intern)
Main Supervisor: Villumsen, Arne (Intern)
Examiner:
von Solms, Nicolas (Intern)
Collin-Hansen, Chr. (Ekstern)
Lykke-Andersen, Holger (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD
Klimaforandringer og Innovation i Byggeriet - region Sjælland

Department of Civil Engineering
Roskilde University
Period: 01/10/2007 → 31/03/2008
Number of participants: 4
Acronym: KIBS
Project ID: 95-25865
Project participant:
Ottosen, Lisbeth M. (Intern)
Quitzau, Maj-Britt (Intern)
Hansen, Kurt Kielsgaard (Intern)
Bonke, Sten (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 180,000.00 Danish Kroner

Transmittans for PhotoSolar PV-rude ved forskellige indfaldsvinkler og rotation af rude

Department of Civil Engineering
Period: 30/09/2007 → 31/12/2007
Number of participants: 1
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 18,700.00 Danish Kroner

Airflow Interactions in Rooms - Convective Plumes Generated by Occupants

Department of Civil Engineering
Period: 01/09/2007 → 30/11/2011
Number of participants: 6
Phd Student:
Zukowska-Tejsen, Daria (Intern)
Supervisor:
Popiolek, Zbigniew (Ekstern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)
Examiner:
Olesen, Bjarne W. (Intern)
Kosonen, Risto (Ekstern)
da Silva, Manuel Carlos G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Behovstyret boligventilation med lavt energiforbrug

Department of Civil Engineering
Period: 01/09/2007 → 31/08/2011
Number of participants: 7
Phd Student:
Mortensen, Dorthe Kragsig (Intern)
Supervisor:
Christoffersen, Lars D. (Intern)
Svendsen, Svend (Intern)
Main Supervisor:
Nielsen, Toke Rammer (Intern)
Examiner:
Clausen, Geo (Intern)
Drivsholm, Christian (Ekstern)
Geoffrey Schild, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Danskbyggeskik.dk
Co-operation research projects Participation in co-operation with Byggecentrum in establishing basic, electronic based data for renovation of multi-storey apartment buildings - to be released as a web-site named www.danskbyggeskik.dk. First part is finished and the web-site is planned to be in function from March 2009. The project is part of "Renovering 2010" (www.renovering2010.dk), funded by Reasdania and Grundejernes Investeringsfond.

Department of Civil Engineering
Period: 01/09/2007 → 08/08/2008
Number of participants: 1
Project ID: 25867
Project Manager, organisational:
Engelmark, Jesper (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 405,000.00 Danish Kroner
Project

Detaljerede simuleringer af lysforhold i rum med elbesparende lyskilder og lysstyring
Department of Civil Engineering
Period: 01/09/2007 → 04/04/2013
Number of participants: 6
Phd Student:
Iversen, Anne (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Fontoynont, Marc (Intern)
Dubois, Marie-Claude (Ekstern)
Osterhaus, Werner (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Facilitating value creation and delivery in construction projects
This PhD project aims to address new methods to intercept and transform user needs (customer values) in construction through a combination of new creative management processes that focus on the interaction between the actors as a
means of delivering value. The PhD project will be carried out in a cross disciplinary cooperation with a concurrent PhD project at Lund University in a consortium together with consultancy companies NIRAS (Denmark) and Tyrens AB (Sweden). The project aims to develop practically applicable methodologies to promote the discussion and sharing of values, leading to value creation in construction projects. The research is directed towards organising project work, with the aim to create the most favourable conditions for customer value generation; understanding the customer as a ‘multiple function of various parties with different interests’ reaching into the culture/behaviour of individuals and organisations.

Department of Civil Engineering
NIRAS A/S
Lund University
Period: 01/09/2007 → 31/08/2010
Number of participants: 3
Value, Value management, Value-based management, Design management, Lean design, Construction Management
Project ID: 25792
Contact person:
Ekholm, Anders (Ekstern)
Project Manager, organisational:
Christoffersen, Anders Kirk (Ekstern)
Bonke, Sten (Intern)

Financing sources
Source: Ph.d Central finansieret
Name of research programme: Ph.d Central finansieret
Amount: 1,050,000.00 Danish Kroner
Project

Numerisk modellering af armerede betonkonstruktioners bæreevne
Department of Civil Engineering
Period: 01/09/2007 → 01/06/2011
Number of participants: 6
Phd Student:
Larsen, Kasper Paaske (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Main Supervisor:
Poulsen, Peter Noe (Intern)
Examiner:
Stang, Henrik (Intern)
Hoang, Linh Cao (Intern)
Krabbenhøft, Kristian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Analyse af behov for vejforskning
Department of Civil Engineering
Arctic Technology Centre
Period: 01/08/2007 → 31/01/2008
Number of participants: 1
Project ID: 25854
Project participant:
Hededal, Ole (Intern)

Financing sources
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 125,000.00 Danish Kroner
**Passive Houses for Arctic Climates**

Department of Civil Engineering  
Period: 01/08/2007 → 29/06/2011  
Number of participants: 7  
Phd Student: Vladyková, Petra (Intern)  
Supervisor: Nielsen, Toke Rammer (Intern)  
Pedersen, Søren (Intern)  
Main Supervisor: Rode, Carsten (Intern)  
Examiner: Villumsen, Ame (Intern)  
Johansson, Dennis (Ekstern)  
Tywoniak, Jan (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

**Studies of Simultaneous Moisture and Multi-ion Transport in Concrete**

Technical University of Denmark  
Department of Civil Engineering  
Period: 01/07/2007 → 01/01/2009  
Number of participants: 1  
Project ID: 25807  
Project Manager, organisational: Johannesson, Björn (Ekstern)

**Financing sources**  
Source: Udenfor rammen  
Name of research programme: Ukendt  
Amount: 820,000.00 Danish Kroner

**Transmittans, reflektans og g-værdi for glas og ruder med integrerede PV-moduler**

Department of Civil Engineering  
Period: 01/07/2007 → 31/12/2007  
Number of participants: 1  
Project Manager, organisational: Schultz, Jørgen Munthe (Intern)

**Financing sources**  
Source: Sam.arb.aftaler, Private danske - Andre virksomheder  
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder  
Amount: 48,300.00 Danish Kroner

**Convective plumes generated by occupants**

Project: PhD (PhD Theses)  
Daria Zukowska, Convective plumes generated by occupants, 2007 – 2011, PhD theses, Technical University of Denmark, Department of Mechanical Engineering, Supervisor: Arsen Melikov

Department of Civil Engineering
Section for Indoor Environment
Period: 01/06/2007 → 31/05/2011
Number of participants: 1
Project participant:
Melikov, Arsen Krikor (Intern)

Detaljerede beregningsmodeller for simulering af energiforbrug i bygninger med nye typer integrerede løsninger for glasfacader

Department of Civil Engineering
Period: 01/06/2007 → 01/04/2009
Number of participants: 3
Phd Student: Vendelboe, Morten Vammen (Intern)
Supervisor: Nielsen, Toke Rammer (Intern)
Main Supervisor: Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Energibesparelser i bygninger i den offentlige sektor

Department of Civil Engineering
Rockwool International
Period: 01/06/2007 → 08/05/2008
Number of participants: 4
Project ID: 25833
Contact person: Kuhn, Susanne (Ekstern)
Project participant: Tommerup, Henrik M. (Intern)
Laustsen, Jacob Birck (Intern)
Project Manager, organisational: Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 112,500.00 Danish Kroner
Project

Energirigtig renovering af større bygninger : fokus på installationer og energiforsyning

Department of Civil Engineering
Department of Mechanical Engineering

COWI A/S
Ellehauge og Kildemoes ApS
Period: 01/06/2007 → 31/12/2009
Number of participants: 5
Project ID: 25859
Contact person: Olesen, Bjarne W. (Intern)
Project participant: Tommerup, Henrik M. (Intern)
Ellehauge, Klaus (Ekstern)
Project Manager, organisational:
Mikkelsen, Svend Erik (Ekstern)
Svendsen, Svend (Intern)

**Financing sources**
Source: Program. Andre statslige danske - Andre prog.midler
Name of research programme: Program. Andre statslige danske - Andre prog.midler
Amount: 550,000.00 Danish Kroner
Project

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**Solvarmeanlægs energibesparelser**
Department of Civil Engineering
Period: 29/05/2007 → 31/12/2008
Number of participants: 4
Project ID: 25839
Project participant:
Furbo, Simon (Intern)
Fan, Jianhua (Intern)
Andersen, Elsa (Intern)
Schultz, Jørgen Munthe (Intern)

**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 700,000.00 Danish Kroner
Project

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**Efficient air distribution methods**
Department of Civil Engineering
Section for Indoor Environment
Section for Building Physics and Services
Period: 01/04/2007 → 31/03/2012
Number of participants: 3
advanced air distribution, invention, office environment, hospital environment
Number of related Ph.D. students: 2
Phd Student:
Bolashikov, Zhecho Dimitrov (Intern)
Zukowska-Tejsen, Daria (Intern)
Project Manager, academic:
Melikov, Arsen Krikor (Intern)

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**Educational practice on PV usage and technology**
The aim of the project is to strengthen the knowledge of the usage of electricity produced by sunlight in all levels of education in order to increase the share from this sustainable and CO2 free energy source and thereby contribute to reach the goals in the present Danish energy policy. The DTU part is focused on the teaching in universities. One of the obstacles in the implementation of PV in the general electricity supply is a lack of knowledge among technical advisors and in construction companies. There is therefore a need to qualify all parties involved in the construction field to secure implementation of PV in all new or renewed buildings whenever possible. The immediate objective of the project in this preliminary phase is to locate existing PV related education material and programs of all kinds and in all educational levels in order to create a complete overview of relevant material. Based on the result of this screening suggestions to supplementary materials and programs will be formed and qualified by a presentation to groups of users in a number of workshops. The project shall be followed by an implementation phase where the developed PV education material is tested under realistic conditions, eventually corrected and thereafter integrated in curriculum’s etc. More partners: Ejvin Beuse, Organisationen for Vedvarende Energi Janus Hendrichsen, Skolernes EnergiForum Bjarne Christensen, Den jydske Haandværkerskole Hanne Lehrskov, Ingeniørhøjskolen i Århus Bo Risbjerg Thomsen, Vitus Bering Horsens Karin Kappel, Solar City Copenhagen / Solar City Horsens Peter Ahm, PA Energy.
Department of Civil Engineering

EnergiMidt A/S
Period: 01/04/2007 → 31/03/2009
Number of participants: 3
Project ID: 25846
Project participant:
Quitau, Maj-Britt (Intern)
Project Manager, organisational:
Hoffmann, Birgitte (Intern)
Frederiksen, Kenn H. B. (Ekstern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 59,000.00 Danish Kroner
Project

Energioptimering af eksisterende ejendomme
Department of Civil Engineering

Realdania
Grundejernes Investeringsfond
Period: 01/04/2007 → 01/04/2008
Number of participants: 1
Project ID: 25852
Contact person:
Vestergaard, Flemming (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 150,000.00 Danish Kroner
Project

Energioptimering af eksisterende ejendomme: Energikoncept.dk
Department of Civil Engineering

COWI A/S
Period: 01/04/2007 → 01/09/2008
Number of participants: 4
Project participant:
Rahbek, Jens Eg (Ekstern)
Svendsen, Svend (Intern)
Kragh, Jesper (Intern)
Project Manager, organisational:
Pratt, Elizabeth (Ekstern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 154,000.00 Danish Kroner
Project

Kvalitetssikring af solvarme, fase 2
Department of Civil Engineering
Period: 01/04/2007 → 31/03/2009
Number of participants: 3
Project ID: 25857
Project participant:
Udvikling af behovstyret ventilation til enfamiliehuse

Section for Building Physics and Services

Department of Civil Engineering

Teknologisk Institut

EcoVent ApS

Trend Control Systems A/S

Lindab International AB

Period: 01/04/2007 → 01/09/2009
Number of participants: 6
Project ID: 25809
Contact person:

Jensen, John Steen (Ekstern)

Boel, Niels (Ekstern)

Stjernegaard, Dan (Ekstern)

Project participant:

Kragh, Jesper (Intern)

Nielsen, Toke Rammer (Intern)

Drivsholm, Christian (Ekstern)

Financing sources

Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 243,999.00 Danish Kroner

BIM Eksperimentariet : Et Building Information laboratory

Department of Civil Engineering

Period: 01/03/2007 → 31/12/2008
Number of participants: 1
Project ID: 25716
Project Manager, organisational:

Vestergaard, Flemming (Intern)

Financing sources

Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 120,000.00 Danish Kroner

Black, Blue and Green: : Integrated urban water management

The project aims to develop concepts, methods and tools new and climate adapted methods for urban infrastructure planning in relation to storm water and waste water. The project team is a multidisciplinary team.

Department of Civil Engineering
University of Copenhagen  
Period: 01/03/2007 → 01/03/2011  
Number of participants: 2  
sustainable infrastructure, integrated storm water management  
Acronym: 2BG  
Project ID: 25832  
Project participant:  
Jensen, Marina Bergen (Ekstern)  
Project Manager, organisational:  
Nielsen, Susanne Balslev (Intern)  

Financing sources  
Source: Forskningsrådene - Andre  
Name of research programme: Forskningsrådene - Andre  
Amount: 189,600.00 Danish Kroner  

Ph.D. studium: Solvarmeanlæg i Grønland  
Department of Civil Engineering  
Period: 01/03/2007 → 28/02/2010  
Number of participants: 1  
Project Manager, organisational:  
Dragsted, Janne (Intern)  

Financing sources  
Source: [Ordinær drift UK 10]  
Name of research programme: [Ordinær drift UK 10]  
Amount: 1,400,000.00 Danish Kroner  

Solvarmeanlæg i Grønland  
Department of Civil Engineering  
Period: 01/03/2007 → 01/06/2011  
Number of participants: 5  
Phd Student:  
Dragsted, Janne (Intern)  
Main Supervisor:  
Furbo, Simon (Intern)  
Examiner:  
Villumsen, Arne (Intern)  
Frank, Frank (Ekstern)  
Schultz, Jørgen Munthe (Intern)  

Financing sources  
Source: Internal funding (public)  
Name of research programme: DTU-lænnet stipendie  
Project: PhD  

Udvikling af nye typer energivinduer i kompositmateriale  
Department of Civil Engineering  
Fiberline Composites A/S  
Period: 01/03/2007 → 31/12/2009  
Number of participants: 7  
Project ID: 25811  
Project participant:  
Kragh, Jesper (Intern)  
Täljsten, Björn (Intern)  
Poulsen, Peter Noe (Intern)
Laustsen, Jacob Birck (Intern)
Jensen, Tage Frank (Ekstern)
Nielsen, Preben (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,120,000.00 Danish Kroner

Designguide til valg af vinduesløsninger i boliger

Department of Civil Engineering
Period: 01/01/2007 → 30/06/2008
Number of participants: 4
Project participant:
Kragh, Jesper (Intern)
Laustsen, Jacob Birck (Intern)
Santos, Inês (Intern)

Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 300,000.00 Danish Kroner

Fastholdelse gennem Øget StudieKompetence

Department of Civil Engineering
LearningLab DTU
Administration
Arctic Technology Centre
Period: 01/01/2007 → 31/12/2009
Number of participants: 4
Acronym: ØSKen
Project participant:
Hoffmann, Birgitte (Intern)
Andersson, Pernille Hammar (Intern)
Hussmann, Peter Munkebo (Intern)

Project Manager, organisational:
Christensen, Hans Peter (Intern)

Financing sources
Source: Uddannelse, udenlandske offentlige og private
Name of research programme: Uddannelse, udenlandske offentlige og private
Amount: 600,000.00 Danish Kroner

Forstærkning af bærende konstruktioner ved pålimning af kompositmateriale

Department of Civil Engineering
Period: 01/01/2007 → 02/02/2011
Number of participants: 6
Phd Student:
Arifovic, Fedja (Intern)
Pore Structure and State of Water of Mixes with Blended Cements

Department of Civil Engineering
Period: 01/01/2007 → 09/11/2011
Number of participants: 7
Phd Student:
Canut, Mariana Moreira Cavalcanti (Intern)
Supervisor:
Haerdtl, Reiner (Ekstern)
McDonald, Peter (Ekstern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Johannesson, Bjorn (Intern)
De Schutter, Geert (Ekstern)
Gallucci, Emmanuel (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Proof of Concept, PoC, Inlet stratification device

Department of Civil Engineering
Period: 01/01/2007 → 31/12/2008
Number of participants: 2
Project participant:
Andersen, Elsa (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 716,949.00 Danish Kroner
Project

Reducing Cross-Infection in Aircraft Cabins

Department of Civil Engineering
Boeing Aircraft Company
Period: 01/01/2007 → 01/01/2011
Number of participants: 1
Project participant:
Fang, Lei (Intern)
**Financing sources**
Source: Udenfor rammen
Name of research programme: 50
Amount: 1.00 Danish Kroner

**Teaching, Studying and Learning : Undersøgeæse af effekter og konsekvense af intensiv og aktiverende undervisning**

Department of Civil Engineering
Office for Study Programmes and Student Affairs
Administration
Department of Mechanical Engineering
Department of Micro- and Nanotechnology
Department of Chemical and Biochemical Engineering
Department of Management Engineering
Period: 01/01/2007 → 31/03/2009
Number of participants: 5
Acronym: TeSt-Learn
Project participant:
Vigild, Martin Etchells (Intern)
Horsewell, Andy (Intern)
Thomsen, Erik Vilain (Intern)
Szabo, Peter (Intern)
Project Manager, organisational:
Christensen, Hans Peter (Intern)

**Financing sources**
Source: Uddannelse. Statslige. Andre statslige
Name of research programme: Uddannelse. Statslige. Andre statslige
Amount: 95,000.00 Danish Kroner

**Det Digitale Byggeris implementeringsnetværk**
Department of Civil Engineering
Dansk Byggeri
Period: 01/12/2006 → 28/02/2007
Number of participants: 1
Project ID: 25716
Project participant:
Vestergaard, Flemming (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 65,000.00 Danish Kroner

**Modellering af samvirkende revner i armerede betonkonstruktioner**
Department of Civil Engineering
Period: 01/12/2006 → 31/08/2011
Number of participants: 7
Phd Student:
Mougaard, Jens Falkenskov (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Poulsen, Peter Noe (Intern)
Evaluation of performance characteristics of newly developed ceiling mounted personalized and mixing ventilation system

Yang Bin Evaluation of performance characteristics of newly developed ceiling mounted personalized and mixing ventilation system, 2006-2009, PhD theses, Technical University of Denmark, Department of Civil Engineering, Supervisor: Arsen Melikov

Department of Civil Engineering
Section for Indoor Environment
Period: 01/11/2006 → 31/10/2009
Number of participants: 1
Project participant: Melikov, Arsen Krikor (Intern)

Niras, Thyborøn Havn: Vurdering af styrkebarometer

Department of Civil Engineering
NIRAS A/S
Number of participants: 2
Project ID: 25000
Contact person: Foged, Niels Nielsen (Intern)
Project Manager, organisational: Bønding, Niels (Ekstern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 10,000.00 Danish Kroner

Advanced Solar Combi Systems

Department of Civil Engineering
Period: 15/10/2006 → 30/06/2010
Number of participants: 5
Phd Student: Yazdanshenas, Eshagh (Intern)
Main Supervisor: Furbo, Simon (Intern)
Examiner: Fan, Jianhua (Intern)
Jordan, Ulrike (Ekstern)
Karlsson, Björn Olof Harry (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Evaluation of Performance of newly developed enhanced displacement ventilation in office environment in the tropics
Project: PhD

Department of Civil Engineering
Section for Indoor Environment
Period: 01/10/2006 → 30/09/2010
Number of participants: 1
Project participant:
Melikov, Arsen Krikor (Intern)

Project

Evaluation of Performance of newly developed enhanced displacement ventilation in office environment in the tropics
Project: PhD

Department of Civil Engineering
Section for Indoor Environment
Period: 01/10/2006 → 30/09/2010
Number of participants: 2
Phd Student:
Sun, Weimeng (Ekstern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)

Project

DanWORM - Danish version of Working on Occupational Risk Model : Accident prevention using ORM
The risk perception in SME’s is normally low, which is closely related to the relatively few accidents that the small enterprises experience by themselves compared to larger enterprises. This is a fact even though the SME’s together represent a higher accident frequency compared to large enterprises. To reach the SME’s we have to find a way to support them because they normally do not have time nor the resources to get the necessary knowledge and awareness for working with their own safety. The Dutch developed WORM project is transferred into a Danish context, with the aim to create a more simple system targeted the SME. The WORM project develops a method that identifies the activities in a person’s daily work that contributes most the person’s risk and also identifies what conditions need to be changed in order to reduce that risk. Our investigation seeks to answer the question whether we can collect information about the risks in SME’s using the WORM method and whether we can find a way to present this information so that the SME’s will be able to use the information constructively. Finally we want to evaluate the impact of this method on occupational safety in SME’s, because the investigation also focuses on the management factors that can motivate the SME’s to increase their risk awareness and own initiatives. The project is carried out for three occupations, carpenters, caretakers, and blacksmiths, all working in enterprises with less than 50 employees.

Department of Civil Engineering
Planning and Management of the Built Environment
Period: 01/10/2006 → 01/07/2009
Number of participants: 3
Acronym: DanWorm
Project ID: 25766
Project participant:
Jørgensen, Kirsten (Intern)
Troen, Hanne (Ekstern)
Project Manager, organisational:
Duijm, Nijs Jan (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 2,270,196.00 Danish Kroner
Relations
Publications:
- Demonstration of Risk Profiling for promoting safety in SME’s
- Message maps for safety barrier awareness
- Accident prevention in SME using ORM
- Message maps for Safety Barrier Awareness
- Prevention of accidents in SME’s
- Risk assessment and prevention of occupational accidents
- Risikovurdering og forebyggelse af arbejdsulykker

Project

Failure in the Construction process: Coordination activities
Failure in coordination is found to be one of the main problems for constructions. The project goal is to use the theories and concepts from the field of accidents and see how these concepts can be used and explained in the field of failure in the construction of buildings and especially in the construction management. The project focuses on the last part of the design process and most of the coordination failures are expected to be.

Department of Civil Engineering
Period: 01/10/2006 → 31/12/2008
Number of participants: 1
Project ID: 25734
Project Manager, organisational:
Jørgensen, Kirsten (Intern)

Financing sources
- Source: Sektorforskningen - Anden sektorforskning
- Name of research programme: Sektorforskningen - Anden sektorforskning
- Amount: 1,000,000.00 Danish Kroner

Project

Participation in urban development: storytelling about democracy and learning in urban development
Development of a book on participation, learning and democracy

Section for Planning and Management of Building Processes

Department of Civil Engineering
Roskilde University
Period: 01/10/2006 → 31/12/2007
Number of participants: 2
Project participant:
Agger, Annika (Ekstern)
Project Manager, organisational:
Hoffmann, Birgitte (Intern)

Financing sources
- Source: Sam.arb.aftaler - Statslige danske
- Name of research programme: Sam.arb.aftaler - Statslige danske
- Amount: 625,000.00 Danish Kroner

Project

Storytelling in urban renewal

Section for Planning and Management of Building Processes

Department of Civil Engineering
Roskilde University
Period: 01/10/2006 → 31/12/2007
Number of participants: 2
Project ID: kommer
Project participant:
Agger, Annika (Ekstern)
Pedestrian-induced lateral vibrations of footbridges. Experimental studies and probabilistic modelling

Department of Civil Engineering
Period: 15/09/2006 → 02/03/2011
Number of participants: 6
Phd Student:
Ingólfsson, Einar Thór (Intern)
Supervisor:
Jönsson, Jeppe (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Koss, Holger (Intern)
Brownjohn, James Mark William (Ekstern)
Macdonald, John H. G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Personalised ventilation – demonstration project

Department of Civil Engineering
Section for Indoor Environment
Exhausto A/S
COWI A/S
Period: 01/09/2006 → 01/09/2008
Number of participants: 1
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Enhancement of stress based cantilever assays through chemical functionalization

Department of Civil Engineering
Period: 01/09/2006 → 30/06/2010
Number of participants: 7
Phd Student:
Bolashikov, Zhecho Dimitrov (Intern)
Supervisor:
Jakobsen, Mogens Havsteen (Intern)
Kyhle, Anders (Intern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)
Examiner:
Olesen, Bjarne W. (Intern)
Kosonen, Risto (Ekstern)
Nielsen, Peter Vilhelm (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønned stipendie
Project: PhD

Fracture Mechanics for Cement Paste and Mortar: Measurement and Modeling
Department of Civil Engineering
Period: 01/09/2006 → 10/11/2010
Number of participants: 6
Phd Student:
Skocek, Jan (Intern)
Supervisor:
Kabele, Petr (Ekstern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Olesen, John Forbes (Intern)
Brühwiler, Eugen (Ekstern)
Karihaloo, Bhushan (Ekstern)

Financing sources
Source: Anden EU-finansiering
Name of research programme: Anden EU-finansiering
Project: PhD

Gæsteprofessorat inden for solvarme
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/09/2006 → 31/12/2008
Number of participants: 2
Project participant:
Karlsson, Björn (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 237,650.00 Danish Kroner
Project

Innovation i nyere bæredygtigt byggeri
Section for Planning and Management of Building Processes
Department of Civil Engineering
Department of Management Engineering
Number of participants: 3
Project participant:
Elle, Morten (Intern)
Emmitt, Stephen (Intern)
Project Manager, organisational:
Jørgensen, Michael Seggaard (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 400,000.00 Danish Kroner
**Bæredygtighedsprofiler for byområder i København: Sustainability urban profile**

The scope of the project is to develop and test a methodology for evaluating the sustainability profile of urban areas within the municipality of Copenhagen.

**Department of Civil Engineering**
**Period:** 15/08/2006 → 01/06/2007
**Number of participants:** 1
**Project ID:** 25780
**Project participant:** Nielsen, Susanne Balslev (Intern)

**Financing sources**
**Source:** Forsk. - Amter og kommuner
**Name of research programme:** Forsk. - Amter og kommuner
**Amount:** 235,000.00 Danish Kroner

**Facetted Glass Shells**
**Department of Civil Engineering**
**Period:** 01/08/2006 → 09/06/2010
**Number of participants:** 8
**Phd Student:** Bagger, Anne (Intern)
**Supervisor:** Almegaard, Henrik (Intern)
Hertz, Kristian Dahl (Intern)
Sobek, Werner (Ekstern)
Main Supervisor:
Jönsson, Jeppe (Intern)
**Examiner:**
Stang, Henrik (Intern)
Greiner, Switbert (Ekstern)
**Overend, Mauro (Ekstern)**

**Financing sources**
**Source:** Internal funding (public)
**Name of research programme:** DTU-lønnet stipendie
**Project:** PhD

**Model for Multidimensional Heat, Air and Moisture Conditions in Building Envelope Components**
**Department of Civil Engineering**
**Period:** 01/08/2006 → 06/01/2010
**Number of participants:** 8
**Phd Student:** Steskens, Paul Wilhelms Maria Hermanus (Intern)
**Supervisor:**
Hjorslev Hansen, Morten (Intern)
Janssen, Hans (Intern)
Dela, Birgitte Friis (Intern)
Main Supervisor:
Rode, Carsten (Intern)
**Examiner:**
Toftum, Jørn (Intern)
Christoffersen, Lars D. (Intern)
Janssens, Arnold (Ekstern)

**Financing sources**
Recent and future permafrost variability, retreat and degradation in Greenland and Alaska: An integrated approach

Department of Civil Engineering
Arctic Technology Centre
University of Alaska Fairbanks
Danish Meteorological Institute
ASIAQ Greenland Survey

Period: 01/08/2006 → 01/08/2009
Number of participants: 8
Project ID: 25775

Project participant:
Foged, Niels Nielsen (Intern)
Ingeman-Nielsen, Thomas (Intern)
Marchenko, Sergey (Ekstern)
Daanen, Ronald (Ekstern)
Christensen, Jens Hesselbjerg (Ekstern)
Stendel, Martin (Ekstern)
Svendsen, Keld Hornbech (Ekstern)

Project Manager, organisational:
Romanovsky, Vladimir (Ekstern)

Financing sources
Source: Forsk. Andre offentlige og private - Udenlandske
Amount: 4,800,000.00 Danish Kroner

Technical Memo of Evalutaion of design values for gravel pad at Concert & Conference Center

Department of Civil Engineering
Rambøll Danmark A/S

Number of participants: 2
Project ID: 25000

Contact person:
Foged, Niels Nielsen (Intern)

Project Manager, organisational:
Mortensen, Jens Kammer (Ekstern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Amount: 4,575.00 Danish Kroner

Optimeret solvarmeproduktion i et liberaliseret elmarked. Demonstration af fuldskalaanlæg

Section for Building Physics and Services
Department of Civil Engineering
PlanEnergi
Arcon Solvarme A/S
Brædstrup Totalenergi A/S
Rambøll Danmark A/S
Marstal Fjernvarme A/S
Steinbeis Stuttgart
Period: 01/07/2006 → 31/12/2008
Number of participants: 2
Project ID: 25774
Project participant:
Fan, Jianhua (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 252,060.00 Danish Kroner

Tungmetaller- Affaldsforbrænding : Financieret af Den Europæiske Fond for Regionaludvikling

Department of Civil Engineering
Arctic Technology Centre
Fonden for Syd-Teknologi- og Udviklingscenter
I/S Refa
Period: 01/07/2006 → 31/03/2008
Number of participants: 4
Project ID: 25602
Project participant:
Jensen, Pernille Erland (Intern)
Villumsen, Arne (Intern)
Møller-Madsen, Søren (Ekstern)
Project Manager, organisational:
Ransby, Erling (Ekstern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 2,800,000.00 Danish Kroner

Udvikling og markedsføring af standardløsning for energieffektive mekaniske ventilationsanlæg i typehuse opført efter BR06

Section for Building Physics and Services
Department of Civil Engineering
Teknologisk Institut
Period: 01/07/2006 → 01/10/2007
Number of participants: 2
Project ID: 25776
Project Manager, organisational:
Grimmig, Mikael (Ekstern)
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 200,000.00 Danish Kroner
Advanced Solar heating and Cooling for Buildings

Cooperation on Ph.D. education concerning solar heating systems with 9 European universities within the Marie Curie Actions program. At DTU a Ph.D. study will be carried out. The aim of the study is to carry out the basic research needed to establish the basis for development of an advanced smart heat storage and control system for solar combi systems with an oil fired boiler or a natural gas burner used as the auxiliary energy supply system. The study will focus on research of the thermal behaviour of differently designed solar combi systems for one family houses. The systems will be based on smart heat storages, which by an oil fired boiler or a natural gas burner can be heated from the top in such a way that both the water volume and water temperature at the top of the heat storage heated by the boiler/burner can vary. The study will among other things consist of the following activities: •Analyses on which heat storage principle is most attractive from a production, economic and thermal performance point of view. •Investigations on how best to transfer heat from the boiler/burner to the heat storage and how best to control the operation of the boiler/burner. Either an external heat exchanger can be used to transfer heat from the boiler/burner to the water in the heat storage or a built in heat exchanger spiral in the heat storage can be used. The control system might be based on weather forecasts and/or expectations for coming heat demands and solar energy production. •CFD (Computational Fluid Dynamics) calculations on the heat transfer inside the heat storage. The thermal behaviour of the heat storage will be elucidated by the calculations. •PIV (Particle Image Velocimetry) measurements and PLIF (Planar Laser Induced Fluorescence) measurements of the fluid velocities and temperatures inside the heat storage. By means of these measurements the CFD model used will be validated. •Development and validation of simulation models for the thermal behaviour of the heat storage and of a solar heating system based on the heat storage. The models will be based on the results of the CFD calculations, and validated by means of experiments with the heat storage. •Calculations with the developed simulation models will elucidate how best to design and control the solar heating system. Based on the investigations recommendations for future development of the system will be given.
**Forsk. EU - Andre EU-midler**

Name of research programme: Forsk. EU - Andre EU-midler  
Amount: 1,405,000.00 Danish Kroner

Project

**Civil Engineering Futures - International Lecture Series (and publication of Book).**

Civil Engineering Futures - International Lecture Series (and publication of Book).

Department of Civil Engineering

Section for Building Design

Period: 01/05/2006 → 01/05/2008

Number of participants: 1

Project Manager, academic:

Jensen, Lotte Bjerregaard (Intern)

Project

**Miljøstyret bygningsdrift af boligejendomme under forskellige ejerformer**

Section for Planning and Management of Building Processes

Department of Civil Engineering

Period: 01/05/2006 → 01/05/2007

Number of participants: 5

Contact person:

Eile, Morten (Intern)

Project participant:

Hoffmann, Birgitte (Intern)

Nielsen, Susanne Balslev (Intern)

Jensen, Per Anker (Intern)

Project Manager, organisational:

Jensen, Jesper Ole (Intern)

**Financing sources**

Source: Udenfor rammen

Name of research programme: Ukendt

Amount: 300,000.00 Danish Kroner

Project

**Solar Thermal Components adapted to common building standards**

Pilot versions of a solar heating/natural gas burner system, a solar heating/pellet burner system and of a façade/roof integrated polymeric collector have been installed in the summer of 2006 in a number of demonstration houses in Denmark, Sweden and Norway. These three new products have been evaluated by means of measurements of the thermal performance and energy savings of the pilot systems in practice and by means of a commercial evaluation. The conclusion of the evaluations is that the products are attractive for the industry partners METRO THERM A/S, Solentek and SOLARNOR. It is expected that the companies will bring the products into the market in 2007. Further, the results of the project have been presented at international and national congresses and seminars for the solar heating branch. The congresses and seminars attracted a lot of interested participants. Furthermore, the project results have been published in international congress papers as well as in national journals in the energy field.

Section for Building Physics and Services

Department of Civil Engineering

University of Oslo

Dalarna University

Riga Technical University

Period: 01/05/2006 → 31/12/2006

Number of participants: 3

Acronym: SCAS

Project ID: 25756

Project participant:

Thür, Alexander (Intern)
Andersen, Elsa (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

**Financing sources**
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 560,000.00 Danish Kroner

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**Svigt i byggeriet - årsagsforståelse og realisering af "at bygge mangelfrit"**

Department of Civil Engineering
Period: 01/05/2006 → 31/08/2007
Number of participants: 2
PhD Student:
Schultz, Casper Siebken (Intern)
Main Supervisor:
Koch, Christian (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

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**Evaluation of performance characteristics of newly developed ceiling mounted personalized and mixing ventilation system**

**PhD project**

Department of Civil Engineering
Section for Indoor Environment
Period: 01/04/2006 → 31/03/2009
Number of participants: 2
personalized ventilation, human response, Design method
PhD Student:
Bin, Yang (Intern)
Main Supervisor:
Melikov, Arsen Krikor (Intern)

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**Integriert Design af nyt Lavenergiebyggeri**

Department of Civil Engineering
Period: 01/04/2006 → 29/06/2011
Number of participants: 6
PhD Student:
Petersen, Steffen (Intern)
Supervisor:
Christoffersen, Lars D. (Intern)
Nielsen, Toke Rammer (Intern)
Examiner:
Janssen, Hans (Intern)
Donn, Michael (Ekstern)
Hensen, Jan (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD
Model for Multidimensional Heat, Air and Moisture Conditions in Building Envelope Components.

Purpose, hypotheses and relevance. Moisture and temperature levels and variations in time and space play a crucial role in degradation processes of building materials, such as silicate materials, metals and polymeric materials where also UV-radiation is a very important factor. An exterior wall can consist of more than 10 different material layers. Furthermore, a wall element is often inhomogeneous in the plane because of counteracting structural and insulating properties. The moisture and temperature conditions inside such a wall are highly dependent on the material combinations and the climate conditions on both sides of the wall. The background and motivation for the project is that most damages that happen to building components occur in places with a complex geometry that cannot be handled correctly by today’s design tools. This could for instance be where different materials meet in joints and where conditions most often have a multidimensional nature. Also apparently regular construction elements have multidimensional parts and features whose hygrothermal conditions should be considered better in the design of buildings, e.g. near beams and columns in common building elements. These loci often represent thermal bridges in the constructions, and they involve the assembly of different components and materials, so there is an increased risk of unintentional airflow or accumulation of moisture. The combination of these factors too often lead to the degradation of materials. Purpose. It is the purpose of the project to develop a computational model for multidimensional transient Heat, Air and Moisture (HAM) flow in building constructions. The model should provide a suitable toolbox for fast and sound computations of moisture and temperature conditions in building components. This project intends to produce a tool that enables the analysis of conditions leading to degradation of building components. Critical temperature and moisture conditions and UV-exposure are partly known and partly collected from field tests and controlled experiments in a laboratory environment. It is the intention that with such a combination of models and systematic collection of empirical knowledge, it will be possible to predict better those degradation processes of building products, which are realised in practice.

Department of Civil Engineering
Danish Building Research Institute
Period: 01/04/2006 → 31/03/2009
Number of participants: 4
Acronym: MD-HAM
Project ID: 25721
Project participant:
Stang, Birgitte Dela (Ekstern)
Hansen, Morten Hjorslev (Ekstern)
Project Manager, organisational:
Møller, Jacob Steen (Intern)
Rode, Carsten (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 1,623,114.00 Danish Kroner
Project

Fuldskala demonstration af termoaktive konstruktioner : Fase 3: Demonstration, evaluering og formidling

Section for Building Physics and Services
Department of Civil Engineering
Department of Mechanical Engineering
COWI A/S
Spæncom A/S
Middelfart Sparekasse A/S
Period: 01/03/2006 → 31/12/2008
Number of participants: 4
Project participant:
Passov, Finn (Ekstern)
Weitzmann, Peter (Intern)
Olesen, Bjarne W. (Intern)
Project Manager, organisational:
Hummelshøj, Reto Michael (Ekstern)

Financing sources
Source: Forsk. Private danske - Andre
Indlejring af erfaringer fra lavenergiehus Sisimiut

Department of Civil Engineering
Period: 01/03/2006 → 31/12/2006
Number of participants: 5
Project ID: 25743
Project participant:
Fan, Jianhua (Intern)
Borchersen, Egil (Intern)
Kragh, Jesper (Intern)
Furbo, Simon (Intern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Program. Andre statslige danske - Andre prog.midler
Name of research programme: Program. Andre statslige danske - Andre prog.midler
Amount: 96,120.00 Danish Kroner

Nye typer bygningsintegrerede ventilationsløsninger med flere funktioner

Department of Civil Engineering
Period: 01/03/2006 → 29/09/2010
Number of participants: 8
Phd Student:
Hviid, Christian Anker (Intern)
Supervisor:
Christoffersen, Lars D. (Intern)
Nielsen, Toke Rammer (Intern)
Olesen, Bjarne W. (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Janssen, Hans (Intern)
Grønbæk, Henning (Ekstern)
Hensen, Jan (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Udvikling og implementering af modeller til bygningsintegreret opvarmning og køling i simuleringsprogrammet BSim

Department of Civil Engineering
Statens Byggeforskningsinstitut
Technical University of Denmark
Lindab Ventilation A/S
Uponor Wirsbo A/S
Danfoss A/S
COWI A/S
Period: 01/03/2006 → 31/12/2007
Number of participants: 8
Project participant:
Rose, Jørgen (Intern)
Grau, Karl (Ekstern)
Johnsen, Kjeld (Ekstern)
Olesen, Bjarne W. (Intern)
Hultmark, Göran (Ekstern)
Skjold, Jan (Ekstern)
Hummelshøj, Reto (Ekstern)
Project Manager, organisational:
Weitzmann, Peter (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimisteriet
Amount: 529,000.00 Danish Kroner

Moisture Buffer Tests
Department of Civil Engineering
H+H Celcon GmbH
Period: 21/02/2006 → 01/09/2006
Number of participants: 2
Project ID: 25741
Contact person:
Bodner, Hans R. (Ekstern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 135,750.00 Danish Kroner

Advanced storage concepts for solar and low energy buildings, IEA-SHC Task 32
The project is the last two years of the Danish participation in the IEA Task 32 project “Advanced storage concepts for solar and low energy buildings”. The Danish participation will be focused on Subtask C: Storage concepts based on phase change materials and subtask D: Storage concepts based on advanced water tanks and special devices. In subtask C a laboratory test heat of fusion storage utilizing a stable super cooling of the heat storage material will be tested in the Department's heat storage test facility. Based on the investigations and on cost estimates the potential for heat of fusion storages for solar heating systems with a solar fraction of 100% for low energy buildings will be evaluated. In subtask D experiments are carried out with the aim to elucidate the durability of a new developed fabric inlet stratifier.

Section for Building Physics and Services
Department of Civil Engineering
BASE Consultants S.A.
University of Stuttgart
Graz University of Technology
University of Kassel
SPF Institut fur Solartechnik Prufung Forschung
University of Lleida
Dalarna University
AEE INTEC
Energy Research Centre of the Netherlands
Period: 16/02/2006 → 31/12/2007
Number of participants: 3
Project ID: 25738
Contact person:
Furbo, Simon (Intern)
Project participant:
Andersen, Elsa (Intern)
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 798,000.00 Danish Kroner

Dampers for the Vibration Control of Structural Cables
Department of Civil Engineering
Period: 01/02/2006 → 04/05/2011
Number of participants: 7
Phd Student:
Krabbenhøft, Jørgen (Intern)
Supervisor:
Poulsen, Peter Noe (Intern)
Santos, Ilmar (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Koss, Holger (Intern)
Damkilde, Lars (Intern)
Macdonald, John H. G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Deformation Caused by Installation and Loading of Large Diameter Piles in Rate Sensitive Saturated Clays
Department of Civil Engineering
Period: 01/02/2006 → 17/06/2011
Number of participants: 3
Phd Student:
Katic, Natasa (Intern)
Supervisor:
Krogsbøll, Anette (Intern)
Main Supervisor:
Hededal, Ole (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Udvikling af nye typer solafskærmningssystemer baseret på dagslysdirigerende solafskærmende glaslameller
Department of Civil Engineering
Danish Building Research Institute
Period: 01/02/2006 → 31/03/2008
Number of participants: 4
Project ID: 25745
Project participant:
Laustsen, Jacob Birck (Intern)
Johnsen, Kjeld (Eksterm)
Traberg-Borup, Steen (Eksterm)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,041,000.00 Danish Kroner
Project

International Seminar on research and education in Urban Management
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 12/01/2006 → 22/12/2007
Number of participants: 3
Contact person:
Jensen, Jesper Ole (Intern)
Project participant:
Elle, Morten (Intern)
Project Manager, organisational:
Nielsen, Susanne Balslev (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 95,000.00 Danish Kroner
Project

Chilled beams – control of air distribution and its impact on human response
Department of Civil Engineering
Section for Indoor Environment
Period: 01/01/2006 → 31/12/2011
Number of participants: 1
active chilled beam, human response, physical environment
Number of related Ph.D. students: 1
Project Manager, academic:
Melikov, Arsen Krikor (Intern)
Project

CFRP Retrofitting of Concrete Structures
Department of Civil Engineering
Period: 01/01/2006 → 05/01/2011
Number of participants: 2
Phd Student:
Orosz, Katalin (Intern)
Main Supervisor:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD
CFRP Retrofitting of Concrete Structures
Department of Civil Engineering
Period: 01/01/2006 → 05/01/2011
Number of participants: 2
Phd Student: Rusinowski, Piotr Michal (Intern)
Main Supervisor: Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Evaluation of measurement results from Low Energy House 2005
Department of Civil Engineering
Period: 01/01/2006 → 31/12/2007
Number of participants: 1
Project Manager, organisational: Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 50,000.00 Danish Kroner
Project

Innovationsnetværk vedrørende integrerede lavenergiløsninger på bygningsområdet
Section for Building Physics and Services
Department of Civil Engineering
Section for Indoor Environment
Department of Mechanical Engineering
Statens Byggeforskningsinstitut
Aalborg University
Period: 01/01/2006 → 30/06/2010
Number of participants: 5
Acronym: LavEByg
Project ID: 25723
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)
Aggerholm, Søren (Ekstern)
Olesen, Bjarne W. (Intern)
Heiselberg, Per (Ekstern)

Financing sources
Source: Program. Andre statslige danske - Andre prog.midler
Name of research programme: Program. Andre statslige danske - Andre prog.midler
Amount: 4,000,000.00 Danish Kroner
Project

Miljøafbødende foranstaltninger på Dundas-halvøen, Grænland
Department of Civil Engineering
Understanding and Simulating wind-induced vibrations of iced vertical cables

Department of Civil Engineering
Period: 01/01/2006 → 04/05/2011
Number of participants: 7
PhD Student:
Gjelstrup, Henrik (Intern)
Supervisor:
Koss, Holger (Intern)
Larsen, Allan (Ekstern)
Main Supervisor:
Georgakis, Christos T. (Intern)
Examiner:
Stang, Henrik (Intern)
Jakobsen, Jasna Bogunovic (Ekstern)
Larose, Guy (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Artiske vejes og landingsbaners bæreevne

Department of Civil Engineering
Period: 01/11/2005 → 13/05/2009
Number of participants: 6
PhD Student:
Jørgensen, Anders Stuhr (Intern)
Supervisor:
Doré, Guy (Ekstern)
Main Supervisor:
Villumsen, Ame (Intern)
Examiner:
Zubeck, Hannele K. (Ekstern)
Hildebrand, Gregers (Ekstern)
Saarenketo, Timo (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD


Department of Civil Engineering
Kvalitetssikring af solvarme

Section for Building Physics and Services

Department of Civil Engineering

PlanEnergi

Aidt Miljø A/S

Nilan A/S

METRO THERM A/S

Period: 05/09/2005 → 30/06/2007
Number of participants: 3
Project participant:
Fan, Jianhua (Intern)
Schultz, Jørgen Munthe (Intern)
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 410,000.00 Danish Kroner

Development of Highly Efficient Personalized Ventilation for Crowded Spaces

Department of Energy Engineering

Department of Civil Engineering

Section for Indoor Environment

STVF

Period: 01/09/2005 → 30/11/2005
Number of participants: 1
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

The Properties and Structural Use of Toughened Glass

Department of Civil Engineering
Number of participants: 6
Phd Student:
Nielsen, Jens Henrik (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Poulsen, Peter Noe (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Jönsson, Jeppe (Intern)
Warren, Paul David (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Udvikling af model til beregning af de økonomiske konsekvenser af indeklimaforbedringer
Department of Civil Engineering
Period: 01/09/2005 → 22/04/2009
Number of participants: 6
Phd Student:
Jensen, Kasper Lynge (Intern)
Supervisor:
Christoffersen, Lars D. (Intern)
Main Supervisor:
Toftum, Jørn (Intern)
Examiner:
Wargocki, Pawel (Intern)
Boerstra, Atze Christiaan (Ekstern)
Seppänen, Olli (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Modeling of Liquid and Ion Transport Mechanisms in Carcked Reinforced Concrete Structures
Department of Civil Engineering
Period: 15/08/2005 → 02/02/2011
Number of participants: 7
Phd Student:
Pease, Bradley Justin (Intern)
Supervisor:
Stang, Henrik (Intern)
Weiss, Jason (Ekstern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Fischer, Gregor (Intern)
Nilsson, Lars-Olof (Ekstern)
Raupach, Michael (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD
Måling af Z-værdier efter kopmetoden for membranen ISOVER Vario KM Duplex

Department of Civil Engineering

Bygge- og Miljøteknik A/S
Period: 01/08/2005 → 25/08/2005
Number of participants: 1
Project ID: 25693
Project participant:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 20,000.00 Danish Kroner

People's Behaviour Regarding Control of the Indoor Environment

Department of Civil Engineering
Period: 01/08/2005 → 02/09/2009
Number of participants: 6
Phd Student:
Andersen, Rune Korsholm (Intern)
Supervisor:
Toftum, Jørn (Intern)
Main Supervisor:
Olesen, Bjarne W. (Intern)
Examiner:
Nicol, James Fergus (Ekstern)
Brohus, Henrik (Ekstern)
Wargocki, Pawel (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

TB2 Anvendelse af RGA i beton: indledende undersøgelser

Section for Construction Materials

Department of Civil Engineering

Department of Environmental Engineering
Period: 01/08/2005 → 31/03/2006
Number of participants: 4
Project ID: 25699
Project participant:
Kjeldsen, Ane Mette (Intern)
Christensen, Thomas Højlund (Intern)
Astrup, Thomas Frueergaard (Intern)
Project Manager, organisational:
Geiker, Mette Rica (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 600,000.00 Danish Kroner
Project
Energy Project Retrofit
Section for Building Physics and Services
Department of Civil Engineering
Rockwool International
Period: 01/06/2005 → 01/11/2008
Number of participants: 3
Project ID: 25690
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Bernhoft, Herman (Ekstern)
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 144,000.00 Danish Kroner

Konstitutiv modeltering af reuver i armerede betonkonstruktioner under varierende belastning
Department of Civil Engineering
Period: 01/06/2005 → 30/11/2005
Number of participants: 4
Phd Student:
Bernth, Peter Hamilton (Ekstern)
Supervisor:
Poulsen, Peter Noe (Intern)
Stang, Henrik (Intern)
Main Supervisor:
Olesen, John Forbes (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Numerical and Physical Modelling of Laterally Loaded Pile in Sand Subject to Cyclic Loading
Department of Civil Engineering
Period: 01/06/2005 → 16/06/2011
Number of participants: 3
Phd Student:
Leth, Caspar Thrane (Intern)
Supervisor:
Krogsbøll, Anette (Intern)
Main Supervisor:
Hededal, Ole (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

EP VILLA - Supplerende beregninger
Department of Civil Engineering
Rockwool International
Period: 19/05/2005 → 01/06/2005  
Number of participants: 3  
Project ID: 25000  
Project participant:  
Tommerup, Henrik M. (Intern)  
Hansen, Mette Beck (Ekstern)  
Project Manager, organisational:  
Svendsen, Svend (Intern)

Financing sources  
Source: Indtægtsdækket virksomhed UK 90  
Name of research programme: Indtægtsdækket virksomhed UK 90  
Amount: 17,860.00 Danish Kroner

Elektrokemisk fjernelse af Cd fra bioasker i pilotskala og vurdering af mulighederne for nyttighævelse af behandlet aske i beton  
Department of Civil Engineering  
Period: 01/05/2005 → 15/12/2005  
Number of participants: 2  
Project ID: 25682  
Project participant:  
Damø, Anne Juul (Intern)  
Project Manager, organisational:  
Ottosen, Lisbeth M. (Intern)

Financing sources  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 460,000.00 Danish Kroner

Måling af Z-værdier for Hygrodiode og ISOVER KM Duplex  
Department of Civil Engineering  
Bygge- og Miljøteknik A/S  
Period: 01/04/2005 → 21/04/2005  
Number of participants: 1  
Project ID: 25594  
Project Manager, organisational:  
Hansen, Kurt Kielsgaard (Intern)

Financing sources  
Source: Indtægtsdækket virksomhed UK 90  
Name of research programme: Indtægtsdækket virksomhed UK 90  
Amount: 13,071.00 Danish Kroner

Fremtidens Boligopvarmning : I relation til nye energibestemmelser 2006  
Department of Civil Engineering  
Danfoss A/S  
Period: 15/03/2005 → 15/04/2005  
Number of participants: 4  
Project ID: 25672  
Project participant:  
Tommerup, Henrik M. (Intern)  
Lund, Klaus (Ekstern)  
Project Manager, organisational:  
Svendsen, Svend (Intern)
Jepsen, Hardy (Ekstern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 16,800.00 Danish Kroner
Project

Elektrokinetisk accelereret indtrængning af bor ved overfladeimprægnering af træ
Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/03/2005 → 01/09/2006
Number of participants: 2
Project ID: 25668
Contact person:
Christensen, Iben Vernegren (Intern)
Project Manager, organisational:
Ottosen, Lisbeth M. (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,368,588.00 Danish Kroner
Project

Udvikling af typehuse i lavenergiklasse 1
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/03/2005 → 01/06/2006
Number of participants: 2
Project ID: 25669
Project participant:
Rose, Jørgen (Intern)
Tommerup, Henrik M. (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 553,000.00 Danish Kroner
Project

Undersøgelse af behovet for et til cirkulationspumper i ét- og tofamilies-huse, nu og i fremtiden
Section for Building Physics and Services
Department of Civil Engineering
Elsparefonden
Period: 01/03/2005 → 31/03/2006
Number of participants: 3
Project ID: 25677
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Christensen, Ulf (Ekstern)
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 100,000.00 Danish Kroner

Project

**Optimal isolering af klimaskærmen i relation til nye skærpede energibestemmelser**

Department of Civil Engineering
Plastindustrien. EPS-sektionen
Period: 01/02/2005 → 07/03/2005
Number of participants: 3
Project ID: 25000
Contact person:
Jørgensen, Claus (Ekstern)
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 20,000.00 Danish Kroner

Project

**Udvikling af værktøjer til at fremme energieffektiv anvendelse af solafskærmminger.**

Department of Civil Engineering
Danish Building Research Institute
Period: 01/02/2005 → 31/01/2008
Number of participants: 4
Project ID: 25663
Project participant:
Laustsen, Jacob Birck (Intern)
Hviid, Christian Anker (Intern)
Johnsen, Kjeld (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,185,000.00 Danish Kroner

Project

**Energibesparelser for "ventilationsvinduet"**

Department of Civil Engineering
PC Vinduer og Døre A/S
Period: 07/01/2005 → 07/02/2005
Number of participants: 3
Project ID: 25587
Contact person:
Christensen, Poul (Ekstern)
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 10,000.00 Danish Kroner

**Generering af varmeeffektdata for typisk eksisterende parcelhus**

Department of Civil Engineering

DEFU a.m.b.a.
Period: 06/01/2005 → 06/02/2005
Number of participants: 3
Project ID: 25589
Contact person:
Jensen, Morten Møller (Ekstern)
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 12,500.00 Danish Kroner

Måling og beregning af samlet U-værdi for "Frederiksbergvindue", 1920 med koblede rammer

Department of Civil Engineering

Center for bygningsbevaring
Period: 02/01/2005 → 30/03/2007
Number of participants: 3
Project ID: 25592
Contact person:
Vadstrup, Søren (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 65,000.00 Danish Kroner

Analysis of Combined Production of Electricity and Heat in Low-Energy Buildings

Department of Civil Engineering
Period: 01/01/2005 → 31/03/2006
Number of participants: 4
Phd Student:
Varming, Niels (Intern)
Supervisor:
Nielsen, Toke Rammer (Intern)
Schultz, Jørgen Munthe (Intern)
Main Supervisor:
Svendsen, Svend (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD
Bedst i Byggeriet : Casestudier af IKT koncepter i den danske byggesektor

Department of Civil Engineering

Erhvervs- og Byggestyrelsen
Period: 01/01/2005 → 01/01/2007
Number of participants: 1
Acronym: BIB
Project participant:
Vestergaard, Flemming (Ekstern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 4,200,000.00 Danish Kroner
Project

BygSol : Samarbejde og Læring i Byggeriet
BygSol is an action oriented project aiming at accelerating and improving collaboration and learning amongst practitioners in building. BYG’s role is to contribute new knowledge about new forms of collaboration and learning models to the experimental activities on site level.

Department of Civil Engineering
Period: 01/01/2005 → 30/06/2006
Number of participants: 2
Project participant:
Pedersen, Elsebet Frydendal (Intern)
Egebjerg, Christin (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 270,000.00 Danish Kroner
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 200,000.00 Danish Kroner
Project

Modelling and Experimental Verification of Reinforced Concrete under Blast Load

Department of Civil Engineering
Period: 01/01/2005 → 09/02/2010
Number of participants: 4
Phd Student:
Riisgaard, Benjamin (Intern)
Supervisor:
Olesen, John Forbes (Intern)
Stang, Henrik (Intern)
Main Supervisor:
Georgakis, Christos T. (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Strategiske Partnerskaber i Byggeriet
Suvey of the nature and occurrence of strategic partnerships in the Danish building industry of today. Comparisons to the situation in UK.

Department of Civil Engineering
Period: 01/01/2005 → 31/03/2006
Number of participants: 2
Acronym: SPB
Project participant:
Kristiansen, Kristian (Intern)
Egebjerg, Christin (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 400,000.00 Danish Kroner

Source: Forskningsprojekter - Erhvervsministeriet
Name of research programme: Forskningsprojekter - Erhvervsministeriet
Amount: 100,000.00 Danish Kroner

Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 195,000.00 Danish Kroner

Project

Nye informations- og kommunikationssystemer på byggepladsen

Section for Planning and Management of Building Processes
Department of Civil Engineering
Number of participants: 1
Project ID: 25639
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 267,000.00 Danish Kroner

Project

Assistance i forbindelse med produktudvikling af vinduesprofi-ler af træ/aluminium og kompositmateriale.

Department of Civil Engineering
Period: 01/11/2004 → 30/04/2005
Number of participants: 2
Project ID: 25591
Project participant:
Laustsen, Jacob Birck (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90 KUP
Name of research programme: Indtægtsdækket virksomhed UK 90 KUP
Amount: 38,781.00 Danish Kroner

Project

Elektrokemisk sanering af kalkmalerier

Department of Civil Engineering
Period: 01/11/2004 → 01/07/2009
Number of participants: 6
Phd Student:
Rörig-Dalgaard, Inge (Intern)
Supervisor:
Hansen, Kurt Kielsgaard (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Geiker, Mette Rica (Intern)
Armero, Marta María Castellote (Ekstern)
Larsen, Poul Klenz (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

**IEA Annex 41 : Funding from EFP 04, Danish Energy Agency**

- Department of Civil Engineering
- Danish Building Research Institute
- Number of participants: 4
- Project ID: 25688
- Project participant:
  - Møller, Jacob Steen (Intern)
  - Grau, Karl (Ekstern)
  - Hansen, Morten Hjorslev (Ekstern)
- Project Manager, organisational:
  - Rode, Carsten (Intern)

**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 399,000.00 Danish Kroner
Project

**IEA Annex 41 : Funding from Tagpapbranchens Oplysningsråd, TOR**

- Department of Civil Engineering
- Number of participants: 2
- Project ID: 25687
- Project Manager, organisational:
  - Møller, Jacob Steen (Intern)
  - Rode, Carsten (Intern)

**Financing sources**
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 30,000.00 Danish Kroner
Project

**Konference i Florida, USA : Støtte fra Otto Mønsteds Fond**

- Department of Civil Engineering
- Period: 01/11/2004 → 31/12/2004
- Number of participants: 2
- Project ID: 25630
- Project participant:
  - Møller, Jacob Steen (Intern)
- Project Manager, organisational:
  - Rode, Carsten (Intern)

**Financing sources**
Source: Gaver, Private danske Fonde
Name of research programme: Gaver, Private danske Fonde
Amount: 7,305.00 Danish Kroner
Project
3D arbejdsmetode
Department of Civil Engineering
Erhvervs- og Byggestyrelsen
Period: 01/10/2004 → 01/01/2007
Number of participants: 1
Project participant:
Vestergaard, Flemming (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 3,000,000.00 Danish Kroner
Project

Målinger af bruttoenergiforbrug i nybyggeri svarende til Bygningsreglement 2005 : 1. videreførelse af projekt
Department of Civil Engineering
Danfoss A/S
Rockwool International
Kalk og Teglværksforeningen af 1893
Period: 01/10/2004 → 01/06/2005
Number of participants: 5
Project ID: 25517
Contact person:
Larsen, Jørn Dalgaard (Ekstern)
Project participant:
Tommerup, Henrik M. (Intern)
Jensen, Claus (Ekstern)
Bisgaard, Tommy (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 30,000.00 Danish Kroner
Project

FUGTTEKNISKE UNDERSØGELSER AF PAPIRULD MED EN NY FORMULERING AF IMPRÆGNERINGEN
Department of Civil Engineering
Miljø Isolering ApS
Period: 20/09/2004 → 15/12/2004
Number of participants: 1
Project ID: 25624
Project Manager, organisational:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 69,015.00 Danish Kroner
Project

ALLHOME – A study on the Relation between Allergy/Asthma and Indoor Air Quality in Homes in Bulgaria
Department of Mechanical Engineering
Department of Civil Engineering
Ventilation measurement in homes based on metabolic CO2 produced by people

Department of Civil Engineering
Section for Indoor Environment
STVF
Period: 01/09/2004 → 31/10/2006
Number of participants: 1
Project participant:
Melikov, Arsen Krikor (Intern)

Evaluering af 3 Agenda 21 Centre I København

Section for Planning and Management of Building Processes
Department of Civil Engineering
Danmarks Pædagogiske Universitet
Period: 01/09/2004 → 07/03/2005
Number of participants: 2
Project ID: 25657
Project participant:
Læssøe, Jeppe (Ekstern)
Project Manager, organisational:
Hoffmann, Birgitte (Intern)

Financing sources
Source: Sam.arb.aftaler - Amter og kommuner
Name of research programme: Sam.arb.aftaler - Amter og kommuner
Amount: 163,100.00 Danish Kroner

Konsultativ assistance og undervisning

Section for Building Materials and Geotechnics
Department of Civil Engineering
ASIAQ - Grønlands Forundersøgelser
Period: 20/08/2004 → 31/12/2004
Number of participants: 1
Project ID: 25559
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 23,556.00 Danish Kroner

Energy Project Villa
Background: The study “Energy savings in existing and new houses” made by DTU identifies a large po-tential for energy savings in houses today and points out construction elements to target. In relation to this a demonstration project would be useful, that shows what is obtainable in practice on site, also cost-benefit wise, when dealing with the challenges of an existing house. Energimærkningsordningen has expressed interest in the project and manage a database with houses
certified since 1997. They have found that the improvements suggested in the reports are often not carried out by the owners even though the payback time is short compared to the lifetime of the house. Via this database a “typical” house that represents a segment with potential for energy savings can be identified. Energimærkningsordningens secretariat has identified villas before 1950 to be the most rewarding segment to approach for energy savings. To get the maximum benefit from the project, in regards to the ongoing political work, a preliminary result should be ready by the beginning of 2005. Project Goal: The goal of this project is to: •Demonstrate and document energy savings obtained by renovating a typical villa built before 1950. Objectives: •Document energy savings and the cost of an energy renovation of the villa (divided into preparation cost, documentation cost and building cost). •Compare achieved savings to expected calculated savings •Test of market response. (Since the target group is defined very clearly by the database a direct marketing effort could be carried out with the results. This would reveal how large a hit-rate you can obtain by having the specific results that people can relate to.)

Section for Building Physics and Services
Department of Civil Engineering

Rockwool International
Period: 15/08/2004 → 01/02/2005
Number of participants: 3
Project ID: 25618
Contact person:
Svendsen, Svend (Intern)
Project participant:
Tommerup, Henrik M. (Intern)
Project Manager, organisational:
Beck Hansen, Mette (Ekstern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 78,000.00 Danish Kroner

Project Development of an Integrated Solar System for Buildings
The objective of the project consists in the study and development of a new generation of solar panels, capable of replacing the demands, for any type of building, be it electric power, hot water or hot air for heating. This will lead to improvements of these facilities regarding the individualised systems in use. The idea arises from the need to palliate the low performance of the photovoltaic generators that doesn't usually go beyond 10 or 15%, because in this type of facilities the heat is not taken advantage of in an appropriate way, leading to a loss of approximately 34% of the incident energy and the performance of the apparatus diminish quickly according the temperature of the collector increases, having important losses as soon as the temperature of the cells are between 40-45°C for modern solar panels. During the project the focus of the work will be: Review of the concept - Energy analysis Design of the system components Manufacturing of the components Installation and integration of the components in a prototype house Development of field tests

Section for Building Physics and Services
Department of Civil Engineering

Millenium Electric T.O.U. Inc.
ad fontes Elbe-Weser GmbH
Ceramica Verea S.A.
Maniero Elettronica S.A.S.
APEX MM Ltd
ttz Bremerhaven
Universidad de Sevilla
Period: 01/08/2004 → 31/07/2007
Number of participants: 2
Acronym: MULTISOLAR
Project participant:
Varming, Niels (Intern)
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)
Grønne regnskaber og Miljøledelse i Grønland

Section for Planning and Management of Building Processes

Department of Civil Engineering

Arctic Technology Centre

Sisimiut Kommune

Period: 01/08/2004 → 01/08/2006

Number of participants: 2

Project ID: 25624

Contact person: Borg, Mads (Ekstern)

Project Manager, organisational: Hoffmann, Birgitte (Intern)

Financing sources

Source: Forskningsprojekter - Miljø- og Energiministeriet

Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet

Amount: 535,000.00 Danish Kroner

Project

Guest Ph.D. student Vit Koverdynsky

Department of Civil Engineering

Period: 01/08/2004 → 31/07/2005

Number of participants: 1

Project ID: 25611

Project Manager, organisational: Rode, Carsten (Intern)

Financing sources

Source: Sam.arb.aftaler - Udenlandske offentlige og private

Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private

Amount: 20,000.00 Danish Kroner

Project

Hærdningsbetinget revnedannelse i højkvalitetsbeton

Detection and quantification of microcracks due to autogenous shrinkage in high-performance concrete represents a problematic issue. Techniques based on crack impregnation typically require drying of the samples, which may introduce further cracks. Other non-destructive techniques, such as x-ray tomography, do not allow sufficient resolution of microcracks. A new technique presented in this paper allows detection of microcracks in cement paste while avoiding artefacts induced by unwanted restraint, drying or temperature variations. The technique consists in casting small circular cylindrical samples of high-performance cement pastes in silicone moulds that exert minimal external restraint. Cast-in steel rods with varying diameter internally restrain the autogenous shrinkage and lead to crack formation. Dimensions of the steel rods are chosen so that the size of this restraining inclusion resembles aggregate size. Gallium intrusion of the cracks and subsequent examination by electron probe micro analysis, EPMA, are used to identify the cracks. The gallium intrusion technique allows controllable impregnation of cracks in the cement paste. A distinct contrast between gallium and the surrounding material and a µm-resolution are ensured by the EPMA technique. Results of crack detection on cement pastes with different autogenous shrinkage behaviour are presented to show applicability and potentialities of the technique.

Section for Building Materials and Geotechnics

Department of Civil Engineering

Period: 01/08/2004 → 30/11/2004

Number of participants: 2

Project ID: 25583
Project participant:
Lura, Pietro (Intern)
Project Manager, organisational:
Jensen, Ole Mejlhed (Intern)

Financing sources
Source: Gaver, Private danske Fonde
Name of research programme: Gaver, Private danske Fonde
Amount: 250,000.00 Danish Kroner

Monitoring of Reinforcement Corrosion
Department of Civil Engineering
Period: 01/08/2004 → 21/10/2009
Number of participants: 7
Phd Student:
Nygaard, Peter Vagn (Intern)
Supervisor:
Klinghoffer, Oskar (Intern)
Møller, Per (Intern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Goltermann, Per (Intern)
Edvardsen, Carola (Ekstern)
Hansson, Carolyn M. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD

Nye Strategier for Organisering på Byggepladsen
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/08/2004 → 31/12/2005
Number of participants: 1
Project ID: 25609
Project participant:
Richter, Anne (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 265,000.00 Danish Kroner

Temperaturafhængighed af bjergartsmekaniske egenskaber
Department of Civil Engineering
Period: 01/08/2004 → 01/06/2011
Number of participants: 7
Phd Student:
Andreassen, Katrine Alling (Intern)
Supervisor:
Hededal, Ole (Intern)
Krogsbøll, Anette (Intern)
Main Supervisor:
Foged, Niels Nielsen (Intern)
Examiner:
- Stenby, Erling Halfdan (Intern)
- Holt, Rune M. (Ekstern)
- Schroeder, Christian (Ekstern)

**Financing sources**
- Source: Internal funding (public)
- Name of research programme: DTU-lønnet stipendie
- Project: PhD

### Whole Building Heat, Air and Moisture Response: IEA ECBCS Annex 41, Subtask 1 leadership

Section for Building Physics and Services

Department of Civil Engineering
- Period: 01/08/2004 → 31/12/2007
- Number of participants: 3
- Project ID: 25617
- Contact person:
  - Rode, Carsten (Intern)
- Project participant:
  - Peuhkuri, Ruut Hannele (Intern)
  - Mortensen, Lone Hedegaard (Intern)

**Financing sources**
- Source: Forsk. Private danske - Fonde
- Name of research programme: Forsk. Private danske - Fonde
- Amount: 300,000.00 Danish Kroner
- Project

### Modelling of ECC Materials using Numerical Formulations Based on Plasticity

Department of Civil Engineering
- Period: 01/07/2004 → 07/03/2008
- Number of participants: 7
- Phd Student:
  - Dick-Nielsen, Lars (Intern)
- Supervisor:
  - Li, Victor C. (Ekstern)
- Pouslen, Peter Noe (Intern)
- Main Supervisor:
  - Stang, Henrik (Intern)
- Examiner:
  - Sørensen, Bent F. (Intern)
  - Jirásek, Milan (Ekstern)
  - Leung, Christopher K. Y. (Ekstern)

**Financing sources**
- Source: Internal funding (public)
- Name of research programme: DTU-lønnet stipendie
- Project: PhD

### NEGST (Next Generation of Solar Thermal Systems)

Department of Civil Engineering
- University of Stuttgart
- Hochschule für Technik
- Arsenal Research
- Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

Instituto National de Engenharia e Technologia Industrial

Centre Scientifique et Technique du Bâtiment

INTA

Dalarna University

University of Kassel

Ecofys B.V.

University of Oslo

Period: 01/07/2004 → 31/12/2006
Number of participants: 4
Contact person:
Furbo, Simon (Intern)
Fan, Jianhua (Intern)
Shah, Louise Jivan (Intern)
Andersen, Elsa (Intern)

Financing sources
Source: Forsk. EU - Ramme program
Name of research programme: Forsk. EU - Ramme program
Amount: 270,000.00 Danish Kroner

Reduktion af energiforbrug til udtørring af bygninger

Section for Building Physics and Services

Department of Civil Engineering

Teknologisk Institut

Period: 01/07/2004 → 30/06/2006
Number of participants: 1
Project ID: 25597
Project participant:
Rode, Carsten (Intern)

Financing sources
Source: Program. Andre statslige danske - Miljø
Name of research programme: Program. Andre statslige danske - Miljø
Amount: 35,000.00 Danish Kroner

Udvikling, produktion og demonstration af forbedret ARCON HT-SA solfanger

Department of Civil Engineering

PlanEnergi

Arcon Solvarme A/S

Marstal Fjernvarme A/S
Material Physics for Civil Engineers: Translation of the textbook

In the project a translation into English of Per Freiesleben Hansen’s textbook Material Physics for Civil Engineers is done.
Diversity management in the construction sector.
Diversity management in the construction sector. The construction industry is facing new challenges, as human resources are increasingly diverse and multicultural. Recruitment and use of this diversity of talents implies changes in the management of human resource. The aim of the project is to investigate how diversity management may conduce changes in the use of human resources in construction industry. The project analyses the various barriers for development of a culture based on diversity. Special attention is paid to the difficulties that new entrant such as women and ethnic minorities among professionals face in this sector. Based on this analysis proposals for change towards diversity management are launched. Some of these are implemented in a large construction firm. The process of change is followed and evaluated by the researcher. The project summarizes its results by proposing an approach to diversity management applicable in the construction sector.

Section for Planning and Management of Building Processes

Diversity management in the construction sector.
Innovation i projektorientert vidensarbejde: Facilitering af kompetenceudholdelse blandt rådgivende ingeniører

Department of Civil Engineering
Period: 01/03/2004 → 31/01/2008
Number of participants: 7
Phd Student:
Bendixen, Mads (Intern)
Supervisor:
Karstoft, Niels Ole (Ekstern)
Prahl, Arne (Ekstern)
Main Supervisor:
Koch, Christian (Intern)
Examiner:
Jensen, Torben Elgaard (Intern)
Albertsen, Niels (Ekstern)
Sørensen, Knut Holtan (Ekstern)

Finance sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Metro-tunneling: Properties of Grout
Evaluation of Grout Properties behind tunnel elements at the Copenhagen Metro Tunnel.

Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/03/2004 → 25/06/2004
Number of participants: 1
Project ID: 25374
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Finance sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 38,430.00 Danish Kroner
Project

Reflekterende undertage
Section for Building Physics and Services
Department of Civil Engineering
Period: 31/01/2004 → 29/02/2004
Number of participants: 2
Project ID: 25544
Project participant:
Holck, Ole (Intern)
Project Manager, organisational:
Rode, Carsten (Intern)

Finance sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 20,425.00 Danish Kroner
Project
A physically based model for concrete durability based on multi-species diffusion and chemical equilibrium considerations

Technical University of Denmark

Department of Civil Engineering
Period: 01/01/2004 → 01/01/2010
Number of participants: 1
Project participant:
Yamada, Kauzo (Ekstern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Project

Application of WST-method for fracture testing of fibre-reinforced cement based composites

To evaluate the reproducibility of the wedge-splitting test method and to provide guidelines, a round robin study was conducted in which three labs participated. The participating labs were: DTU – the Technical University of Denmark, Department of Civil Engineering; CTH – Chalmers University of Technology, Department of Structural Engineering and Mechanics; and SP – the Swedish National Testing and Research Institute. Two different mixes were investigated; the difference between the mixes was the fibre length (Mix 1 with 40 kg of 35 mm long fibres and Mix 2 with 40 kg of 60 mm long fibres). The test results from each lab were analysed and a study of the variation was performed. From the study of the intra-lab variations, it is evident that the variations of the steel fibre-reinforced concrete properties are significant. The coefficient of variance for the splitting load was found to vary between 20 to 40%. The investigation of the inter-lab variation, based on an analysis of variance (ANOVA) indicated that there is no inter-lab variation. The test result can be said to be independent of the testing location and the equipment used (with or without CMOD-control). The conclusions that can be drawn from this study are that: the wedge-splitting test method is a suitable test method for assessment of fracture properties of steel fibre-reinforced concrete; the test method is easy to handle and relatively fast to execute; the test can be run with CMOD-control or without, in a machine with a constant cross-head displacement rate (if rate is equal to or less than 0.25 mm/min); due to variations in fibre distribution, the scatter of the test results is high; the dimensions of the specimen (height, width, and thickness) should, if possible, be four times the maximum fibre length, or at least more than three times the fibre length; using inverse analysis, the tensile fracture properties can be interpreted from the test result as a bi-linear stress-crack opening relationship. Key words: Fibre-reinforced concrete, fracture testing, wedge-splitting test method, round-robin test, Nordtest.

Section for Structural Engineering
Department of Civil Engineering
Chalmers University of Technology
SP Sveriges Provnings- och Forskningsinstitut
Period: 01/01/2004 → 31/12/2004
Number of participants: 3
Project ID: 25580
Project participant:
Löfgren, Ingemar (Ekstern)
Johansson, Mathias (Ekstern)
Project Manager, organisational:
Olesen, John Forbes (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 333,000.00 Danish Kroner

Competitive Solar Heating Systems for Residential Buildings
Department of Civil Engineering
Period: 15/12/2003 → 15/08/2007
Number of participants: 5
Phd Student:
Thur, Alexander (Ekstern)
Main Supervisor:
Furbo, Simon (Intern)
Examiner:
Schultz, Jørgen Munthe (Intern)
Jordan, Ulrike (Intern)
Perers, Bengt (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Laboratorieundersøgelser : Triaksialforsøg med sand
Section for Building Materials and Geotechnics
Department of Civil Engineering
LIC-engineering A/S
Period: 01/12/2003 → 04/12/2004
Number of participants: 1
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 59,404.00 Danish Kroner

Citytunneln : Borability and bit wear in Siliceous limestone and flint in Malmö
Expert evaluation of Borability and bit wear for tunneling in Siliceous limestone and flint at Malmö Citytunnel
Section for Building Materials and Geotechnics
Department of Civil Engineering
Citytunneln
Number of participants: 3
Evaluation of energy efficient personalized air units for enhanced ventilation in the tropics
Evaluation of energy efficient personalized air units for enhanced ventilation in the tropics, National University of Singapore, Singapore, 2003-2005, Co-PI.
Research project in collaboration with National University of Singapore.

Department of Civil Engineering
Section for Indoor Environment
National University of Singapore
Period: 01/11/2003 → 31/10/2005
Number of participants: 1
Project participant:
Melikov, Arsen Krikor (Intern)

Calculation of thermal properties of aluminium window and facade profiles
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/11/2003 → 01/11/2004
Number of participants: 2
Project ID: 901125528
Project participant:
Svendsen, Svend (Intern)
Project Manager, organisational:
Laustsen, Jacob Birck (Intern)

Multifunctions solenergianlaeg
Department of Civil Engineering
Period: 01/11/2003 → 15/03/2004
Number of participants: 2
Phd Student:
Vejen, Niels Kristian (Intern)
Main Supervisor:
Furbo, Simon (Intern)

Project: PhD
Optimering af byggeprocesser med Snublestensanalyse
Section for Planning and Management of Building Processes
Department of Civil Engineering
NCC
Period: 01/11/2003 → 01/10/2005
Number of participants: 4
Project participant:
Richter, Anne (Intern)
Apelgren, Søren (Ekstern)
Project Manager, organisational:
Koch, Christian (Intern)
Møgelhøj, Torben (Ekstern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 388,000.00 Danish Kroner

Optimering af Byggeprocesser med Snublestensanalyse
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/11/2003 → 30/09/2004
Number of participants: 1
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forsk. Private danske - Andre
Name of research programme: Forsk. Private danske - Andre
Amount: 388,000.00 Danish Kroner

Udarbejdelse af pjece: Indeklima og tegl
Section for Building Physics and Services
Department of Civil Engineering
MURO/Danske Tegl
Period: 01/11/2003 → 31/03/2004
Number of participants: 2
Project ID: 25530
Project participant:
Bøgh, Søren (Ekstern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 15,000.00 Danish Kroner

Design af grønlandske referencevejrdataår
Section for Building Physics and Services
Department of Civil Engineering
ASIAQ - Grønland's Forundersøgelser
Period: 01/10/2003 → 01/02/2004
Number of participants: 3
Contact person:
Karlsen, Håkon Gjessing (Ekstern)
Project participant:
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 80,000.00 Danish Kroner
Project:

Management of Reinforcement Corrosion
Department of Civil Engineering
Period: 01/10/2003 → 07/05/2009
Number of participants: 6
Phd Student:
Küter, Andre (Intern)
Supervisor:
Møller, Per (Intern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Ottosen, Lisbeth M. (Intern)
Hansson, Carolyn M. (Ekstern)
Leisner, Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Plasticitetsteori for stålkonstruktioner
Department of Civil Engineering
Period: 01/10/2003 → 16/04/2007
Number of participants: 7
Phd Student:
Hansen, Thomas (Intern)
Supervisor:
Gath, Jesper (Intern)
Nielsen, Mogens Peter (Intern)
Main Supervisor:
Agerskov, Henning (Intern)
Examiner:
Jönsson, Jeppe (Intern)
Kærn, Jens Christian (Ekstern)
Rasmussen, Kim John Rise (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: ErhvervsPhD-ordningen VTU
Project: PhD
SCC Konsortium

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/10/2003 → 31/03/2007
Number of participants: 1
Project ID: 25551
Project participant: Geiker, Mette Rica (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 100,000.00 Danish Kroner

Brudmekanisk modellering af armerede betonkonstruktioner

Department of Civil Engineering
Period: 01/09/2003 → 09/03/2007
Number of participants: 7
PhD Student: Asferg, Jesper Lundegaard (Ekstern)
Supervisor: Olesen, John Forbes (Intern)
Poulsen, Peter Noe (Intern)
Main Supervisor: Stang, Henrik (Intern)
Examiner: Jönsson, Jeppe (Intern)
Karihaloo, Bhushan (Ekstern)
Sluys, Lambertus Johannes (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Forbedret designgrundlag for store vindmøllelæver af fiberkompositter - fase 2

Section for Building Materials and Geotechnics
Department of Civil Engineering
Risø National Laboratory for Sustainable Energy
Aalborg University
LM Glasfiber A/S
VESTAS Wind Systems A/S
Period: 01/09/2003 → 31/07/2005
Number of participants: 1
Project Manager, organisational: Stang, Henrik (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 336,000.00 Danish Kroner

Fugttekniske undersøgelser på dansk hørmåtte
Section for Building Materials and Geotechnics

Department of Civil Engineering

Dansk Landbrugsrådgivning
Period: 01/09/2003 → 01/02/2004
Number of participants: 3
Project ID: 25509
Project participant:
Astrup, Thomas Fruergaard (Intern)
Jacobsen, Ulla Gjøl (Intern)

Project Manager, organisational:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Sam arb aftaler, Private danske - Andre virksomheder
Name of research programme: Sam arb aftaler, Private danske - Andre virksomheder
Amount: 85,000.00 Danish Kroner

Project

Udvikling af energikønisk ventilationsløsning med varmøgenvinding til boliger

Section for Building Physics and Services

Teknologisk Institut

EcoVent ApS
Period: 01/09/2003 → 31/12/2005
Number of participants: 5
Project ID: 25518
Contact person:
Ravn, Ole (Ekstern)
Jensen, John Steen (Ekstern)

Project participant:
Nielsen, Toke Rammer (Intern)
Kragh, Jesper (Intern)

Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 244,800.00 Danish Kroner

Project

Brandprøvning af betoner i forbindelse med Malmö Citytunnel : Test for eksplosiv afskalning

Section for Building Materials and Geotechnics

Department of Civil Engineering

Section for Building Physics and Services
Period: 18/08/2003 → 23/10/2003
Number of participants: 3
Project participant:
Hertz, Kristian Dahl (Intern)
Kristiansen, Finn Harken (Intern)

Project Manager, organisational:
Sørensen, Lars Schiøtt (Intern)

Financing sources
Source: Sam arb aftaler - Udenlandske offentlige og private
**Energibesparelser i eksisterende og nye boliger**

Department of Civil Engineering

Rockwool International  
Period: 01/08/2003 → 31/01/2004  
Number of participants: 3  
Project ID: 25513  
Contact person:  
Bugge Garn, Claus (Ekstern)  
Project participant:  
Tommerup, Henrik M. (Intern)  
Svendsen, Svend (Intern)

**Financing sources**

Source: Forsk. Private danske - Andre  
Name of research programme: Forsk. Private danske - Andre  
Amount: 146,000.00 Danish Kroner

**Komfortforhold og lastudjævning ved energieffektiv køling med termoaktive konstruktioner - analyse og praktiske forsøg – ELFOR PSO 2003**

Section for Building Physics and Services  
Department of Civil Engineering  
COWI A/S  
Teknologisk Institut  
Spæncom A/S  
Period: 01/08/2003 → 01/09/2005  
Number of participants: 4  
Project participant:  
Weitzmann, Peter (Intern)  
Jensen, Trine (Ekstern)  
Passov, Finn (Ekstern)  
Project Manager, organisational:  
Hummelshøj, Reto Michael (Ekstern)

**Financing sources**

Source: Indtægtsdækket virksomhed UK 90  
Name of research programme: Indtægtsdækket virksomhed UK 90  
Amount: 600,000.00 Danish Kroner

**Målinger af bruttoenergiforbrug i nybyggeri svarende til Bygningsreglement 2005**

Department of Civil Engineering  
Section for Building Physics and Services  
Thy-Mors Energi  
Nordvestjysk Elforsyning  
NESA A/S  
Period: 01/08/2003 → 01/09/2004  
Number of participants: 5  
Project ID: 25517
Measurement techniques of autogenous deformation

A characteristic feature of modern, high-performance concrete is a low porosity and a discontinuous capillary pore structure of the cement paste. This is encompassed by keeping a low water/cement ratio with the aid of superplasticizers and by adding silica fume to the mixture. From a material point of view these modern concretes generally possess some highly advantageous properties compared to traditional concrete. Examples of these include good workability in the fresh state, high strength, low permeability and improved durability. However, these types of concrete also possess some problematic properties, such as autogenous deformation.

Quality and Cost of Fabricated Advanced Welded Structures

The possibilities for producing optimized welded structures in high-strength steel and aluminium by use of the newest technology, including high-productivity fabrication methods (robot technology), are studied in this project. Of special interest in this connection are the fatigue properties of the structures, especially the fatigue life at a realistic stochastic loading. In the project, the fatigue life is determined both in experimental investigations and analytically by use of fracture mechanics.
Management concepts in change management

Management concepts in change management Standard concepts are increasingly used in the management of change in organizations. The concepts integrate a diagnosis of the current problems of firms with a set of solutions. Most concepts imply the use of technology, typically IKT. This project aims at producing a textbook. The book will develop an understanding of how standard concepts may bring about change in organizations, by focusing on the dynamic process where concepts, actors and organizational context interact. The book consists of three parts. The first part gives a theoretical introduction to the field, and dynamic model is developed. In the second part this model is used in four in depth cases, focusing on the process of change. The third part is a handbook – and reviews important standard concepts currently used. The book addresses students and practitioners interested in organizational change management – primarily with an engineering background.

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 31/07/2003 → 01/12/2003
Number of participants: 2
Project ID: 25578
Project participant:
Kamp, Annette (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Udenfor rammen
Name of research programme: Ukendt
Amount: 200,000.00 Danish Kroner
Project
Ultimativ styrke af Vestas' vingeboksdesign

Department of Civil Engineering
Period: 01/07/2003 → 22/04/2009
Number of participants: 7
Phd Student: 
Jensen, Find Mølholt (Intern)
Supervisor: 
Branner, Kim (Intern)
Wedel-Heinen, Jens Jakob (Ekstern)
Main Supervisor: 
Stang, Henrik (Intern)
Examiner: 
Berggreen, Christian (Intern)
Fuglsang, Lars (Ekstern)
Las, J. Mikel (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Risø (Løn)
Project: PhD

Varmetekniske beregninger for ovenlys

Section for Building Physics and Services
Department of Civil Engineering
Period: 01/07/2003 → 01/10/2003
Number of participants: 2
Project participant: 
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 44,199.40 Danish Kroner
Project

Bæredygtigt Arktisk byggeri i det 21. århundrede: Energierigtige vinduer til bæredygtigt byggeri i kolde klimaer

Section for Building Physics and Services
Department of Civil Engineering
Period: 01/06/2003 → 31/12/2006
Number of participants: 4
Project ID: 9527125501
Project participant: 
Laustsen, Jacob Birck (Intern)
Tommerup, Henrik M. (Intern)
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 1,520,000.00 Danish Kroner
Project
integrating Lean Construction and Lean design: Processes and Methods

Department of Civil Engineering
Period: 01/06/2003 → 08/11/2006
Number of participants: 6
Phd Student: Jørgensen, Bo (Ekstern)
Supervisor: Bonke, Sten (Intern)
Main Supervisor: Emmitt, Stephen (Intern)
Examiner: Jensen, Per Langaa (Intern)
Bouchlaghem, Dino (Ekstern)
Bröchner, Jan (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Optimal Seat Control Algorithm

Department of Mechanical Engineering
Department of Civil Engineering
Section for Indoor Environment
Johneson Control
Period: 01/05/2003 → 30/11/2005
Number of participants: 1
Project participant: Melikov, Arsen Krikor (Intern)

Hygrotermisk mikroklima på indvendige overflader af klimaskærmen

Department of Civil Engineering
Period: 01/05/2003 → 15/08/2007
Number of participants: 6
Phd Student: Mortensen, Lone Hedegaard (Intern)
Supervisor: Peuhkuri, Ruut Hannele (Intern)
Main Supervisor: Rode, Carsten (Intern)
Examiner: Svendsen, Svend (Intern)
Brohus, Henrik (Ekstern)
Hagentoft, Carl Eric Hartvig (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Hygrothermal Performance of Whole Buildings

Section for Building Physics and Services
Department of Civil Engineering
Period: 01/05/2003 → 01/05/2006  
Number of participants: 3  
Project ID: 25.466  
Project participant:  
Peuhkuri, Ruut Hannele (Intern)  
Mortensen, Lone Hedegaard (Intern)  
Project Manager, organisational:  
Rode, Carsten (Intern)  

Financing sources  
Source: Forskningsrådene - STVF  
Name of research programme: Forskningsrådene - STVF  
Amount: 2,600,000.00 Danish Kroner  

PSO F&U 3206: Elektrokemisk fjernelse af cadmium fra bioasker  
Section for Building Materials and Geotechnics  
Department of Civil Engineering  
Energi E2 A/S  
Krüger A/S  
Period: 01/05/2003 → 30/09/2004  
Number of participants: 4  
Project participant:  
Dame, Anne Juul (Intern)  
Project Manager, organisational:  
Ottosen, Lisbeth M. (Intern)  
Simonsen, Peter (Ekstern)  
Christensen, Terkel (Ekstern)  

Financing sources  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 1,100,000.00 Danish Kroner  

Varmetekniske beregninger  
Section for Building Physics and Services  
Department of Civil Engineering  
Period: 01/05/2003 → 17/08/2005  
Number of participants: 1  
Project ID: 25485  
Project Manager, organisational:  
Laustsen, Jacob Birck (Intern)  

Financing sources  
Source: Sam.arb.aftaler, Private danske - Andre virksomheder  
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder  
Amount: 49,256.00 Danish Kroner  

Sustainable arctic building technology for the 21st century - Evacuated tubular solar collectors  
Department of Civil Engineering  
Period: 28/04/2003 → 31/12/2006  
Number of participants: 2  
Contact person:  
Shah, Louise Jivan (Intern)  
Project Manager, organisational:
Furbo, Simon (Intern)

**Financing sources**
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 2,490,000.00 Danish Kroner

**Collaboration on the Agenda. An anthology about environmental teaching**
Department of Civil Engineering
Aarhus University
Period: 01/04/2003 → 30/04/2004
Number of participants: 1
Project Manager, organisational:
Hoffmann, Birgitte (Intern)

**Environmental management and green accounting in Greenland : Pilot Project**
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/04/2003 → 31/08/2003
Number of participants: 1
Project Manager, organisational:
Hoffmann, Birgitte (Intern)

**Grønne regnskaber og Miljøledelse i Grønland : Et forprojekt**
Section for Planning and Management of Building Processes
Department of Civil Engineering
Arctic Technology Centre
Period: 01/04/2003 → 01/06/2004
Number of participants: 2
Project ID: 25502
Project participant:
Gabriel, Søren (Intern)
Project Manager, organisational:
Hoffmann, Birgitte (Intern)

**IEA Task 32: Advanced storage concepts for solar thermal systems in low energy buildings**
University Library
Technical Information Center of Denmark
Department of Civil Engineering
University of Stuttgart
SPF
Graz University of Technology
Dalarna University
Advanced Energy Economy

Period: 20/02/2003 → 31/12/2005
Number of participants: 8
Contact person:
Drück, Harald (Ekstern)
Project participant:
Andersen, Elsa (Intern)
Schultz, Jørgen Munthe (Intern)
Vogelsanger, Peter (Ekstern)
Streicher, Wolfgang (Ekstern)
Bales, Chris (Ekstern)
Weiss, Werner (Ekstern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimisteriet
Amount: 2,129,000.00 Danish Kroner

Project

Bæredygtigt arktisk byggeri i det 21. århundrede : Energirigtige vinduer
Section for Building Physics and Services

Department of Civil Engineering
Period: 01/02/2003 → 01/02/2006
Number of participants: 1
Project ID: BYG.DTU 25500
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 1,520,000.00 Danish Kroner

Project

Bæredygtigt arktisk byggeri i det 21. århundrede : Ventilationssystemer
Section for Building Physics and Services

Department of Civil Engineering
Period: 01/02/2003 → 01/02/2006
Number of participants: 3
Project ID: BYG.DTU 25479
Project participant:
Rose, Jørgen (Intern)
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Cold Bridge Problem in Sandwich Panels, Clinic Buildings, Thule

Section for Building Physics and Services

Department of Civil Engineering

PP Consult
Period: 01/02/2003 → 31/03/2003
Number of participants: 2
Project participant:
Nielsen, Hans Jørgen (Ekstern)

Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 3,774.00 Danish Kroner

Design af cementbaserede materialer med given mikrostruktur

Department of Civil Engineering
Period: 01/02/2003 → 29/01/2007
Number of participants: 7
Phd Student:
Kjeldsen, Ane Mette (Intern)

Supervisor:
Hansen, Kurt Kielsgaard (Intern)

Stang, Henrik (Intern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Goltermann, Per (Intern)
Nilsson, Lars-Olof (Ekstern)
Wallevik, Ólafur Haraldsson (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Earthquake Analysis of Concrete Structures

Department of Civil Engineering
Period: 01/02/2003 → 16/04/2007
Number of participants: 8
Phd Student:
Costa, João Luis Domingues (Ekstern)

Supervisor:
Bento, Rita (Ekstern)
Levtchitch, V. (Ekstern)
Nielsen, Mogens Peter (Intern)
Main Supervisor:
Traberg, Søren (Intern)
Examiner:
Jönsson, Jeppe (Intern)
Bessason, Bjarni (Ekstern)
Sanjayan, Jay G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Ventilation med varmeggenvinding til arktisk klima
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/02/2003 → 01/12/2004
Number of participants: 2
Project participant:
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 75,000.00 Danish Kroner
Project

Energimæssige beregninger af vinduesprofiler system V200 og V400
Section for Building Physics and Services
Department of Civil Engineering
Period: 06/01/2003 → 12/01/2003
Number of participants: 3
Project participant:
Kragh, Jesper (Intern)
Laustsen, Jacob Birck (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 72,878.00 Danish Kroner
Project

Produktudvikling af nye vinduer og glasfacader med integrerede funktioner
Section for Building Physics and Services
Department of Civil Engineering
Period: 03/01/2003 → 04/01/2003
Number of participants: 2
Project participant:
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 66,737.00 Danish Kroner
Project
Acoustic properties and consolidation of deep-sea chalk

Department of Environmental Engineering

Department of Civil Engineering
Period: 01/01/2003 → 31/12/2003
Number of participants: 2
Acronym: 358
Project participant:
Røgen, Birte (Intern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 0.00 Danish Kroner

Anvisning: Beregning af varmeforbrug i Grønland
Guideline for calculating heat loss from buildings in Greenland. A guideline for performing detailed calculations of heat loss from buildings in Greenland has been developed. The guideline includes all the necessary information for performing calculations along with detailed descriptions of window calculations, tabulated values of thermal transmittance coefficients for typical thermal bridges, demands according to the Building Code etc. Report: R-086, BYG.

Section for Building Physics and Services

Department of Civil Engineering

Arctic Technology Centre
Period: 01/01/2003 → 03/01/2003
Number of participants: 2
Project participant:
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 75,000.00 Danish Kroner

Competitive solar heating systems for residential buildings

Department of Civil Engineering

Lund Institute of Technology
University of Oslo
Dalarna University
Riga Technical University
Period: 01/01/2003 → 31/12/2006
Number of participants: 8
Contact person:
Rekstad, John (Ekstern)
Bales, Chris (Ekstern)
Blumberga, Dagnija (Ekstern)
Project participant:
Thür, Alexander (Intern)
Karlsson, Björn (Ekstern)
Meir, Michaela (Ekstern)
Fiedler, Frank (Ekstern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 1,750,000.00 Danish Kroner

Moisture Buffering of Building Materials : Workshop
NORDTEST Workshop
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/01/2003 → 31/12/2003
Number of participants: 1
Project ID: 25472
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 74,000.00 Danish Kroner

Network for RTD on self compacting concrete
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/01/2003 → 01/01/2006
Number of participants: 1
Acronym: Nordic SCC net
Project ID: 25516
Project participant:
Geiker, Mette Rica (Intern)

Financing sources
Source: Sam arb aftaler - Udenlandske offentlige og private
Name of research programme: Samarb aftaler - Udenlandske offentlige og private
Amount: 150,000.00 Danish Kroner

PETUS-project (Practical Evaluation Tools for Urban Sustainability).
Section for Planning and Management of Building Processes
Department of Civil Engineering
Cardiff University
Universite de Liege
Joanneum Research
Institut National des Sciences Appliquees de Lyon
Etukeno Oy Helsinki
Wansdronk Architektuur
University of Architecture, Civil Engineering and Geodesy
Environmental Protection Agency
Copenhagen Energy A/S
Danish Broadcast Corporation
Danish Building and Urban research
The Ecological Council
The Danish Centre for Urban Ecology
Boligforeningen 3B
FSB (Housing Association)
Period: 01/01/2003 → 31/12/2005
Number of participants: 1
Project participant:
Jensen, Jesper Ole (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 17,560,000.00 Danish Kroner

Project Practical Evaluation Tools for Urban Sustainability
Department of Civil Engineering
University of Architecture, Civil Engineering and Geodesy
Wansdronk Architektuur
Etukeno Oy Helsinki
Institut National des Sciences Appliquees de Lyon
Joanneum Research
Universite de Liege
Cardiff University
Period: 01/01/2003 → 31/12/2005
Number of participants: 1
Project participant:
Elle, Morten (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 17,560,000.00 Danish Kroner

Project Taumoses Legat - Cementbaserede materialer : Project 25566
Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/01/2003 → 01/01/2005
Number of participants: 2
Project ID: 25566
Project participant:
Kjeldsen, Ane Mette (Intern)
Project Manager, organisational:
Geiker, Mette Rica (Intern)

Financing sources
Source: Gaver, Private danske Fonde
Name of research programme: Gaver, Private danske Fonde
Amount: 100,000.00 Danish Kroner

**Beregning af U-værdier for bygningsdele til VIF's U-værdi tabel : U-værdi 2003**

Section for Building Physics and Services

Department of Civil Engineering

Varmesolering Foreningen

Period: 01/12/2002 → 30/10/2003

Number of participants: 5

Project ID: 25441

Project participant:
Rose, Jørgen (Intern)
Weitzmann, Peter (Intern)
Henriksen, Torben (Ekstern)
Petersen, Michael (Ekstern)

Project Manager, organisational:
Rode, Carsten (Intern)

**Financing sources**

Source: Indtægtsdækket virksomhed UK 90

Name of research programme: Indtægtsdækket virksomhed UK 90

Amount: 63,187.00 Danish Kroner


**Optimale vinduessystemer 2. fase, IEA-SHC task 27**

Department of Civil Engineering

Period: 19/11/2002 → 31/12/2003

Number of participants: 4

Project participant:
Nielsen, Toke Rammer (Intern)
Holck, Ole (Intern)
Rosenfeld, Jean (Intern)

Project Manager, organisational:
Svendsen, Svend (Intern)

**Financing sources**

Source: Forskningsprojekter - Miljø- og Energiministeriet

Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet

Amount: 430,000.00 Danish Kroner


**Ledelsesinnovationer i byggeriet**

Department of Civil Engineering


Number of participants: 6

Phd Student:
Simonsen, Rolf Bang (Intern)

Supervisor:
Bonke, Sten (Intern)

Main Supervisor:
Koch, Christian (Intern)

Examiner:
Clausen, Christian (Intern)
Borgbrant, Jan (Ekstern)
Gøth, Steffen (Ekstern)
Moisture related barriers to increased wood utilization: Understanding wood-water interactions in the cell wall

Section for Building Materials and Geotechnics

Department of Civil Engineering

Royal Veterinary and Agricultural University

Period: 01/11/2002 → 05/07/2008

Number of participants: 4

Contact person:

Engelsen, Søren Balling (Ekstern)

Felby, Claus (Ekstern)

Hoffmeyer, Preben (Intern)

Project participant:

Thygesen, Lisbeth Garbrecht (Intern)

Financing sources

Source: Forskningsrådene - STVF

Name of research programme: Forskningsrådene - STVF

Amount: 1,550,000.00 Danish Kroner

New Intermediary services and the transformation of urban water supply and wastewater disposal systems

Department of Civil Engineering

Institut für Regionalentwicklung und Strukturplanung

University of Newcastle upon Tyne

University of Salford

Panteion University of Athens

Metropolitan Research Institute

Urban Alternatives Association in Bulgaria

Period: 01/11/2002 → 31/10/2005

Number of participants: 3

Project participant:

Elle, Morten (Intern)

Nielsen, Susanne Balslev (Intern)

Hoffmann, Birgitte (Intern)

Financing sources

Source: Forsk. EU - Rammeprogram

Name of research programme: Forsk. EU - Rammeprogram

Amount: 1,380,000.00 Danish Kroner

Regulations and recommendations for separation between solar collector fluids and domestic water

Department of Civil Engineering

Bodycote Metealrs Testing Canada Inc.

Period: 16/10/2002 → 10/03/2003

Number of participants: 2

Project participant:

Shah, Louise Jivan (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 25,000.00 Danish Kroner

Causes of occupational accidents – an accident analysis tool
Section for Planning and Management of Building Processes
Department of Civil Engineering
Sectional Work Environment Council of Construction and Building
Bymusen - Digital kommunikation
Period: 01/10/2002 → 31/03/2004
Number of participants: 2
Project participant:
Nørnberg, Lise (Intern)
Project Manager, organisational:
Richter, Anne (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 424,481.00 Danish Kroner

Climate station in Sisimiut
Arctic Technology Centre, ARTEK
Department of Civil Engineering
ASIAQ Greenland Survey
Period: 01/10/2002 → 31/12/2003
Number of participants: 1
Project Manager, organisational:
Møller, Jacob Steen (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 250,000.00 Danish Kroner

Highly insulating and light transmitting aerogel glazing for super insulating windows
The objective of this European project is to investigate and develop highly insulating windows based on glazing with partly evacuated monolithic silica aerogel. The project involves three different main topics: 1) Material development (aerogel) and process optimization, 2) characterization of the aerogel material and the aerogel glazing and 3) application, i.e. glazing assembly and thermal optimization of total glazing solution. BYG-DTU is coordinating the project and is further responsible for the application part of the project. Main results are investigation of heat treatment of aerogels for improved optical quality and design and making of two test boxes for experimental investigation of outside condensation on highly insulating windows. Results have been presented at 7th International Symposium on Aerogels.

Section for Building Physics and Services
Department of Civil Engineering
Ecole des Mines de Paris
Produit Chimiques Auxiliaires et de Synthèses
Airglass AB

Norwegian University of Science and Technology

Lund Institute of Technology

Centre Scientifique et Technique du Bâtiment

Fraunhofer Gesellschaft

Period: 01/10/2002 → 01/12/2005
Number of participants: 11
Acronym: HILIT+
Project ID: ENK6-CT-2002-00648
Contact person:

Rigacci, Arnaud (Ekstern)
Chapot, Jean-Marie (Ekstern)
Gullberg, Leif (Ekstern)
Einarsrud, Mari-Ann (Ekstern)
Sundén, Bengt (Ekstern)
Nitz, Peter (Ekstern)

Project participant:
Schultz, Jørgen Munthe (Intern)
Kristiansen, Finn Harken (Intern)
Lund, Hans (Intern)

Chevalier, Bruno (Ekstern)

Project Manager, organisational:
Jensen, Karsten Ingerslev (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 3,962,000.00 Danish Kroner

Human response to Personalized Ventilation

Department of Mechanical Engineering

Department of Civil Engineering

Section for Indoor Environment

STVF

Period: 01/09/2002 → 30/11/2005
Number of participants: 1

Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Development of Air terminal Device with High Efficiency

Department of Energy Engineering

Department of Civil Engineering

Section for Indoor Environment

Period: 01/09/2002 → 31/12/2004
Number of participants: 1

Project Manager, organisational:
Melikov, Arsen Krikor (Intern)
Analyser til det nye grønlandske bygningsreglement

Section for Building Physics and Services

Department of Civil Engineering
Period: 01/09/2002 → 01/11/2002
Number of participants: 2
Project participant:
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 95,000.00 Danish Kroner

Accident prevention in construction companies – Safety culture and learning

Department of Civil Engineering

Danish Construction Association
Danish Work Environment Authority
Period: 01/08/2002 → 30/04/2004
Number of participants: 2
Project participant:
Pedersen, Elsebet Frydendal (Intern)
Project Manager, organisational:
Richter, Anne (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 1,582,800.00 Danish Kroner

Evaluering af udviklingsprojekt

Section for Building Physics and Services

Department of Civil Engineering
Period: 01/08/2002 → 30/11/2002
Number of participants: 1
Project ID: 25395
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90 KUP
Name of research programme: Indtægtsdækket virksomhed UK 90 KUP
Amount: 24,375.00 Danish Kroner

FRC-Steel Composite Bridge Deck

Department of Civil Engineering
Period: 01/08/2002 → 30/06/2006
Number of participants: 8
Phd Student:
Walter, Rasmus (Intern)
Supervisor:
Gimsing, Niels Jørgen (Intern)
Olesen, John Forbes (Intern)
Vejrum, Tina (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Täljsten, Björn (Intern)
Karihaloo, Bhushan (Ekstern)
Walraven, J. C. (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

**U-værditabel efter EU-standarder**
Section for Building Physics and Services
Department of Civil Engineering
Landsforeningen Økologisk Byggeri
Period: 01/08/2002 → 30/09/2002
Number of participants: 1
Project ID: 25388
Project Manager, organisational:
Rode, Carsten (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 58,000.00 Danish Kroner
Project

**BEST (Better Enterprise SysTem implementation)**
Section for Planning and Management of Building Processes
Department of Civil Engineering
Agence de la Productique
CEC Concurrent Engineering Consulting S.R.L.
Center for Technology and Innovation Management
Cranfield University
Fundación para el Desarrollo de la Ciencia y la Tecnología en Extremadura
Gedas United Kingdom Ltd.
Qualitech Experts Ltd
Norges Tekniske Hoegskole
University of Twente
XPert Technologies SA
COWI A/S

HTH Kekkener A/S
Period: 01/07/2002 → 30/11/2004
Number of participants: 1
Project ID: 25423
Project participant:
Buhl, Henrik (Intern)

**Financing sources**
Arbejdulykker og Sikkerhedskultur

Department of Civil Engineering
Risø National Laboratory for Sustainable Energy
Arbejdsmiljøinstituttet
Arbejdsmedicinsk Klinik
Period: 01/06/2002 → 01/01/2006
Number of participants: 1
Project Manager, organisational: Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 170,000.00 Danish Kroner

BEST (Better Enterprise SysTem implementation)

Department of Civil Engineering
Agence de la Productique
 Concurrent Engineering Consulting S.R.L.
 Center for Technology and Innovation Management
 Cranfield University
 Fundación para el Desarrollo de la Ciencia y la Tecnología en Extremadura
 Gedas United Kingdom Ltd.
 K.P.A. Kenett–Preminger Associates Ltd
 Qualitech Experts Ltd
 Norges Tekniske Hoegskole
 University of Twente
 XPert Technologies SA
 COWI A/S
 HTH Køkkener A/S
 Period: 01/06/2002 → 31/12/2004
 Number of participants: 2
 Project participant: Koch, Christian (Intern)
 Buhl, Henrik (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 1,500,000.00 Danish Kroner

Bestemmelse af de varmetekniske egenskaber af forsatsvinduer og gl. koblede vinduer – eksperimentelt og beregnet

Section for Building Physics and Services
Department of Civil Engineering

Raadvad, Nordisk center til bevarelse af håndværk
Period: 01/06/2002 → 01/11/2003
Number of participants: 4
Project ID: 25450
Project participant:
Kampmann, Thomas (Ekstern)
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)
Jensen, Claus Franceos (Intern)

Financing sources
Source: Samarb. Aftaler, Private danske - Andre virksomheder
Name of research programme: Samarb. Aftaler, Private danske - Andre virksomheder
Amount: 90,000.00 Danish Kroner

Ulykkesforebyggelse i byggevirksomheder
Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/06/2002 → 22/12/2004
Number of participants: 1
Project ID: 25364
Project participant:
Richter, Anne (Intern)

Financing sources
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Forsk. Andre statslige danske i øvrigt
Amount: 1,582,800.00 Danish Kroner

Improving the Quality of Existing Urban Building Envelopes : Cost action C-12
Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/05/2002 → 31/01/2005
Number of participants: 1
Project participant:
Engelmark, Jesper (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 100,000.00 Danish Kroner

Glued Connections in Timber Structures
Department of Civil Engineering
Period: 01/04/2002 → 31/03/2006
Number of participants: 1
Project ID: 25421
Project Manager, organisation:
Hoffmeyer, Preben (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,500,000.00 Danish Kroner

**Project**

**Arktisk lavenerghus i Sisimiut**

Department of Civil Engineering  
Period: 13/03/2002 → 31/12/2003  
Number of participants: 1  
Project participant:  
Møller, Jacob Steen (Intern)

**Financing sources**  
Source: Forsk. Private danske - Fonde  
Name of research programme: Forsk. Private danske - Fonde  
Amount: 5,000,000.00 Danish Kroner  

**Experimental and Computational Analysis of Flow Patterns at Inlet Devices of Solar Water Stores**

Department of Civil Engineering  
Period: 01/03/2002 → 29/02/2004  
Number of participants: 2  
Contact person:  
Jordan, Ulrike (Intern)  
Project Manager, organisational:  
Furbo, Simon (Intern)

**Financing sources**  
Source: Forsk. EU - Andre EU-midler  
Name of research programme: Forsk. EU - Andre EU-midler  
Amount: 1,087,200.00 Danish Kroner  

**Metoder til optimering på bygningsenergiområdet**

Department of Civil Engineering  
Period: 01/03/2002 → 09/03/2007  
Number of participants: 7  
Phd Student:  
Pedersen, Frank Ørbech (Intern)  
Supervisor:  
Behm, Benny (Intern)  
Nielsen, Hans Bruun (Intern)  
Main Supervisor:  
Svendsen, Svend (Intern)  
Examiner:  
Rode, Carsten (Intern)  
Christiansen, Edmund (Ekstern)  
Gustafsson, Stig-Inge (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

**Videniedelse i praksisfællesskaber i byggeproduktion**

Department of Civil Engineering  
Period: 01/03/2002 → 29/01/2007  
Number of participants: 5  
Phd Student:  
Thuesen, Christian (Intern)
Supervisor:
Møgelhøj, Torben (Ekstern)
Main Supervisor:
Koch, Christian (Intern)
Examiner:
Bonke, Sten (Intern)
Elkjær, Bente (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Barrierer for økologisk byggeri
Department of Civil Engineering
NIRAS A/S
Danish Building and Urban research
Period: 01/02/2002 → 30/09/2003
Number of participants: 2
Project participant:
Elle, Morten (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 50,000.00 Danish Kroner

Arbejdsmiljøudvikling i vidensintensive virksomheder
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/01/2002 → 01/10/2005
Number of participants: 1
Project ID: 25367
Project participant:
Buser, Martine (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 200,000.00 Danish Kroner

Diffusion og forankring af produktinnovationer i Renovering
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/01/2002 → 01/10/2005
Number of participants: 2
Project ID: 25381
Project participant:
Simonsen, Rolf Bang (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Ingeniørgeologi for kvartære aflejringer i Grønland med speciel vægt på hydrologi og geoteknik

Department of Civil Engineering
Period: 01/01/2002 → 23/10/2007
Number of participants: 4
Phd Student:
Clausen, Helle (Intern)
Supervisor:
Baumgartner, Francois (Intern)
Villumsen, Ane (Intern)
Main Supervisor:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Centerfinansieret
Project: PhD

Kompetence og kvalifikationsprofiler for den moderne byggeproduktionsingeniør

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/01/2002 → 01/10/2005
Number of participants: 2
Project ID: 25382
Project participant:
Gottlieb, Stefan (Ekstern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 123,600.00 Danish Kroner
Project

Limfjordskollegiet

Section for Planning and Management of Building Processes

Department of Civil Engineering

Aalborg University
Period: 01/01/2002 → 01/01/2003
Number of participants: 1
Project participant:
Bonke, Sten (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 100,000.00 Danish Kroner
Project

Measurement and evaluation of energy consumption and indoor thermal comfort in Rockwool International A/S low energy office building "Building 2000"
Continued measurements and evaluation of energy consumption and indoor thermal environment in Rockwool International low energy office building.
**New Window Framing Technologies for Aerogel and Other Highly Insulating Glazing**

The objective of this European project is to develop framing systems with a heat loss coefficient matching the best glazing solutions on the market, i.e. a heat loss coefficient of approximately 0.5 W/m2K. The works has been concentrated on identifying the critical parts in the frame and develop new designs and ideas to overcome these. BYG-DTU is responsible for the detailed thermal simulations needed for evaluation of new ideas and materials. Main result is a working document describing in detail the heat flow patterns in complex window frames and identifying the weak parts.
Name of research programme: Forsk. EU - Rammeprogram
Amount: 2,702,500.00 Danish Kroner
Project

Pensionistordning Liste 1 §5 og §8 : Kontrol med energikonsulenters behandling af vinduessager.

Section for Building Physics and Services
Department of Civil Engineering
Raadvad, Nordisk center til bevarelse af håndværk

Energistyrelsen
Period: 01/01/2002 → 01/12/2002
Number of participants: 4
Project ID: 25366
Project participant:
Svendsen, Svend (Intern)
Jensen, Claus Franceos (Intern)
Kampmann, Thomas (Ekstern)
Project Manager, organisational:
Fox, Sergio (Ekstern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 25,000.00 Danish Kroner
Project

Praktisk U-værdi samt fastlæggelse af korrektionsfaktorer for isoleringsevne/U-værdi ved praktisk udførelse af isolering af bygningskonstruktioner med alternativ/økologisk isolering

Section for Building Physics and Services
Department of Civil Engineering
Teknologisk Institut
Period: 01/01/2002 → 30/06/2004
Number of participants: 3
Project ID: 25385
Project participant:
Holck, Ole (Intern)
Olsen, Lars (Ekstern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Forskningsprojekter - Erhvervsministeriet
Name of research programme: Forskningsprojekter - Erhvervsministeriet
Amount: 413,000.00 Danish Kroner
Project

Selvkompakterende betons formfyldning

Department of Civil Engineering
Period: 01/01/2002 → …
Number of participants: 9
Phd Student:
Thrane, Lars Nyholm (Intern)
Supervisor:
Glavind, Mette (Ekstern)
Skov, Jørgen (Ekstern)
Stang, Henrik (Intern)
Szabo, Peter (Intern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Jensen, Ole Mejhlede (Intern)
Banfill, Phillip Frank Gower (Ekstern)
Jensen, Per Fogh (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Sikkerhedskultur og arbejdssulykker
Department of Civil Engineering
Herning Sygehus
Period: 01/01/2002 → 01/01/2005
Number of participants: 1
Project ID: 25447
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 480,000.00 Danish Kroner
Project

Theory and Application of the Electromagnetic Induction Geophysical Method in the Arctic Region West Greenland
Department of Civil Engineering
Period: 01/01/2002 → 02/02/2006
Number of participants: 5
Phd Student:
Ingeman-Nielsen, Thomas (Intern)
Supervisor:
Baumgartner, Francois (Intern)
Main Supervisor:
Villumsen, Arne (Intern)
Examiner:
Rasmussen, Thorkild M. (Ekstern)
Dahlin, Torleif (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

The potential of Larch for exterior use
Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/01/2002 → 31/12/2005
Number of participants: 1
Project ID: 25490
Project Manager, organisational:
Hoffmeyer, Preben (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 150,000.00 Danish Kroner

Project

Translucent isolerende klimaskærm: Målinger og beregninger af et bygningselement med honeycomb.

Section for Building Physics and Services

Department of Civil Engineering
Period: 01/01/2002 → 01/07/2002
Number of participants: 3
Project participant:
Holck, Ole (Intern)
Kragh, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 245,000.00 Danish Kroner

Project

Ulykkesforebyggelse i byggevirksomheder - Sikkerhedskultur og læringsbaserede forebyggelsesværktøjer

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/01/2002 → 01/01/2003
Number of participants: 3
Project ID: 24364
Project participant:
Pedersen, Elsebet Frydendal (Intern)
Richter, Anne (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 1,582,800.00 Danish Kroner

Project

Værktøjer til byggeledelse i nye organisationsformer på byggepladsen

Department of Civil Engineering
Period: 01/01/2002 → 06/02/2007
Number of participants: 2
Phd Student:
Marton, Judith (Intern)
Main Supervisor:
Koch, Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Project

Værktøj til analyse af årsager til ulykker

Section for Planning and Management of Building Processes

Department of Civil Engineering
BAR Bygge & Anlæg
Period: 01/01/2002 → 01/01/2003
Number of participants: 2
Project ID: 25425
Project participant:
Nørnberg, Lise (Intern)
Project Manager, organisational:
Richter, Anne (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 262,000.00 Danish Kroner

Copenhagen City Ring - Heat transmission tunnel: Tunneling in limestone
Department of Civil Engineering
COWI Consultants A/S
Period: 11/12/2001 → 31/12/2009
Number of participants: 3
Project ID: 25374
Contact person:
Foged, Niels Nielsen (Intern)
Project participant:
Søren D. Eskesen (Ekstern)
Project Manager, organisational:
Peter G. Jackson (Ekstern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 23,700.00 Danish Kroner

Efficiencies of boilers/burners in one family houses
Department of Civil Engineering
Danish Gas Technology Centre A/S
Danish Technological Institute
By og Byg
Period: 07/12/2001 → 28/02/2004
Number of participants: 5
Project participant:
Shah, Louise Jivan (Intern)
Frederiksen, Karsten Vinkler (Ekstern)
Christiansen, Christian (Ekstern)
Aggerholm, Søren (Ekstern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 211,900.00 Danish Kroner

Engineering Geological expert evaluation and Rock Mechanical Properties
Section for Building Materials and Geotechnics

Department of Civil Engineering

COWI A/S
Period: 01/12/2001 → 31/12/2004
Number of participants: 2
Project ID: 25374
Project participant:
Jackson, Peter Graham (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 280,000.00 Danish Kroner

Project

Kedeleffektiviteter i enfamiliehuse
Department of Civil Engineering

TI

Danish Gas Technology Centre A/S
Period: 01/12/2001 → 31/03/2003
Number of participants: 1
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 211,900.00 Danish Kroner

Project

New liquid crystal smart window and its production process
The objective of this European project is to investigate and develop windows with liquid crystal layers offering the possibility to control the solar energy transmittance of window glazing. BYG-DTU is coordinating the project and is further responsible for component measurements. Main results are measured spatial distribution of light and solar transmittance on different control situations for the glazing.

Section for Building Physics and Services

Department of Civil Engineering

CEMES - CNRS
Polymage
Duna Design S.A.
Bartenbach LichtLabor GmbH
Centre Scientifique et Technique du Bâtiment
UMR-CNRS 6622, Physique de la Matier Condensee
Period: 01/12/2001 → 24/01/2005
Number of participants: 9
Acronym: SMARTWIN II
Project ID: ENK6-CT2001-00549
Contact person:
Mitov, Michel (Ekstern)
Gandolfo, Viviane (Ekstern)
Solé, Josep (Ekstern)
Solar heating utilization in Latvia
Department of Civil Engineering
Esbensen Consultants A/S
Period: 21/11/2001 → 31/12/2004
Number of participants: 3
Project participant:
Shah, Louise Jivan (Intern)
Vejen, Niels Kristian (Intern)
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forsk. EU - Rammeprogram
Name of research programme: Forsk. EU - Rammeprogram
Amount: 2,015,500.00 Danish Kroner
Project

Solvarmeudnyttelse i Letland
Department of Civil Engineering
Esbensen Rådgivende Ingeniører A/S
Period: 21/11/2001 → 31/12/2004
Number of participants: 2
Contact person:
Furbo, Simon (Intern)
Project participant:
Shah, Louise Jivan (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energim ministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energim ministeriet
Amount: 280,000.00 Danish Kroner
Project

Forbedring af Arbejdsmiljøet med new office og vidensledelse
Department of Civil Engineering
Period: 01/11/2001 → 31/01/2003
Number of participants: 3
Project ID: 25367
Project participant:
Buser, Martine (Intern)
Bendixen, Mads (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

**Financing sources**
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 200,000.00 Danish Kroner
Project

Forbedring af Arbejdsmiljøet med new office og vidensledelse
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/11/2001 → 31/07/2004
Number of participants: 3
Project ID: 25367
Project Manager, organisational: Koch, Christian (Intern)
Buser, Martine (Intern)
Bendixen, Mads (Intern)

**Financing sources**
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 200,000.00 Danish Kroner
Project

Ulykkesforebyggelse I forbindelse med nedbrydningsarbejde
Section for Planning and Management of Building Processes
Department of Civil Engineering
DEMEX AB
Dansk Byggeri
Arbejdstilsynet
Period: 01/11/2001 → 15/01/2004
Number of participants: 1
Project ID: 25348
Project Manager, organisational: Christensen, Knud (Intern)

**Financing sources**
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Forsk. Andre statslige danske i øvrigt
Amount: 496,360.00 Danish Kroner
Project

WINDAT, Windows as Renewable Energy Sources for Europe – Window Energy Data Network
Section for Building Physics and Services
Department of Civil Engineering
Period: 30/10/2001 → 31/05/2004
Number of participants: 3
Project ID: 25322
Project Manager, organisational:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)
Pedersen, Frank Ørbech (Intern)

**Financing sources**
EWERS, European Window Energy Rating System

Department of Civil Engineering
Period: 24/10/2001 → 25/02/2003
Number of participants: 2
Project ID: 25323
Project participant:
Jensen, Claus Franceos (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 340,000.00 Danish Kroner

Marstal følgeprojekt til EU-projekt om udvidelse af solvarmecentralen i Marstal

Section for Building Physics and Services

Teknologisk Institut
Period: 21/10/2001 → 31/12/2002
Number of participants: 1
Project Manager, organisational:
Heller, Alfred (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 380,000.00 Danish Kroner

Casestudier i brugen af projektweb

Department of Civil Engineering

NCC
Period: 15/10/2001 → 01/04/2003
Number of participants: 1
Project Manager, organisational:
Christensen, Knud (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 250,000.00 Danish Kroner

Planlægning af ulykkesforebyggelse ved nedbrydningsarbejde : – udvikling af en praktisk anvendelig risikovurderingsmetode

Department of Civil Engineering

Golder Associates A/S
Dansk Byggeri
Arbejdstilsynet
Period: 15/10/2001 → 15/01/2004
Number of participants: 1
Project Manager, organisational:
Christensen, Knud (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 491,448.00 Danish Kroner

Stimulering af udviklingen af bedre nye vinduer
Section for Building Physics and Services
Department of Civil Engineering
Period: 08/10/2001 → 30/06/2003
Number of participants: 3
Project ID: 25366
Project participant:
Laustsen, Jacob Birck (Intern)
Jensen, Claus Franceos (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 300,000.00 Danish Kroner

Aktiviteter vedr. udvikling af plastliner til sæsonvarmelagre
Department of Civil Engineering
Teknologisk Institut
John Hunderup A/S
Period: 02/10/2001 → 31/12/2002
Number of participants: 0

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 100,000.00 Danish Kroner

Elektrodialytisk fjernelse af tungmetaller fra havneslam
Department of Civil Engineering
Period: 01/10/2001 → 23/03/2005
Number of participants: 6
Phd Student:
Kirkelund, Gunvor Marie (Intern)
Supervisor:
Villumsen, Anne (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Mortensen, John (Ekstern)
Calmano, Wolfgang (Ekstern)
Ledin, Anna (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: Centerfinansieret
Project: PhD

Study of Project Web Usage
Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/10/2001 → 31/08/2002
Number of participants: 1
Project ID: 25318
Project Manager, organisational:
Christensen, Knud (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 350,000.00 Danish Kroner

4-etagers boligbyggeri ved Sana i Nuuk: Forundersøgelse ved hjælp af multi-elektrode profilering
Department of Civil Engineering
Arctic Technology Centre
ASIAQ - Grønlands Forundersøgelser
Period: 17/09/2001 → 31/01/2002
Number of participants: 2
Project ID: 25370
Contact person:
Jørgensen, Anne Mette (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Sam.arb.aftaler - Udenlandske offentlige og private
Name of research programme: Sam.arb.aftaler - Udenlandske offentlige og private
Amount: 65,000.00 Danish Kroner

Solar heating research by VELUX visiting professor Peter Allen
Department of Civil Engineering
Period: 13/09/2001 → 31/12/2001
Number of participants: 1
Project Manager, organisational:
Allen, Peter (Intern)

Financing sources
Source: Forsk. Private danske - Fonde
Name of research programme: Forsk. Private danske - Fonde
Amount: 177,033.00 Danish Kroner

Effect of Prestressing in Brittle Elements of Concrete and masonry
Department of Civil Engineering
Period: 01/09/2001 → 31/03/2006
Number of participants: 6
Phd Student:
Xibin, Xu (Ekstern)
Supervisor:
Zhenglin, Wang (Ekstern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Täljsten, Björn (Intern)
Chen, Ganwei (Ekstern)
Skeptrup, Erik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Friplads
Project: PhD

Holostic Approach to Tropical Building
Department of Civil Engineering
Period: 01/09/2001 → 30/04/2007
Number of participants: 2
Phd Student:
Reimann, Gregers Peter (Intern)
Main Supervisor:
Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Ringprøve/samkalibrering af vanddamp permeabilitetsmålinger iht. EN-ISO 12572
Section for Building Materials and Geotechnics

Norges Byggforskningsinstitutt
Number of participants: 1
Project ID: 25331
Project participant:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 15,633.00 Danish Kroner
Project

Evaluering af forsøg med tværfaglighed og medbestemmelse på byggepladser
Department of Civil Engineering
Period: 01/08/2001 → 01/07/2004
Number of participants: 3
Project ID: 25353
Project participant:
Marton, Judith (Intern)
Buhl, Henrik (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Evaluering af forsøg med tværfaglighed og medbestemmelse på byggepladser

Department of Civil Engineering
Period: 01/08/2001 → 31/07/2004
Number of participants: 3
Project ID: 25353
Project participant:
Marton, Judith (Intern)
Buhl, Henrik (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 200,160.00 Danish Kroner

Forebyggelse af arbejdssulykker i bygge og anlæg: Afdækning af årsager til ulykker

Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/08/2001 → 01/06/2002
Number of participants: 3
Project ID: 25372
Project participant:
Pedersen, Elsebet Frydendal (Intern)
Koch, Christian (Intern)
Project Manager, organisational:
Richter, Anne (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 381,250.00 Danish Kroner

Forebyggelse af arbejdssulykker i bygge og anlæg – Afdækning af årsager til ulykker

Section for Planning and Management of Building Processes
Department of Civil Engineering
BAR Bygge & Anlæg
Period: 01/08/2001 → 01/06/2002
Number of participants: 3
Project ID: 25372
Project participant:
Pedersen, Elsebet Frydendal (Intern)
Koch, Christian (Intern)
Project Manager, organisational:
Richter, Anne (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 381,250.00 Danish Kroner

From Process to Product: Comparing Quality in Social House Building in Europe

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/08/2001 → 01/08/2002
Number of participants: 2
Project ID: 25152
Project Manager, organisational:
Bonke, Sten (Intern)
Pedersen, Elsebet Frydendal (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 60,000.00 Danish Kroner

Kombinerede solvarmeanlæg til nemvarme og opvarmning af brugsvand

Department of Civil Engineering
Period: 01/08/2001 → 15/08/2007
Number of participants: 4
Phd Student:
Andersen, Elsa (Intern)
Main Supervisor:
Furbo, Simon (Intern)
Examiner:
Karlsson, Björn Olof Harry (Ekstern)
Vajen, Klaus (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Planning of Accident Prevention in connection with Demolition Work

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/08/2001 → 30/09/2002
Number of participants: 2
Project ID: 25348
Project participant:
Trap, Niels (Ekstern)
Project Manager, organisational:
Christensen, Knud (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 100,000.00 Danish Kroner

Assistanceordning for solvarmebranchen

Department of Civil Engineering
Period: 05/07/2001 → 31/08/2002
Number of participants: 1
Project participant:
Furbo, Simon (Intern)
**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 400,000.00 Danish Kroner
Project

Prøvestand til solvarme-kombisystemer
Department of Civil Engineering
Period: 05/07/2001 → 31/12/2002
Number of participants: 1
Project participant:
Furbo, Simon (Intern)

**Financing sources**
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 193,000.00 Danish Kroner
Project

Durability of Concrete Produced from White Portland Cement Subjected to Chemical Attack
Department of Civil Engineering
Period: 01/07/2001 → 24/08/2004
Number of participants: 4
Phd Student:
Nielsen, Erik Pram (Intern)
Supervisor:
Herfort, Duncan (Ekstern)
Main Supervisor:
Geiker, Mette Rica (Intern)
Examiner:
Glasser, Fredrik Paul (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

**Improvement of Fatigue Life of Welded Structures by Grinding**
The main purpose of this project is to study the possibilities for increasing the fatigue life of welded steel structures by post-weld treatment (grinding). The results obtained at the moment indicate that considerable increases in fatigue life may be obtained by use of these methods. In the project, the fatigue life is primarily determined by experimental investigations. The project is a part of a common Nordic research project: FE-Design 2003, "Bättre utnyttjande av høghållfast stål genom framtagning av rationell dimensioneringsteknik før komplexa svetsade strukturer".

Section for Structural Engineering
Department of Civil Engineering
Norwegian University of Science and Technology
KTH - Royal Institute of Technology
MAN B&W Diesel A/S
Volvo CE
Period: 01/07/2001 → 31/12/2005
Number of participants: 1
Project participant:
Agerskov, Henning (Intern)

**Financing sources**
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 458,000.00 Danish Kroner
Project

START-program: EU's 5. rammeprogram, ansøgning, Thematic Network
Department of Civil Engineering
Period: 28/06/2001 → 31/12/2001
Number of participants: 1
Project participant:
Heller, Alfred (Intern)

Financing sources
Source: Forskningsrådene - STVF
Name of research programme: Forskningsrådene - STVF
Amount: 100,000.00 Danish Kroner
Project

Arktisk solenergisymposium
Department of Civil Engineering
Arctic Technology Centre
Period: 25/06/2001 → 18/12/2001
Number of participants: 1
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 240,000.00 Danish Kroner
Project

Sekretariatsbistand, bygninger : Carsten Rode
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/06/2001 → 31/12/2001
Number of participants: 1
Acronym: EFP2002
Project ID: 25013
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 32,925.00 Danish Kroner
Project

Solvareanlæg til Herlev Huse
Section for Building Physics and Services
Department of Civil Engineering
Duer Rådgivende Ingeniører A/S
Period: 01/06/2001 → 31/03/2002
Number of participants: 1
Project participant:
Furbo, Simon (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Termoaktive konstruktioner til hybrid opvarmning og køling af kontorhuse

Section for Building Physics and Services

Department of Civil Engineering

COWI A/S

Teknologisk Institut

Period: 01/06/2001 → 01/03/2002

Number of participants: 3

Project ID: 25319

Weitzmann, Peter (Intern)
Jacobsen, Trine (Ekstern)

Project Manager, organisational:

Hummelshøj, Reto Michael (Ekstern)

Financing sources

Source: Forsk. Andre statslige danske i øvrigt

Name of research programme: Forsk. Andre statslige danske i øvrigt

Amount: 38,000.00 Danish Kroner

Elasticitet og styrke af tegl og mørtel

Department of Civil Engineering

Period: 01/05/2001 → ...

Number of participants: 7

Phd Student:

Findsen, Karsten (Intern)

Supervisor:

Bøgh, Søren (Ekstern)
Feddersen, Bent (Ekstern)

Main Supervisor:

Nielsen, Mogens Peter (Intern)

Examiner:

Hansen, Lars Pilegaard (Ekstern)
Hagsten, Lars German (Intern)
Svensson, Eilif (Intern)

Financing sources

Source: Internal funding (public)

Name of research programme: Erhvervsforskerordningen

Project: PhD

2. ordens plasticitetsteori

Department of Civil Engineering

Period: 01/04/2001 → 10/06/2005

Number of participants: 6

Phd Student:

Gudmand-Høyer, Tim (Intern)

Supervisor:

Andreasen, Bent Steen (Ekstern)

Main Supervisor:

Nielsen, Mogens Peter (Intern)

Examiner:
Stang, Henrik (Intern)
Hoang, Linh Cao (Intern)
Sanjayan, Jay G. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Beslutningsstøtte til vidensledelse i projektering

Department of Civil Engineering
Birch & Krogboe A/S
Period: 01/04/2001 → 01/07/2002
Number of participants: 1
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 174,000.00 Danish Kroner
Project

Beslutningsstøtte til vidensledelse i projektering

Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/04/2001 → 31/07/2002
Number of participants: 2
Project ID: 25268
Project participant:
Simonsen, Rolf Bang (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 174,000.00 Danish Kroner
Project

Konstruktioner af skøre materialer

Department of Civil Engineering
Period: 01/04/2001 → …
Number of participants: 7
Phd Student:
Hansen, Lars Zenke (Intern)
Supervisor:
Andreasen, Bent Steen (Ekstern)
Bøgh, Søren (Ekstern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Hansen, Lars Pilegaard (Ekstern)
Hagsten, Lars German (Intern)
Hansen, Klavs Feilberg (Ekstern)

Financing sources
Forsøgsbygninger med nye typer klimaskærmkonstruktioner
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/03/2001 → 31/12/2003
Number of participants: 1
Project ID: BYG.DTU 25067
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 1,302,000.00 Danish Kroner

Translucent isolerende klimaskærm
Section for Building Physics and Services
Department of Civil Engineering
H.S. Hansen A/S
Period: 05/02/2001 → 05/03/2003
Number of participants: 3
Project ID: 25257
Project participant:
Holck, Ole (Intern)
Graversen, Niels J. (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 282,000.00 Danish Kroner

Joint use of Ground Penetrating Radar and Geoelectricity, and its Application in Arctic environment, Greenland
Department of Civil Engineering
Period: 01/02/2001 → 31/05/2002
Number of participants: 3
Phd Student:
Delapierre, André (Intern)
Supervisor:
Baumgartner, Francois (Intern)
Main Supervisor:
Villumsen, Arne (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Simuleringsmodel af bygninger med bygningsintegrerede varme- og kølesystemer
Department of Civil Engineering
Period: 01/02/2001 → 16/11/2004
Number of participants: 5

**Phd Student:**
Weitzmann, Peter (Intern)

**Main Supervisor:**
Svendsen, Svend (Intern)

**Examiner:**
Olesen, Bjarne W. (Intern)
Jóhannesson, Gudni (Ekstern)
Olsen, Lars (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

**Malmö City Tunnel: Engineering Geological expert evaluation and Rock Mechanical**
Engineering Geological expert evaluation and Rock Mechanical of Limestone related to tunneling for the Malmö City Railway

Section for Building Materials and Geotechnics
Department of Civil Engineering

COWI A/S
Period: 12/01/2001 → 03/04/2003
Number of participants: 4
Contact person:
Jackson, Peter G. (Ekstern)
Project participant:
Salomonsen, Inger (Ekstern)
Steenfelt, Jørgen S. (Ekstern)
Project Manager, organisational:
Foged, Niels Nielsen (Intern)

**Financing sources**
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 280,000.00 Danish Kroner
Project

**Casestudier i brugen af projektweb**
Department of Civil Engineering

NCC
Period: 01/01/2001 → 01/01/2002
Number of participants: 2
Project ID: 25318
Contact person:
Andresen, Jan L. (Intern)
Project Manager, organisational:
Christensen, Knud (Intern)

**Financing sources**
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 350,000.00 Danish Kroner
Project

**Energitigt gulvvarme til BR2005**
Department of Civil Engineering
Teknologisk Institut
TherniSol A/S
Period: 01/01/2001 → 01/01/2003
Number of participants: 5
Project participant:
Weitzmann, Peter (Intern)
Kragh, Jesper (Intern)
Olsen, Lars (Ekstern)
Laursen, Bjørn Møller (Ekstern)

Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 598,000.00 Danish Kroner

Etablering af udstyr til karakterisering af solafskærmninger
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/01/2001 → 25/02/2003
Number of participants: 2
Project ID: 25201
Project participant:
Svendsen, Svend (Intern)
Rosenfeld, Jean (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,500,000.00 Danish Kroner

Harmonisering af grundlaget for beregning af energetilskuddet fra vinduer
Department of Civil Engineering
Period: 01/01/2001 → 01/01/2003
Number of participants: 2
Project ID: 25375
Project participant:
Nielsen, Toke Rammer (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 140,000.00 Danish Kroner

IEA Task 26 Solar Combi Systems
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/01/2001 → 31/12/2002
Number of participants: 1
Project participant:
Furbo, Simon (Intern)
Financing sources
Source: Forskningsprojekter - Miljø- og Energimisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimisteriet
Amount: 323,795.00 Danish Kroner
Project

Kompetence og kvalifikationsprofiler for den moderne byggeproduktionsingeniør

Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/01/2001 → 01/01/2002
Number of participants: 1
Project ID: 25382
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 122,600.00 Danish Kroner
Project

Kompetence og kvalifikationsprofiler for den moderne byggeproduktionsingeniør

Department of Civil Engineering
NCC
Period: 01/01/2001 → 01/01/2002
Number of participants: 2
Project ID: 25382
Project participant:
Thuesen, Christian (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 122,600.00 Danish Kroner
Project

SolEnergiCentret

Section for Building Physics and Services
Department of Civil Engineering
Period: 01/01/2001 → 31/12/2001
Number of participants: 1
Project participant:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimisteriet
Amount: 520,000.00 Danish Kroner
Project

Udvikling, optimering og projektering af nye typer klimaskærmskonstruktioner af betonelementer

Section for Structural Engineering
Department of Civil Engineering
Period: 01/01/2001 → 01/01/2003
Number of participants: 1
Project ID: 25308
Project participant: Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 693,000.00 Danish Kroner
Project

Udvikling, optimering og projekttering af nye typer klimaskærmskonstruktioner af betonelementer, der demontrerer opfyldelse af energikrav i BR2005

Section for Building Physics and Services

Department of Civil Engineering
Statens Byggeforskningsinstitut
Period: 01/01/2001 → 01/02/2004
Number of participants: 3
Project ID: 25308
Project participant:
Tommerup, Henrik M. (Intern)
Munch-Andersen, Jørgen (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 743,000.00 Danish Kroner
Project

Værdibaseret samarbejde i Limfjordskollegiet: Forsøgsprojekt under By- og Boligministeriets program 'Bygherrer skaber værdier'

Department of Civil Engineering
Period: 01/01/2001 → 01/05/2003
Number of participants: 1
Project Manager, organisational:
Bonke, Sten (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 100,000.00 Danish Kroner
Project

Værdibaseret samarbejde i Limfjordskollegiet: Forsøgsprojekt under Erhvervs- og Bolig Styrelsens program 'Bygherrer skaber værdier'

Department of Civil Engineering
Period: 01/01/2001 → 01/05/2003
Number of participants: 1
Project ID: 25448
Project Manager, organisational:
Bonke, Sten (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 100,000.00 Danish Kroner
**Environmental indicators for Buildings and Groups of Buildings**

Department of Civil Engineering  
Period: 01/12/2000 → 22/10/2004  
Number of participants: 6  
PhD Student:  
Dammann, Sven (Intern)  
Supervisor:  
Hansen, Klaus (Ekstern)  
Main Supervisor:  
Eile, Morten (Intern)  
Examiner:  
Hoffmann, Birgitte (Intern)  
Kortman, Jaap (Ekstern)  
Mortensen, Peder Duelund (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Forskerakademiets Samfinansier  
Project: PhD

**Fugtfordeling i absorberende isoleringsmaterialer : Moisture distribution in absorbent insulation**

Section for Building Physics and Services  
Department of Civil Engineering  
Period: 01/12/2000 → 30/04/2003  
Number of participants: 5  
Project ID: 25.204  
Project participant:  
Peuhkuri, Ruut Hannele (Intern)  
Padfield, Tim (Intern)  
Hansen, Kurt Kielsgaard (Intern)  
Mortensen, Lone Hedegaard (Intern)  
Project Manager, organisational:  
Rode, Carsten (Intern)

**Financing sources**  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 138,412.00 Danish Kroner  
Project

**Overfladens betydning for varme- og fugtforhold i bygningers klimaskærm og de drift- og vedligeholdelsesmæssige konsekvenser heraf**

Department of Civil Engineering  
Period: 15/11/2000 → 26/03/2004  
Number of participants: 6  
PhD Student:  
Møller, Eva B. (Intern)  
Supervisor:  
Christoffersen, Lars D. (Intern)  
Main Supervisor:  
Rode, Carsten (Intern)  
Examiner:  
Hansen, Kurt Kielsgaard (Intern)  
Olsen, Lars (Intern)  
Sedlbauer, Klaus (Ekstern)
Financing sources
Source: Internal funding (public)
Name of research programme: Samarbejdsaftalenfor
Project: PhD

Ulykkesanalysemethode for Grafisk Branche
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/11/2000 → 30/04/2001
Number of participants: 3
Project ID: 25078
Project participant:
Engberg, Heidi (Intern)
Dyhrberg, Mette Bang (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam arb.aftaler, Private danske - Andre virksomheder
Amount: 134,460.00 Danish Kroner
Project

Ulykkesprojekt
Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/11/2000 → 01/07/2002
Number of participants: 3
Project ID: 25202
Project participant:
Richter, Anne (Intern)
Pedersen, Elsebet Frydendal (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam arb.aftaler, Private danske - Andre virksomheder
Amount: 483,000.00 Danish Kroner
Project

Generel understøttelse af virksomheders produktudvikling-FASE 2
Section for Building Physics and Services
Department of Civil Engineering
Period: 31/10/2000 → 25/02/2003
Number of participants: 5
Project ID: 25218
Project participant:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)
Jensen, Claus Franceos (Intern)
Kragh, Jesper (Intern)
Noyé, Peter Anders (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energimisteriet
Name of research programme: Forskningsprojekter - Miljø- og Energimisteriet
Klassifikation af ruder i energimæssig henseende – følsomhedsanalyse af metoden og tilføjelse af informationer om metoden i kompendierne om ruder og vinduers energimæssige egenskaber. FASE 2.

Section for Building Physics and Services

Department of Civil Engineering
Period: 31/10/2000 → 25/02/2003
Number of participants: 2
Project ID: 25216
Project participant:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 300,000.00 Danish Kroner

Udredning vedrørende energimærkning af forsatsvinduer, glasfacader og ovenlys

Section for Building Physics and Services

Department of Civil Engineering
Period: 31/10/2000 → 25/02/2003
Number of participants: 3
Project ID: 25215
Project participant:
Jensen, Claus Franceos (Intern)
Krath, Jesper (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 330,000.00 Danish Kroner

Videnshjemtagning og prøvning af højtemperatursolfangere

Department of Civil Engineering
Period: 19/10/2000 → 31/01/2002
Number of participants: 1
Project participant:
Heller, Alfred (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 180,000.00 Danish Kroner

Beregning af energibesparelse ved energirenovation af vinduer

Section for Building Physics and Services

Department of Civil Engineering
Period: 10/10/2000 → 25/02/2003
Number of participants: 2
Project ID: 25365
Project participant:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 100,000.00 Danish Kroner
Project

Centre of Education and Training in Renewable Energy and Energy Efficiency: USM - Malaysia

Department of Civil Engineering
Period: 30/09/2000 → 31/10/2004
Number of participants: 1
Acronym: CETREE
Project ID: 25333
Contact person:
Hoffmann, Birgitte (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 350,400.58 Danish Kroner
Project

Anwendung von bakteriellen extracellulären polymeren bei elektrodialytischem rennung von chromverunreinigter boden

Department of Civil Engineering
Period: 01/09/2000 → 06/04/2006
Number of participants: 6
Phd Student:
Jensen, Pernille Erland (Intern)
Supervisor:
Ahring, Birgitte Kær (Intern)
Main Supervisor:
Ottosen, Lisbeth M. (Intern)
Examiner:
Mortensen, John (Ekstern)
Hansen, Susanne Schiøtz (Ekstern)
Lynch, Rod (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnnet stipendie
Project: PhD

Improving Buildings Structural Quality by New Technologies: COST action C-12

Department of Civil Engineering
Period: 01/09/2000 → 31/01/2005
Number of participants: 1
Project participant:
Engelmark, Jesper (Intern)

Financing sources
Source: Forsk. EU - Andre EU-midler
Name of research programme: Forsk. EU - Andre EU-midler
Amount: 100,000.00 Danish Kroner
Investigation and Optimisation of Heat Storage Tanks for Low-Flow SDHW Systems

Department of Civil Engineering
Period: 01/09/2000 → 26/05/2004
Number of participants: 4
Phd Student:
Knudsen, Søren (Intern)
Main Supervisor:
Furbo, Simon (Intern)
Examiner:
Rode, Carsten (Intern)
Vajen, Klaus (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Elektrodialytisk rensning af forskellige tungmetalforurenede affaldstyper

Department of Civil Engineering
Period: 01/08/2000 → 19/10/2004
Number of participants: 5
Phd Student:
Christensen, Iben Vernegren (Intern)
Supervisor:
Ottosen, Lisbeth M. (Intern)
Main Supervisor:
Villumsen, Arne (Intern)
Examiner:
Helsen, Lieve Maria Louis (Ekstern)
Thygesen, Lisbeth Garbrecht (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samarbejdsaftalefinans
Project: PhD

Moisture Transport in Wood A Study of Physical-Mathematical Models and their Numerical Implementation

Department of Civil Engineering
Number of participants: 6
Phd Student:
Krabbenhøft, Kristian (Intern)
Supervisor:
Hoffmeyer, Preben (Intern)
Main Supervisor:
Damkilde, Lars (Intern)
Examiner:
Rode, Carsten (Intern)
Pettersson, Hans (Ekstern)
Ranta-Maunus, Alpo (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD
MTS 815 Rock Testing System: Temperature effects of water injection in oil reservoir rock

Section for Building Materials and Geotechnics

Department of Civil Engineering

Period: 01/08/2000 → 31/12/2002

Number of participants: 1

Project Manager, organisational:

Foged, Niels Nielsen (Intern)

Financing sources

Source: Sam.arb.aftaler, Private danske - Fonde
Name of research programme: Sam.arb.aftaler, Private danske - Fonde
Amount: 549,600.00 Danish Kroner

Project

MTS 815 Rock Testing System: Temperature effects of water injection in oil reservoir rock

MTS 815 was bought from the Norwegian Geotechnical Institute based on a donation from MÆRSK Olie og Gas. Moved from Building 373 to building 119 and reinstalled. Self financed costs budget 2003 50.000 DKK

Section for Building Materials and Geotechnics

Department of Civil Engineering

Period: 01/08/2000 → 31/12/2003

Number of participants: 1

Project Manager, organisational:

Foged, Niels Nielsen (Intern)

Financing sources

Source: Gaver, Private danske Andre private
Name of research programme: Gaver, Private danske Andre private
Amount: 500,000.00 Danish Kroner

Project

Modelling the effects of moisture and load history on the mechanical properties of wood.

Section for Planning and Management of Building Processes

Department of Civil Engineering

Period: 01/06/2000 → 31/12/2006

Number of participants: 1

Project ID: 25139

Project Manager, organisational:

Hoffmeyer, Preben (Intern)

Financing sources

Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 3,800,000.00 Danish Kroner

Project

New concretes through the addition of layer silicats

Section for Building Materials and Geotechnics

Department of Civil Engineering

De Nationale Geologiske Undersøgelser for Danmark og Grønland

Aarhus University

Dansk Beton Teknik A/S

Russian Academy of Sciences
Reliability of timber structures.
Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/06/2000 → 01/02/2003
Number of participants: 1
Project ID: 25269
Project Manager, organisational:
Hoffmeyer, Preben (Intern)
Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 3,000,000.00 Danish Kroner
Project

Undersøgelse af masseovnes termiske egenskaber
Section for Building Physics and Services
Department of Civil Engineering
Fornyet Energi ApS
Ovnbyggerlaug OLE
Period: 29/05/2000 → 31/12/2001
Number of participants: 1
Project Manager, organisational:
Heller, Alfred (Intern)
Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 50,000.00 Danish Kroner
Project

Assistanceordning vedrørende producenters energimærkning af ruder og vinduer
Section for Building Physics and Services
Department of Civil Engineering
Period: 28/05/2000 → 25/02/2003
Number of participants: 3
Project ID: 25075
Project Manager, organisational:
Svendsen, Svend (Intern)
Jensen, Claus Franceos (Intern)
Laustsen, Jacob Birck (Intern)
Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
**Vinduessystemer med dynamiske egenskaber**

Department of Civil Engineering  
Period: 19/05/2000 → 29/12/2003  
Number of participants: 3  
Project ID: 25074  
Project Manager, organisational:  
Svendsen, Svend (Intern)  
Duer, Karsten (Intern)  
Laustsen, Jacob Birck (Intern)

**Financing sources**

Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 350,000.00 Danish Kroner  
Project

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**Fugtteknisk grundlag for fastsættelse af designværdier for varmeledningsevnen**

Section for Building Physics and Services  
Department of Civil Engineering  
Danish Standards Association  
Period: 09/05/2000 → 31/10/2001  
Number of participants: 3  
Project ID: 25065  
Project participant:  
Rudbeck, Claus Christian (Intern)  
Dufour, Jørgen (Ekstern)

**Financing sources**

Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 290,000.00 Danish Kroner  
Project

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**De gode metoder**

Section for Planning and Management of Building Processes  
Department of Civil Engineering  
Period: 01/05/2000 → 28/02/2001  
Number of participants: 5  
Project ID: 25300  
Project participant:  
Engberg, Heidi (Intern)  
Tholander, Brit Frimer (Intern)  
Vogelius, Peter (Intern)  
Dyhrberg, Mette Bang (Intern)  
Koch, Christian (Intern)

**Financing sources**

Source: Sam.arb.aftaler, Private danske - Andre virksomheder  
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder  
Amount: 230,560.00 Danish Kroner  
Project
**Modellering af mekaniske og fysisk-kemiske egenskaber af plantefibre - kompositmaterialer med forbedrede egenskaber**

*Department of Civil Engineering*

**Period:** 01/05/2000 → 24/08/2004  
**Number of participants:** 8  
**Phd Student:**  
Madsen, Bo (Intern)  
**Supervisor:**  
Thomsen, Anne Belinda (Intern)  
Damkilde, Lars (Intern)  
Lilholt, Hans (Intern)  
**Main Supervisor:**  
Hoffmeyer, Preben (Intern)  
**Examiner:**  
Hansen, Kurt Kielsgaard (Intern)  
Berglund, Lars (Ekstern)  
Olesen, Per (Intern)

**Financing sources**

Source: Internal funding (public)  
Name of research programme: Forskningsrådsfinansiering  
Project: PhD

**Solvarme i Grønland**

*Section for Building Physics and Services*

*Department of Civil Engineering*

**Arctic Technology Centre**  
**Period:** 13/04/2000 → 17/12/2001  
**Number of participants:** 1  
**Project Manager, organisational:**  
Furbo, Simon (Intern)  
**Financing sources**

Source: Forsk. Andre offentlige og private - Nordiske  
Name of research programme: Forsk. Andre offentlige og private - Nordiske  
**Amount:** 5,000.00 Danish Kroner  
Project

**Teaching about energy**

*Section for Planning and Management of Building Processes*

*Department of Civil Engineering*

**Aarhus University**  
**Period:** 01/04/2000 → 30/04/2004  
**Number of participants:** 1  
**Project Manager, organisational:**  
Hoffmann, Birgitte (Intern)  
**Financing sources**

Source: Forskningsprojekter - Andre ministerier og styrelser  
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser  
**Amount:** 1,480,440.00 Danish Kroner  
Project

**Klassifikation af ruder i energimæssig henseende – følsomhedsundersøgelse af metoden og tilføjelse af informationer om metoden i kompendierne om ruder og vinduers energimæssige egenskaber. FASE 1**
Section for Building Physics and Services

Department of Civil Engineering
Period: 10/03/2000 → 01/09/2000
Number of participants: 2
Project ID: 25066
Project participant:
Svendsen, Svend (Intern)
Laustsen, Jacob Birck (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 150,000.00 Danish Kroner
Project

Displacement processes in fractured reservoir chalk

Department of Environmental Engineering
Section for Building Materials and Geotechnics
Department of Civil Engineering
Geotechnical Institute
De Nationale Geologiske Undersøgelser for Danmark og Grønland
COWI A/S
Period: 01/03/2000 → 31/12/2002
Number of participants: 2
Project ID: 25250
Contact person:
Foged, Niels Nielsen (Intern)
Project Manager, organisational:
Christensen, Helle Foged (Intern)

Financing sources
Source: Indtægtsdækket virksomhed UK 90
Name of research programme: Indtægtsdækket virksomhed UK 90
Amount: 800,000.00 Danish Kroner
Project

Centerkontrakt byggeklassifikation

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/02/2000 → 31/12/2002
Number of participants: 1
Project ID: 25162
Project Manager, organisational:
Howard, Robert (Intern)

Financing sources
Source: Sam.arb.aftaler - Statslige danske
Name of research programme: Sam.arb.aftaler - Statslige danske
Amount: 1,200,000.00 Danish Kroner
Project

Dybdeanalyse af tekniske, psykosociale og organisatoriske begivenheder førende til arbejdsulykker

Department of Civil Engineering
Period: 01/02/2000 → 15/07/2003
Number of participants: 7
Eksperimental og analytisk fugtdynamik i sammensatte bygningskonstruktioner

Department of Civil Engineering
Period: 01/02/2000 → 17/10/2003
Number of participants: 6
Phd Student:
Peuhkuri, Ruut Hannele (Intern)
Supervisor:
Hansen, Kurt Kielsgaard (Intern)
Main Supervisor:
Rode, Carsten (Intern)
Examiner:
Hjorslev Hansen, Morten (Intern)
Holm, Andreas (Intern)
Time, Berit (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Glacial konsolidering af polare moræneaflejringer

Department of Civil Engineering
Period: 01/02/2000 → 10/04/2003
Number of participants: 7
Phd Student:
Christoffersen, Poul (Intern)
Supervisor:
Piotrowski, Jan A. (Ekstern)
Tulaczyk, Slawek (Ekstern)
Main Supervisor:
Villumsen, Arne (Intern)
Examiner:
Reeh, Niels (Intern)
Hambrey, Michael J. (Ekstern)
Johnsen, Sigfús Jóhann (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD
Moisture based determination of the design value of thermal conductivity based on the declared values for thermal insulation materials in typical building constructions

The project is financed by the Danish Energy Agency’s programme on thermal insulation methods that are friendly both to the external environment and to the working environment. The purpose of the project is to create a basis for determining the practical thermal conductivity for insulation materials by taking into account the moisture that is found in building constructions under typical conditions. The determination of the practical thermal conductivity will mainly be based on theoretical calculations of heat and moisture conditions in selected building constructions. The method is developed for generic insulation materials, but will mainly be used to examine conditions in constructions with alternative insulation materials, e.g., cellulose fibre, sheep's wool, and flax, which by nature have a substantial amount of hygroscopic moisture. Determination of the practical thermal conductivity is of importance for the manufacturers of insulation materials, especially the alternative insulation materials.

Department of Buildings and Energy
Department of Civil Engineering

Danish Standard
Period: 01/02/2000 → 31/05/2000
Number of participants: 3
Project participant:
Rudbeck, Claus Christian (Intern)
Dufour, Jørgen (Ekstern)
Project Manager, organisational:
Rode, Carsten (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 130,000.00 Danish Kroner
Project

Vandinjektion og oliefortrængning i sprækkede reservoirbjærgarter

Department of Civil Engineering
Period: 01/02/2000 → 19/07/2005
Number of participants: 5
Phd Student:
Lykke, Miriam Mølgaard (Intern)
Main Supervisor:
Foged, Niels Nielsen (Intern)
Examiner:
Fabricius, Ida Lykke (Intern)
Engstrøm, Finn (Ekstern)
Graue, Arne (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Centerkontrakt Byggeklassifikation : Research on international experience and the future effects of IT.

Department of Civil Engineering

Teknologisk Institut
Period: 01/01/2000 → 01/01/2002
Number of participants: 1
Project ID: 25162
Project Manager, organisational:
Howard, Robert (Intern)

Financing sources
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Forsk. Andre statslige danske i øvrigt
Amount: 1,200,000.00 Danish Kroner

Generel understøttelse af virksomheders produktudvikling, FASE 1
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/01/2000 → 31/12/2001
Number of participants: 3
Project ID: 25068
Project participant:
Laustsen, Jacob Birck (Intern)
Noyé, Peter Anders (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 450,000.00 Danish Kroner

High performance hemp fibres and improved fibre network for composites (HeFiNaC)
Department of Civil Engineering
Period: 01/01/2000 → 01/06/2005
Number of participants: 1
Project ID: 25209
Project participant:
Møller, Jacob Steen (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 1,700,000.00 Danish Kroner

Lågkonstruktioner for damvarmelagre - Fase IV
Section for Building Physics and Services
Department of Civil Engineering
NIRAS A/S
Plastconsult
PlanEnergi
Rambøll Danmark A/S
Marstal VVS Holding Aps
Jakobsen & Blindkilde A/S
Period: 01/01/2000 → 31/12/2002
Number of participants: 1
Project participant:
Heller, Alfred (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 1,500,000.00 Danish Kroner
Master in Durability and Repair of Concrete Structures
Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/01/2000 → 01/01/2002
Number of participants: 2
Project participant:
Markeset, Gro (Ekstern)
Project Manager, organisational:
Geiker, Mette Rica (Intern)

Financing sources
Source: Gaver, Private danske Fonde
Name of research programme: Gaver, Private danske Fonde
Amount: 940,000.00 Danish Kroner

Structure-property relations for timber sawn from wind-damaged stems of Norway spruce
Department of Civil Engineering
Period: 01/01/2000 → 31/12/2004
Number of participants: 1
Project ID: 25140
Project Manager, organisational:
Hoffmeyer, Preben (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 800,000.00 Danish Kroner

Termisk karakterisering af PV-vinduer
Section for Building Physics and Services
Department of Civil Engineering
Teknologisk Institut
Period: 01/01/2000 → 11/06/2003
Number of participants: 3
Project participant:
Jacobsen, Trine Dalsgaard (Ekstern)
Schultz, Jørgen Munthe (Intern)
Project Manager, organisational:
Jensen, Søren Østergaard (Ekstern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 19,600.00 Danish Kroner

Transport Object Platform (TOP)
Department of Planning
Development and implementation of a GIS-based Transport Object Platform within the ARC/INFO environment.

Department of Civil Engineering
Atkins Denmark A/S
Period: 01/01/2000 → 31/12/2001  
Number of participants: 1  
Project Manager, organisational: Nielsen, Otto Anker (Intern)  

**Solvarmeanlæg ved biomassefyrede fjernvarmecentraler**  
Section for Building Physics and Services  
Department of Civil Engineering  
Rambøll Danmark A/S  
Jørgen Bladt A/S  
Period: 21/12/1999 → 31/10/2001  
Number of participants: 1  
Project Manager, organisational: Heller, Alfred (Intern)  

**Financing sources**  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 400,000.00 Danish Kroner  

Optimale vinduesystemer, IEA-SHC-task 27  
Department of Civil Engineering  
Period: 15/12/1999 → 31/01/2003  
Number of participants: 4  
Project participant: Nielsen, Toke Rammer (Intern)  
Holck, Ole (Intern)  
Rosenfeld, Jean (Intern)  
Project Manager, organisational: Svendsen, Svend (Intern)  

**Financing sources**  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 1,269,000.00 Danish Kroner  

Danish/Swiss research cooperation on solar heating  
Department of Civil Engineering  
SPF  
Period: 08/12/1999 → 31/08/2001  
Number of participants: 1  
Project participant: Furbo, Simon (Intern)  

**Financing sources**  
Source: Forskningsprojekter - Miljø- og Energiministeriet  
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet  
Amount: 430,000.00 Danish Kroner  

Anvendelse af kompositmaterialer i byggeriet  
Department of Civil Engineering
Period: 01/12/1999 → 01/05/2006
Number of participants: 6
Phd Student:
Andersen, Birte Møller (Intern)
Supervisor:
Borchersen, Egil (Intern)
Main Supervisor:
Engelmark, Jesper (Intern)
Examiner:
Hertz, Kristian Dahl (Intern)
Dahl, Torben (Ekstern)
Vanggård, Ole (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

Bygningsintegreret varmeagring af solvarme i terrændæk
Section for Building Physics and Services
Department of Civil Engineering
Period: 01/12/1999 → 31/05/2001
Number of participants: 3
Project ID: 25722
Project participant:
Weitzmann, Peter (Intern)
Holck, Ole (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 407,000.00 Danish Kroner
Project

Forbedring af arbejdsmiljøet med tværgående informationsteknologi og virtuelle produktionsgrupper
Department of Civil Engineering
Period: 01/11/1999 → 31/07/2002
Number of participants: 4
Project ID: 25163
Project participant:
Richter, Anne (Intern)
Buhl, Henrik (Intern)
Nørnberg, Lise (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Erhvervsministeriet
Name of research programme: Forskningsprojekter - Erhvervsministeriet
Amount: 747,600.00 Danish Kroner
Project

Forbedring af arbejdsmiljøet med tværgående informationsteknologi og virtuelle produktionsgrupper: Arbejdsministeriets handlingsplan 1999-s sundhedsfremmende arbejdsmiljøinitiativer
Section for Planning and Management of Building Processes
Revnedannelse i betonkonstruktioner under hærdefasen

Department of Civil Engineering
Period: 01/09/1999 → 24/10/2003
Number of participants: 7
PhD Student:
Østergaard, Lennart (Intern)
Supervisor:
Damkilde, Lars (Intern)
Lange, David Albert (Ekstern)

Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Brincker, Rune (Intern)
Karihaloo, Bhushan (Ekstern)
Svensson, Eilif (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Evaluation of KFB's Public Transport Research Program
The project, which is carried out together with COWI, consists in an evaluation of a major Swedish research program. Evaluation method: Questionnaire to all project leaders, in depth interviews with a group project leaders, statistical and qualitative evaluation of the entire program.

Department of Planning
Department of Civil Engineering
Period: 01/08/1999 → 31/12/1999
Number of participants: 2
Project participant:
Denver, Lene (Ekstern)
Project Manager, organisational:
Jørgensen, N O (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 50,000.00 Danish Kroner
Project
**Måleprogram, jordslangeiølager i Marstal**

Section for Building Physics and Services

Department of Civil Engineering

Marstal Fjernvarme A/S

PlanEnergi

Period: 21/06/1999 → 31/10/2001

Number of participants: 1

Project Manager, organisational:

Heller, Alfred (Intern)

**Financing sources**

Source: Forskningsprojekter - Miljø- og Energiministeriet

Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet

Amount: 100,000.00 Danish Kroner

**Project**

Large low flow solar heating system with a smart solar tank and pump

A large solar heating system based on two sections, one facing west and one facing east, will be built at "Sundparken" in Helsingør. Each section will have a collector area of 168 m². The solar tank will be a 10000 l with three different stratification manifold arrangements. These arrangements are designed in such a way that the thermal stratification in the tank is built up in the best possible way. Therefore it is expected that the thermal performance will be very high for the system. A monitoring system for the system will be installed so that it is possible to follow the operation of the system and to measure the thermal performance.

Department of Buildings and Energy

Department of Civil Engineering

Rådgivende ingeniørfirma A/S

Period: 31/05/1999 → 30/09/2000

Number of participants: 5

Project participant:

Andersen, Elsa (Intern)

Shah, Louise Jivan (Intern)

Vejen, Niels Kristian (Intern)

Duer, Vagn (Ekstern)

Project Manager, organisational:

Furbo, Simon (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 277,500.00 Danish Kroner

**Project**

Measurement and evaluation of energy consumption and indoor climate in new office building

The purpose of the project is to design a measuring programme for an advanced highly insulated office building at Rockwool International A/S in Denmark in order to document the expected low energy consumption and the indoor thermal environment. The design of the office building includes new developed highly insulated constructions without vapour barrier and use of natural ventilation, which still is a new area of research. The project is divided into three parts: 1) Design of the measuring system (number and position of required sensors), 2) Implementation of the computer controlled data acquisition and 3) Development of a data handling system, that almost instantly combines all the measured data into a few key values that will be presented on the Internet. The results will be valuable for further development of highly insulated building constructions and for the understanding of natural ventilation.

Department of Buildings and Energy

Department of Civil Engineering

Rockwool International

Period: 14/05/1999 → 31/12/2000

Number of participants: 2

Project participant:
Low-flow solvarme med intelligent soltank og termisk styret pumpe

Section for Building Physics and Services

Department of Civil Engineering

Period: 03/05/1999 → 31/05/2001
Number of participants: 1

Furbo, Simon (Intern)

Financing sources

Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 277,500.00 Danish Kroner

Equipment to investigate moisture distribution in absorbing insulation materials

Moisture absorption in organic thermal insulation material may level out the distribution of moisture in the material. Two mechanisms substantiate this hypothesis: 1. The insulation absorbs a considerable amount of water vapour - enough that short term condensation may not form. 2. A number of lab tests and case-studies show that water is transported through absorbing materials partially driven by gradients in moisture content. As a result, absorbing insulation may be less susceptible to condensation during winter. The experiment developed in this project will confirm or reject these assumptions in a scale and in an environment that resembles the conditions in a roof or wall construction. The setup makes it possible to control the temperature, humidity, and air pressure conditions across an experimental wall.

Department of Buildings and Energy

Department of Structural Engineering and Materials

Department of Civil Engineering

Danish Building Research Institute

Period: 01/04/1999 → 31/05/2000
Number of participants: 3

Padfield, Tim (Intern)
Nicolaisen, Asta (Eksterm)

Project Manager, organisational:

Rode, Carsten (Intern)

Overall evaluation of windows - possible improvements within 5 years

Development of windows has been focused on reducing the U-value of frame and glazing. Only in few cases the net energy flow through the window during the heating season has been evaluated and in that case often for south oriented windows. Initial calculations on a single family house shows a 30 percent reduction in heating demand related to the total window area if a double glazed low energy glazing with low iron glass is used compared to use of triple glazed super insulating glazing due to the larger solar energy transmittance of the low iron glazing. The main goal of this project is to stimulate the development of windows with an improved overall energy performance in preparation for the coming Danish Building Code 2005. The overall evaluation includes the interaction of U-value, g-value, window-wall joint and conditions for application, e.g. influence on indoor thermal environment and risk of condensation - inside as well as
outside. Participation of glass-, glazing- and window professionals ensures that the results of the project are realistic and could form the basis for product developments concerning energy efficient windows.

Department of Buildings and Energy

Department of Civil Engineering

Pilkington Floatglas A/S

Scan Gobain Glass A/S

Vinduesproducenternes Samarbejdsorganisation

Period: 01/04/1999 → 30/06/2001
Number of participants: 6
Project participant:
Svendsen, Svend (Intern)
Mogensen, Morten Møller (Intern)
Lorentzen, Carl Axel (Ekstern)
Mølholm, Niels Bo (Ekstern)
Nielsen, Hans (Ekstern)

Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 800,000.00 Danish Kroner

Project

Lavenerghus 2010 - forprojekt

Arctic Technology Centre, ARTEK

Department of Civil Engineering

Arctic Technology Centre

TI
Period: 09/03/1999 → 04/04/2002
Number of participants: 1
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 100,000.00 Danish Kroner

Project

Energy efficient, demand controlled ventilation for dwelling for the future

An evaluation is carried out to determine whether it is possible to reduce the base ventilation of different types of residential buildings, and to determine the requirement for increased ventilation in certain rooms and periods. It will be determined whether it is possible to reduce the net energy consumption and environmental load by using demand controlled ventilation. A calculation model is developed which predicts the indoor humidity conditions and CO2 levels from weather data given by the test reference year.

Department of Buildings and Energy

Department of Civil Engineering

Danish Building Research Institute
Period: 01/03/1999 → 30/06/2000
Number of participants: 2
Project participant:
Bergsøe, Niels C. (Ekstern)
Project Manager, organisational:
Rode, Carsten (Intern)
Concrete elements with better insulation and less thermal bridge effect
The aim of the project is to stimulate a development of concrete elements with better insulation and less thermal bridges. The outer walls of concrete elements are typically less insulated than other outer walls. With the present and future demand for better insulated outer walls it is necessary to develop concrete elements for outer walls focusing on their insulation properties. The objective is to develop the buildings so that they acquire just as good energy properties as other buildings. In co-operation with producers of concrete elements the project is to put forward and analyse a series of proposals for changing the design of concrete elements with a view to increasing the insulation thickness and reduce the effect of thermal bridges. The best suggested solutions within each scope of application (building designed for residential, business or industrial purposes) will be thoroughly investigated and documented so that they can easily be used when buildings are designed and constructed according to the present and future building codes and regulations.

Department of Buildings and Energy
Department of Civil Engineering
Danish Building Research Institute
Period: 01/02/1999 → 01/01/2001
Number of participants: 4
Project participant:
Tommerup, Henrik M. (Intern)
Larsen, Henning (Intern)
Munch-Andersen, Jørgen (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 600,000.00 Danish Kroner

Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Elektrodialytisk fjernelse af tungmetaller fra flyveaske
Department of Civil Engineering
Period: 01/02/1999 → 30/09/2002
Number of participants: 6
Phd Student:
Dame, Anne Juul (Intern)
Supervisor:
Ottosen, Lisbeth M. (Intern)
Main Supervisor:
Villumsen, Arne (Intern)
Examiner:
Mortensen, John (Ekstern)
Jappe Frandsen, Flemming (Intern)
Thöming, Jorg (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samarbejdsaftalefinans
Project: PhD

Metode til optimering af bygninger med hensyn til energi og indeklima

Department of Civil Engineering
Period: 01/02/1999 → 21/01/2003
Number of participants: 5
Phd Student:
Nielsen, Toke Rammer (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Rode, Carsten (Intern)
Gustafsson, Stig-Inge (Ekstern)
Olsen, Lars (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Optimering af klimaskærm samt varme- og ventilationsanlæg i et typehus mht. energiforbrug, indeklima og økonomi

Section for Building Physics and Services
Period: 01/02/1999 → 01/02/2001
Number of participants: 2
Project ID: 164-59-5078
Project participant:
Rose, Jørgen (Intern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 720,000.00 Danish Kroner
Project

Helhedsvurdering af vinduer – mulige produktforbedringer inden for en tidshorisont på 5 år

Section for Building Physics and Services
Department of Civil Engineering
IEA Task 13, Advanced Solar Energy Dwellings: Danish participation in an international working group

This project forms the Danish participation in an international IEA working group, which scope was to gather and process monitoring results from 15 low energy houses designed and built during the IEA Solar Heating & Cooling programme, task 13 project. Only a few of the houses were built in time for a whole year of monitoring within the frame of the project. Therefore the IEA expressed their interest in forming a small working group that ended up with only two countries involved: Denmark and Holland. The gathering of monitoring results was performed by elaboration of a comprehensive questionnaire, which was sent to all 11 former participating countries. Twelve out of fifteen possible answers were received. The outcome of the project is a total overview of expected and measured energy consumption, the thermal indoor climate and the experiences gained from the house design as well from the many innovative technologies introduced in the buildings. On average the savings on the total energy consumption (heating, domestic hot water, electricity) amounts to 60% - a little less than the goal of 75%, but a fairly good result taking the experimental nature of the project into account. Besides, it has been shown in praxis that highly insulated buildings can achieve a very good indoor thermal environment without summer overheating problems if this is given the required attention during the design phase. The houses are all different and a wide spread of many different experiences are obtained. However, some general things have been seen in practically all the buildings: the required airtightness of the thermal envelope is hard to reach; ventilation systems often lead to annoying noise and draught; special attention is needed for avoidance of overheating by careful planning of the distribution of windows and choice of glazing type combined with automatic controlled venting and solar shading; installations and systems need to be simple and understandable for the inhabitant.

Ecological wastewater handling on Christiansø - a small island in the Baltic

Christiansø and Frederikskø, two small rocky Danish islands, are inhabited by 100 residents. On top of this comes 1000 daily tourists during the summer period. Currently, the wastewater is discharged untreated into the Baltic sea. The bedrock underground, the distance to the mainland, the peaks in wastewater production and the relatively strict nature preservation
regulations implies that conventional wastewater transport and treatment is expensive and not considered appropriate. Consequently, this project aimed at identifying alternative solutions based on source control and "green" treatment methods. A number of alternative systems solutions were drawn up and evaluated in a holistic manner.

Department of Environmental Engineering

Department of Civil Engineering
Period: 01/01/1999 → 30/06/2001
Number of participants: 4
Acronym: 221
Project participant:
Hauger, Mikkel Boye (Intern)
Smith, Morten (Intern)
Gabriel, Søren (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

IEA task 13
14 countries and the European Commission had participated in the IEA Task 13 project "Advanced Soar Low Energy Dwellings" under the IEA Solar Heating and Cooling Programme. Within the project each participating country has analysed and designed 1 or 2 low energy houses/buildings in close co-operation with the other participants. The aim was to achieve the lowest possible total energy consumption for heating, domestic hot water and use of electricity. A general difficulty with realisation of the design projects has delayed the finishing of the buildings and the connected monitoring programs beyond the dead line of task 13. As a result the final IEA Technical Report contains only a limited number of monitored results. The main goal of the project is to collect available material from the participants in task 13 concerning measured and calculated results and present the main results of the different projects in one report. The report will give a total overview of the different buildings and the achieved results: 1) a short description of the individual houses and the special energy saving techniques used, 2) expected and monitored results from a wide range of different building types and 3) a description of the achieved experiences.

Department of Buildings and Energy

Department of Civil Engineering
Statens Byggeforskningsinstitut
Period: 01/01/1999 → 31/12/2000
Number of participants: 2
Project participant:
Thomsen, Kirsten Engelund (Ekstern)
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 300,000.00 Danish Kroner

Low energy house 2010 - feasibility study
The objective with this feasibility study is to plan research and demonstration activities, aiming to identify the design and features of the standard Danish low energy house year 2010. This project aims at achieving the ambitious energy goals through a synergy with other driving forces bringing changes in the building sector, such as the need for an overall sustainability of buildings, improved building quality, improved indoor climate and improved living qualities, and improved architectural standards for new housing. This project seeks to establish dynamic and flexible consortia between research institutes, building industry, clients, consultants and financing institutes for housing, these consortia being targeted towards Low Energy House 2010. This project is closely linked to two Danish strategic framework programs, one focusing on the new building year 2005, the other focusing on buildings year 2030. Furthermore, the project relates to the Danish Solar Energy Plan of Action 1998 - 2000, and the European 5th Framework Program for Research, Demonstration and Dissemination, FP5, 1998 - 2002. Finally this Danish feasibility study will contribute to, and benefit from participation in the planned IEA SHC activity 'IEA Task 28: Solar sustainable Housing', which also runs through a feasibility study phase in
Department of Buildings and Energy
Department of Civil Engineering
Energicenter Danmark
Statens Byggeforskningsinstitut
Esbensen Rådgivende Ingeniører A/S
Cenergia
Period: 01/01/1999 → 31/03/2000
Number of participants: 6
Project participant:
Furbo, Simon (Intern)
Thomsen, Kirsten Engelund (Ekstern)
Jørgensen, Olaf Bruun (Ekstern)
Mørck, Ove (Ekstern)
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)
Kristensen, Poul Erik (Ekstern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project

Nye ledelsesformer og arbejdssulykker i dansk industri- værktøjer baseret på læring og sikkerhedskultur

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/01/1999 → 01/07/2001
Number of participants: 3
Project ID: 25160
Project participant:
Richter, Anne (Intern)
Kamp, Annette (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Amount: 560,000.00 Danish Kroner
Project

Solar Energy Center Denmark

A number of activities in different fields were carried out: SIMULATION PROGRAMMES:-A state of the art of solar energy programmes developed and used by Solar Energy Center Denmark was worked out.-Simulation programmes for solar domestic hot water systems were built out so that a flexible variable hot water consumption could be simulated. The programmes were further developed so that the mixing occuring in the solar tank during hot water tapping could be simulated.-A plan for future activities on simulation programmes for Solar Energy Center Denmark was worked out. TEST METHODS:-Existing test methods for solar tanks were evaluated. Based on this improved test methods for the future were worked out.-Investigations on mixing in solar tanks during hot water tapping were carried out.-Existing test methods for evacuated tubular solar collectors were evaluated. Based on this recommendations for future testing of evacuated tubular solar collectors were worked out.-Existing simulation programmes were evaluated by means of measurements for different solar domestic hot water systems in a test facility. ASSISTANCE FOR THE SOLAR ENERGY BRANCH:-Investigations of a solar heating system based on the natural gas burner/solar tank-unit Block Gas Sol was carried out.The investigations were carried out for the company Baxi A/S.-Development of an ideal solar tank. This work was carried out for the company AquaHeat I/S.-Test of a solar collector with and without an antireflection treated glass as cover. This investigation was carried out for Sunarc A/S. SOLAR ENERGY TECHNOLOGIES: Different solar energy technologies were evaluated with regard to energy savings, costs, durability, energy pay back time etc.
Department of Buildings and Energy  
Risø National Laboratory for Sustainable Energy  
Department of Civil Engineering  
Danish Technological Institute  
Period: 01/01/1999 → 31/12/1999  
Number of participants: 5  
Project participant:  
Duer, Karsten (Intern)  
Shah, Louise Jivan (Intern)  
Andersen, Elsa (Intern)  
Vejen, Niels Kristian (Intern)  
Project Manager, organisational:  
Furbo, Simon (Intern)  

**Financing sources**  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 1,050,000.00 Danish Kroner  

The social context of urban development towards sustainability  
Department of Civil Engineering  
Period: 01/01/1999 → 31/01/2005  
Number of participants: 3  
Phd Student:  
Guimaraes, Ana Maria Marinho (Intern)  
Supervisor:  
Jørgensen, Michael Segaard (Intern)  
Main Supervisor:  
Elle, Morten (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD  

Visiting Professor Chair on Concrete Technology  
Section for Building Materials and Geotechnics  
Department of Civil Engineering  
Period: 01/01/1999 → 01/01/2005  
Number of participants: 4  
Project participant:  
Stang, Henrik (Intern)  
Hansen, Kurt Kielsgaard (Intern)  
Jensen, Ole Mejhede (Intern)  
Project Manager, organisational:  
Geiker, Mette Rica (Intern)  

**Financing sources**  
Source: Gaver, Private danske Fonde  
Name of research programme: Gaver, Private danske Fonde  
Amount: 5,000,000.00 Danish Kroner  
Project  

Guidelines for the construction of heat storage in sand  
The aim of the project is to make a relatively short and popular guide for the dimensioning and construction of solar heat storage in a building integrated sand volume under single family houses. The guide will be based on experience from
parameter studies and already constructed systems. The guide will be based on accessible Danish literature and construction experience.

Department of Buildings and Energy

Department of Civil Engineering

Aidt Miljø A/S
Period: 01/12/1998 → 31/05/2000
Number of participants: 1
Project Manager, organisational:
Duer, Karsten (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 210,000.00 Danish Kroner

Integrated Design Optimisation of Building Energy Performance and Indoor Environment
Research project

Department of Civil Engineering
Section for Indoor Environment
Technical University of Sofia
University of Strathclyde
Czech Technical University
Silesian University of Technology
Evgueni Iordanov & Co.
Period: 01/11/1998 → 31/10/2001
Number of participants: 1
Number of related Ph.D. students: 3
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Highly Insulating and Light Transmitting Aerogel Glazing for Window
In order to overcome the normal contradiction between high insulation capacity and high solar transmittance, monolithic silica aerogel is applied as transparent insulation material in windows. The project deals with both the production process of aerogel and the aerogel glazing. Our part of the project here at the Department concerns mainly; the glazing assembly process, optimization of the glazing, characterisation of the aerogel window and technical and economical evaluation. At the end of the project, it is expected that the following are developed: A supercritical CO2 based production process with recovery, that can give flat aerogel tiles of 60 cm square as well as a glazing assembly process suited for industrial production, for the same size. And finally a general scheme for demonstration of the new technology will be drafted. The project is a follow-up to two previous JOULE 2 projects (contracts JOU2-CT92-0192 and JOU2-CT93-0375) and it is funded by the EU JOULE 3 programme, contract JOR3-CT97-0187. The Department is coordinator of the project.

Department of Buildings and Energy
Department of Civil Engineering
Fraunhofer Gesellschaft
Air Liquide Gas AB
Ecole des Mines de Paris
Centre Scientifique et Technique du Bâtiment
Université Lyon
Produit Chimiques Auxiliares et de Synthéses
Highly Insulating and Light Transmitting Aerogel glazing for Window (HILIT Aerogel Window)

The HILIT AEROGEL WINDOW project with participants from Denmark (coordinator), France, Germany, Norway and Sweden, was formulated in order to develop a safe and clean production of monolithic silica aerogel based on supercritical CO2 drying of the gels, to study the process parameters and to transfer the results from lab- to mid- and finally to large-scale making of 60 by 60 cm² in a pre-industrial plant. The large samples forms the basis for assembly of evacuated aerogel glazings optimised with respect to thermal and optical properties. The production process development and transfer to pre-industrial fabrication of aerogels has succeeded in all details. A pilot plant for precursor elaboration has been established and precursors of required amount and quality has been delivered to all partners. Studies at lab-scale have identified the important parameters for optimising the mixing of the chemicals, which is the mixing rate and the HF (catalyst) flow rate. A mixing reactor have been designed and successfully transferred to large-scale application. At large scale a complete CO2 loop has been build including CO2 regaining by separation of CO2 from the solvent. The CO2 has been reused for several batch runs. The up scaling required invention of several technical solutions related to moulding and handling of the large gels. Despite the efforts only aerogels with a thickness up to 15 mm have been produced with a good reproducibility. The thermal conductivity is approximately 0.015 W/mK at atmospheric pressure and 0.010 W/mK at 10 hPa. The optical properties have been improved compared to previous aerogels thanks to the process and the very smooth surfaces obtained by the developed moulding system at large scale and a heat treatment of the dried aerogel that seems to remove remaining chemical compounds stuck to the aerogel. A rim seal solution that offers the required air and moisture tightness without leading to severe thermal bridge effects has been developed as well as an assembly process including heat treatment and evacuation in a vacuum chamber. The centre U-value is measured for several prototype glazings to 0.68 W/m²K, which is somewhat higher than the targeted value of 0.4 W/m²K due to the thinner aerogel sheets available. The overall U-value including the thermal bridge effect of the rim seal solution is measured to 0.74 W/m²K. The solar energy transmittance is measured to 76% thanks to the use of low-iron glass with an anti reflective coating.
Thermal characterisation of sealed glazing unit with internal bars free from the glass surfaces

Common bar windows are characterised by severe thermal bridge effects compared to the center heat loss of the glazing due to the bars. The solution under investigation has an external bar system glued to the glazing surfaces and an internal bar system kept at a certain distance from the internal glass surfaces of the glazing. In this way the thermal bridge effect is reduced due to the gas filled gap between glass surface and the internal bar. An important question is the level of convection in the gap, which cannot be simulated by common thermal simulation programmes. Therefore, measurements in a guarded hotbox are carried out.
Assessment of sustainable wastewater handling in sewerless settlements

The purpose is to develop a method for comparative assessment of solutions for sustainable handling of wastewater in the open land. The perspective is transparency and a better agreement between different stakeholders’ perception of what sustainable wastewater handling is. The assessment method will be incorporated in a generally accessible and practicable computer-based decision support system for use in planning and quality control of projects. The basic premise of the method is that no specific technologies are inherently sustainable, or ecological, but that the sustainability of the total system of technologies for a settlement in a given location must be assessed in a holistic and transparent manner. The method brings wastewater handling into focus, but related waste streams and stormwater is included in the assessments, when their handling are directly coupled with the handling of wastewater. Settlements without traditional sewer systems are covered, e.g. farm houses, summer cottages, garden allotments, villages and ecological settlements planned with specific reference to avoiding sewers. These types of settlements have very different natural and manmade preconditions and the method thus rests on site-analyses of local conditions. The project will involve external stakeholders through case-studies where solutions for existing or planned settlements are assessed to test and illustrate the assessment method.

Department of Environmental Engineering

Department of Civil Engineering

Period: 01/10/1998 → 30/06/2002
Number of participants: 6
Acronym: kloaklose
Project ID: 30027
Project participant:
Eilersen, Ann Marie (Intern)
Hauger, Mikkel Boye (Intern)
Henze, Mogens (Intern)
Smith, Morten (Intern)
Gabriel, Søren (Intern)
Project Manager, organisational:
Mikkelsen, Peter Steen (Intern)

Financial sources
Source: Unknown
Name of research programme: Ukendt
Amount: 18,000.00 Danish Kroner
Project

X-ray measurements on wood - spectra measurements

The scope is to measure moisture content and dry density of wood by use of x-ray equipment. Before calculation of moisture and dry density it has shown necessary to make an analytical correction of the measured spectrum. The project is a cooperation between the private firm GNI and BKM.

Department of Structural Engineering and Materials

Department of Civil Engineering

GNI
Period: 15/09/1998 → 14/02/1999
Number of participants: 4
Project participant:
Jensen, Signe Kamp (Intern)
Gerword, Leif (Ekstern)
Nielsen, Gorm Groot (Ekstern)
Project Manager, organisational:
Hansen, Kurt Kielsgaard (Intern)

Financial sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,312,000.00 Danish Kroner
Project
**Rock Mechanical Properties of Jurassic Underburden at Valdemar**

Department of Civil Engineering  
Geotechnical Institute  
De Nationale Geologiske Undersøgelser for Danmark og Grønland  
Period: 01/09/1998 → 01/06/2002  
Number of participants: 1  
Project ID: 25190  
Project Manager, organisational:  
Foged, Niels Nielsen (Intern)

**Financing sources**  
Source: Indtægtsdækket virksomhed UK 90  
Name of research programme: Indtægtsdækket virksomhed UK 90  
Amount: 400,000.00 Danish Kroner

**Byggesektorens IT-anvendelse**

Department of Civil Engineering  
Period: 01/08/1998 → 18/03/2002  
Number of participants: 5  
PhD Student:  
Andresen, Jan Lambrecht (Intern)  
Main Supervisor:  
Howard, Robert (Intern)  
Examiner:  
Normann Andersen, Tom (Intern)  
Atkin, Brian Lawrence (Ekstern)  
Karlshøj, Jan (Intern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

**Status on thermal storage in small buildings**

The aim of the project is to make a short and popular overview of the status within the field of storage of thermal energy in small buildings. The energy stored is considered to origin mainly from solar energy. Five different storing techniques are described: Storing energy in water, sand, stones, building components and in chemical reactions. The overview will be based on accessible Danish literature.

Department of Buildings and Energy  
Department of Civil Engineering  
Danish Technological Institute  
AIDT A/S  
L.Ø.B.  
Period: 01/07/1998 → 31/01/2000  
Number of participants: 1  
Project Manager, organisational:  
Duer, Karsten (Intern)

**Financing sources**  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 210,000.00 Danish Kroner
**Project**

**Calibration of cameras from Terma Electronics**
When testing ammunition for guns and canons, the track and rotation of the projectile has to be described just after firing. The company Terma Electronics in Århus has developed an unique system to measure the bullet by taking photographs with 25 cameras and the make measurements on the photographs in an electronic instrument. The system is exported all over the world. The cameras and their lens systems has to be calibrated to find the camera constant, principal point and the lens distortion in order to make the measurements.

Department of Applied Civil and Environmental Engineering
Department of Civil Engineering

Terma A/S  
Period: 01/06/1998 → 01/10/1998  
Number of participants: 2  
Project participant:  
Poulsen, Erik Lund (Intern)  
Project Manager, organisational:  
Mærsk-Møller, Ole (Intern)

**Financing sources**
Source: Unknown  
Name of research programme: Ukendt  
Amount: 100,000.00 Danish Kroner

**Transport Telematics and Road User Charging (FORTRIN)**
Development and evaluation of an electronic, mileage dependent road user charging system. The project includes behavioural studies, economic and environmental analysis and traffic impact modelling.

Department of Planning
Department of Civil Engineering

Aalborg University  
Period: 01/06/1998 → 31/05/2001  
Number of participants: 5  
Project participant:  
Herslund, Mai-Britt (Intern)  
Østergaard, Marianne Harms (Intern)  
Jensen, Peder (Intern)  
Jørgensen, Lars (Intern)  
Project Manager, organisational:  
Kildebogaard, Jan (Intern)

**Financing sources**
Source: Unknown  
Name of research programme: Ukendt  
Amount: 3,000,000.00 Danish Kroner  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 1,500,000.00 Danish Kroner

**Energi og livsstil - En analyse af livsstilens betydning for energiforbruget**

Department of Civil Engineering

Period: 01/05/1998 → 15/03/2002
Number of participants: 6
Phd Student:  
Nielsen, Stefan Kruger (Intern)
Energi- og miljøanalyse af kollektive trafiksystemer

Department of Civil Engineering
Period: 01/05/1998 → …
Number of participants: 7
Phd Student:
Meibom, Peter (Intern)
Supervisor:
Hansen, Elsebeth (Ekstern)
Meyer, Niels I (Intern)
Main Supervisor:
Nørgaard, Jørgen (Intern)
Examiner:
Sørensen, Bent (Ekstern)
Bak, Flemming (Ekstern)
Johansson, Bengt (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Stabilitet og kryb af gaskaverner i salt

Department of Civil Engineering
Period: 01/05/1998 → 31/03/2001
Number of participants: 2
Phd Student:
Dahl, Mikkel Kristian (Intern)
Main Supervisor:
Foged, Niels Nielsen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Heat and moisture characteristics of alternative thermal insulation materials.
The research is divided between Department of Buildings and Energy (IBE), which focus on heat characteristics of alternative insulation materials and moisture calculations of constructions, and Department of Structural Engineering and Materials (BKM), which focus on measurements of moisture characteristics of alternative insulation materials. The BKM part concerns measurements of sorption curves, water vapour permeability, capillary suction and the moderating influence of absorbent materials on the relative humidity of large, leaky enclosures. Alternative thermal insulation materials are made from organic fibres: paper, sheeps wool or flax. Also perlite insulation belongs to this group.

Department of Structural Engineering and Materials
Investigation of Heat and Moisture Performance of Alternative Insulation Materials

Investigations are carried out on some insulation products which are "alternative" to the ones that are traditionally used in Danish constructions. The alternative products are claimed to be friendly both to the environment and to the labour force. The materials investigated are: cellulose insulation, sheep wool, flax, and perlite. These materials, except for the last one, are very hygroscopic. The following investigations are carried out: 1. Experimental investigation of the thermal conductivity at different humidity conditions. The thermal conductivity is determined for the different materials with a guarded hot plate apparatus in which different vapour pressure conditions can be maintained over the specimens. 2. Experimental investigation of the effect of natural convection on heat transfer. Heat transfer is measured in full size walls with insulation of either cellulose or sheep's wool when installed in a hot box/cold box facility. The dimension of the insulation's measuring area is 1000 mm width x 3000 mm height x appr. 400 mm thickness. 3. Computational analysis of the hygrothermal performance of constructions with alternative insulation products. The hygrothermal performance of constructions with alternative insulation products is analysed with a computational model for combined heat and moisture transfer. The analysis concerns both traditional wall and roof constructions with the alternative insulation products, and some alternative designs prescribed by manufacturers of alternative insulation materials. All three investigations are compared against similar results when mineral fibre is used. The moisture transport properties of the materials (sorption, vapour transmission, and suction) are investigated in a companion project by the Department of Structural Engineering and Materials, DTU.
Strategic Alliances in Construction

In this Ph.D.-study strategic alliances in construction are investigated as means of productivity improving organisational changes. The research perspective in particular is focusing on the influence of 'trust' in permanent collaborating organisations. Empirically the study is engaged in the large Danish development programme 'Process and Product Development in Construction', run by the Ministry of Business and Industry plus the Ministry of Housing. The performance of four consortia within this programme will be evaluated. Theoretically the study will draw upon conceptions of trust and furthermore 'experimental economy' will be applied in order to establish a basis of quantitative analysis in the research process.
New type of window with slim frames and large daylight and solar energy transmission

The aim of the project is to investigate the possibility of developing a new type of windows with a slim frame construction integrated in the glazing. The total frame area should be decreased by approximately 50% relative to common windows leading to a 20% increase of daylight and solar radiation transmission. Two different solutions will be investigated both using fibre glass reinforced polyester profiles - a sealed glazing unit and a very light ventilated glazing unit, which should get a lifetime comparable with other building constructions (roof, walls). Beside the enlarged transparent area to total window area the distance between the glass panes should be increased in order to minimise the thermal bridge effect of the traditional rim seal solution. The large distance between the glass panes allows for built-in solar shading devices and/or night insulation between the glass panes in the light ventilated solution. The two solutions will be investigated in parallel in close co-operation with the industrial partners and prototypes should be made for measurements of total heat loss coefficient, total solar transmittance and for tests under realistic climatic conditions. Especially the risk of condensation inside the light ventilated solution requires a detailed study and real test.

Department of Buildings and Energy

Department of Civil Engineering

Velfac A/S
Fiberline Composites A/S
Period: 01/03/1998 → 30/06/2000
Number of participants: 4
Project participant:
Svendsen, Svend (Intern)
Hammer, Carl (Ekstern)
Knudsen, Eric S. (Ekstern)

Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 670,000.00 Danish Kroner

Samvirkende jord- og betonkonstruktioner

Department of Civil Engineering
Number of participants: 7
Phd Student:
Jantzen, Thomas (Intern)
Supervisor:
Feddersen, Bent (Ekstern)
Kammer, Jens (Ekstern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Stang, Henrik (Intern)
Jensen, Bjarne Christian (Ekstern)
Sørensen, Carsten S. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD
Intelligent soltank

Department of Civil Engineering
Period: 12/02/1998 → 26/04/2001
Number of participants: 1
Project Manager, organisational:
Furbo, Simon (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 580,000.00 Danish Kroner
Project

ACCURACY OF DRAUGHT MEASUREMENT

Department of Civil Engineering
Section for Indoor Environment
Period: 01/02/1998 → 31/01/2000
Number of participants: 1
low velocity measurements, improved instruments, draft prediction, requirements, standards
Number of related Ph.D. students: 1
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Accuracy of Draught Measurement

Department of Civil Engineering
Section for Indoor Environment
Gebruder TROX GmbH
Dantec Measurement Technology A/S
SWEMA
Innova Air Tech Instruments
 CETIAT
 ADAI
Silesian University of Technology
Period: 01/02/1998 → 31/01/2000
Number of participants: 1
Number of related Ph.D. students: 4
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Danish Transport Council project: Transport Economics and Decision Models (TEAM)
The main objective of TEAM is to formulate socio-economic project evaluation methods that are based on welfare economic principles. The methods, furthermore, shall be useful for examination of current transport planning issues and, at the same time, be made available as modules of decision models aiming at decision support applications. It is also intended that the project shall establish collaboration between the participating organisations: Copenhagen University, Institute of Economics, Technical University of Denmark, Department of Planning, and COWIconsult. The project consists of two main parts, namely one part relating to Assessment Theory and another to Decision Models. It is intended that all three partners are involved in both parts. Specifically, IFP will be responsible for two projects, with one project concerning the Development of Strategic Mobility Impact Models and the other, the Formulation of Optimal Investment Strategies for a Corridor Programme of Transport Infrastructure Projects. In addition to the research project, TEAM also organises a monthly seminar where topics of relevance for the research area are presented.
Energiforbrug og livsstil
Department of Civil Engineering
Period: 01/02/1998 → 31/01/2003
Number of participants: 3
PhD Student:
Levin-Jensen, Anna Karina M. (Intern)
Supervisor:
Læssøe, Jeppe (Intern)
Main Supervisor:
Nørgaard, Jørgen (Intern)
Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Interaction of concrete and soil structures
Structure/soil interaction is partly a neglected problem, probably because in the engineering curriculum it overlaps different departments and partly because it is a rather complex problem. In recent years a number of cases have been reported, where concrete walls have been damaged due to a faulty evaluation of the structure/soil interaction. The most difficult problems arise, when the structure is rather brittle, for instance an unreinforced concrete structure. In the first phase of the project it is attempted to get a better understanding of the constitutive properties of soil. This is done by developing a so-called toy model. A toy model is a model, which can be used for illustrating a phenomenon, but it cannot normally be used for accurate quantitative calculations. The toy model consist of cylinders with friction (Danish: pinde model). Different packing arrangements are assumed with the purpose to study standard failure tests like the shear box test and the triaxial test. Other packings are used to illustrate the constitutive equations up to failure. Finally, the model is used to evaluate the effect of elastic deformations in the contact zones relative to deformations due to sliding. In the next phase a new earth pressure theory is developed. It is based on strict equilibrium stress fields contrary to the mixture of upper- and lower bound solutions. normally used. Further a new optimization technique is developed which is able to deal with problems of a size encountered in practise. The optimization procedures, as for example linear programming routines, are only able to solve problems of academic interest. The new method will be based on a combination of a series of linear elastic solutions with modified stiffness matrices depending on the yield condition for the material. It is hoped that this method can also be used to treat brittle structure/soil interaction.

Interaction of concrete and soil structures
Department of Structural Engineering and Materials
Department of Civil Engineering
Rambøll Danmark A/S
Period: 01/02/1998 → 01/02/2001
Number of participants: 4
Project participant:
Jantzen, Thomas (Intern)
Feddersen, Bent (Ekstern)
Mortensen, Jens Kammer (Ekstern)
Project Manager, organisational:
Nielsen, Mogens Peter (Intern)
Project

Ny vinduestype med smal ramme/karmkonstruktion og stort lys- og solindfald

Section for Building Physics and Services
Department of Civil Engineering
Velfac A/S
Fiberline Composites A/S
Period: 01/02/1998 → 30/04/2002
Number of participants: 4
Project participant:
Svendsen, Svend (Intern)
Hammer, Carl (Ekstern)
Knudsen, Eric S. (Ekstern)
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Forskningsprojekter - Miljø- og Energiministeriet
Name of research programme: Forskningsprojekter - Miljø- og Energiministeriet
Amount: 670,000.00 Danish Kroner
Project

Greensand research
The aim of the project is to study the petrophysical properties of greensand in the North Sea area

Department of Geology and Geotechnical Engineering
Department of Civil Engineering
Period: 01/01/1998 → 31/12/1999
Number of participants: 3
Project participant:
Solymar, Mikael (Ekstern)
Middleton, Mike (Ekstern)
Project Manager, organisational:
Fabricius, Ida Lykke (Intern)

Financing sources
Source: Unknown
Name of research programme: Uンドト
Amount: 500,000.00 Danish Kroner
Project

Humidity in Buildings
Contribution to the International Centre for Indoor Environment and Energy: Modelling and experimental investigation of humidity transfer and energy consumption in buildings. The research aims at establishing complete modelling capabilities of the hygrothermal conditions in buildings with their spaces, building materials, furnishing, activity of occupants, and influence from exterior conditions.

Department of Buildings and Energy
Section for Indoor Environment
Department of Civil Engineering
Period: 01/01/1998 → 31/12/2002
Number of participants: 2
Project participant:
Photogrammetry in Seismic Interpretation

Department of Planning
Department of Civil Engineering
University of Oslo
Period: 01/01/1998 → 31/12/1998
Number of participants: 3
Project participant:
Jensen, Eva Tokika (Intern)
Planke, Sverre (Ekstern)
Project Manager, organisational:
Dueholm, Keld (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 35,000.00 Danish Kroner

The Nussuaq Basin, West Greenland
Photogrammetric mapping of faults and fractures.

Department of Planning
Department of Civil Engineering
De Nationale Geologiske Undersøgelser for Danmark og Grønland
Period: 01/01/1998 → 31/12/1999
Number of participants: 2
Project participant:
Boesen, Anders (Ekstern)
Project Manager, organisational:
Dueholm, Keld (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 60,000.00 Danish Kroner

Transport risks by different transport modes
A working party under the European Transport Safety Council develops risk and exposure data for different transport modes and transport environments in the EU.

Department of Planning
Department of Civil Engineering
Period: 01/01/1998 → 01/06/1999
Number of participants: 5
Project participant:
Glansdorp, Cees (Ekstern)
Broughton, Jeremy (Ekstern)
Koomstra, Matthijs (Ekstern)
Project Manager, organisational:
Jørgensen, N O (Intern)
Project Manager, academic:
Evans, Andrew (Ekstern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 30,000.00 Danish Kroner

Preservation of Technological Artefacts of Historical Interest
Department of Planning
Department of Civil Engineering
Society of Danish Civil Engineers
Period: 31/12/1997 → 01/01/9999
Number of participants: 2
Project participant:
Sørensen, E. Rafn (Ekstern)
Project Manager, organisational:
Rallis, Tom A (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

Flexible Dwellings in Ørestaden
Participation in public competition on flexible dwellings in Ørestaden. In co-operation with architect MAA Søren Koch.
Department of Buildings and Energy
Department of Civil Engineering
Period: 01/12/1997 → 24/02/1998
Number of participants: 2
Project participant:
Koch, Søren (Ekstern)
Project Manager, organisational:
Engelmark, Jesper (Intern)

Ledelse af teknologisk forandring i byggesektoren
Department of Civil Engineering
Period: 01/12/1997 → 28/03/2003
Number of participants: 6
Phd Student:
Clausen, Lennie (Intern)
Supervisor:
Nielsen, Jørgen (Ekstern)
Main Supervisor:
Bonke, Sten (Intern)
Examiner:
Koch, Christian (Intern)
Larsson, Bengt (Ekstern)
Petersen, Lars Holten (Ekstern)
The Role of End Users in Building Productivity
This project takes the concept of “end users” as its point of departure because these are potentially very important in shaping developments through demand. However, this potential is not always realised due to existing institutional constraints. The role of end users are being comparatively investigated with respect to productivity improvements in the two national construction sectors of Denmark and Sweden. By comparing critical problem areas in both national sectors an identification of potential improvements is made possible. This result will be presented as policy recommendations that can be useful inputs in the user-oriented development efforts in the two countries.

Department of Planning
Department of Civil Engineering
Uppsala University
Danish Building Research Institute
Period: 01/12/1997 → 31/03/1999
Number of participants: 4
Project participant:
Jørgensen, Tom Rydahl (Intern)
Fältling, Lars (Ekstern)
Bang, Henrik (Ekstern)
Project Manager, organisational:
Bonke, Sten (Intern)

Accidents statistics at roundabouts
The objective of this project is to review accident data for Danish roundabouts from 1991 to 1996 in order to study if accident patterns have changed in recent years where a fairly large number of roundabouts have been constructed. This study is a follow-up on earlier projects.

Department of Planning
Department of Civil Engineering
Vejdirektoratet
Carl Bro A/S
Period: 01/11/1997 → 01/06/1999
Number of participants: 3
Project participant:
Jørgensen, Else (Ekstern)
Jeppesen, Stig V. (Ekstern)
Project Manager, organisational:
Jørgensen, N O (Intern)
IT Barometer survey in Scandinavia
Survey of the use of computing and communications in building design, construction and management organisations in Denmark, Sweden and Finland. Joint survey during 1998 with KTH Stockholm and VTT Finland.

Department of Planning
Department of Civil Engineering
Number of participants: 3
Project participant:
Bjork, Bo-Christer (Ekstern)
Kiviniemi, Arto (Ekstern)

Project Manager, organisational:
Howard, Robert (Intern)

Topographic mapping by SAR
Topographic maps containing both thematic information about objects (e.g. forests, agricultural areas, roads, and buildings), and elevation information for the surface are used in numerous applications, for instance for registration and planning purposes in municipalities, counties, government agencies, and civil engineering companies. The availability of high-resolution Earth observation data from spaceborne and airborne sensors both today and in the future has focused the attention on the role for such sensors in speeding up and making more efficient the process of compiling and revising topographic maps. The advantages of the SAR sensors are for instance their all-weather mapping capabilities, and their complementarity compared to optical sensors. The ultimate objective of the research is to be able to perform quickly and efficiently compiling and updating of topographic maps using such data. The specific objectives are: To evaluate requirements of today for topographic mapping with a view to present and future remote sensing capabilities. To evaluate the potential of the polarimetric and interferometric SAR to detect the necessary object classes to be used for the thematic map content, and to evaluate the complementarity with traditional methods, as well as the accuracy of retrieval methods. To study the potential of SAR for change detection as a means of fast, frequent and cost-efficient updating of existing map information. The project was finalized in 2000, and a number of methods have been developed, e.g. for edge detection, segmentation, and change detection. Furthermore, the classification potential of the polarimetric SAR data has been evaluated. Results have been or will be published at conferences and in papers.

Department of Electromagnetic Systems
Department of Civil Engineering
Department of Electrical Engineering
National Survey and Cadastre
Period: 01/11/1997 → 31/12/2000
Number of participants: 10
Project participant:
Dall, Jørgen (Intern)
Madsen, Søren Nørvang (Intern)
Schou, Jesper (Intern)
Dierking, Wolfgang (Intern)
Jacobi, Ole (Intern)
Dueholm, Keld (Intern)
Frederiksen, Poul (Intern)
Jørgensen, Lars T. (Ekstern)
Knudsen, Per (Ekstern)

Project Manager, organisational:
Skriver, Henning (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 0.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 132,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
**Project on electric vehicles**
The objective of the project is to evaluate the utilisation of electric vehicles in Danish transport.

**Department of Buildings and Energy**
**Department of Civil Engineering**
Elkraft A.m.b.A.
Period: 01/10/1997 → 28/02/1998
Number of participants: 2
Project participant:
Lindboe, Hans H. (Ekstern)
Project Manager, organisational:
Jørgensen, Kaj (Intern)

**Financing sources**
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

**Highway Bridge in Aluminium**
In this project, the possibilities for constructing smaller bridges in aluminium as an alternative to traditional bridges in concrete, steel or composite concrete-steel, are studied. The main emphasis is put on fatigue problems in the aluminium bridge. Of special interest is fatigue under a realistic stochastic loading. The project includes both theoretical and experimental determination of the fatigue life at constant amplitude and stochastic loading. The project is carried out as a PhD-project.

**Department of Civil Engineering**
Period: 01/09/1997 → 31/12/2005
Number of participants: 2
Project participant:
Gimsing, Niels Jørgen (Intern)
Project Manager, organisational:
Agerskov, Henning (Intern)

**Financing sources**
Source: Forsk. Andre offentlige og private - Nordiske
Name of research programme: Forsk. Andre offentlige og private - Nordiske
Amount: 457,000.00 Danish Kroner

**Modeller i energiplanlægning med henblik på en bæredygtig udvikling**

**Department of Civil Engineering**
Period: 01/09/1997 → 14/01/2003
Number of participants: 7
Phd Student:
Karlsson, Kenneth Bernard (Intern)
Supervisor:
Meyer, Niels I (Intern)
Morthorst, Poul Erik (Intern)
Main Supervisor:
Nørgaard, Jørgen (Intern)
 Examiner:
Jespersen, Jesper (Intern)
Hvelplund, Frede (Ekstern)
Pedersen, Sigurd Lauge (Ekstern)

**Financing sources**
**Vejbro i aluminium**

Department of Civil Engineering  
Period: 01/09/1997 → 08/01/2007  
Number of participants: 6  
Phd Student:  
Rom, Søren (Intern)  
Supervisor:  
Gimsing, Niels Jørgen (Intern)  
Main Supervisor:  
Agerskov, Henning (Intern)  
Examiner:  
Poulsen, Peter Noe (Intern)  
Haagensen, Per (Ekstern)  
Svensson, Eilif (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-lønnet stipendie  
Project: PhD

**Fugttransport og konvektion i bygningskonstruktioner**

Department of Civil Engineering  
Period: 01/08/1997 → 18/02/2003  
Number of participants: 5  
Phd Student:  
Gudum, Charlotte (Intern)  
Main Supervisor:  
Rode, Carsten (Intern)  
Examiner:  
Hagentoft, Carl-Eric Hartvig (Ekstern)  
Andersen, Karl Terager (Intern)  
Svendsen, Svend (Intern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: DTU-Stipendium, Eksperiment  
Project: PhD

**Rensning af tungmælaforurenede vandige opløsninger i tilknytning til elektrodialytisk jordrensning**

Department of Civil Engineering  
Period: 01/08/1997 → 17/04/2001  
Number of participants: 6  
Phd Student:  
Hansen, Lene (Intern)  
Supervisor:  
Bech-Nielsen, Gregers (Intern)  
Main Supervisor:  
Villumsen, Arne (Intern)  
Examiner:  
Jacobsen, Torben (Ekstern)  
Calmano, Wolfgang (Ekstern)  
Mortensen, John (Ekstern)  

**Financing sources**
Forebygelse af arbejdsulykker gennem ændringer i sikkerhedskulturen

Department of Civil Engineering
Period: 01/07/1997 → 04/06/2004
Number of participants: 6
Phd Student:
Dyhrberg, Mette Bang (Intern)
Supervisor:
Clausen, Christian (Intern)
Main Supervisor:
Koch, Christian (Intern)
Examiner:
Broberg, Ole (Intern)
Larsson, Tore Johan (Ekstern)
Nielsen, Klaus T. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

U-value measurements on roof window
This project deals with U-value measurements performed on a roof window. The measurements have been performed as part of the development of standard testing procedures for thermal characterization of windows, using the procedures given in CEN prEN 12412:1996 with a few modifications especially concerning the calibration procedure. The measurements were carried out at the Technical University of Denmark, Department of Buildings and Energy

Department of Buildings and Energy

Velux A/S
Period: 01/07/1997 → 30/09/1997
Number of participants: 1
Project Manager, organisational:
Duer, Karsten (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 30,000.00 Danish Kroner
Project

Reveille-project
The name is acronym for "Regulation in Energy Systems with Renewable Energy in National and Local Energy Planning". The project investigate the options for a sustainable energy system in Denmark on the basis of energy savings and renewable energy. IBE’s role was to analyse the potentials for saving heat and electricity.

Department of Buildings and Energy

Aalborg University
Period: 01/06/1997 → 01/06/1998
Number of participants: 2
Project participant:
Karlsson, Kenneth Bernard (Intern)
Project Manager, organisational:
Nørgaard, Jørgen (Intern)
Cyclists’ and pedestrians’ effect on right turning capacity at signalised intersections

The project is concerned with the effects of cyclists and pedestrians on the right turning capacity for cars at signalised intersections. Four intersections in Copenhagen with heavy cycle traffic has been observed and delays found by means of regression techniques. Also, a simulation model has been developed in order to generalise the limited empirical results. Paper has been accepted for international capacity seminar in Copenhagen, June 1998.

Department of Planning

Department of Civil Engineering
Period: 01/05/1997 → 01/09/1998
Number of participants: 3
Project participant:
Aagaard, Pierre Egom (Intern)
Rysgaard, Rikke (Ekstern)
Project Manager, organisational:
Jørgensen, N O (Intern)

Vandabsorption i træ- og plantefibre

Department of Civil Engineering
Period: 01/05/1997 → 17/04/2001
Number of participants: 4
Phd Student:
Strømdahl, Kenneth (Intern)
Main Supervisor:
Hoffmeyer, Preben (Intern)
Examiner:
Olesen, Per (Intern)
Hansen, Kurt Kielsgaard (Intern)

ECO-CAMPUS, Energy Environment network of European universities and research centers

The project is carried out by an international network between universities in France, Denmark, Finland, Greece, Poland, Portugal and Romania. The aim is to investigate the energy and environmenal situation at the universities themselves, realizing the importance of these institutions being examples for the rest of societies, especially the students. Studies from various campuses are analysed and compared.

Department of Buildings and Energy
Department of Environmental Science and Engineering
Department of Civil Engineering

Department of Environmental Engineering
Period: 15/02/1997 → 01/01/9999
Number of participants: 8
Project participant:
Gabriel, Søren (Intern)
Roturier, Jacques (Ekstern)
Laine, T. (Ekstern)
Apostolidou, E. (Ekstern)
Gula, A. (Ekstern)
Deformation Problems in Reinforced Concrete
Research on deformation problems in reinforced concrete in Denmark has been scanty, due to the relatively high focus on strength problems during decades. In this project some important deformation problems are studied. The purpose is to model reinforced concrete in much the same way as the load carrying capacity problems have been modelled. In uniaxial problems the crack formation model developed by David Holkmann Olsen is refined to make it possible to take into account tension stiffening effects. The uniaxial model then is extended to bending in beams. In shear problems the diagonal compression field is used and in the linear-elastic cracked state the governing parameters are determined by minimization of the complementary elastic energy. Besides beams in bending and shear, disks in pure shear will be treated. The results of these efforts has been partly published, see Publications. Later is it attempted to use the same model for combined actions in beams, first of all combined bending and torsion, in which case the stiffness properties are important in lateral stability problems. In a following phase stress calculation for complex stress states is dealt with. Focus will be on stresses in reinforcement near concentrated forces, a problem which arises in connection with anchorage of prestressing reinforcement. As a biproduct modelling of crack tip stress fields near sharp cracks are studied by using the same stress fields. This part of the project has been published, see Publications, Morten Bo Christiansen. Finally, stress and stiffness determination is carried out in box girders by means of the models investigated. The importance of warping stresses and warping deformations are studied. The theory is thought to combine ideas of the Vlasov theory for thin-walled closed sections and ideas developed in the first phases of the project.

Department of Structural Engineering and Materials
Department of Civil Engineering
Rambøll Danmark A/S
Period: 01/02/1997 → 01/02/2000
Number of participants: 4
Project participant:
Stang, Henrik (Intern)
Christiansen, Morten Bo (Intern)
Feddersen, Bent (Ekstern)
Project Manager, organisational:
Nielsen, Mogens Peter (Intern)
Project

Konstitutiv...
Department of Civil Engineering
Period: 01/02/1997 → 12/07/2000
Number of participants: 2
Phd Student:
Christiansen, Morten Bo (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Large-Scale Solar Heating
Department of Civil Engineering
Contribution to formulation of development programme for alternative thermal insulation material  
A programme is written for development of thermal insulation materials that are healthy both to the labour force and to the external environment. The programme is written on behalf of the Danish Energy Agency. Contribution is given to the formulation of the programme.

Department of Buildings and Energy  
Department of Civil Engineering  
Danish Building Research Institute  
Period: 01/01/1997 → 30/05/1997  
Number of participants: 2  
Project participant:  
Nicolajsen, Asta (Ekstern)  
Project Manager, organisational:  
Rode, Carsten (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 25,000.00 Danish Kroner  
Project

Determination of the Fracture Energy of Concrete  
The project concerned the experimental determination of the fracture energy of concrete. A comparison between two test methods was carried out: the three point bend test on a notched beam and the wedge-splitting test. The project was a part of a Nordic round-robin test carried out with the support from Nordtest.

Department of Structural Engineering and Materials  
Department of Civil Engineering  
Swedish National Testing and Research Institute  
SINTEF Civil and Environmental Engineering  
Period: 01/01/1997 → 01/08/1997  
Number of participants: 1  
Project Manager, organisational:  
Stang, Henrik (Intern)  

Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 30,000.00 Danish Kroner  
Project
Fast Ferry Energy Consumption
The objective of the project was to calculate energy consumption of selected passenger transport trip chains - focusing particularly on the role of ferry transport

Department of Buildings and Energy
Department of Civil Engineering

Tetraplan A/S
Period: 01/01/1997 → 31/03/1997
Number of participants: 2
Project participant:
Petersen, Morten Steen (Ekstern)
Project Manager, organisational:
Jørgensen, Kaj (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 24,000.00 Danish Kroner

Armeret murværks konstruktive egenskaber

Department of Civil Engineering
Period: 01/11/1996 → …
Number of participants: 2
Phd Student:
Hagsten, Lars German (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Erhvervsforskerordningen
Project: PhD

Low-energy glazings
The aim of the project is to make and test an apparatus for assembling of evacuated, monolithic silica aerogel and xerogel glazings. Hereby it is expected that a simple and cheap method for industrial production of evacuated aerogel and xerogel glazings can be shown. The project is carried out in two major steps. The first concerns design and manufacturing of the apparatus. The second step will be different tests of the apparatus itself and production of a limited number of aerogel glazings. During several national projects and two EU-JOULE 2 projects, there is developed aerogel and xerogel glazings which have very small cold bridge effect of the rim seal. In order to obtain a fast evacuation of the aerogel/xerogel material, which is crucial at an industrial production, a method has been sketched. And this method is applied in this project. The results of the project will be used to show benefits of the method and the project will serve as input for an EU-JOULE 3 proposal.

Department of Buildings and Energy
Department of Civil Engineering

Scanglas A/S
Scan Gobain Glass A/S
Period: 15/10/1996 → 31/12/1997
Number of participants: 3
Project participant:
Brauer, Harald (Ekstern)
Malholm, Niels Bo (Ekstern)
Project Manager, organisational:
Jensen, Karsten Ingerslev (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
The role of absorbent building materials in moderating changes of relative humidity
A Ph.D. study for BA Tim Padfield, The Conservation Department at the Danish National Museum. The project is described in detail on the home page of the National Museum. Main supervisor: Anders Nielsen Co-supervisors: Kurt Kielsgaard Hansen, BKM and Carsten Rode, IBE

Department of Structural Engineering and Materials
Department of Buildings and Energy
Department of Civil Engineering
National Museum of Denmark
Number of participants: 4
Project participant:
Hansen, Kurt Kielsgaard (Intern)
Padfield, Tim (Intern)
Rode, Carsten (Intern)

Project Manager, organisational:
Nielsen, Anders (Intern)

GIS-T; Sub-project on traffic models
In recent years a Danish debate on the use of traffic models have taken place in the professional community. IFP has among others participated intensively in this debate. One of the conclusions has been that many reminiscences of the early development of traffic models still exist - despite the recent development in computer and software technology, as well as theoretical development. A number of fundamental problems are: 1) That the coherence between sub-models seldom equals the road users and passengers decision-making process. 2) That the use of variables in different sub-models seldom are consistent with each other. 3) That advantages and disadvantages with the sequential versus other more recent model approaches have not been discussed thoroughly. 4) That people do not act rational as most models assumes. 5) That supply models (e.g. matrix estimation, route choice and traffic assignment) are too simplified in many decision making context. In phase 2 of the GIS-T programme, the above problems are dealt with in more fundamental discussions, while the following sub-models are dealt with more thoroughly; 1) Route Choice Models, 2) Matrix Estimation Methods and 3) Probit models for mode choices.

Department of Planning
Department of Civil Engineering

Tetraplan A/S
Period: 01/09/1996 → 01/06/1997
Number of participants: 12
Project participant:
Leleur, Steen (Intern)
Brems, Camilla Riff (Intern)
Nielsen, Erik Rude (Intern)
Grevy, Bo (Intern)
Israelson, Thomas (Intern)
Thorlacius, Per (Intern)
Hansen, Christian Overgaard (Ekstern)
Bloch, Karsten Sand (Ekstern)
Nielsen, Jan (Ekstern)
Nielsen, Mogens (Ekstern)
Petersen, Jens Møller (Ekstern)

Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
NECER (Network of European Centrifuges for Environmental Research)
Development of centrifuge Physical Models in the field of Environmental Geotechnics The main objective of the programme is to develop the capabilities of centrifuge modelling in environmental geotechnics and to assess its limits.

Three basic tasks have been selected as scientific programme:

Task A- Development of measuring and observation devices for detection of contaminant migration. This task would cover the selection of markers to simulate pollutants, the development and assessment of miniature probes for their detection, and the investigation of numerical image processing for monitoring of contaminant migration in two-dimensional problems.

Task B- Assessment of problems of pollutant transport in non-saturated soils. This task would deal with identification of scaling laws and similitude requirements and would include reference tests for cross testing in order to evaluate the reproducibility of simple problems within the areas of saturated and non-saturated soil conditions.

Task C- Cracking and faulting of saturated clay barriers and liners in relation with transport of contaminants. This task would represent attempts to consider engineering applications where cracks and faults (either naturally present or induced) may affect the efficiency of clay barriers or liners concerning pollution containment. Effect of coupling between flow of contaminants and deformation of the solid matrix could be included in the analysis.

The project is described in the following web-page: http://www.lcpc.fr/~necer/necerwww.htm

Department of Applied Civil and Environmental Engineering

Department of Civil Engineering

LCPC

City University London

University of Cambridge

Delft Geotechnics

ISMES

Laboratorio Nacional de Engenharia Civil

University of Manchester

Ruhr-Universität Bochum

Delft University of Technology

University of Wales

Period: 01/09/1996 → 31/05/2001

Number of participants: 12

Project participant:

Bagge, Gunnar (Intern)

GARNIER, Jacques (Ekstern)

Taylor, N. (Ekstern)

Bolton, M.D. (Ekstern)

Weststrate, F.A. (Ekstern)

Peano, A. (Ekstern)

Silva, M.A.G. (Ekstern)

Merrifield, C. (Ekstern)

König, D. (Ekstern)

Allersma, H.G.B. (Ekstern)

Davies, M.C.R. (Ekstern)

Project Manager, organisational:

Fuglsang, Leif D (Intern)

Financing sources

Source: Unknown

Name of research programme: UKENDT

Amount: 600,000.00 Danish Kroner

Project

Network of European Centrifuges for Environmental Geotechnic Research: TMR programme of the EC
The Copenhagen Harbour Tunnel Project
The initial stages of the planning process concerning large infrastructure projects are often based on rather simplified modelling efforts - if any. Based on this, large-scale traffic modelling studies are often agreed upon. However, even though traffic models are becoming more and more complex, a number of simplifications are often decided upon in the early stage of the study, e.g. whether to model induced traffic and land use interaction. Even if the best practice is followed, the forecasts may turn out far from the actual flows. In addition, the work is often so comprehensive, that only few alternatives are examined thoroughly (although the GIS-technology has eased the work process). As a result, the reasonableness of using traffic models in the planning process has often been debated. The Harbour Tunnel project is an early GIS-based assessment of the impacts of a proposed road-tunnel under the harbour of Copenhagen. Besides relying as much as possible on existing models, the study has used a minimum-maximum strategy to search for critical and non-critical traffic components. As an example induced traffic may be difficult to assess, but the 'maximum reasonable induced traffic' could clarify whether it is relevant to consider induced traffic at all. In the same manner recommendations could be given to the need for detailed investigations of e.g. land-use interaction, truck-traffic, detailed route choices, traffic calming, trip distribution and mode choice. A large number of alternatives were examined, several of which could clearly be rejected. In addition, the study provided useful recommendations for a subsequent full-scale modelling study (not yet started). Some of these recommendations were surprising even for experienced modellers.

Department of Civil Engineering

Carl Bro A/S
Tetraplan A/S

Theory of Masonry Structures
Although masonry structures have been built in several thousands of years, no development of a basic theory has taken place. In earlier time the structures were wholly based on practical experience. In the past 100 years a large amount of empirical knowledge has been collected. For the basic strength parameters empirical formulas have been suggested and code rules have been formulated. In Denmark rational failure theories based on the theory of plasticity have been successfully developed. In this project it will be attempted to use the experience obtained for concrete and reinforced concrete structures in order to develop a comprehensive theory of masonry and reinforced masonry. The problems considered are compressive strength as a function of block and mortar strength, tensile strength, compressive strength at concentrated loadings and shear strength of reinforced masonry beams. Further a basic theory of the yield moments in transversally loaded walls will be created. The basic strength parameters are the compressive and tensile strengths of the block, the same parameters for the mortar and the strength of the interface between block and mortar. These parameters are determined by either standard tests or newly developed test procedures (Klaus Feilberg Hansen, SBI).

Department of Structural Engineering and Materials
Strength and Deformation Problems in Cracked Concrete
The strength and deformation properties of concrete and reinforced concrete is strongly dependent on the internal crack system. This crack system may be characterized either as microcracks or macrocracks. Microcracks are present even before loading. They are mainly due to the shrinkage of the cement paste. Loading may further increase the number and width of microcracks and gives rise to a so-called load induced anisotropy. Macrocracks are in most cases visible on the surface of the structure. When stressed reinforcement passes a macrocrack a further increase of internal cracking takes place. In the project the Jin-Ping Zhang model for non shear reinforced elements is further developed. Structural elements as conventional beams, prestressed beams and hollow-core slabs including both statically determinate and statically indeterminate elements are treated. The first results are very promising. The model is extended to disks, i.e. plane elements loaded in their own plane. A theory based on a model material fully cracked in all directions in the plane as a
limiting case is developed. This part of the project has important bearings on the numerous rehabilitation projects on all kinds of reinforced structures which are carried out throughout the world in these years. In a second part of the project the micro-mechanical model formulated by Jin-Ping Zhang for failure in concrete is further developed. The influence of fiber reinforcement on the compressive strength is studied and an extension to predict the descending branch of the compression stress strain relation of concrete will be made. The models will be incorporated in some standard commercial programs which are used in rehabilitation projects. One or more bridges suffering severe cracking will be investigated using the theory developed.

Department of Structural Engineering and Materials
Department of Civil Engineering
Rambøll Danmark A/S
Period: 01/08/1996 → 01/08/1999
Number of participants: 4
Project participant:
Hoang, Linh Cao (Intern)
Stang, Henrik (Intern)
Project Manager, organisational:
Nielsen, Mogens Peter (Intern)
Feddersen, Bent (Ekstern)

Klimaaskærmekonstruktioners sikkerhed mod funktionssvigt og nedbrydning
Department of Civil Engineering
Period: 01/07/1996 → 12/04/2000
Number of participants: 2
Phd Student:
Rudbeck, Claus Christian (Intern)
Main Supervisor:
Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering-SU
Project: PhD

Infodatabase
In cooperation with KMS a metadatabase on geographic related data in Denmark is being developed. The database will include information on 180 different databases and will be accessible on the internet.

Department of Planning
Department of Civil Engineering
Kort og Matrikelstyrelsen
Period: 01/05/1996 → 01/04/1997
Number of participants: 3
Project participant:
Lind, Morten (Ekstern)
Nielsen, Anders (Ekstern)
Project Manager, organisational:
Jacobi, Ole Illum (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

Sustainable Flow Management
The project aims at capturing the processes shaping the networks, understanding the flow managers and testing the transferability between regions and sectors. The project is based on a number of regional studies, case studies and a transferability study. In 1997 case studies of Buildings, Plans and Networks have been carried out, the work in 1998 has
been a cross-regional analysis - and writing the final report.

Department of Planning

Department of Civil Engineering

Institut für Regionalentwicklung und Strukturplanung

University of Newcastle upon Tyne

ELIUS
Period: 01/05/1996 → 30/06/1998
Number of participants: 6
Project participant:
Jensen, Jesper Ole (Intern)
Nielsen, Susanne Balslev (Intern)
Marvin, Simon (Ekstern)
Spiropoulou, Catherine Veï (Ekstern)
Project Manager, organisational:
Elle, Morten (Intern)
Moss, Timothy (Ekstern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,086,715.00 Danish Kroner

Human perception of air movement: Impact of airflow frequency and direction on the sensation of draught
Department of Civil Engineering
Section for Indoor Environment
Period: 01/04/1996 → 31/03/1999
Number of participants: 2
velocity fluctuations, human response, measurements
Phd Student:
Zhou, Genhong (Intern)
Supervisor:
Melikov, Arsen Krikor (Intern)

Group of programmes. Revising of the objectives and effort fields within the
The objective of the project is to make suggestions for objectives and effort fields to the Danish Environmental PRotection Agency’s future cleaner technology and recycling effort in the construction sector. In addition a suggestion for guidelines to initiate and implement projects in this field should be made. Objectives and priorities of effort fields for the future effort are made in the light of the lately implemented mid evaluation of the Danish Environmental protection Agency’s "Part action plan for cleaner technology and recycling effort in the construction sector 1993-97", and current knowledge about the construction sector's environmental conditions is involved. Furthermore, a coordination with other relevant public initiatives within the field has been made, including the Ministry of Housing and Building’s Action Plan for Urban Ecology as well as initiatives within the field of traffic and working environment. The proposal for guidelines to initiate and to implement projects is worked out in the light of the experiences from the previous effort as well as in the light of the proposals from the above mentioned midway evaluation. The intention is to target the future effort and to promote generally oriented development activities through involvement of all relevant parties and environmental aspects. In addition, operational and evaluational intentions of the effort must be expressed.

Department of Planning

Department of Civil Engineering

COWI A/S

Danish Building Research Institute
Period: 01/04/1996 → 31/12/1996
Number of participants: 3
Project participant:
Henrik, Kærgaard (Ekstern)
Hansen, Klaus (Ekstern)
Project Manager, organisational:
Jensen, Niels-Arne (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 145,000.00 Danish Kroner
Project:

Træs mekanosorptive egenskaber
Department of Civil Engineering
Period: 01/04/1996 → 10/04/2003
Number of participants: 6
Phd Student:
Jensen, Signe Kamp (Intern)
Supervisor:
Damkilde, Lars (Intern)
Main Supervisor:
Hoffmeyer, Preben (Intern)
Examiner:
Rode, Carsten (Intern)
Kliger, Robert (Ekstern)
Olesen, Per (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Aspects of Foundation Failure in Danish Residential Development
This collaborative research project investigates comparatively the incidence of foundation failures in residential building in three European countries. The findings are related to the industrial and technological frameworks in the countries in order to identify the influence of these structural parameters on the occurrence and handling of failures. On this basis the general demands on a technology management model for residential building are conceptualised.

Department of Planning
Department of Civil Engineering
Nottingham Trent University
University of Bucharest
Period: 01/03/1996 → 31/12/1997
Number of participants: 3
Project participant:
Leving, Peter (Intern)
Carter, Geoffrey (Ekstern)
Project Manager, organisational:
Bonke, Sten (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 126,000.00 Danish Kroner
Project:

Biomasse til energiformål
Department of Civil Engineering
Period: 01/03/1996 → 18/10/2000
Number of participants: 2
Phd Student:
Salomonsen, Kristian Buch (Intern)
Main Supervisor:
Nørgaard, Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Rationelle styrkekriterier for konstruktionstræ udsat for tværtræk

Department of Civil Engineering
Period: 01/03/1996 → 01/08/2001
Number of participants: 6
Phd Student:
Pedersen, Martin Bo Uhre (Intern)
Supervisor:
Hoffmeyer, Preben (Intern)
Main Supervisor:
Damkilde, Lars (Intern)
Examiner:
Larsen, Hans Jørgen (Intern)
Blass, H.J. (Ekstern)
Petersson, Hans (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Simulation of truck-traffic to the Harbour of Copenhagen

In connection with the work 'Environmental impacts of freight transport by truck and ship - A pilot project for the Copenhagen Metropolitan area' done by Copenhagen Business University, Otto Anker Nielsen was hired to do a simulation of the distribution and routes of truck-traffic on the road network in Copenhagen. Truck flows were investigated within 3 categories to- and from Copenhagen: International traffic, traffic to- and from the harbour and national traffic. Traffic surveys delivered by the Business Univ. were split up in a more detailed level by a sketch method. Hereafter the traffic was assigned onto a road network earlier implemented at IFP by a probit-based route choice model. Beside the practical part of the work, the study gave some interesting insight to truck driver's route choices: 1.Truck drivers have a less stochastic behaviour than personal car drivers. 2.Truck drivers have a large preference for big roads (especially motorways) and little preference for small roads. Thus, weighted speeds (perceived costs) can advantiously be used in the model in stead of the real speeds. In addition the preference seems to be better described by using travel time rather than travel cost (or length) as explanatory variable. 3.It is less important to use a traffic dependent model (User Equilibrium) than for personal car traffic (under the premise that the traffic network is medium loaded as in Copenhagen).

Department of Planning
Department of Civil Engineering

Danish Environmental Survey
Period: 01/03/1996 → 01/06/1996
Number of participants: 3
Project participant:
Nedergaard, Kristen (Ekstern)
Marskell, Peter (Ekstern)

Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Sustainable Development Indicator Working Group

Complex systems like our societies are often dealt with through indicators, which are selected as guideposts to indicate whether the system is on the track of development wanted. Sustainable development of our societies is often expressed as the aim. The project is an attempt to suggest - not the actual appropriate indicators - but rather some guidelines on how to select the indicators in a democratic process. The working group consists of around twenty researchers from all over the world, all members of the Balaton Group. The project was finished by a report "Indicators and Information for Sustainable Development", written by Donella Meadows, Dartmouth College, N.H., USA, published by The Sustainability Institute, PO Box 174, Hartland Four Corners, VT 05049, USA.

Department of Buildings and Energy
Department of Civil Engineering
Dartmouth College
University of Kassel
University of Canterbury

Period: 01/03/1996 → 01/09/1998
Number of participants: 4

Meadows, Donella (Ekstern)
Bossel, Hartmuth (Ekstern)
Peet, John (Ekstern)

Nørgaard, Jørgen (Intern)

Financing sources
Source: Unknown

Name of research programme: Ukendt
Amount: 1.00 Danish Kroner

Udmattelsesstyrken for træ

Department of Civil Engineering

Period: 01/03/1996 → 31/07/2001
Number of participants: 6

Phd Student:
Clorius, Christian Odin (Intern)

Supervisor:
Damkilde, Lars (Intern)

Main Supervisor:
Hoffmeyer, Preben (Intern)

Examiner:
Larsen, Hans Jørgen (Intern)
Blass, H.J. (Ekstern)

Petersson, Hans (Ekstern)

Financing sources
Source: Internal funding (public)

Name of research programme: DTU-Su Stipendium, Eksperiment

Project: PhD

Undersøgelse og modellering af termiske forhold i low flow solvarmeanlæg

Department of Civil Engineering

Period: 01/03/1996 → 17/12/1999
Number of participants: 3

Phd Student:
Dynamic Response of SWEMAAIR 300 Thermal Anemometer with SWA-01 Velocity Transducer

Department of Energy Engineering
Department of Civil Engineering
Section for Indoor Environment
SWEMA
Silesian University of Technology
Period: 01/02/1996 → 30/11/2006
Number of participants: 1
Project Manager, organisational: Melikov, Arsen Krikor (Intern)

Klimaskærmens varmetekniske forhold

Department of Civil Engineering
Period: 01/02/1996 → 25/10/1999
Number of participants: 2
PhD Student: Rose, Jørgen (Intern)
Main Supervisor: Svendsen, Svend (Intern)

Windows with an improved energy balance of 30%

The aim of the project is to improve the energy performance of windows for residential buildings with at least 30% relative to common standard. The energy performance is regarded as the net energy contribution from the window, i.e. the difference between usable transmitted solar radiation and the heat loss during the heating season. The thermally weak parts of the windows are the spacer forming the rim seal in sealed glazing units and the window frames. Especially with respect to the frames, this part of the window often forms an area of 30% of the total window area - an area that has a higher heat loss coefficient than at the centre of the glazing and furthermore is opaque, i.e. the heat loss will not be compensated by transmission of solar radiation. The project investigates the possibilities of making smaller and better insulating window frames and to eliminate or decrease the thermal bridge effect of the rim seal spacer. A promising result will be made as a prototype for testing in the laboratory.
GIS-T; Sub-project on methods for quality control of data and model results

The use of digital maps and adjacent databases have the potential to ease the work process when setting up traffic models. However, such methods do not necessarily secure against data errors. The amount of data in traffic models is rapidly increasing (especially due to new technologies such as GIS), which results in extremely time consuming quality controls in practice. Due to the amount and complexity of the work, many errors and deficiencies are overlooked. Such disregards in the data foundation of traffic models results often in doubtful traffic models. In addition it becomes difficult to determine whether problems stems from the data foundation, simplified assumptions or the structure of the traffic models. Thus quality control of data and models must be seen as a whole. It is the sub-projects goal to develop GIS-based methods and guidelines for quality control of data, as well as to develop validation methods for traffic models. This will provide a significant contribution to the quality of traffic forecasts. Several good experiences with the methodologies have already been achieved in different applied projects (especially the Harbour Tunnel project) and several Danish/Nordic and International papers on the subject are on their way. See the GIS-T programme for organizational details on the project.

Department of Planning
Department of Civil Engineering
Tetraplan A/S
Period: 02/01/1996 → 01/06/1997
Number of participants: 12
Project participant:
Leleur, Steen (Intern)
Brems, Camilla Riff (Intern)
Thorlacius, Per (Intern)
Grevy, Bo (Intern)
Nielsen, Erik Rude (Intern)
Israelsen, Thomas (Intern)
Hansen, Christian Overgaard (Ekstern)
Bloch, Karsten Sand (Ekstern)
Nielsen, Jan (Ekstern)
Nielsen, Mogens (Ekstern)
Petersen, Jens Møller (Ekstern)
Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 750,000.00 Danish Kroner
Project

BRITE-EURAM Project Improved Quality Assurance and Methods of Grouting Post-tensioned Tendons, EC-Contract No. BRPR-CT95-0099
Corrosion problems due to badly grouted ducts in post-tensioned concrete structures are present throughout the EC countries, albeit less publicity has been given in some. Dramatic collapses in both the UK and Belgium, premature demolitions and unforeseen extensive maintenance works all over Europe has created great concern. Improvements on current processes of grouting post-tensioning ducts cannot be achieved by any single action on its own, but require parallel developments in the field of grouting materials, grouting techniques and QA/QC systems. It is therefore the objective of the project to: - introduce suitable QA systems which can be applied during and immediately after grouting. - develop grouts which have improved properties viz. flowability, bleed, volume change, stability etc. - develop improved grouting techniques and specifications.
Department of Structural Engineering and Materials  
Department of Civil Engineering  
Gifford and Partners  
Dansk Beton Teknik A/S  
Danish Road Directorate  
Belgian Building Research Institute  
Identity  
CINEC  
Period: 01/01/1996 → 31/03/1999  
Number of participants: 3  
Project participant:  
Olesen, John Forbes (Intern)  
Dela, Birgitte Friis (Intern)  
Project Manager, organisational:  
Stang, Henrik (Intern)  
Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 850,000.00 Danish Kroner  

**Building Envelope for New Buildings and Energy Renovation of Existing Buildings**  
The project is to further the heat economy of new buildings and existing buildings through a technology development of building envelopes, excl. windows. The aim of the project is therefore to establish the theoretical, experimental and practical basis for the future building envelope by the following means: To clarify a range of building physical problems of thermal and hygric nature of highly insulated constructions, cold bridges, new materials etc. on the basis of detailed measurements. With the results of the measurements to contribute to the revision of norms and calculation methods with the emphasis on multidimensional heat flows. To inform about the gained knowledge to relevant authorities, organizations and firms.

Department of Buildings and Energy  
Department of Civil Engineering  
Danish Building Research Institute  
Period: 01/01/1996 → 31/12/2000  
Number of participants: 5  
Project participant:  
Rudbeck, Claus Christian (Intern)  
Rose, Jørgen (Intern)  
Tommerup, Henrik M. (Intern)  
Andersen, Jørgen Munch (Ekstern)  
Project Manager, organisational:  
Svendsen, Svend (Intern)  
Financing sources  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 2,750,000.00 Danish Kroner  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 1,000,000.00 Danish Kroner  
Source: Unknown  
Name of research programme: Ukendt  
Amount: 810,000.00 Danish Kroner  
Project

Section for Planning and Management of Building Processes
Department of Civil Engineering
Period: 01/01/1996 → 01/01/2002
Number of participants: 5
Project participant:
Buhl, Henrik (Intern)
Nørnberg, Lise (Intern)
Hagedorn-Rasmussen, Peter (Intern)
Vogelius, Peter (Intern)
Project Manager, organisational:
Koch, Christian (Intern)

Financing sources
Source: Forskningsprojekter - Erhvervsministeriet
Name of research programme: Forskningsprojekter - Erhvervsministeriet
Amount: 1,900,000.00 Danish Kroner

Characterisation and industrial utilisation of plantfibres for environmental friendly products (Biomat).

Section for Building Materials and Geotechnics
Department of Civil Engineering
Period: 01/01/1996 → 31/12/2003
Number of participants: 1
Project ID: 25145
Project Manager, organisational:
Hoffmeyer, Preben (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 4,000,000.00 Danish Kroner

Development with Sustainable Use of Electricity
The purpose of the project was to organize and run a workshop by that name in Lopuszna, Poland from 17-21 June 1996, and afterward edit the papers for the proceedings book. 49 participated, including 14 key speakers. Most participants were from the central and east European countries. Subjects covered electricity saving statistic, national programs, implementation, and experimental low electricity houses. Getting authors to submit papers and afterwards editing them for proceedings was the last task.

Department of Buildings and Energy
Department of Civil Engineering
Polish Foundation for Energy Efficiency
University of Coimbra
Period: 01/01/1996 → 01/10/1998
Number of participants: 3
Project participant:
Gula, Adam (Ekstern)
de Almeida, Anibal T. (Ekstern)
Project Manager, organisational:
Nørgaard, Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 165,000.00 Danish Kroner
**Durability of Fibre Reinforced Concrete Structures (Part of Design Methods for Fibre Reinforced Concrete)**

The research has indicated that fibre reinforced concrete has better durability than normal concrete. Durability parameters has been measured on cracked as well as uncracked specimens. Also the pore structure in the concrete has been characterized.

Department of Structural Engineering and Materials

Department of Civil Engineering

Period: 01/01/1996 → 31/12/1998

Number of participants: 2

Project participant:

Hansen, Ernst Jan De Place (Intern)

Project Manager, organisational:

Hansen, Kurt Kielsgaard (Intern)

**Financing sources**

Source: Unknown

Name of research programme: Ukendt

Amount: 22,000.00 Danish Kroner

**Organizational learning**

The project is a case study of the knowledge transfer in the Øresund Project

Department of Planning

Department of Civil Engineering

Stanford University

Chalmers University of Technology

Period: 01/01/1996 → 01/07/1996

Number of participants: 2

Project participant:

Harkola, Julia (Ekstern)

Project Manager, organisational:

Gaarslev, Axel (Intern)

**Passive control of structure subjected to extreme dynamic loads**

Department of Civil Engineering

Period: 01/01/1996 → 14/04/2000

Number of participants: 4

Phd Student:

Mualla, Imad H (Intern)

Main Supervisor:

Nielsen, Leif Otto (Intern)

Examiner:

Jensen, Jørgen Juncher (Intern)

Svensson, Eilif (Intern)

**Financing sources**

Source: Internal funding (public)

Name of research programme: Selvfinansierende (privatist)

Project: PhD
Transportation behaviour and Everyday Life
The objective of the project is to summarise and analyse Danish passenger transportation patterns with a view to prepare a basis for a study of the relations between lifestyles, daily life conditions and actual transport patterns. In particular, the project focuses on the integration of transportation in the family activity patterns.

Department of Buildings and Energy
Department of Management Engineering
Department of Civil Engineering

Period: 01/01/1996 → 31/12/1996
Number of participants: 2
Project participant:
Jørgensen, Ulrik (Intern)

Project Manager, organisational:
Jørgensen, Kaj (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 375,000.00 Danish Kroner

Digital Elevation Model
As preparation for a new digital elevation model (DEM) of Denmark users of the DEM were asked what quality they would expect of a new DEM. On the basis of this query, new and existing data are added to the existing DEM aiming to improve its quality. The project is made in cooperation with the department of geography at the University of Copenhagen and Kort og Matrikelstyrelsen.

Department of Planning
Department of Civil Engineering
University of Copenhagen
Kort og Matrikelstyrelsen

Period: 01/10/1995 → 31/12/1998
Number of participants: 4
Project participant:
Frederiksen, Poul (Intern)
Balstrøm, T. (Ekstern)
Larsen, Jacob Nordby (Ekstern)

Project Manager, organisational:
Jacobi, Ole Illum (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

Design Methods for Fibre Reinforced Concrete
Background In Denmark, FRC-materials have been introduced in a number of different areas. These include storage tanks, membranes, industrial floors and facade elements. The use of FRC materials in these areas is taking place on a more or less empirical basis or based on design criteria linked to specific fiber types and set up by fiber manufactures. It is expected that Danish industry will meet tough competition in the years to come in the field of FRC-materials and structures. It is very important that a theoretical basis is established which makes it possible to design FRC-materials with respect to fracture toughness. Futhermore, that it becomes possible to design FRC-structures taking the expected toughness of the material into account. In this process it is important that test methods are established which makes it possible to verify that the expected toughness has in fact been achieved. In this connection it is important to realize that current design and test methods for concrete structures does not open such possibilities and that empirical and semi-empirical design methods ties the designer to certain fiber types and obstructs a rational optimization process. Objectives It is the overall objectives of the present project to: suggest design methods for concrete structures involving parameters quantifying the fracture toughness set up relationships between toughness parameters and fiber reinforcement design practical and reliable test methods for the determination of toughness Furthermore the workability, durability and fire resistance of FRC materials will be evaluated.
Department of Structural Engineering and Materials
Department of Civil Engineering
Danish Technological Institute
Aalborg University
Rambøll Danmark A/S
NCC Rasmussen & Schiotz A/S
4K-Beton A/S

Period: 01/09/1995 → 30/04/1999
Number of participants: 5
Project participant:
Olesen, John Forbes (Intern)
Bendixen, Søren (Intern)
Hansen, Kurt Kielsgaard (Intern)
Hansen, Ernst Jan De Place (Intern)

Project Manager, organisational:
Stang, Henrik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 3,610,000.00 Danish Kroner

Egenspændinger i hærdnende beton

Department of Civil Engineering
Period: 01/09/1995 → 17/12/1999
Number of participants: 4
Phd Student:
Dela, Birgitte Friis (Intern)
Supervisor:
Hansen, Kurt Kielsgaard (Intern)
Nielsen, Lauge Fuglsang (Intern)
Main Supervisor:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

De lokale udeklimaparametres betydning for varme- og fugttransport ved overfladen af klimaskærmstrilutioner

Department of Civil Engineering
Number of participants: 3
Phd Student:
Kragh, Mikkel Kristian (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD
Optimering af varmtvandssystemer under hensyntagen til varmtvandsbehovet samt energi- og vandforbruget under en generel inddragelse

Department of Civil Engineering
Period: 01/08/1995 → 30/06/1998
Number of participants: 2
Phd Student:
Boye-Hansen, Lise (Intern)
Main Supervisor:
Furbo, Simon (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Transfer of Solar Water Heating Technology to Developing Countries - A Contribution to Environmentally Sustainable Framework

Department of Civil Engineering
Period: 01/08/1995 → 09/04/2001
Number of participants: 3
Phd Student:
Ahmad, Bashir (Intern)
Supervisor:
Baark, Erik (Intern)
Main Supervisor:
Galster, Georg (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Measurement of U-values on Termecon Profile Systems RF50NC and RF50ISO
Aluminium profiles for glass constructions traditionally forms a major thermal bridge in the construction compared to the centre heat loss of the glazing itself. The aim of the project is to measure the thermal bridge effect of a common profile construction and an improved profile. Based on the results of the measurements new improvements should be developed for further testing.

Department of Buildings and Energy
Department of Civil Engineering

Termecon A/S
Period: 01/07/1995 → 01/01/9999
Number of participants: 4
Project participant:
Fritzel, Peter (Intern)
Svendsen, Svend (Intern)
Rasmussen, Mogens (Ekstern)
Project Manager, organisational:
Schultz, Jørgen Munthe (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 50,000.00 Danish Kroner
Project
Monitoring for Project - Solar Heating in Ottrupgaard, Denmark.
Monitoring performance of seasonal pit water storage with hybrid liner of clay and plastic at Ottrupgaard, Denmark. The objective of the project is to investigate the performance and efficiency of the Ottrupgaard central solar heating, prove the applicability of the applied materials, obtain the heat losses and to verify the simulations made with the program SEASONSOL.

Department of Buildings and Energy
Department of Civil Engineering

PlanEnergi
Period: 01/07/1995 → 30/05/1997
Number of participants: 2
Project participant:
Maureschat, Gerald (Intern)
Project Manager, organisational:
Heller, Alfred (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 422,000.00 Danish Kroner

Action plan of cleaner technology and recycling effort in the building industry - mid evaluation
The objective of the project is to implement a systematical evaluation of the Danish Environmental Protection Agency's effort concerning cleaner technology and recycling in the construction sector. The evaluations include the projects initiated according to "Part action plan for cleaner technology and the recycling effort in the construction sector 1993-97" (Danish environmental Protection Agency 1992) as well as the projects implemented within the frames of the plan's two forerunners, "Action plan for cleaner technology in the construction sector 1991-1993" and "Action plan for construction waste 1991-1993". The evaluation is carried out in the light of the objectives expressed in the part action plan. Furthermore, current knowledge of environmental problems concerning the construction sector's activities and products is involved in the evaluation. The total effect of the implemented projects is evaluated, for example this involves an evaluation of the promotion of the results and the implementation in the construction sector's businesses and as far as possible an evaluation of the environmental effect of the effort. In addition, the most important barriers to the promotion of cleaner technology and recycling have been investigated. Finally, a proposal to give priority to the Ministry of Environment's future effort in this field is prepared.

Department of Planning
Department of Civil Engineering

Danish Technological Institute
Period: 01/06/1995 → 31/10/1997
Number of participants: 5
Project participant:
Jensen, Niels-Arne (Intern)
Christensen, Niels Valdemar Trap (Intern)
Amini, René Bo (Intern)
Nielsen, Julius (Ekstern)
Project Manager, organisational:
Christensen, Knud (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 990,000.00 Danish Kroner

Floating Lid Construction for Pit Water Storage - Phase I.
At Ottrupgaard, Denmark, a pit water heat store of 1,500 m3 and a lid area of about 700 m2 are built for seasonal storage of a solar collector field of 560 m2. The lid price is the largest component of a pit water store with a cost share of about 57%, more precisely 1,163 Dkr./m2. The development of lid constructions is crucial for the development of pit water storage as it seems that the development of the other main component for large-scale solar heating, the solar collectors will not have a breakthrough in the near future. The Ottrupgaard lid design is basically a sandwich element construction of PUR-foam between two metallic covers. The elements are joint in situ by special steel profiles. A two-step sealing with
silicone mass and bitumen-tape is applied to tighten the construction. The project is to find and evaluate a floating lid design at Ottrupgaard and give a survey of the known floating lid design for pit water storage.

Department of Buildings and Energy
Department of Civil Engineering
Nellemann Consultants
PlanEnergi
Plastconsult
ZW Energiteknik AB
Period: 01/06/1995 → 30/03/1997
Number of participants: 2
Project participant:
Jensen, Frank Frøsig (Intern)
Project Manager, organisational:
Heller, Alfred (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 329,000.00 Danish Kroner

Traditional solar heating systems cover between 5 and 10% of the heat demand for domestic hot water and comfort heating. By applying storage capacity this share can be increased much. The Danish producer of solar heating systems, Aidt-Miljø, markets such a system including storage of dry sand heated by PP-pipe heat exchanger. Heat demand is reduced due to direct solar heating, and due to storage. The storage affects the heat demand passive due to higher temperatures. Hence heat loss is reduced and passive heating is optioned. In theory, by running the system flow backwards, active heating can be achieved. The objective of the project was to evaluate this system by measurement and simulation. Measurements on a low-energy building unfortunately gave rather poor results, simulations were carried out by the computer program EMGP3. The results of the project are among others: The system is rather simple. Much work can be self-made to keep the price down. The system is working, but heat exchange from plastic piping to sand is rather poor. The dimensioning of the volume is rather difficult based on common knowledge. Passive heating, hence reduction of heat demand, due to the storage and especially due to the oversized solar collector area of the system, was achieved. Active heating from the sand storage was not observed. The pay-back time for the system can be estimated to be similar to solar heated domestic hot water systems in general. A number of minor improvements on the system could be pointed out.

Department of Buildings and Energy
Department of Civil Engineering
Aidt Miljø A/S
Period: 01/06/1995 → 31/12/1996
Number of participants: 2
Project participant:
Jensen, Frank Frøsig (Intern)
Project Manager, organisational:
Heller, Alfred (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 349,000.00 Danish Kroner

Air/liquid collectors
The aim of the project is to determine precise efficiency equations for combined air/liquid solar collectors. Equations which contains all relevant information on the solar collectors. A simulation program (Kviksol) will be modified in order to be able to handle this kind of collectors. The modified simulation program will be used for the determination of the surplus in performance which solar heating systems with this type of solar collectors for combined preheating of ventilation air and domestic hot water will have. The simulation program and the efficiency equation will allow the manufactures to optimize this kind of systems.
**Beregningsmodeller og målemetoder for varmetransport i Rockwool mineraluld**

Department of Civil Engineering  
Period: 01/05/1995 → 26/06/1998  
Number of participants: 3  
Phd Student: Dyrbøl, Susanne (Intern)  
Main Supervisor: Svendsen, Svend (Intern)  
Examiner: Hansen, Preben Nordgaard (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Erhvervsforskerordningen  
Project: PhD

**Noise Impact Analyses based on GIS- and BBR-registers**

When standard GIS are used for traffic noise impact assessment, this has usually been done by using the built-in buffer-and overlay tools. However, recent research by IFP and TetraPlan Ltd. shows that the use of these tools can result in a crude and systematic misestimation of the noise level along building facades and thereby also the number of residences affected by noise of certain levels. New methods developed by TetraPlan Ltd. consider the barriers of different buildings as well as noise reflections. As part of the work a methodology for creating a ‘synthetic’ 3-D model based on GIS-maps and the Danish Building register has been developed. The work builds on two pilot projects ("Svendborg" & "Middelfart") named after the concerned cities. In the second phase of the GIS-T programme, the evaluation of traffic noise based on detailed map and register data are continued. A method to split buildings in floors and apartments has been developed. Based on this, analyses of coherence between noise and different socioeconomic data from the Danish Building Register (BBR) and personal register (CPR) are carried through. This provides a first step in the direction of analyses of traffic noise's relationship with socioeconomic data.
Nielsen, Erik Rude (Intern)
Simonsen, Arne (Ekstern)
Lind, Morten (Ekstern)
Nielsen, Hugo Lyse (Ekstern)
Hvidtfeldt, Henrik (Ekstern)
Knudsen, Jørgen (Ekstern)
Kragh, Jørgen (Ekstern)
Bloch, Karsten Sand (Ekstern)
Project Manager, organisational: Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1.00 Danish Kroner
Project

Thermal Solar System Design
Department of Civil Engineering
Number of participants: 3
Phd Student:
Qin, Lin (Intern)
Main Supervisor:
Furbo, Simon (Intern)
Examiner:
Svendsen, Svend (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Friplads_SU
Project: PhD

Plastic theory applied to shear walls
Department of Civil Engineering
Period: 01/03/1995 → 20/01/1998
Number of participants: 2
Phd Student:
Liu, Lunying (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Blandet Finansiering-SU
Project: PhD

Education as a Means in Energy Policy
The project should be considered as a pilot project for more thorough investigation the extend to which the educational system is used and could be used as a means for achieving energy political targets. Focus of the pilot project has been at education of the age group 16-19 years. The role and importance of the education for shaping environmental consciousness is discussed. Analyses of the educational programs and to what extent they promote or allow for focussing on energy and environmental problems.

Department of Buildings and Energy
Department of Civil Engineering
Rambøll Danmark A/S
Frederiksværk Highschool
Period: 01/02/1995 → 30/04/1996
Number of participants: 5
Project participant:
Geertsen, Jette (Ekstern)
Gydesen, Annette (Ekstern)
Hansen, Elsebeth (Ekstern)
Bredsdorf, Axel (Ekstern)
Project Manager, organisational:
Nørgaard, Jørgen (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 386,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 386,000.00 Danish Kroner

Fatigue Fracture of Fibre Reinforced Concrete - An Experimental and Theoretical Study
Department of Civil Engineering
Period: 01/02/1995 → 26/06/1998
Number of participants: 3
Phd Student:
Jun, Zhang (Intern)
Supervisor:
Agerskov, Henning (Intern)
Main Supervisor:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Informationsudveksling byggeriets parter imellem
Department of Civil Engineering
Period: 01/02/1995 → 30/06/1998
Number of participants: 5
Phd Student:
Sørensen, Lars Schiøtt (Intern)
Main Supervisor:
Borchersen, Egil (Intern)
Examiner:
Aagaard, Niels-Jørgen (Intern)
Larsen, Jørn Steen (Ekstern)
Vestergaard, Flemming (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

SPEAR - Strategic Penetration and Adoption of Renewables
The SPEAR Project has developed a methodology for regional integration of renewable energy. SPEAR partners in
Germany, Portugal, the Netherlands, the United Kingdom, Ireland and Denmark have worked with a variety of local
counterparts, ranging from municipalities to regional development bodies, from utilities to county councils to set out
integrated renewable energy plans addressing local needs and concerns. The SPEAR Project has provided a synthesis of
options and methodologies available at local levels within a number of different European political, administrative,
economic and technical context. Each partner has used the Strategic Assessment Framework for the Implementation of Rational Energy (SAFIRE) cost-benefit model with local counterparts in their areas to develop integrated renewable energy plans to the year 2020. These plans have formed a framework for integrated planning at local and regional levels for policy makers, planners, energy specialists, and other local authorities.

Department of Buildings and Energy
Department of Civil Engineering
Energy for Sustainable Development Ltd.
Centro de Estudos em Economia da Energia dos Transportes e do Ambiente
WREAN/Western Regional Energy Agency Network
Department of Economic Development
Zentrum für Europäische Wirtschaftsforschung
Energy Research Centre of the Netherlands
Údarás na Gaeltachta
Q-SET Ltd.

Period: 01/02/1995 → 30/06/1996
Number of participants: 12
Project participant:
Levin-Jensen, Anna Karina M. (Intern)
Bess, Mike (Ekstern)
Bollinger, Philippe (Ekstern)
Gibson, Robert (Ekstern)
Foye, Lawrence (Ekstern)
Bräuer, Wolfgang (Ekstern)
Vögele, Stefan (Ekstern)
Diepstraten, Frans (Ekstern)
Perrells, Adriaan (Ekstern)
Conlan, Frank (Ekstern)
Borgan, Mike (Ekstern)
Project Manager, organisational:
Meyer, Niels I (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 320,000.00 Danish Kroner

Project Karakterisering af avancerede vinduer

Department of Civil Engineering
Period: 01/01/1995 → 24/07/2001
Number of participants: 5
Phd Student:
Duer, Karsten (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Furbo, Simon (Intern)
Fredlund, Bertil (Ekstern)
Olsen, Lars (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Kandidatstipendium ansat på DT
Project: PhD
KONMAT 6
KONMAT is a danish network cooperation for the Engineering Schools, DTU and the University of Aalborg. The subject is constructions and materials, and the aim is to improve on the quality of the education. The subgroup KONMAT 6 deals with statics with special emphasize on general methods and use of information technology.

Department of Structural Engineering and Materials

Department of Civil Engineering
Period: 01/01/1995 → 31/12/1997
Number of participants: 6
Project participant:
Andersen, Erik (Ekstern)
Holck, Niels (Intern)
Hansen, Svend Aage (Intern)
Brøchner, Torben (Ekstern)
Sørensen, John Dalsgaard (Intern)
Project Manager, organisational:
Damkilde, Lars (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 280,000.00 Danish Kroner

KONMAT 7
KONMAT is a danish network cooperation for the Engineering Schools, DTU and the University of Aalborg. The subject is construction and materials, and the aim is to improve on the quality of the education. The subgroup KONMAT 7 deals with Finite Element methods with special emphasize on the application on structural problems.

Department of Structural Engineering and Materials

Department of Civil Engineering
Period: 01/01/1995 → 31/12/1997
Number of participants: 6
Project participant:
Andersen, Erik (Ekstern)
Christensen, Lars (Intern)
Hansen, Svend Aage (Intern)
Holck, Niels (Intern)
Sørensen, John Dalsgaard (Intern)
Project Manager, organisational:
Damkilde, Lars (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 280,000.00 Danish Kroner

Road User Perception
A well known accident factor: that one road user do not see another road user before a collision happens is examined. Laboratory experiments and full scale driving tests are performed and interviews with accident and near accident parties are carried out.

Department of Planning

Department of Civil Engineering

University of Helsinki

Swedish National Road and Transport Research Institute
The Materials and the Load-bearing Capacities of Lightweight Aggregate Concrete Elements

Department of Buildings and Energy
Department of Civil Engineering
Ramboll Danmark A/S
Ingholt Consult ApS
Period: 01/01/1995 → 01/01/1997
Number of participants: 3
Project participant:
Goltermann, Per (Ekstern)
Ingholt, N.U. (Ekstern)
Project Manager, organisational:
Larsen, Henning (Intern)

Transport of Dangerous Goods, Phase 2
Two types of models are developed: 1) models for the probability of an accident involving D.G. on road or railway, 2) models for human injuries and environmental damages related to given D.G. releases. GIS-models are used to describe population density and environmental sensitivity related to topography, rivers and soil conditions.

Department of Planning
Department of Civil Engineering
COWI A/S
LHBConsult
Period: 01/01/1995 → 01/09/1998
Number of participants: 3
Project participant:
Rallis, Tom A (Intern)
Grevy, Bo (Intern)
Project Manager, organisational:
Jørgensen, N O (Intern)

Financing sources
Source: Unknown
Aerodynamics of long-span bridges

Department of Civil Engineering
Period: 01/09/1994 → 09/09/1997
Number of participants: 3
Phd Student: Larose, Guy (Intern)
Supervisor: Dyrbye, Claes (Intern)
Main Supervisor: Gimsing, Niels Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

Methods for trip matrix estimation
Most conventional methods for estimating trip matrices from traffic counts assumes either that the counts are error-free deterministic variables or they use a simplified traffic assignment model. Without these quite rough assumptions, the methods often demand prohibitive calculation times. In the project a new matrix-estimation method, ‘Multiple Path Matrix Estimation’ (MPME) has been developed which do not have these properties. Regarding route choices it corresponds to the models developed in 2a. For practitioners, MPME is most promising in cases where an old trip-matrix needs to be updated for use in sketch-plan models or as pivot-matrix in larger traffic models. MPME has been tested and used successfully in several full-size cases (from small cities with 25,000 inhabitants to metropolitan areas with 5 million inhabitants). In all cases, the method gave lower deviations between traffic counts and estimated traffic than other tested methods. It converged smoothly within acceptable calculation times. It is now being implemented in the US GIS-T, ‘TransCAD’, which is produced by the Boston-company, ‘Caliper Corporation’.

Department of Planning
Department of Civil Engineering
Tetraplan A/S
Period: 01/09/1994 → 07/12/1997
Number of participants: 12
Project participant: Brems, Camilla Riff (Intern)
Leleur, Steen (Intern)
Thorlacius, Per (Intern)
Grevy, Bo (Intern)
Israelsen, Thomas (Intern)
Nielsen, Erik Rude (Intern)
Hansen, Christian Overgaard (Ekstern)
Bloch, Karsten Sand (Ekstern)
Nielsen, Jan (Ekstern)
Nielsen, Mogens (Ekstern)
Petersen, Jens Møller (Ekstern)
Project Manager, organisational: Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1.00 Danish Kroner
Project
Probit models for mode choice
Logit-models are almost solely used for mode choice modelling. Often, the model-type is used also to model trip
distribution and sometimes trip production. The relatively simpleness of the logit-models and the availability of standard
software packages are some of the reasons for its prevalence. The disadvantages by logit-models on the other hand are
their premise of indepen-dence between alternatives, which is problematic when dealing with many alternatives partly
dependent of each other (e.g. car, bicycle, bus, light rail and rail). This can be avoided by using probit-models. However,
the multinomial probit-model have so far been difficult to handle for real-scale cases, but recent developments in computer
technology and mathematical simulation methods have given new possibilities for use of this model. The project
investigates both from a theoretical and practical point of view the possibilities of using Probit models for mode-choices. In
addition the subjects of mode-chains and trip-chains are dealt with. For organizational details on the traffic model sub-
projects; see the GIS-T programme.

Department of Planning
Department of Civil Engineering
Tetraplan A/S
Period: 01/09/1994 → 01/09/1999
Number of participants: 12
Project participant:
Brems, Camilla Riff (Intern)
Grevy, Bo (Intern)
Israelsen, Thomas (Intern)
Leleur, Steen (Intern)
Nielsen, Erik Rude (Intern)
Thorlacius, Per (Intern)
Hansen, Christian Overgaard (Ekstern)
Bloch, Karsten Sand (Ekstern)
Nielsen, Jan (Ekstern)
Nielsen, Mogens (Ekstern)
Petersen, Jens Møller (Ekstern)
Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1.00 Danish Kroner

Route Choice Models and Traffic Assignment
Route choice models are critical as they provides the final output of traffic models and thus give input to impact analyses
on link-level, e.g. local environmental and safety considerations. As such, it is mostly the results of route choice models
that are directly addressed by the political decision maker. A major task in the project has been to develop route choice
models which consider delays in intersections. In addition the traditional Stochastic User Equilibrium Model has been
extended to consider differences in road users utility functions. These two theoretical developments has proven
successfully in several applied projects. Sub-projects have carried out together with Tetraplan and Hague Consulting.
Issues concerning passenger's route choices in public transport, multiple-class assignment and methods to enumerate
cost from assignment models are now being developed.

Department of Planning
Department of Civil Engineering
Tetraplan A/S
Period: 01/09/1994 → 01/09/1999
Number of participants: 12
Project participant:
Brems, Camilla Riff (Intern)
Leleur, Steen (Intern)
Thorlacius, Per (Intern)
Grevy, Bo (Intern)
Nielsen, Erik Rude (Intern)
The GIS-T Programme: Use of Geographic Information Systems in Traffic Planning and Decision Support (GIS-T)

The GIS-programme's underlying purpose is to renew the quantitative methodologies used in traffic planning and to open for the treatment of questions, which so far has been overwhelming of data- and software reasons. The main goals of the programme can be summarised as: 1) To clarify possibilities and limitations of the use of quantitative methods, including GIS-based methods, as basis for decision making regarding traffic and infrastructure. 2) Hence to develop new improved decision tools, among other approaches by utilising the possibilities in the GIS-technology. 3) To test the newly developed methods in applied projects. 4) To propagate theoretical and practical knowledge in Danish and International fora and to involve the results in the M.Sc.- and Ph.D.-education at the department. These goals are to be fulfilled within the following areas of focus: 1) Methods for data-handling and quality control 2) Traffic models 3) Impact analyses (among others economics, accessibility, safety and environmental impacts) 4) Decision Support Systems and 5) Methods for quality control of models and their results. The GIS-T programme consists of a number of coordinated projects, where GIS (Geographic Information Systems) are used. The projects have different focus within the area of traffic planning but they all have in common that GIS can ease and improve the methodologies and state of practice. The largest projects are described individually other places in this annual report. Otto Anker Nielsen is coordinator of the programme.

Department of Planning

Department of Civil Engineering

Tetraplan A/S

Period: 01/09/1994 → 01/06/1997

Number of participants: 14

Project participant:
Leleur, Steen (Intern)
Kronbak, Jacob (Intern)
Brems, Camilla Riff (Intern)
Thorlacius, Per (Intern)
Grevy, Bo (Intern)
Nielsen, Erik Rude (Intern)
Israelsen, Thomas (Intern)
Moshøj, Claus Rehfeld (Intern)
Hansen, Christian Overgaard (Ekstern)
Bloch, Karsten Sand (Ekstern)
Nielsen, Jan (Ekstern)
Nielsen, Mogens (Ekstern)
Petersen, Jens Møller (Ekstern)

Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 500,000.00 Danish Kroner

Project

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Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 3,300,000.00 Danish Kroner

Project
Use of GIS-T for traffic planning in developing countries

It is widely recognised that developing countries face huge problems regarding traffic and infrastructures. This is not only the case in rural areas - the traditional focus of developing projects - but also in the urban areas. The traffic congestion causes that large resources in form of manpower, vehicles and goods are tied up in the traffic. This in turn results in less economic development, prohibitive pollution and a high rate of traffic accidents. If the traffic planners had better and more accessible tools for analyzing impacts of different project proposals, the scarce means in the developing countries could be used more efficiently. However, the existing research in traffic models mainly addresses issues and travel patterns in industrial countries. Due to among other things differences in standard of infrastructure, types of modes, economy, driving behaviour, available data, these models cannot directly be used in developing countries. The joint research programme between IFP, DTU and Bandung Institute of Technology, ITB, will contribute to the development of such models. IFP has had a long-term relationship with ITB. The City of Bandung, Indonesia (5 mil. inhabitants) has so far been used as case for the work.

Department of Planning

Department of Civil Engineering

Bandung Institute of Technology

Period: 01/09/1994 → 01/12/1996
Number of participants: 3
Project participant:
Israelsen, Thomas (Intern)
Nielsen, Erik Rude (Intern)

Project Manager, organisational:
Nielsen, Otto Anker (Intern)

Modelling of porous materials' structure and its relation to material properties

Department of Civil Engineering

Period: 15/08/1994 → 01/12/2000
Number of participants: 3
Phd Student:
Mullit, Paw Mac (Intern)
Supervisor:
Hansen, Kurt Kielsgaard (Intern)
Main Supervisor:
Nielsen, Lauge Fuglsang (Intern)

A Combined Tuned Absorber and Impact Damper

Ph.D. project by Frederic Collette. Tuned vibration absorbers are passive controllers of excessive vibrations around the resonant frequencies of lightly damped structures. This thesis deals with a vibration absorber combining a tuned absorber with an impact damper. The viscous damped tuned absorber, the so-called Tuned Mass Damper (TMD), is presented to give an overview of this conventional absorber. The analytical optimization procedure for the TMD is described and an analysis of the sensitivity of the effectiveness of the TMD to variations of its parameters is conducted. A magnetic implementation of the TMD is tested on a steel frame and the experimental measurements are compared with the analytical and computational results. The vibration control capability of two different implementations of the combined tuned absorber and impact damper is investigated in the vicinity of the fundamental mode of the considered steel frame under a random excitation. The combined tuned absorber and 'suspended' impact damper considers the impact damper to follow a totally free translation between each collision. The numerically simulated results are compared to experimental measurements. The effectiveness of the optimal combined absorber is evaluated numerically and its sensitivity to variations of the clearance, the coefficient of restitution and the mass ratio between the impact damper and the tuned absorber is analyzed. The combined tuned absorber and 'rolling/sliding' impact damper considers the impact damper as a ball rolling and sliding directly on the tuned absorber between each collision. The numerically simulated results are compared to experimental measurements. The effectiveness of the optimal combined absorber is evaluated numerically and its sensitivity to variations of the clearance, the coefficient of restitution, the coefficient of friction and the mass ratio between the impact damper and the tuned absorber is analyzed.

Department of Structural Engineering and Materials
Modellering og beregning af bygningers termiske forhold

Department of Civil Engineering
Period: 01/08/1994 → 10/03/1999
Number of participants: 3
Phd Student:
Rahbeck, Jens Eg (Intern)
Main Supervisor:
Svendsen, Svend (Intern)
Examiner:
Aggerholm, Søren (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Integration and Consistency Problems in Building Product Models.
The goal of this PhD project is to expose the problems of building product models, with special reference to the problems regarding integration of different contributions from several concurrent working designers. A model for coordination and cooperation has been developed (named "KOSA", after the equivalent Danish phrase "KOordination og Samarbejde"), which allows several users to work concurrently on various interconnected aspects of a composite project representation, such that the overall representation remains consistent. The model takes into consideration the special needs and demands of building design projects, including responsibility and ownership, relations and dependencies, coordination and collaboration, design goals and design task decompositon. A stay during 1996 at College of Architecture at Georgia Institute of Technology, USA, resulted in an exposition of the shortcomings of existing database technology with respect to serving the needs and demands of building design projects. Project closed (apart from publication activity).

Reinforced Concrete Shear Walls
For a long time it was believed that reinforced concrete frame structures were superior to other reinforced concrete structures regarding behavior in seismic zones. For instance most high rise buildings in Japan are frame structures either in steel, in reinforced concrete or in composite materials. However, it has turned out that structures stabilized by shear walls in many respects have fulfilled the conditions in earthquake regions better than framed structures. In recent years,
therefore a large amount of research has been conducted on shear walls throughout the world. This research includes theory development as well as experimental research. Since Denmark has a long tradition in formulating failure theories for structures and structural elements based on the theory of plasticity, it was felt natural to investigate the capabilities of these theories to predict the behavior of shear walls. The known solutions are not sufficient for that purpose. In the project new solutions especially suited for applications on shear walls are developed. These solutions are based on lower bound as well as upper bound solutions. To predict the deflections of a structure under earthquake load it is attempted to use as a basis the stress field at the ultimate load and minimize the complementary elastic energy for this stress field. Very good agreement has been found between numerous tests and calculation regarding the ultimate load. The tests cover concrete compressive strengths up to 120 MPa and yield strengths of reinforcement up to 1400 MPa. The project is closely connected to the project “Precast Concrete Structures in Earthquake Regions”.

Department of Structural Engineering and Materials

Aalborg University

Period: 01/04/1994 → 31/12/1998

Number of participants: 3

Project participant:

Liu, Lunying (Intern)

Hansen, Lars Pilegaard (Ekstern)

Project Manager, organisational:

Nielsen, Mogens Peter (Intern)

Financing sources

Source: Unknown

Name of research programme: Ukendt

Amount: 300,000.00 Danish Kroner

Numerisk modellering af tømnings- og fyldningsforhold i siloer

Department of Civil Engineering

Period: 01/03/1994 → 31/05/2002

Number of participants: 2

Phd Student:

Olsen, Jørgen Flemming (Intern)

Main Supervisor:

Nielsen, Leif Otto (Intern)

Financing sources

Source: Internal funding (public)

Name of research programme: DTU-Su Stipendium, Eksperiment

Project: PhD

Transportation based on Renewable Energy

The overall objective of the project is to investigate the scope for transportation fuels based on renewable energy sources and to assess the environmental consequences of introducing these fuels in Denmark. In this project phase, the main emphasis is on electric, hybrid and hydrogen propulsion. The project has covered the following main tasks: registration of international development trends and activities in the field of electric, hybrid and hydrogen drive; establishment of a technology catalogue covering the principal technologies of the field; simulation analyses of selected technologies for different driving patterns.

Department of Buildings and Energy

Research Center Risø

Period: 01/03/1994 → 01/01/9999

Number of participants: 2

Project participant:

Nielsen, Lars H. (Ekstern)

Project Manager, organisational:

Jørgensen, Kaj (Intern)
Development and Investigation of Evacuated Windows Based on Monolithic Silica Xerogel Spacers

The objective of the project is to develop and investigate insulating glazings based on evacuated monolithic silica xerogel spacers. Low density monolithic silica xerogel is dried at atmospheric pressure. The process results in an increased density of xerogels compared to aerogels which leads to a slightly higher thermal conductivity with typical values of 0.030 W/(m K) measured in air at atmospheric pressure. If evacuated below 50-100 hPa the thermal conductivity will be approximately 0.013 W/(m K). The silica xerogel has to be protected against liquid water, that will demolish the pore structure of the material due to the surface tensions. The project has been carried out as a co-operation between institutes and companies in Denmark, France, Germany, Norway and Sweden. Scientific developments have made it possible to prepare low density monolithic silica xerogels, only from about 1990, and developments in both the production process as well as size of the samples are necessary for a commercial use of the material. The improvement of the production process has as the main goals to improve the optical quality and the thermal conductivity of the monolithic silica xerogel by decreasing the density. Secondary an increase of the sample size should be achieved primarily by means of an optimisation of the drying process. The thermal properties make the monolithic silica xerogel a well suited material for insulating glazings. Using the material as spacer between two layers of glass with a vacuum tight sealing of the rim combined with an internal gas pressure below 50-100 hPa result in an insulating glazing having a heat loss coefficient comparable with that of the surrounding walls, but at the same time offers a large solar heat gain possibility. Development of an airtight and vapour tight rim seal with negligible thermal bridge effect is one of the main goals of the project.

Department of Civil Engineering
Universität Würzburg
Centre Scientifique et Technique du Bâtiment
Ecole des Mines de Paris
Université Lyon
Produit Chimiques Auxiliaires et de Synthéses
Airglass AB
Norwegian University of Science and Technology
Scan Gobain Glass A/S
Period: 01/01/1994 → 31/12/1996
Number of participants: 11
Project participant:
Jensen, Karsten Ingerslev (Intern)
Schultz, Jørgen Munthe (Intern)
Fricke, J. (Ekstern)
Chevalier, J. L. (Ekstern)
Achard, P. (Ekstern)
Pajonk, G. (Ekstern)
Durant, M. (Ekstern)
Henning, S. (Ekstern)
Einarsrud, M.-A. (Ekstern)
Mølholm, N. B. (Ekstern)
Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 687,000.00 Danish Kroner

Photogrammetry in the Lithosphere Project
Part of a larger research project under The Danish National Research Foundation studying lithology, plate tectonics and continental building around the northern Atlantic. Extensive photogeological analysis of structures in volcanic rocks in East
Greenland are carried out using multi-model photogrammetry under extreme conditions.

Department of Planning

Department of Civil Engineering

Natural History Museum of Denmark
Period: 01/01/1994 → 31/12/1999
Number of participants: 3
Project participant:

Jensen, Eva Tokika (Intern)
Pedersen, Asger, K. (Ekstern)
Project Manager, organisational:

Dueholm, Keld (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 800,000.00 Danish Kroner

Project

Determination of the performance of a combined air/water solar heating system VP-SOL.
The aim of the projekt is to determine how much higher the performance of a solar heating system for combined preheating of air and water is compared to a system only for preheating of water. A solar heating system for combined preheating of air and water is installed in a house. A period of at least one year of measurement will be carried out on the system. The measured performance of the system will be compared with the simulated performance of a solar system only for preheating of water.

Department of Buildings and Energy

Department of Civil Engineering

Danish Technological Institute

Aidt Miljø A/S
Period: 03/12/1993 → 16/04/1998
Number of participants: 4
Project participant:

Kristiansen, Finn Harken (Intern)
Jensen, Søren Østergaard (Ekstern)
Formand, Torkild (Ekstern)
Project Manager, organisational:

Saxhof, Bjarne (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 347,680.00 Danish Kroner

Project

Broer med rumlige kablesystemer

Department of Civil Engineering
Period: 01/11/1993 → 22/04/1997
Number of participants: 5
Phd Student:

Vejrum, Tina (Intern)
Supervisor:

Stang, Henrik (Intern)
Main Supervisor:

Gimsing, Niels Jørgen (Intern)
Examiner:

Hansen, Lars Pilegaard (Ekstern)
Svensson, Eilif (Intern)
Financing sources
Source:  Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp
Project: PhD

Elektrokinetisk Jordrensning
Department of Civil Engineering
Number of participants: 4
Phd Student:
Jespersen, Rune Dyre (Intern)
Supervisor:
Bech-Nielsen, Gregers (Intern)
Main Supervisor:
Villumsen, Ame (Intern)
Examiner:
Skou, Eivind Morten (Ekstern)

Financing sources
Source:  Internal funding (public)
Name of research programme: Erhvervforskerordningen
Project: PhD

IEA Task 19: Solar Air Systems
In Task 19: Solar Air Systems the focus is on the developement of better components, analyses, development and optimizing of systems and evaluations of buildings with air solar systems. The results are collected in a handbook made as a projekt guide for engineers and in a "Case Study Book" with examples of buildings with air collector systems. The projekt is split into two subtasks. Subtask A, Systems, includes the following area: -preparation of the handbook with information about 6 main system types. -Development of new modelling and analysing possibilities. -Development of new components together with the industri. Subtask B, Buildings, includes: -Analyses and measurements on selected buildings. -Report of these buildings to the Case Study Book.

Department of Buildings and Energy
Department of Civil Engineering
Eidgenössische Technische Hochschule
Period: 01/10/1993 → ...
Number of participants: 3
Project participant:
Kristiansen, Finn Harken (Intern)
Hastings, Robert (Ekstern)
Project Manager, organisational:
Saxhof, Bjarne (Intern)

Financing sources
Source:  Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project

IEA Task 19: Solar Air Systems
In Task 19: Solar Air Systems the focus is on the developement of better components, analyses, development and optimizing of systems and evaluations of buildings with air solar systems. The results are collected in a handbook made as a projekt guide for engineers and in a "Case Study Book" with examples of buildings with air collector systems. The projekt is split into two subtasks. Subtask A, Systems, includes the following area: -preparation of the handbook with information about 6 main system types. -Development of new modelling and analysing possibilities. -Development of new components together with the industri. Subtask B, Buildings, includes: -Analyses and measurements on selected buildings. -Report of these buildings to the Case Study Book.

Department of Buildings and Energy
Department of Civil Engineering

Eidgenössische Technische Hochschule
Period: 01/10/1993 → 01/01/9999
Number of participants: 2
Project participant:
Hastings, Robert (Ekstern)
Project Manager, organisational:
Kristiansen, Finn Harken (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

Project

Bygningsmodeller for styrke/stivheds forhold i betonkonstruktioner specielt mded henblik på afhærdningsfasen.

Department of Civil Engineering
Period: 01/08/1993 → 21/10/1997
Number of participants: 3
Phd Student:
Hauggaard-Nielsen, Anders Boe (Intern)
Main Supervisor:
Damkilde, Lars (Intern)
Examiner:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Fugtkapacitetens betydning for fugttransport i byggematerialer.

Department of Civil Engineering
Period: 01/08/1993 → 15/06/1997
Number of participants: 2
Phd Student:
Jensen, Jette Brunnstrøm (Intern)
Main Supervisor:
Hansen, Kurt Kielsgaard (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-Su Stipendium, Eksperiment
Project: PhD

Tidsafhængige skilleflade-paramentre i cementbaserede kompositmaterialer.

Department of Civil Engineering
Period: 01/07/1993 → 22/12/1997
Number of participants: 4
Phd Student:
Rasmussen, Torben Valdbjørn (Intern)
Main Supervisor:
Stang, Henrik (Intern)
Examiner:
Bager, Dirch (Ekstern)
Svensson, Eilif (Intern)

Financing sources
Betonelementbyggeri i jordskælsområder.

Department of Civil Engineering
Period: 01/06/1993 → 22/04/1997
Number of participants: 3
Phd Student:
Jagd, Lars (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Ottosen, Niels Saabye (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiets Samfinansier
Project: PhD

Fiberteonimplementering.

Department of Civil Engineering
Period: 01/06/1993 → ...
Number of participants: 2
Phd Student:
Pedersen, Carsten Mark V. (Intern)
Main Supervisor:
Stang, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp
Project: PhD

Fracture mechanics and fatigue crack propagation.

Department of Civil Engineering
Period: 01/06/1993 → 27/01/1997
Number of participants: 4
Phd Student:
Hansen, Thomas Cornelius (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Hansen, Lars Pilegaard (Ekstern)
Svensson, Eilif (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsstip.-SU, Eksp
Project: PhD

The monotonic and cyclic behavior of crackr, precast concrete elements.

Department of Civil Engineering
Period: 01/06/1993 → 22/04/1997
Number of participants: 3
Phd Student:
Zhang, Jin-Ping (Intern)
Precast Concrete Structures in Earthquake Regions
In earthquake regions the requirements to ductility of precast concrete structures are often considerably higher than in other regions. Therefore often the concepts developed in Denmark have to be modified when they are applied in earthquake regions. The purpose of the project is to find new and better design models for structural elements and joints applicable in such situations. Primarily the efforts are concentrated on developing reliable models for monotonic loads because the behavior predicted for monotonic loads usually envelopes the behavior for cyclic loads. This part of the project has been finished by the publication of a ph.d. dissertation (Jens Christoffersen). Concrete strength is partly determined by cracking. Cracks may be microcracks already present before loading. Loading may enhance microcracking and further introduce macrocracks. Emphasis has been put on the role of cracking by developing new models for the behavior of structural elements super-sensitive to crack development, e.g. non shear reinforced beams and slabs. Further the particularly important problem related to the microcracking due to stressed reinforcement passing a macrocrack has been treated. Finally, a new micromechanical model for concrete considered as a two-phase material is developed. This part of the project has been terminated by the publication of a ph.d. dissertation (Jin-Ping Zhang). Complicated structural elements may preferably nowadays be calculated using finite element methods. A new finite-element program has been developed. The program takes into account the development of macrocracks and changes in crack direction and yielding of reinforcement. The strength reduction due to cracking as described above is handled according to the Jin-Ping Zhang model. Project finished by ph.d. dissertation (Lars Jagd).

Department of Structural Engineering and Materials
Department of Civil Engineering
Aalborg University
Period: 01/05/1993 → 31/12/1997
Number of participants: 5
Project participant:
Christoffersen, Jens (Intern)
Zhang, Jin-Ping (Intern)
Jagd, Lars (Intern)
Hansen, Lars Pilegaard (Ekstern)
Project Manager, organisational:
Nielsen, Mogens Peter (Intern)

Financial sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,400,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 2,400,000.00 Danish Kroner

Anvendelse af ultrafiltrering til behandling af humusholdigt grund-/overfladevand.

Department of Civil Engineering
Period: 01/02/1993 → 22/04/1996
Number of participants: 5
Phd Student:
Alborzfar, Maryam (Intern)
Supervisor:
Grøn, Christian (Intern)
Main Supervisor:
Villumsen, Arne (Intern)
Space mapping for engineering optimization
The space mapping technique is intended for optimization of engineering models which involve very expensive function evaluations. It is assumed that two different models of the same physical system are available: Besides the expensive model of primary interest (denoted the fine model), access to a cheaper (coarse) model is assumed which may be less accurate. The main idea of the space mapping technique is to use the coarse model to gain information about the fine model, and to apply this in the search for an optimal solution of the latter. Thus the technique iteratively establishes a mapping between the parameters of the two models which relate similar model responses. Having this mapping, most of the model evaluations can be directed to the fast coarse model. In many cases this technique quickly provides an approximate optimal solution to the fine model that is sufficiently accurate for engineering purposes. Thus the space mapping technique may be considered a preprocessing technique that perhaps must be succeeded by use of classical optimization techniques.

Department of Informatics and Mathematical Modeling
Department of Civil Engineering
McMaster University
Period: 01/01/1993 → …
Number of participants: 9
Project participant:
Nielsen, Hans Bruun (Intern)
Søndergaard, Jacob (Intern)
Pedersen, Frank Ørbech (Intern)
Bakr, Mohamed (Ekstern)
Bandler, John (Ekstern)
Cheng, Qingsha (Ekstern)
Gebre-Mariam, Daniel (Ekstern)
Mohamed, Ahmed (Ekstern)
Project Manager, organisational:
Madsen, Kaj (Intern)
BRITE-EURAM Project NEWPAVE, EC-Contact No. BRE2-CT92-0162
Project on the development of thin flexible cementitious overlays for strengthening, repair and maintenance of asphalt pavements. The material shall have a longer service life and less need for maintenance than traditional flexible surfacings, thus making the material competitive on a life time cost calculation. The project deals with the following: - Development of a design criteria for such a material. - Development of a cementitious overlay material which can be used for strengthening and a wearingcourse on flexible pavements even when applied in thin layers. - Development of a paving technique. - Full scale testing - Development of a draft specification for the use of the new material.

Department of Structural Engineering and Materials
Department of Civil Engineering
Aalborg Portland A/S
Dansk Beton Teknik A/S
Danish Road Directorate
Kvaerner Technology Limited
Transport Research Laboratory
Laboratorio Nacional de Engenharia Civil
Period: 01/12/1992 → 31/03/1997
Number of participants: 2
Project participant:
Jun, Zhang (Intern)
Project Manager, organisational:
Stang, Henrik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 591,500.00 Danish Kroner

Development and Investigation of Evacuated Windows Based on Monolithic Silica Aerogel Spacers
The objective of the project is to develop and investigate insulating glazings based on evacuated monolithic silica aerogel spacers. Monolithic silica aerogel is a highly porous material (pore volume 90%) with an equivalent typical thermal conductivity of 0.020 W/(m K) when air filled. If evacuated below 50-100 hPa the thermal conductivity is only 0.008 W/(m K) which is approximately 20% of the value for commonly used insulation materials. However, the silica aerogel has to be protected against liquid water, that will demolish the pore structure of the material. For the application in window glazings the protection against liquid water is formed by placing the aerogel in between two sheets of glass and sealing the rim.
The project has been carried out in co-operation between institutes and companies in Denmark, France, Germany and Sweden. The improvement of the production process has as the main goals to develop a safer process than the traditional one and to improve the optical quality of the monolithic silica aerogel. The thermal properties make the monolithic silica aerogel an excellent material for insulating glazings. Using the material as spacer between two layers of glass with a vacuum tight sealing of the rim combined with an internal gas pressure below 50-100 hPa result in an insulating glazing having a heat loss coefficient comparable with that of the surrounding wall, but at the same time offers a large solar heat gain possibility. However, the rim seal is the crucial point as it has to be airtight and vapour tight, but it may not become a serious thermal bridge that destroys the total performance of the glazing. Development of an airtight and vapour tight rim seal with negligible thermal bridge effect is one of the main goals in the project.

Department of Civil Engineering
Scan Gobain Glass A/S
Universität Würzburg
Centre Scientifique et Technique du Bâtiment
Ecole des Mines de Paris
Université Lyon
Produit Chimiques Auxiliaires et de Synthèses
Airglass AB
Period: 01/12/1992 → 31/12/1996
Number of participants: 10
Project participant:
Jensen, Karsten Ingerslev (Intern)
Schultz, Jørgen Munthe (Intern)
Mølholm, N. B. (Ekstern)
Fricke, J. (Ekstern)
Chevalier, J. L. (Ekstern)
Achard, P. (Ekstern)
Pajonk, G. (Ekstern)
Durant, M. (Ekstern)
Henning, S. (Ekstern)

Project Manager, organisational:
Svendsen, Svend (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,106,000.00 Danish Kroner

Static and Dynamic Behavior of Cable Supported Bridges with small Width-to-Span Ratios.

Department of Civil Engineering
Period: 01/12/1992 → …
Number of participants: 5
Phd Student:
Larsen, Søren Vestergaard (Intern)

Supervisor:
Dyrbye, Claes (Intern)

Main Supervisor:
Gimsing, Niels Jørgen (Intern)

Examiner:
Hansen, Svend Ole (Ekstern)

Svensson, Eilif (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskerakademiet's Samfinansier
Project: PhD

Materialedata og plasticitetsteori for COMPRECI

Department of Civil Engineering
Period: 01/10/1992 → …
Number of participants: 5
Phd Student:
Nielsen, Morten (Intern)

Supervisor:
Jensen, Bjarne Christian (Ekstern)

Nepper-Christensen, Palle (Ekstern)

Main Supervisor:
Nielsen, Mogens Peter (Intern)

Examiner:
Sørensen, Hans-Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: ATV- Gammel ordning
Project: PhD
IEA SHCP Task 18, Advanced Glazing and Associated Materials for Solar and Building Applications

The Task objective is to develop the scientific, engineering and architectural basis which will support the commercial development of advanced glazings in buildings and other solar applications with the aim of realising significant energy and environmental benefits. Advanced glazing materials investigated include: Monolithic silica aerogels, transparent insulation materials, glazing with incorporated blinds and shading low-emittance coatings, evacuated glazings, angular selective transmittance coatings, holographic and prismatic materials, variable transmittance electrochromic, thermochromic and liquid crystal devices. Principal areas of activity: · Energy performance assessment of residential and commercial buildings employing advanced glazing. · Definition and determination of glazing performance criteria. · Glazing selection and design
in heating-dominated and cooling-dominated climates. · Window life cycle analysis. · Promotion of best practice, provision of applications guidance, education and information dissemination. · Development of new and/or improved materials and prototype windows. · Determination of optical and thermal performance. · Development of recommended test procedures for key glazing measurements. · Instrumentation design, development, calibration and error analysis. · Angular dependent measurements of total, diffuse and specular optical properties. · Comparison of measured glazing performance, improved design tools and new algorithm development. · Properties and performance of candidate spacer and sealant materials. · Improved window, frame and edge seal design and construction.

Department of Civil Engineering

Fraunhofer Gesellschaft

University of New South Wales

National Research Council of Canada

VTT - Technical Research Centre of Finland

CSTM/SM

Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

National Industrial Reseach Institute of Nagoya

TNO Building and Construction Research

Norwegian Institute of Technology

Uppsala University

Société d'Étude de l'Environnement

U.S. Department of Energy

Royal Danish Academy of Fine Arts

Period: 01/04/1992 → 31/03/1997

Number of participants: 17

Project participant:

Rudbeck, Claus Christian (Intern)

Svendsen, Svend (Intern)

Platzer, Werner (Ekstern)

Ballinger, John (Ekstern)

Elmahdy, Hakim (Ekstern)

Virtanen, Markku (Ekstern)

Maccari, Augusto (Ekstern)

Tanemura, Sakae (Ekstern)

d Geus, Aart (Ekstern)

Aschehoug, Oyvind (Ekstern)

Macias, Manuel (Ekstern)

Roos, Arne (Ekstern)

Bremer, Pierre (Ekstern)

Taylor, Sam (Ekstern)

Frandsen, Sophus (Ekstern)

Project Manager, organisational:

Duer, Karsten (Intern)

Hutchins, Michael G. (Ekstern)

Financing sources

Source: Unknown

Name of research programme: Ukedt

Amount: 3,586,176.00 Danish Kroner

Betonelementbyggeri i jordskælvsområder.

Department of Civil Engineering
Period: 01/02/1992 → 11/10/1996
Phd Student:
Christoffersen, Jens (Intern)
Supervisor:
Dyrbye, Claes (Intern)
Main Supervisor:
Nielsen, Mogens Peter (Intern)
Examiner:
Jensen, Bjarne Christian (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-stipendium
Project: PhD

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**Udmattelse i stålkonstruktioner under stokastisk last.**

Department of Civil Engineering
Period: 01/02/1992 → 19/05/1995
Number of participants: 3
Phd Student:
Ibsø, Jan Behrendt (Intern)
Main Supervisor:
Agerskov, Henning (Intern)
Examiner:
Svensson, Eilif (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-stipendium
Project: PhD

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**Total Quality Management in Construction**
The project aims at contributing to establishing of effective TQM (Total Quality Mangement) in Nordic construction industry by development of methods and by exchange of experience on effective ways of:- management, quality improvement, establishment of quality systems and practical measuring of results- management and cooperation to obtain personal involvement by employee on all organizational levels and good relations with customers and suppliers.

The project is a joint effort between VTT, Chalmers, Norwedian Building Research Institute, DTU and 13 Nordic contractors.

Section for Planning and Management of Building Processes

Department of Civil Engineering
Period: 01/01/1992 → 31/12/1996
Number of participants: 1
Project Manager, organisational:
Gaarslev, Axel (Intern)

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**Hærdedesign af betonelementer**

Department of Civil Engineering
Period: 01/11/1991 → 08/12/1995
Number of participants: 2
Phd Student:
Andersen, Mette Elbæk (Intern)
Main Supervisor:
Damkilde, Lars (Intern)

**Financing sources**
Source: Internal funding (public)
**Krybebrud under cyklisk belastning**

Department of Civil Engineering  
Number of participants: 4  
Phd Student:  
Nielsen, Helle Skovby (Intern)  
Main Supervisor:  
Villumsen, Arne (Intern)  
Examiner:  
Byskov, Esben (Intern)  
Runnesson, Kenneth (Ekstern)

**Financing sources**

Source: Internal funding (public)

** Scenario Workshop Methodology**

The scenario workshop is a method engaging a number of different actors in the planning and development of complex technological systems. For further information see http://www.cordis.lu/easw/home.html. In May 1997 DTU held a workshop on wastewaster management. In 1998 the Eurocities introduced scenario workshop as the tool for local discussions of a sustainable future. The methodology is used in a number of international projects. Further development has taken place in 1999, using the experience of Department of Planning

Department of Planning  
Department of Civil Engineering  
CEC -DGXIII/D2  
Danish Board of Technology  
Roskilde University  
The Danish Centre for Urban Ecology  
Agenzia per l’Alta Tecnologia  
Dialogic  
The Internation Institute of the Urban Environment  
Period: 01/10/1991 → 01/01/9999  
Number of participants: 9  
Project participant:  
Andersen, Ida (Ekstern)  
Danielsen, Oluf (Ekstern)  
Nielsen, Lise Drewes (Ekstern)  
Holck-Christsiansen, Jens (Ekstern)  
Martinez, Paolo (Ekstern)  
Bilderbeek, Rob (Ekstern)  
vан Delft, Yvonne (Ekstern)  
Project Manager, organisational:  
Elle, Morten (Intern)  
Fernadez, Francisco (Ekstern)  

**Human response to cooling with air jets**

Human response to cooling with air jets, ASHRAE, USA, ASHRAE RP-518, 1991-1993  

Department of Civil Engineering
ASHRAE
Period: 01/01/1991 → 31/12/1993
Number of participants: 1
Project Manager, organisational:
Melikov, Arsen Krikor (Intern)

Project Technology Assessment in Ghana: Building Research Capabilities at the University of Ghana, Legon
The project is defined as a long-term research collaboration between the involved departments in Denmark and Ghana. The overall aims of the continued research collaboration are: · to develop technology assessment as a research and teaching area at the University of Ghana at Legon · to develop and qualify policy recommendations for general technology policy in Ghana through the institution of a Technology Forum · to facilitate the upgrade of theoretical knowledge, methodological tools and practical experience of the Ghanaian staff through research collaboration. · Provision of expertise in dissemination of results of research to both political fora and private sector companies. Three research areas are defined for the collaboration: i) Research Area I: Telecommunications and information technology infrastructure: research on urban and rural telecommunications, computer systems and network development, and regulation policy. ii) Research Area II: Energy technology: research on energy efficiency options, the introduction of new forms of energy, and co-ordination of policies under a national energy policy. iii) Research Area III: Energy savings in transport: research on the possibilities for substitution of transport of persons through use of telecommunications

Department of Telecommunication

Department of Civil Engineering

Department of Photonics Engineering
Period: 01/01/1991 → 01/07/2001
Number of participants: 4
Project participant:
Falch, Morten (Intern)
Henten, Anders (Intern)
Møller, Dorte Marianne (Intern)
Project Manager, organisational:
Skouby, Knud Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 3,000,000.00 Danish Kroner

Department of Civil Engineering

Period: 01/07/1990 → 15/09/1994
Number of participants: 2
Phd Student:
Jensen, Jørgen Lauritzen (Ekstern)
Main Supervisor:
Nielsen, Leif Otto (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Gammel ordning u/skema-SU
Project: PhD

Department of Planning

Geologic Photogrammetry
Digital and analytical photogrammetric methods for geological mapping are developed and tested based on actual mapping experiments predominantly in Greenland.
Introspective observations of architectural sketch design
An empirical method (Replication Protocol Analysis) for the study of design cognition has been developed and tested on an actual case. Project closed.

Principper og metoder for opstilling af datamodeller til byggetekniske anvendelser

Stabile og instabile revnedannelser i beton
Simulation of pavement deterioration
The project has two major components: 1) models for calculating stresses and strains in pavement structures (response models), and 2) models relating these stresses and strains to pavement deterioration. In 1999 a paper entitled "Will Nonlinear Backcalculation Help?" was a keynote presentation at the ASTM symposium on "Nondestructive Testing of Pavements and Backcalculation of Moduli" in Seattle, June 30 to July 1. At the "International Conference on Accelerated Pavement Testing" in Reno, Nevada a paper entitled "Layer moduli during HVS testing: comparing laboratory results with backcalculations from FWD and MDD deflections" was presented. The paper was co-authored by J.T. Harvey and M. Riemer from University of California at Berkeley and by J.A. Prozzi from CSIR in South Africa. At the 78th Annual Meeting of the Transportation Research Board, Washington D.C., January 10-14, a paper entitled "Deterioration Models for Managing Flexible Pavements" was presented. The group working on a new Danish standard for structural design of pavements, under the auspices of the Road Directorate, continued in 1999. The new standard will be partly based on the simulation program MMOPP (Mathematical Model Of Pavement Performance) developed at IFP. A beta-version was sent out for testing, and a seminar was held with the beta-testers on September 29 at the Danish Road Institute.

Department of Planning
Department of Structural Engineering and Materials
Department of Civil Engineering

Danish Road Directorate
Period: 01/01/1976 → …
Number of participants: 3
Project participant:
Sjølin, Finn Ole (Intern)
Kieler, Thomas Lau (Intern)

Project Manager, organisational:
Ulildtz, Per (Intern)

Activities:

Presentation - Energy and Building Technology - A look into the future
Period: 30 Sep 2019
Alfred Heller (Guest lecturer)

Department of Civil Engineering

Description
Presentation of ideas for the future of building automation, cloud services, IoT and more

Documents:
CKI Conference DTU - sept 2017 - Next gen Building Tec (v2)

Related event
Siemens-DTU CKI conference 2017
19/09/2017 → …
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Applied Thermal Engineering (Journal)
Period: Jan 2018
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International

**Related journal**

*Applied Thermal Engineering*

1359-4311
Central database
Activity: Research › Peer review of manuscripts

**Automation in Construction (Journal)**

Period: Nov 2017
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International

**Related journal**

*Automation in Construction*

Local database
Activity: Research › Peer review of manuscripts

**International Journal of Heat and Mass Transfer (Journal)**

Period: Nov 2017
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International

**Related journal**

*International Journal of Heat and Mass Transfer*

0017-9310
Central database
Activity: Research › Peer review of manuscripts

**Chairman PhD Assessment Committee**

Period: 15 Nov 2017
Toke Rammer Nielsen (Internal examiner)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International
Activity: Examinations and supervision › Internal examination

**Participation in workshop with two presentations**

Period: 13 Nov 2017 → 15 Nov 2017
Mads Holten Rasmussen (Guest lecturer)
Department of Civil Engineering
Section for Building Design
Participation in workshop with two presentations: “Recent Changes in the Building Topology Ontology” and “Web-based topology queries on a BIM model”

Degree of recognition: International

Documents:
- Presentation - Web-based topology queries on a BIM model
- Presentation - Recent changes in the Building Topology Ontology

Related event

LDAC2017 – 5th Linked Data in Architecture and Construction Workshop
13/11/2017 → 15/11/2017
Dijon, France
Activity: Talks and presentations › Conference presentations

Obduktion af en betonkonstruktion – hvordan finder vi ud af (næsten) alt ??
Period: 9 Nov 2017
Per Goltermann (Other)
Department of Civil Engineering
Section for Structural Engineering

Description
Geolog Sara E. Hoffritz forklarede hvordan man med meget små prøver (0,06g pr stk) kan obducere en stor betonkonstruktion og ved denne obduktion finde ud af næsten alt om hvilke materialer der er anvendt og hvordan disse er blevet behandlede og måske senere også blevet nedbrudte

Related external organisation

Dansk Betonforening
Activity: Other

Energy and Buildings (Journal)
Period: Oct 2017
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International

Related journal

Energy and Buildings 0378-7788
Central database
Activity: Research › Peer review of manuscripts

Linked Building Data
Period: 31 Oct 2017
Mads Holten Rasmussen (Guest lecturer)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International
Documents:
- 171031_buildingSMART_MHRA_wRefs

Related external organisation

buildingSMART International Council
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

**buildingSMART: International Standard Summit**  
**Period:** 30 Oct 2017 → 2 Nov 2017  
Jan Karlshøj (Organizer)  
Department of Civil Engineering  
Section for Building Design  

**Description**  
Organizer of Building Room activities  
buildingSMART Summit London, UK  

**Related event**  
**buildingSMART: International Standard Summit**  
30/10/2017 → 02/11/2017  
London, United Kingdom  
Activity: Attending an event › Participating in or organising a conference

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**To what extent can Corporate Social Responsibility be seen as a guaranty for a company's social responsibility?**  
**Period:** 25 Oct 2017  
Kåre Hendriksen (Guest lecturer)  
Department of Civil Engineering  
ARTEK, Section for Arctic Engineering and Sustainable Solutions  
Degree of recognition: International  

**Related event**  
**PhD Course: Sustainability, extractives industries, communities and social responsibility: Greenland and be-yond**  
22/10/2017 → 27/10/2017  
Sisimiut, Greenland  
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

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**Chairman PhD Assessment Committee**  
**Period:** 24 Oct 2017  
Toke Rammer Nielsen (Internal examiner)  
Department of Civil Engineering  
Section for Building Energy  
Degree of recognition: International  
Activity: Examinations and supervision › Internal examination

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**Greenland - A historical view - from a socio technical perspective**  
**Period:** 22 Oct 2017  
Kåre Hendriksen (Guest lecturer)  
Department of Civil Engineering  
ARTEK, Section for Arctic Engineering and Sustainable Solutions  
Degree of recognition: International  

**Related event**  
**PhD Course: Sustainability, extractives industries, communities and social responsibility: Greenland and be-yond**  
22/10/2017 → 27/10/2017  
Sisimiut, Greenland  
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities
PhD Course: Sustainability, extractives industries, communities and social responsibility: Greenland and be-yond  
Kåre Hendriksen (Organizer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International

Related event

PhD Course: Sustainability, extractives industries, communities and social responsibility: Greenland and be-yond  
22/10/2017 → 27/10/2017
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

University of the Arctic Thematic Network Arctic Sustainable Resources and Social Responsibility  
Kåre Hendriksen (Organizer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International

Related event

University of the Arctic Thematic Network  
Arctic Sustainable Resources and Social Responsibility  
21/10/2017 → 29/10/2017
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

International Association HySafe (External organisation)  
Period: 30 Sep 2017 → 30 Sep 2019
Frank Markert (Chairman)
Department of Civil Engineering
Section for Building Design

Description
IAHySafe- elected member of board (secretary of association)
Degree of recognition: International

Related external organisation

International Association HySafe  
Activity: Membership › Board duties in companies, associations, or public organisations

Cases of Lightweight Structures for Polar Areas  
Period: 25 Sep 2017 → 28 Sep 2017
Julian Christ (Speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Section for Structural Engineering

Description
Presented the Paper 'Cases of Lightweight Structures for Polar Areas' at the IASS Annual Symposium 2017 at HafenCity University Hamburg (Germany).
Degree of recognition: International

Related organisation
Cases of Lightweight Structures for Polar Areas
Christ, J. (Speaker)
25 Sep 2017 → 28 Sep 2017
Activity: Talks and presentations › Conference presentations

Chairman PhD Assessment Committee
Period: 25 Sep 2017
Toke Rammer Nielsen (Internal examiner)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International
Activity: Examinations and supervision › Internal examination

High Tech Summit
Period: 20 Sep 2017 → 21 Sep 2017
Alfred Heller (Organizer)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities
Description
Organizer Smart Cities and Smart Buildings Tracks
Related event
High Tech Summit
20/09/2017 → 21/09/2017
Kongnes Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

High Tech Summit
Period: 20 Sep 2017 → 21 Sep 2017
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design
Description
Building track
Degree of recognition: National
Related event
High Tech Summit
20/09/2017 → 21/09/2017
Kongnes Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Current work related to hydrogen safety in infrastructures
Period: 14 Sep 2017
Frank Markert (Invited speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International
Documents:
Hamburg ws14092017-b
Related event
IEA Hydrogen task 37: Safety Stakeholder workshop
14/09/2017 → …
Hamburg, Germany
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

NORA studietur om vandforsyning og udfordringer i Sydgrønland
Period: 14 Sep 2017 → 21 Sep 2017
Kåre Hendriksen (Organizer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International

Related event
NORA studietur om vandforsyning og udfordringer i Sydgrønland
14/09/2017 → 21/09/2017
Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Open BIM: Focusing on buildingSMART standards
Period: 11 Sep 2017
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Lecture on buildingSMART standards: IDM, MVD, IFC, BCF, bsDD at Aalborg University.

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Chairman PhD Assessment Committee
Period: 29 Aug 2017
Toke Rammer Nielsen (Internal examiner)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International
Activity: Examinations and supervision › Internal examination

Nordic Fire and Safety Days 2017
Period: 14 Aug 2017 → 15 Aug 2017
Frank Markert (Organizer)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International

Related event
Nordic Fire and Safety Days 2017
17/08/2017 → 18/08/2017
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference
Energy Efficiency (Journal)
Period: Jul 2017
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy

Related journal
Energy Efficiency
1570-646X
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.43 SJR 0.74 SNIP 0.816, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Chairman PhD Assessment Committee
Period: 27 Jul 2017
Toke Rammer Nielsen (Internal examiner)
Department of Civil Engineering
Section for Building Energy
Degree of recognition: International
Activity: Examinations and supervision › Internal examination

Induration and Biot's Coefficient of Palaeogene Limestone
Period: 9 Jul 2017 → 13 Jul 2017
Katrine Alling Andreassen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Center for Energy Resources Engineering
Degree of recognition: International

Related event
6th Biot Conference on Poromechanics
09/07/2017 → 13/07/2017
Paris, France
Activity: Talks and presentations › Conference presentations

Proposing a Central AEC Ontology That Allows for Domain Specific Extensions
Period: 5 Jul 2017
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design

Description
A minimal ontology describing building topology.
Degree of recognition: International
Documents:
Slides

Related event
The 34th CIB W78 Information Technology for Construction Conference: JC3 - The Joint Conference on Computing in
Construction
04/07/2017 → 07/07/2017
Heraklion, Greece
Activity: Talks and presentations › Conference presentations
The 34th CIB W78 Information Technology for Construction Conference
Period: 4 Jul 2017 → 12 Jul 2017
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International

Related event
The 34th CIB W78 Information Technology for Construction Conference: JC3 - The Joint Conference on Computing in Construction
04/07/2017 → 07/07/2017
Heraklion, Greece
Activity: Talks and presentations › Conference presentations

"Evacuation in day-care centres: Fire safety aspect of staff-to-child ratios"
Period: 13 Jun 2017
Anne Simone Dederichs (Other)
Zeshan Ali (Other)
Department of Civil Engineering
Section for Building Design

Description
Poster
Degree of recognition: International

Related event
12th IAFSS International Symposium on Fire Safety Science
12/07/2017 → 16/02/2018
Lund, Sweden
Activity: Talks and presentations › Conference presentations

Food production and exports in the Arctic island operated society - Qaanaaq an example
Period: 9 Jun 2017
Kåre Hendriksen (Speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International

Related event
International Conference on Arctic Social Sciences
07/06/2017 → 12/06/2017
Umeå, Sweden
Activity: Talks and presentations › Conference presentations

Understanding the potentials and development dynamics of Arctic island-economies as pre-conditions for sustainable regional and societal planning
Period: 9 Jun 2017
Kåre Hendriksen (Speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International

Related event
Byggeri for millioner til DTU’s bygningsingeniører
Period: 8 Jun 2017
Per Goltermann (Other)
Department of Civil Engineering
Section for Structural Engineering

Description
Gennemgang og diskussion ad DTU's udviklingsplaner for byggeriet, samt rundvisning og diskussion af byggeløsninger i bygning 128

Related external organisation
Dansk Betonforening

Activity: Talks and presentations › Conference presentations

9th International Congress of Arctic Social Sciences
Period: 7 Jun 2017 → 12 Jun 2017
Kåre Hendriksen (Organizer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Organizer and chair of session: Island operations - a driver in the urbanization?
Degree of recognition: International

Related event
9th International Congress of Arctic Social Sciences: ICASS IX
08/06/2017 → 12/06/2017
Umeå, Sweden
Activity: Attending an event › Participating in or organising a conference

Udviklingskonference for mindre bosteder
Period: 30 May 2017 → 31 May 2017
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Erhvervsudvikling i mindre bosteder - Qaanaaq og Qeqertat - et eksempel
Inoqarfinni minnerusuni inuutissarsiormerk inerisaaneq - Qaanaaq aamma Qeqertat – assersuut

Related event
Udviklingskonference for mindre bosteder
30/05/2017 → 31/05/2017
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

NORA Workshop Vand i Arktiske ø-driftssamfund Vandindvindingssystemer i Suðureyri og Flateyri
Period: 22 May 2017 → 24 May 2017
Kåre Hendriksen (Organizer)
Department of Civil Engineering
Related event

NORA Workshop Vand i Arktiske ø-driftssamfund Vandindvindingssystemer i Suðureyri og Flateyri
22/05/2017 → 24/05/2017
Isafjordur, Iceland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Innovative new concept for asphalt based railway construction
Period: 17 May 2017
Tulika Bose (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Degree of recognition: National

Related external organisation
The Danish rail sector association (Banebranchen)
Tivoli Congress centre, copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

OB-17: Symposium on Occupant Behaviour and Adaptive Thermal Comfort
Period: 17 May 2017
Rune Korsholm Andersen (Organizer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Degree of recognition: International

Related event

OB-17: Symposium on Occupant Behaviour and Adaptive Thermal Comfort: Joint IEA EBC Annex 66 and 69 Symposium
17/05/2017 → 17/05/2017
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Applying LCA in decision making- the need and the future perspective
Period: 10 May 2017
Yan Dong (Speaker)
Simona Miraglia (Other)
Stefano Manzo (Other)
Stylianos Georgiadis (Other)
Hjalte Jomo Danielsen Sarup (Other)
Elena Boriani (Other)
Tine Hald (Other)
Sebastian Thöns (Other)
Michael Zwicky Hauschild (Other)
Department of Management Engineering
Quantitative Sustainability Assessment
Centre for oil and gas – DTU
Transport DTU
Transport Modelling
Department of Applied Mathematics and Computer Science
Description

There is nowadays a need of including sustainable considerations in the policy and decision making. Sound decision making requires evidence-based support, i.e. decision analysis to help decision makers in identifying the best alternative based on the associated impacts. Decision analysis includes four steps: 1) structure decision problem; 2) assess possible impacts associated with alternatives; 3) determine stakeholder preferences and 4) evaluate alternatives. Decision analysis can be performed applying different tools, such as cost-benefit analysis (CBA), risk assessment, and life cycle assessment (LCA).

LCA is a decision analysis tool that focuses on environmental impacts. One limit is that LCA is based on defined impact
categories and therefore does not provide information for those impacts and consequences out of the LCA scope. However, the LCA framework closely follows the decision analysis scheme and has the potential to be integrated with other decision analysis tools to enhance their assessment of environmental impacts.

To understand why LCA is needed in the policy decision context, we looked into the decision support for policy in several disciplines. Taking sustainable transport policy as an example, the traditional decision analysis tool for choosing the best alternative is CBA. CBA mainly analyses socio-economic impacts, such as travel time savings and costs, while only some environmental impacts are considered; i.e. the damage costs of greenhouse gas emissions, particulate matters, SOx, NOx and noise. Therefore, current transport policy making rarely reflect a full environmental profile of the suggested alternatives. Making decisions based on incomplete information may lead to sub-optimal solutions, especially where the environment is a major concern. There is a growing attention of conducting LCA in transport. Some identified environmental hotspots, such as consumer and household behavior, which may be the focus for future policies. Others assess the environmental impacts associated with building infrastructures and vehicle use. These studies verify that LCA can successfully quantify the environmental profile of alternatives in transport policy, if the relevant physical changes, e.g. vehicle travel distance and new infrastructures, are well-defined. However, before integrating LCA with other decision analysis methods for decision support, the study system, objectives, scopes, evaluation metrics and uncertainty handling need to be aligned.

Degree of recognition: International
Links:
https://brussels.setac.org/

Related event

SETAC Europe: 27th Annual Meeting – Environmental Quality Through Transdisciplinary Collaboration
07/05/2017 → 13/07/2017
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

Guest lecture at Ecole des Mines de Saint-Etienne
Period: 4 May 2017
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Use of the SEAS-ontologies (Smart Energy Aware Systems) for modeling flow systems
Degree of recognition: International
Documents:
Slides

Related external organisation

Ecole des Mines de Saint-Etienne
France
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Ecole des Mines de Saint-Etienne
Period: 3 May 2017 → 5 May 2017
Mads Holten Rasmussen (Visiting researcher)
Department of Civil Engineering
Section for Building Design

Description
Research visit at Ecole de Mines de Saint-Etienne, France
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

Smart Cities Day Vienna
Period: 2 May 2017 → 3 May 2017
Alfred Heller (Speaker)
Description
International expert for international and national smart cities projects.
Presenter for the lab to living lab to business - value chain.
Degree of recognition: International

Related event
Smart Cities Day Vienna
02/05/2017 → 03/05/2017
Vienna, Austria
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Vidensmodeller - BIM er meget mere end 3D-geometri
Period: 26 Apr 2017
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: Regional
Documents:
170426 Modellering af viden

Related external organisation
NIRAS A/S
Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Perlekædebroer og andre nye superlette konstruktioner
Period: 18 Apr 2017
Per Goltermann (Other)
Department of Civil Engineering
Section for Structural Engineering
Description
Professor Kristian Hertz foredrog over de ingeniørmæssige udfordringer ved at lave den nye type superlette betonkonstruktioner ved brug af præfabrikerede elementer og rationelle produktions og montagemetoder

Related external organisation
Dansk Betonforening
Activity: Other

buildingSMART: International Standard Summit
Period: 3 Apr 2017 → 6 Apr 2017
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design
Description
Organizer of Building Room activities

buildingSMART Summit Barcelona, Spain
Related event
buildingSMART: International Standard Summit
03/04/2017 → 06/04/2017
Barcelona, Spain
Activity: Attending an event › Participating in or organising a conference

Energy Efficiency (Journal)
Period: Mar 2017
Toke Rammer Nielsen (Reviewer)
Department of Civil Engineering
Section for Building Energy

Description
Review of journal article
Degree of recognition: International

Related journal
Energy Efficiency
1570-646X
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.43 SJR 0.74 SNIP 0.816, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Indvendig ydervægisolering – Findes der en sikker metode ?
Period: 29 Mar 2017
Tommy Riviere Odgaard (Speaker)
Søren Peter Bjørlov (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: National

Related event
Ejendomsmessen
29/03/2017 → 30/03/2017
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Trends i byggeriet – IoT, Big data - Inspiration fra DTU, CITIES og Vidensbyen
Period: 23 Mar 2017
Alfred Heller (Speaker)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Inviteret præsentation af de erfaringer der er lavet i CITIES og Vidensbyen omkring Internet of Things, Science Cloud for
Cities og mere
Documents:
Bygnetværk - Alfred Heller - marts 2017

Related external organisation
Byggeriets netværk
København
Activity: Talks and presentations › Conference presentations
Bella Sky Hotel: Design og bygning af verdens skæveste hotel
Period: 7 Mar 2017
Per Goltermann (Other)
Department of Civil Engineering
Section for Structural Engineering

Description
Kaare Dahl præsenterede og diskuterede de bygningsingeniørmæssige udfordringer ved at designe og bygge verdens skæveste hotel ved brug af præfabrikerede elementer

Related external organisation
Dansk Betonforening
Activity: Other

Cities research for District Heating Innovation
Period: 6 Mar 2017
Alfred Heller (Speaker)
Henrik Madsen (Speaker)
Centre for IT-Intelligent Energy Systems in Cities
Department of Civil Engineering
Department of Applied Mathematics and Computer Science

Description
Workshop on further development of district heatings after 4DH. Henrik presented mathematical tools for district heating, and Alfred presented the Science Cloud for District Heating Innovation.
Documents:
Data Infrastruktur - Niras møde Århus marts 2017 - Alfred Heller

Related external organisation
NIRAS A/S
Denmark
Activity: Talks and presentations › Conference presentations

Plandage 2017
Period: 10 Feb 2017
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Samfundsmæssige vækstpotentiale
Degree of recognition: National

Related event

Tværoffentligt Seminar 2017 - om balanceret vækst
Period: 8 Feb 2017
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Description**
Parametre for landsplanarbejde
Degree of recognition: National

**Related event**
Tværoffentligt Seminar 2017 - om balanceret vækst
07/02/2017 → 08/02/2017
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

**Smart City workshop between TUBerlin, NTNU and DTU**
Period: 7 Feb 2017
Alfred Heller (Speaker)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Science Hub for Cities - a common platform for city research (presentation)
Documents:
Alfred Heller et al.- NTNU-MTU-DTU, Nov 2015 (at DTU)

**Related event**
Smart City workshop between TUBerlin, NTNU and DTU
06/02/2017 → 07/02/2017
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

**Gæsteforelæsning ved Technion**
Period: 27 Jan 2017
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International
Documents:
Slides

**Related external organisation**
Technion-Israel Institute of Technology
Israel
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**Steering Committee meeting Water DTU**
Period: 17 Jan 2017
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Presentation of Science Cloud for Water DTU Steering Committee

**Related event**
Steering Committee meeting Water DTU
17/01/2017 → …
External assessment of students "Byggeinformatik"
Period: 16 Jan 2017
Jan Karlshøj (External examiner)
Department of Civil Engineering
Section for Building Design
Activity: Examinations and supervision › External examination

Technion-Israel Institute of Technology
Period: 15 Jan 2017 → 21 Jan 2017
Mads Holten Rasmussen (Visiting researcher)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

WP3 CITIES Workshop on 'Value creation by use of city data'
Period: 12 Jan 2017
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities
Description
Presentation of Science Cloud for Cities
Related event
WP3 CITIES Workshop on 'Value creation by use of city data'
12/01/2017 → …
Aarhus, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Vidensby Netværk for Klima og grøn teknologi
Period: 7 Jan 2017
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Description
IT infrastruktur for byer - Cloud, IoT i Lyngby, Vidensby Hub
Præsentation ved Vidensby Netværk for Klima og grøn teknologi
Related event
Vidensby Netværk for Klima og grøn teknologi
07/02/2017 → …
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Advisory group for Master of Civil Engineering study (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Advisory group for Master of Civil Engineering study at the Technical University of Denmark

Body type: Advisory group

Related external organisation
Advisory group for Master of Civil Engineering study
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

bips Implementation Group (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)

Department of Civil Engineering
Section for Building Design

Description
The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry

Body type: Software Implementation Group

Related external organisation
bips Implementation Group
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

buildingSMART International Council (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)

Department of Civil Engineering
Section for Building Design

Description
Member of buildingSMART Council

The International Council is the legal governing body of BuildingSMART International consisting of two representatives from each buildingSMART chapter. The Council meet once a year.

Body type: Not-for-profit
Degree of recognition: International
Links:
http://buildingsmart.org/about/community/international-council/ (Member of Council)

Related external organisation
buildingSMART International Council
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

buildingSMART Nordic Board (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Vice-chairman)

Department of Civil Engineering
Section for Building Design

**Description**

buildingSMART Nordic is a member of buildingSMART International

buildingSMART Nordic consists of buildingSMART organisations in Denmark, Finland, and Sweden. Estonia, Lithuania, and Poland are observers.

Body type: Not-for-profit
Degree of recognition: International
Links:
http://buildingsmart.org/about/community/international-council/ (Member of Council)

**Related external organisation**

buildingSMART Nordic Board
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

CEN TC442 (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)

Department of Civil Engineering
Section for Building Design

**Description**

CEN, the European Committee for Standardization, is an association that brings together the National Standardization Bodies of 33 European countries

Body type: TC 442

**Related external organisation**

CEN TC442
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Danish Standard S-808 (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)

Department of Civil Engineering
Section for Building Design

**Description**

Structuring of information for the construction industry.

Body type: Mirror Committee

**Related external organisation**

Danish Standard S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Member)

Department of Civil Engineering
Section for Building Design

**Description**

Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)
Related external organisation

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual
Activity: Membership › Membership of research networks or expert groups

Ledelses- og samarbejdsudvalg (External organisation)
Period: 1 Jan 2017 → 31 Dec 2017
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Related external organisation

Ledelses- og samarbejdsudvalg
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Departementet for Kommuner, Bygder, Yderdistriktet, Infrastruktur og Boliger, Grønlands Selvstyre (External organisation)
Period: 2016 → …
Kåre Hendriksen (Chairman)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Nautisk udvalg, Departementet for Kommuner, Bygder, Yderdistriktet, Infrastruktur og Boliger, Grønlands Selvstyre
Degree of recognition: National
Documents:
Nautisk Udvalg - kontaktpersoner -aug 2017

Related external organisation

Departementet for Kommuner, Bygder, Yderdistriktet, Infrastruktur og Boliger, Grønlands Selvstyre
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ELLEA1: Isotropic Layered Elasticity in Excel: Pavement analysis tool for students and engineers
Period: 2016
Eyal Levenberg (Other)
Department of Civil Engineering
Section for Geotechnics and Geology

Description
ELLEA1 (ver. 0.96) performs real time computation of stresses, strains and displacements in a layered elastic half-space due to two uniformly loaded circular areas applied at the surface (Excel 2016 spreadsheet). Five fully bonded layers are considered, each weightless, homogenous, and isotropic.
Documents:
ELLEA1(ver0.96)

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

ELLVA1: Isotropic Layered Viscoelasticity in Excel (moving load): Advanced pavement analysis tool for students and engineers
Period: 2016
Eyal Levenberg (Other)
ELLVA1 (Ver 0.83) computes stresses, strains and displacements in a layered viscoelastic half-space due to a single, uniformly loaded, circular area that is moving with constant speed along a straight line. Five fully bonded weightless, homogeneous, and isotropic layers are considered. Developed by Dr. Eyal Levenberg, Technion-DTU, July 2016.

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Inno-SE Integrated Energy Systems (External organisation)
Period: 2016 → …
Alfred Heller (Chairman)
Department of Civil Engineering
Section for Building Energy
Description
Head of Advisory Board
Body type: National Innovation Cluster
Related external organisation

Inno-SE Integrated Energy Systems
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
Period: 2016
Per Goltermann (Chairman)
Department of Civil Engineering
Section for Structural Engineering
Description
Innovation in Teaching
Related event

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
15/08/2016 → 29/08/2016
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Journal of Exposure Science and Environmental Epidemiology (Journal)
Period: 2016 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Related journal

Journal of Exposure Science and Environmental Epidemiology
1559-0631
**Member of the PhD Assessment Committee, DTU Representative. (External organisation)**
Period: 2016 → …
Lotte Bjerregaard Jensen (Participant)

Department of Civil Engineering

*Description*
Member of the PhD Assessment Committee, DTU Representative, Malene Hagen Eriksen's PhD

Member of the PhD Assessment Committee, DTU Representative, Malene Hagen Eriksen's PhD

*Degree of recognition: International*

*Related external organisation*

**Metroselskabet. Planning of light rail stations in CPH Metropolitan area.: Perceived safety in public transport environments. The influence on customers and revenue**
Period: 16 Dec 2016
Sofie Kirt Strandbygaard (Lecturer)

Department of Civil Engineering

*Description*
Consultant: Presentation and discussion at Metroselskabet. Contribution to the design and planning process in relation to the new light rail stations in Copenhagen

Contribution to a Work Group: planning and designing metrostations and light rail stations. Participants were executive members of the Copenhagen Municipality Council economic department and the Metroselskabet.

*Related external organisation*

**Unknown external organisation**
*Activity: Talks and presentations › Conference presentations*

**BIM in the industry**
Period: 9 Dec 2016
Mads Holten Rasmussen (Speaker)

Department of Civil Engineering

*Description*
Experiences from my job as HVAC-engineer at Alectia.

Documents:

*Slides*

*Related external organisation*

**Ghent University**
Belgium
*Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities*

**Greenland island infrastructures**
Period: 7 Dec 2016 → 10 Dec 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event

**Sustainable Arctic Resources and Social Responsibility: University of the Arctic Thematic Network**
07/12/2016 → 10/12/2016
Syktyvkar, Russian Federation
Activity: Talks and presentations › Conference presentations

**Oslo BIM Symposium**
Period: 7 Dec 2016 → 8 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Participant as supervisor for PhD student from Oslo and Ankershus University College of Applied Sciences

Oslo BIM Symposium

Related event

**Oslo BIM Symposium**
07/12/2016 → 08/12/2016
Oslo, Norway
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**W3C Linked Building Data Community Group (External organisation)**
Period: 1 Dec 2016 → 1 Jan 2025
Mads Holten Rasmussen (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Forum for discussion about and development of standards and best practices for exchange of building data on the web. On biweekly online meetings researchers and industry stakeholders participate.
Degree of recognition: International
Links:
https://www.w3.org/community/lbd/ (Community Group Homepage)
https://github.com/w3c-lbd-cg (W3C Linked Building Data CG - Github page)

Related external organisation

**W3C Linked Building Data Community Group**
Activity: Membership › Membership of research networks or expert groups

**Sustain-ATV Conference 2016**
Period: 30 Nov 2016
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Living Labs – From scientific labs to the smart city
COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level. The objective of this Action is to contribute to structuring existing knowledge and to developing innovative approaches on how to build more secure and safe cities. Studies have shown that there is a correlation between the structure and organization of urban space and crime: new criminological theory supports this point of view. The Justice and Home Affairs Council of the EU has underlined that crime prevention through design is a successful and effective strategy for crime prevention and needs to be supported. Despite this, new projects are being implemented all over Europe without considering safety criteria, creating urban areas where crime or fear of crime can make life difficult. The Action develops new knowledge and innovative approaches, putting together theoretical thinking and practical experience. The scientific programme works simultaneously on one hand on innovative approaches deriving from research and experts and on the other hand on the know-how acquired through best practical experience of participating countries. The above is done through lectures, seminars, focused working groups as well as a workshop. Dissemination of awareness is an important aspect for working in the field of CP-UDP field and the Action devotes much effort to this issue.

COST TU 1203 (European Coorporation in Science and Technology)
Links:
http://costtu1203.eu/ (COST TU 1203 )

Related event

EERA Conference 2016
Alfred Heller (Speaker)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Triple Helix Cooperation in Research
Documents:

Related event

EERA Conference 2016
24/10/2016 → 25/10/2016
Birmingham, United Kingdom
Activity: Talks and presentations › Conference presentations
ATV årsøde
Period: 14 Nov 2016
Alfred Heller (Invited speaker)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Integrated and Intelligent Energy Systems

Documents:
ATV Conference - Integrated and Intelligent Energy Systems - Nov 2016 - Alfred Heller

Related event
ATV årsøde: Akademy of Technical Sciences - Annual meeting
14/11/2016 → …
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

EERA JP Energy Integration
Period: 2 Nov 2016 → 4 Nov 2016
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
EERA Joint Programme in Energy Integration - half-annual workshop.

Related event
EERA JP Energy Integration
02/11/2016 → 04/11/2016
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Carbon Track and Trace workshop
Period: 1 Nov 2016
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Workshop on Carbon Track and Trace - CITIES cooperation

Related event
Carbon Track and Trace workshop
01/11/2016 → …
Trondheim, Norway
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

DTU visit at NTNU
Period: 31 Oct 2016
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Deans visit for cooperation between the universities
Related event

DTU visit at NTNU: Deans visit
31/10/2016 → 01/11/2016
Trondheim, Norway
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

UPTAKE OF CHEMICALS FROM INDOOR AIR: PATHWAYS AND HEALTH EFFECTS
Period: 31 Oct 2016
Gabriel Bekö (Invited speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event

ICHES 2016
29/10/2016 → 02/11/2016
Nagoya, Japan
Activity: Talks and presentations › Conference presentations

Et historisk view - i et socioteknisk perspektiv
Period: 30 Oct 2016
Kåre Hendriksen (Lecturer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Forelæsning på Ilisimatusarfik, Grønlands Universitet
Degree of recognition: National

Related event

Grønlands historie
30/10/2016 → 30/10/2016
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

The City of Knowledge - A triple-helix organization
Alfred Heller (Speaker)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
How triple helix organization bring sucess to smart energy systems.

Related event

EERA Conference 2016
24/10/2016 → 25/10/2016
Birmingham, United Kingdom
Activity: Talks and presentations › Conference presentations

9th International Conference on Indoor Air Quality Ventilation & Energy Conservation In Buildings
Kyriaki Foteinaki (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event

9th International Conference on Indoor Air Quality Ventilation & Energy Conservation In Buildings
23/10/2016 → 26/10/2016
Songdo, Korea, Republic of
Activity: Attending an event › Participating in or organising a conference

Flow Measurement
Period: 13 Oct 2016
Mariya Petrova Bivolarova (Invited speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
Introducing different used in practice methods for airflow measurement in building ventilation systems

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Lederseminar i Danmarks Meteorologiske Institut (DMI)
Period: 12 Oct 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Presentation: Rammebetingelser for Grønlands erhvervsudvikling

Related event

Lederseminar i Danmarks Meteorologiske Institut (DMI)
12/10/2016 → 12/10/2016
København, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Historic Mortars Conference 2016
Tessa Kvist Hansen (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Presentation of conference paper

Related event

Historic Mortars Conference 2016
10/10/2016 → 12/10/2016
Santorini, Greece
Activity: Talks and presentations › Conference presentations

Greenland island infrastructures – energy challenges for the fishing industry
Kåre Hendriksen (Invited speaker)
Related event

Arctic Circle Conference: REMOTE RENEWABLE CASE STUDIES: PARTICIPATORY STAKEHOLDER ENGAGEMENT FOR A SUSTAINABLE FUTURE
07/10/2016 → 09/10/2016
Reykjavik, Iceland
Activity: Talks and presentations › Conference presentations

CPH Climate Solutions
Period: 3 Oct 2016
Kyriaki Foteinaki (Speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event

CPH Climate Solutions
03/10/2016 → 04/10/2016
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Greenland - Fishing and climate change
Period: 26 Sep 2016
Kåre Hendriksen (Lecturer)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Lecture at Háskólasafn Vestfjarða
University Centre of the Westfjords
Degree of recognition: National

Related event

Greenland - fishing and climate change
26/09/2016 → 26/09/2016
Isafjordur, Iceland
Activity: Talks and presentations › Conference presentations

Settlements in Greenland - economy and development
Period: 26 Sep 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Public lecture: Settlements in Greenland – economy and development

Related event

Settlements in Greenland - economy and development
26/09/2016 → 26/09/2016
Isafjordur, Iceland
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities
CITIES - Research Centre for Cities  
Period: 25 Sep 2016  
Alfred Heller (Lecturer)  
Department of Civil Engineering  
Centre for IT-Intelligent Energy Systems in Cities  
Documents:  
CITIES - Singapore -BCA - Alfred Heller 25-09-2016

Related event

Smart and sustainable cities: DTU-BCA Executive Development Programme 2016  
26/09/2016 → 30/09/2016  
Copenhagen, Denmark  
Activity: Talks and presentations › Conference presentations

Executive Development Programme with Technical University of Denmark  
Period: 25 Sep 2016 → 1 Oct 2016  
Alfred Heller (Organizer)  
Department of Civil Engineering  
Centre for IT-Intelligent Energy Systems in Cities  
Description  
Scientific organizer of Master Track for Executive Masters from Singapore.  
Executive Development Programme for BCA Singapore

Related event

Executive Development Programme with Technical University of Denmark: Master Course  
25/09/2016 → 01/10/2016  
Kgs. Lyngby, Denmark  
Activity: Attending an event › Participating in or organising a conference

Engineered Transparency  
Period: 20 Sep 2016 → 21 Sep 2016  
Jens Henrik Nielsen (Chairman)  
Department of Civil Engineering  
Section for Structural Engineering  
Description  
Engineered Transparency  
Engineered Transparency, Conference on Glass

Related event

Engineered Transparency: International Conference at GLASSTEC  
20/09/2016 → 21/09/2016  
Düsseldorf, Germany  
Activity: Attending an event › Participating in or organising a conference

buildingSMART Summit Autumn  
Period: 19 Sep 2016 → 26 Sep 2016  
Jan Karlshej (Organizer)  
Department of Civil Engineering
Section for Building Design

Description
Organizer of Building Room activities

buildingSMART Summit Jeju, Korea

Related event

buildingSMART Summit Autumn
26/09/2016 → 29/09/2016
Jeju, Korea, Republic of
Activity: Attending an event › Participating in or organising a conference

Greenland - far from reaching The United Nations Millennium Development Goal - Why?
Period: 18 Sep 2016 → 21 Sep 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Degree of recognition: International
Documents:
160620 Abstract eng

Related event

Water Innovations for Healthy Arctic Homes
18/09/2016 → 21/09/2016
Anchorage, United States
Activity: Talks and presentations › Conference presentations

Water and Sanitation Summary for Greenland
Period: 18 Sep 2016 → 21 Sep 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event

Water Innovations for Healthy Arctic Homes
18/09/2016 → 21/09/2016
Anchorage, United States
Activity: Talks and presentations › Conference presentations

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
Period: 15 Sep 2016 → 29 Sep 2016
Ole Mejlhede Jensen (Organizer)
Department of Civil Engineering
Section for Building Design

Related event

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
15/08/2016 → 29/08/2016
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

CESBP 2016
Period: 14 Sep 2016 → 16 Sep 2016
Tessa Kvist Hansen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Participation in conference

Related event
CESBP 2016: Central European Symposium on Building Physics
14/09/2016 → 16/09/2016
Dresden, Germany
Activity: Attending an event › Participating in or organising a conference

Examination board, Ph.D. Joren Pelfrene: "Numerical Analysis of the Post-Fracture Response of Laminated Glass under Impact and Blast Loading", TU Gent (External organisation)
Period: 14 Sep 2016
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International

Related external organisation
Examination board, Ph.D. Joren Pelfrene: "Numerical Analysis of the Post-Fracture Response of Laminated Glass under Impact and Blast Loading", TU Gent
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Qaanaaq Vandforsyning – en forudsætning for udvikling
Period: 14 Sep 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event
Selskabet for Arktisk Forskning og Teknologi (SAFT)
14/09/2016 → 14/09/2016
København, Denmark
Activity: Talks and presentations › Conference presentations

Rammebetingelser for Grønlands erhvervsudvikling
Period: 12 Sep 2016
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event
Hvordan etableres en investeringsfond for Grønland?: Ingeniørforeningen i Danmark
København, Denmark
Activity: Talks and presentations › Conference presentations

Ghent University
Period: 11 Sep 2016 → 15 Feb 2017
Mads Holten Rasmussen (Visiting researcher)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

11th Conference on Process and Product Modelling
Period: 7 Sep 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Presentation of two papers with students. Chaired one session.

In the last two decades, the biannual ECPPM (European Conference on Product and Process Modelling) conference series, as the oldest BIM conference, has provided a unique platform for the presentation and discussion of the most recent advances with regard to the ICT (Information and Communication Technology) applications in the AEC/FM (Architecture, Engineering, Construction and Facilities Management) domains. ECPPM2016 is the 11th European Conference on Product & Process Modeling, the flagship conference event of the European Association of Product and Process Modeling (EAPPM), with a long standing history of excellence in product and process modeling in building industry, which is currently known as building information modeling (BIM). ECPPM2016 covers complementary thematic areas that hold great promise for the advancement of research and technological development in the modelling of complex engineering systems. In this context, ECPPM2016 foresees to attract high quality research papers and to provide a platform for the cross fertilization of new ideas and know-how in relation to the special conference themes.

Related event
11th Conference on Process and Product Modelling
07/09/2016 → 09/09/2016
Limassol, Cyprus
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

11th European Conference on Product and Process Modelling
Period: 7 Sep 2016 → 9 Sep 2016
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International

Related event
11th European Conference on Product and Process Modelling
07/09/2016 → 09/09/2016
Limassol, Cyprus
Activity: Talks and presentations › Conference presentations

teaching at Hvidovre Gymnasium: teaching
Period: 29 Aug 2016
Sofie Kirt Strandbygaard (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Teaching four lections at Hvidovre gymnasium and HF in planning and modernism

Teaching a class at Hvidovre gymnasium for a couple of lessons in order to interview them afterwards for my research project: their perception of the S-train station and the public transport
Related external organisation

Hvidovre Gymnasium and HF
Hvidovre, Denmark
Activity: Other

Historical Masonry
Inge Rørig-Dalgaaard (Organizer)
Department of Civil Engineering
Section for Building Design

Description
Organization of the Historical Masonry conference
Links:

Related event

Historical Masonry
22/08/2016 → 24/08/2016
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design

Description
Organiser of Segment on Building Information Modelling Open Data Standards in Civil Engineering (BIM) in relation to the Rilem conference at DTU in 2016.

Building Information Modelling
Open Data Standards in Civil Engineering (BIM)
Links:
http://www.conferencemanager.dk/MSSCE2016/13bim-workshop.html (Building Information Modelling Open Data Standards in Civil Engineering (BIM))

Related event

International RILEM Conference on Materials, Systems and Structures In Civil Engineering
15/08/2016 → 29/08/2016
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Trafikdage 2016
Sofie Kirt Strandbygaard (Speaker)
Section for Building Design
Department of Civil Engineering
Center for Nanostructured Graphene

Description
Perceived safety around public transport
conference presentation
Documents:
Trafikdage Aalborg. Udvidet resume. Lokalmiljøet omkring stationen Sammenhængen mellem oplevet tryghed og brugen af kollektiv transport_1

Links:
http://www.trafikdage.dk/ (traffic conference in Denmark Ålborg)

Related event

Trafikdage 2016
22/08/2016 → 23/08/2016
Ålborg, Denmark
Activity: Talks and presentations › Conference presentations

Chinese Academy of Sciences
Period: 21 Aug 2016 → 22 Jan 2017
Gerald Englmair (Visiting researcher)
Department of Civil Engineering
Section for Building Energy

Description
Research stay at CAS IEE: Chinese Academy of Sciences, Institute of Electrical Engineering
Activity: Visiting an external institution › Visiting another research institution

Greenland island infrastructures – energy challenges to the fishing industry
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Documents:
160805 Article Greenland infrastructure Master

Related event

ENERGY TRANSITIONS AND A GLOBALIZED ARCTIC The Role of Science, Technology and Governance
17/08/2016 → 18/08/2016
Singapore, Singapore
Activity: Talks and presentations › Conference presentations

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design

Description
PhD course on BIM in Civil Engineering - focusing on open standards
Links:
https://files.conferencemanager.dk/medialibrary/2A179311-431D-479F-9B86-AC05B769477E/images/BIM_-_phd-courseprogram.pdf (PhD course on open BIM)

Related event

International RILEM Conference on Materials, Systems and Structures in Civil Engineering
15/08/2016 → 29/08/2016
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
**Sprout Week: summer school**  
Sofie Kirt Strandbygaard (Other)  
KT Consortium  
Department of Civil Engineering  
Section for Building Design  

**Description**  
Summer school in planning around public transport.  
Reviewer.  
Links:  
http://sprout.talentweek.dk/  

**Related external organisation**  
DAC (Danish Architectural Center)  
Strandgade 27B DK, 1401 Copenhagen K, Copenhagen, Denmark  
Activity: Other  

**OB-16 International Symposium on Building Energy Performance and Occupant Behavior**  
Period: 3 Aug 2016  
Rune Korsholm Andersen (Speaker)  
Department of Civil Engineering  
Section for Indoor Climate and Building Physics  

**Description**  
VERIFICATION OF OCCUPANTS’ BEHAVIOUR MODELS IN RESIDENTIAL BUILDINGS  
Documents:  
Abstract for OB 16 symposium aug 2016 version 2  

**Related event**  
**OB-16 International Symposium on Building Energy Performance and Occupant Behavior**  
03/08/2016 → 03/08/2016  
Ottawa, Canada  
Activity: Talks and presentations › Conference presentations  

**Holisteecc (External organisation)**  
Period: 1 Aug 2016 → 30 Sep 2017  
Jan Karlshøj (Member)  
Department of Civil Engineering  
Section for Building Design  

**Description**  
The HOLISTEEC project aims at providing the European AEC/FM industry with a comprehensive design approach taking into account the whole building life-cycle and the influence of the neighborhoods, with the objective to make a decisive contribution to built environment energy efficiency improvement.  
Member of advisory board  

**Body type:** FP7-2013-NMP-ENV-EeB project  
**Degree of recognition:** International  
**Links:**  
http://www.holisteecproject.eu (Holistic and optimized life-cycle integrated support for energy-efficient building design and construction)  

**Related external organisation**  
Holisteecc
Open BIM: Focusing on buildingSMART standards
Period: 15 Jul 2016
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Lecture on buildingSMART standards: IDM, MVD, IFC, BCF, bsDD at Aalborg University.

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Skinful of Secrets: Dermal Exposure and Effects
Period: 7 Jul 2016
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Degree of recognition: International

Related event
14th international conference on Indoor Air Quality and Climate
03/07/2016 → 08/07/2016
Ghent, Belgium
Activity: Talks and presentations › Conference presentations

Molio Advisory Board (External organisation)
Period: 1 Jul 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The non-for-profit organisation of bips and Byggecentrum has merged into Molio in 2016.

Body type: Advisory Board

Related external organisation
Molio Advisory Board

Molio Implementation Group (External organisation)
Period: 1 Jul 2016 → 30 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The non-for-profit organisation of bips and Byggecentrum has merged into Molio in 2016.

Body type: Software Implementation Group
**Related external organisation**

**Molio Implementation Group**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Molio International Committee (External organisation)**
Period: 1 Jul 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The non-for-profit organisation of bips and Byggecentrum has merged into Molio in 2016.

Body type: Committee

**Related external organisation**

**Molio International Committee**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**open BIM in Denmark**
Period: 30 Jun 2016
Jan Karlshøj (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Invited speaker for giving a status on open BIM in Denmark

Documents:
Denmark

**Related event**

**BIM's day: Organised by buildingSMART France**
30/06/2016 → 30/06/2016
Paris, France
Activity: Talks and presentations › Conference presentations

**Grønne forretningsmodeller**
Period: 29 Jun 2016
Christian Anker Hvid (Participant)
Department of Civil Engineering
Section for Building Energy

Description
Grønne forretningsmodeller - 4 temamøder arrangeret af Dansk Arkitektur Center og COWI om hvordan man øger værdien af byggeriet

**Related event**

**Grønne forretningsmodeller**
29/06/2016 → …
Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**LDAC2016 – 4th Linked Data in Architecture and Construction Workshop**
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design
Degree of recognition: International

Related event

LDAC2016 – 4th Linked Data in Architecture and Construction Workshop
21/06/2016 → 23/06/2016
Madrid, Spain
Activity: Talks and presentations › Conference presentations

Nordic Fire & Safety Days
Rolff Ripke Leisted (Participant)
Department of Civil Engineering
Section for Building Design

Description
The Nordic Fire & Safety Days June 16th and 17th 2016 is a yearly event carried out by the Nordic universities and research institutes dealing with risk and fire safety. The conference is held by SP Technical Research Institute of Sweden in collaboration with Aalborg University in Copenhagen and the Technical University of Denmark, Lund University, Aalto University, Norwegian University of Science and Technology, University of Stavanger University College Haugesund and Iceland University as well as VTT Technical Research Centre of Finland Ltd and the Danish Institute of Fire and Security Technology.

Related event

Nordic Fire & Safety Days
16/06/2016 → 17/06/2016
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Folketingets Grønlandsudvalg
Period: 8 Jun 2016
Kåre Hendriksen (Speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Præsentation: ARTEK forskning og forskningsbaseret undervisning

Related event

Folketingets Grønlandsudvalg
08/06/2016 → 08/06/2016
Sisimiut, Greenland
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Occupant behaviour (IEA Annex 66)
Period: 25 May 2016
Rune Korsholm Andersen (Invited speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
Organiser and speaker in workshop about Occupant behaviour (IEA Annex 66) during the Clima2016 conference in Aalborg
The 17th Nordic Geotechnical Meeting
Period: 25 May 2016 → 27 May 2016
Chiara Latini (Participant)
Department of Civil Engineering
Section for Geotechnics and Geology

Description
The aim of the conference is to strengthen the relationships between practicing engineers, researchers and scientists within the fields of geotechnics, geotechnical engineering and engineering geology with special emphasis on the Nordic region.

Documents:
Dynamic stiffness of horizontally vibrating suction caissons

12th REHVA World Congress CLIMA 2016
Period: 22 May 2016 → 25 May 2016
Kyriaki Foteinaki (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

12th REHVA World Congress CLIMA 2016
Period: 22 May 2016 → 25 May 2016
Aalborg, Denmark
Activity: Attending an event › Participating in or organising a conference

IABSE board Denmark (External organisation)
Period: 28 Apr 2016
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering

Description
member of the danish IABSE board

IABSE board Denmark
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
IABSE international working group 1: Glass Structures (External organisation)
Period: 27 Apr 2016
Jens Henrik Nielsen (Secretary)
Department of Civil Engineering
Section for Structural Engineering

Description
Vice chair
Degree of recognition: International

Related external organisation
IABSE international working group 1: Glass Structures
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Fire intensity of sandwich panels of foam and other materials
Period: 15 Apr 2016
Rolff Ripke Leisted (Invited speaker)
Department of Civil Engineering
Section for Building Design
Documents:
COFISH_2016

Related event
CONFERENCE ON FIRE SAFETY & HEALTH 2016
15/04/2016 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

ARTEK Event 2016 - International Conference
Period: 12 Apr 2016 → 14 Apr 2016
Steffen Davidsen (Speaker)
Department of Environmental Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event
ARTEK Event 2016 – International Conference: Sanitation in Cold Climate Regions
12/04/2016 → 14/04/2016
Sisimiut, Greenland
Activity: Talks and presentations › Conference presentations

ARTEK Event 2016 – International Conference
Period: 12 Apr 2016 → 14 Apr 2016
Kåre Hendriksen (Speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Presentation: Waste handling in Arctic island operated societies
Documents:
160306 Extendet abstract Kåre Sektorisering

Related event
ARTEK Event 2016 – International Conference: Sanitation in Cold Climate Regions
12/04/2016 → 14/04/2016
**ARTEK Event 2016 – International Conference**

*Period: 12 Apr 2016 → 14 Apr 2016*

Kåre Hendriksen (Speaker)

Department of Civil Engineering

ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Description**

Presentation: Qaanaaq - Fresh water – a prerequisite for development

Documents:

160306 Extended_Abstract water Kåre uden sidehoved

**Related event**

**ARTEK Event 2016 – International Conference: Sanitation in Cold Climate Regions**

12/04/2016 → 14/04/2016

Sisimiut, Greenland

Activity: Talks and presentations › Conference presentations

**buildingSMART Summit Spring**

*Period: 11 Apr 2016 → 14 Apr 2016*

Jan Karlshøj (Organizer)

Department of Civil Engineering

Section for Building Design

**Description**

Organizer of Building Room activities

**Related event**

**buildingSMART Summit Spring**

11/04/2016 → 14/04/2016

Rotterdam, Netherlands

Activity: Attending an event › Participating in or organising a conference

**Qaanaaq distrikt – infrastruktur og erhvervsgudlag**

*Period: 8 Apr 2016 → 11 Apr 2016*

Kåre Hendriksen (Invited speaker)

Department of Civil Engineering

ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Related event**

**Plandage 2016 i Sisimiut**

08/04/2016 → 11/04/2016

Sisimiut, Greenland

Activity: Talks and presentations › Conference presentations

**BIM World 2016**

*Period: 7 Apr 2016*

Jan Karlshøj (Speaker)

Department of Civil Engineering
Section for Building Design

Description
Invited speaker at "Regarding national strategies, which are the actions of bSI’s chapters and bSI?" seen from a Danish perspective.

Building Information Modeling: a key role in building practices, data and value creation
The success of the BIM World event is proof that BIM and digital models have become the main driving force behind innovation and performance in the construction industry, urban planning and regional development. Technology convergence (BIM, GIS, 3D, computer-assisted maintenance management, connected devices, smart building, big data, cloud, mobility, augmented reality, etc.) will make it possible for industry stakeholders generally to mass produce and share multi-scale digital models, from buildings to regions. The interoperability of digital models with line-of-business tools, the new collaborative working methods and the controlled availability of data are helping to optimize resources, enhance the quality of the services rendered, and offer users new digital experiences. Dynamically-updated models will play a key role in interfacing between digital technologies, the various professional fields, built works and usage data to improve operational efficiency and deliver new services.

Related event

BIM World 2016
06/12/2016 → 07/12/2016
Paris, France
Activity: Talks and presentations › Conference presentations

Arktisk Workshop om Forskning og Uddannelse
Kåre Hendriksen (Participant)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Arktisk Workshop om Forskning og Uddannelse

Related event

Arktisk Workshop om Forskning og Uddannelse
29/03/2016 → 30/03/2016
Hindsgavl, Denmark
Activity: Attending an event › Participating in or organising a conference

IEA EBC Annex 67
Period: 16 Mar 2016
Panagiota Gianniou (Speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
Findings of common exercise: Flexibility of detached single zone building

Related event

IEA EBC Annex 67: 2nd Working meeting
16/03/2016 → …
Trondheim, Norway
Activity: Talks and presentations › Conference presentations

Udfordringer for fremtidens boligbyggeri i bygder og yderdistrikter
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

Related event

Fremtidens boligbyggeri i bygderne og yderdistriktene
09/03/2016 → …
Upernavik, Greenland
Activity: Talks and presentations › Conference presentations

Top meeting CITIES - DiCyPS
Period: 3 Mar 2016
Alfred Heller (Participant)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Presenter of CITIES
Top meeting between CITIES and DiCyPS

Related event

Top meeting CITIES - DiCyPS
03/03/2016 → …
Ålborg, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Urban Living Labs
Period: 25 Feb 2016 → 26 Feb 2016
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

Description
Presentation of Innovation Cycle for Living Labs at DTU and Copenhagen area
International seminar on living labs

Related event

Urban Living Labs
25/02/2016 → 26/02/2016
Newcastle, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Changing the paradigm in DK: Regarding IT in construction
Period: 10 Feb 2016 → 11 Feb 2016
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Præsentation vedr. brug af it i byggesektoren
Jan Karlshøj
**Related event**

**IKT-lederuddannelse**
Period: 10/02/2016 → 11/02/2016
Middelfart, Denmark
Activity: Talks and presentations › Conference presentations

**Workshop om naturvidenskabelig bachelor på Ilisimatusarfik**
Period: 28 Jan 2016 → 29 Jan 2016
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
Description
Artek struktur og relevante kurser

**Related event**

**Workshop om naturvidenskabelig bachelor på Ilisimatusarfik**
28/01/2016 → 29/01/2016
Nuuk, Greenland
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**RIBuild open seminar**
Period: 21 Jan 2016
Tessa Kvist Hansen (Participant)
Department of Civil Engineering
Section for Building Design
Description
RIBuild Open Seminar: Sikker indvendig efterisolering af ældre bygninger

**Related event**

**RIBuild open seminar: Sikker indvendig efterisolering af ældre bygninger**
21/01/2016 → ...
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Erhvervsudvikling i Qaanaaq distrikt - muligheder og barrierer**
Period: 20 Jan 2016 → 22 Jan 2016
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering

**Related event**

**Selvstyrets erhvervsseminar i Qaanaaq**
20/01/2016 → 22/01/2016
Qaanaaq, Greenland
Activity: Talks and presentations › Conference presentations

**Application of Digital Image Correlation for Material Testing**
Period: 19 Jan 2016 → 21 Jan 2016
Andrei Costache (Lecturer)
Department of Civil Engineering
Department of Mechanical Engineering
Description
(Course lecturer)
Links:
Related event

Eksperimentel strukturel mekanik
04/01/2016 → 22/01/2016
Kgs. Lyngby, Denmark
Activity: Other

Polar DTU
Period: 18 Jan 2016
Kåre Hendriksen (Participant)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions
Description
Præsentation: Qaanaaq distrikt – infrastruktur og erhvervsggrundlag

Related event

Polar DTU
18/01/2016 → 18/01/2016
DTU Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The Future of Lean Design Management
Period: 14 Jan 2016
Mads Holten Rasmussen (Speaker)
Department of Civil Engineering
Section for Building Design

Related event

The Future of Lean Design Management
14/01/2016 → 14/01/2016
Helsinki, Finland
Activity: Talks and presentations › Conference presentations

NORA Workshop - Vand i højarktis og ø-driftssamfund
Period: 12 Jan 2016 → 15 Jan 2016
Kåre Hendriksen (Organizer)
Department of Civil Engineering
Description
Foredrag: - Arktiske ø-driftssamfund - barrierer og potentialer for bæredygtig udvikling - At udnytte de lokale erhvervsmuligheder - Qaanaaq som eksempel
NORA Worshop Vand i højarktis og ø-driftssamfund

Related event

NORA Workshop - Vand i højarktis og ø-driftssamfund
12/01/2016 → 15/01/2016
Ilulissaq, Greenland
Activity: Attending an event › Participating in or organising a conference

Advisory group for Master of Civil Engineering study (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Advisory group for Master of Civil Engineering study at the Technical University of Denmark
Body type: Advisory group

Related external organisation
Advisory group for Master of Civil Engineering study
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

bips Implementation Group (External organisation)
Period: 1 Jan 2016 → 30 Jun 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry
Body type: Software Implementation Group

Related external organisation
bips Implementation Group
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

buildingSMART International Council (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Member of buildingSMART Council
The International Council is the legal governing body of BuildingSMART International consisting of two representatives from each buildingSMART chapter. The Council meet once a year.
Body type: Not-for-profit
Degree of recognition: International
Links:
http://buildingsmart.org/about/community/international-council/ (Member of Council)

Related external organisation
buildingSMART International Council
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

buildingSMART Nordic Board (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Chairman)
Description
buildingSMART Nordic is a member of buildingSMART International

buildingSMART Nordic consists of buildingSMART organisations in Denmark, Finland, and Sweden. Estonia, Lithuania, and Poland are observers.

Body type: Not-for-profit
Degree of recognition: International
Links:
http://buildingsmart.org/about/community/international-council/ (Member of Council)

Related external organisation

buildingSMART Nordic Board
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

CEN TC442 (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
CEN, the European Committee for Standardization, is an association that brings together the National Standardization Bodies of 33 European countries

Body type: TC 442

Related external organisation

CEN TC442

Danish Standard S-808 (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Structuring of information for the construction industry.

Body type: Mirror Committee

Related external organisation

Danish Standard S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Member)
Department of Civil Engineering
Section for Building Design
Description
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)

Coordination of ISO 29481 Part 1

Body type: Standardisation
Degree of recognition: International

Related external organisation
ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual
Activity: Membership › Membership of research networks or expert groups

Ledelses- og samarbejdsudvalg (External organisation)
Period: 1 Jan 2016 → 31 Dec 2016
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Related external organisation

Ledelses- og samarbejdsudvalg
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Environment International (Journal)
Period: 2015 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related journal
Environment International
0160-4120
Central database
Activity: Research › Peer review of manuscripts

Head of activity - Integrated Energy Systems (External organisation)
Period: 2015 → 2016
Alfred Heller (Chairman)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Head of working group on Integrated Energy System Innovation under CLEAN, Inno-SE innovation cluster.

Body type: Committee
Links:

Related external organisation

Head of activity - Integrated Energy Systems
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
IEA EBC Annex 67 (External organisation)
Period: 2015 → 2019
Rongling Li (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
An international expert group working on the research topic of energy flexible buildings
Degree of recognition: International
Links:

Related external organisation
IEA EBC Annex 67
Activity: Membership › Membership of research networks or expert groups

Nordic Research Council (External organisation)
Period: 2015 → …
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy

Description
Evaluator for the Nordic Research Council

Related external organisation
Nordic Research Council
Activity: Membership › Membership in review committee

PhD committee, Kaunas University of Technology, Lithuania (External organisation)
Period: 2015 → …
Gabriel Bekö (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related external organisation
PhD committee, Kaunas University of Technology, Lithuania
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

DTU Sustain Conference 2015
Period: 17 Dec 2015
Kyriaki Foteinaki (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event
DTU Sustain Conference 2015
17/12/2015 → 17/12/2015
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference
TRC Transit Crime Network (External organisation)
Period: 14 Dec 2015
Sofie Kirt Strandbygaard (Participant)
Department of Civil Engineering
Section for Building Design

Description
Transit Crime Research Network – TCR- Network is an open forum for discussions of research topics related to crime and safety in transportation environments but may also involve general queries and discussions about crime and place, crime prevention and space-centered methodologies (both qualitative and quantitative). Topics of relevance also involve ‘the whole journey approach’ in transit crime research as well as queries that account for the needs for safe transportation from a variety of perspectives and users.

Users of this list have the advantage being able to check previous discussions, retrievable by date, thread, subject and author.
TCR- Network is an inclusive arena and therefore has no moderators. However, we all count on your discretion when using the list. In order to subscribe, approval from the administrator is necessary.
TCR- Network is sponsored by the School of Architecture and Built Environment, KTH, Stockholm, Sweden, and is administered by Vania Ceccato, 2014. The list was initiated by Marcus Felson, Texas State University, USA, in 2012, in an email discussion format.

Body type: TCR-Network is an email user list devoted to research on crime and safety in transportation environments.
Degree of recognition: International

Related external organisation
TRC Transit Crime Network
Activity: Membership › Membership of research networks or expert groups

Polarforskerkonference
Period: 3 Dec 2015 → 4 Dec 2015
Kåre Hendriksen (Organizer)
Department of Civil Engineering

Description
Infrastruktur og bæredygtig erhvervsudvikling At udnytte de lokale erhvervsmuligheder – Qaanaaq som eksempel

Polarforskerkonference, Aalborg 2015

Related event
Polarforskerkonference: Infrastruktur og bæredygtig erhvervsudvikling
03/12/2015 → 04/12/2015
Aalborg, Denmark
Activity: Attending an event › Participating in or organising a conference

International Conference on Solar Heating and Cooling for Buildings and Industry 2015
Period: 2 Dec 2015 → 4 Dec 2015
Gerald Englmair (Participant)
Department of Civil Engineering
Section for Building Energy

Related event
4th International Conference on Solar Heating and Cooling for Buildings and Industry 2015
02/12/2015 → 04/12/2015
Istanbul, Turkey
Activity: Attending an event › Participating in or organising a conference
IBPSA-Nordic technical event BuildSim-Nordic 2015
Period: Nov 2015
Kyriaki Foteinaki (Participant)
Department of Civil Engineering

Related event
IBPSA-Nordic technical event BuildSim-Nordic 2015
02/11/2015 → 03/11/2015
Aalborg, Denmark
Activity: Attending an event › Participating in or organising a conference

Smart Buildings: Combining energy efficiency, flexibility and comfort
Period: 26 Nov 2015
Alfred Heller (Invited speaker)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

Description
Presentation of White Paper "Smart Buildings: Combining energy efficiency, flexibility and comfort" by State of Green
Introductory presentation of the event topic on smart buildings and energy systems - A Nordic perspective.
Documents:
- Smart Buildings - White Paper for a green transition
Links:

Related event
Nordic diplomacy event on Smart Buildings Technologies: A Nordic-Danish Perspective
26/11/2015 → …
Vilnius, Lithuania
Activity: Talks and presentations › Conference presentations

Building energy demand for smart energy cities
Period: 25 Nov 2015
Panagiota Gianniou (Speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event
CITIES WP1/WP2 meeting in Energinet headquarters
25/11/2015 → …
Fredericia, Denmark
Activity: Talks and presentations › Conference presentations

Miljøstrategisk Årsømøde 2015
Period: 24 Nov 2015
Jens-Phillip Petersen (Organizer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
Organisation/conduction of panel discussion and workshop ""Lokale implementering af energistrategier - hvordan kan energistrategier få større merværdi for lokale byområder?"" at the Miljøstrategisk Årsømøde 2015
Related event

Miljøstrategisk Årsmødet 2015
23/11/2015 → 24/11/2015
Activity: Attending an event › Participating in or organising a conference

At udnytte de lokale erhvervsmuligheder – Qaanaq som eksempel
Period: 18 Nov 2015
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering

Description
Innovationskonference Nuuk 2015

Related event

Innovationskonference
17/11/2015 → 18/11/2015
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

IT Kompetenceudvikling workshop Ungasissuminngaanit
Period: 18 Nov 2015
Kåre Hendriksen (Participant)
Department of Civil Engineering

Description
IT Kompetenceudvikling workshop Ungasissuminngaanit, Nukissiorfiit, Nuuk 2015

Related event

IT Kompetenceudvikling workshop Ungasissuminngaanit
19/11/2015 → 19/11/2015
Nuuk, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Tagboliger i eksisterende ejendomme - planlægning og løsninger
Period: 12 Nov 2015
Søren Peter Bjarløv (Invited speaker)
Department of Civil Engineering

Section for Building Design
Documents:
watch[1]

Related event

TAGBOLIGER I EKSISTERENDE EJENDOMME - PLANLÆGNING OG LØSNINGER
12/11/2015 → 12/11/2015
COPENHAGEN, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Triple Helix Cooperation for Scalability - Presentation
Period: 9 Nov 2015
Alfred Heller (Invited speaker)
Department of Civil Engineering
Related event

0: Nordic Smart & Clean Cities
05/11/2015 → 06/11/2015
Helsinki, Denmark
Activity: Talks and presentations › Conference presentations

Oslo and Akershus University College of Applied Sciences (External organisation)
Period: 6 Nov 2015
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
PhD assessment committee

Assessment of Eilif HJelseth's PhD thesis
Degree of recognition: International

Related external organisation

Oslo and Akershus University College of Applied Sciences
Pilestredet 35, P1838, Oslo, Norway
Activity: Membership › Membership in review committee

IBPSA-Nordic technical event BuildSim-Nordic 2015
Period: 2 Nov 2015 → 3 Nov 2015
Katarzyna Marta Luc (Speaker)
Department of Civil Engineering
Section for Building Energy

Related event

IBPSA-Nordic technical event BuildSim-Nordic 2015
02/11/2015 → 03/11/2015
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

Forskningsbibliotekernes Lederkollegiets Seminar
Period: 28 Oct 2015
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

Description
Seminar omkring spørgsmålet, om forskningsbiblioteker har en rolle at spille i forhold til forskningsdata, -systemer og -services.
Documents:
Forskningsbiblioteker - Forskeres behov for data services - Alfred Heller - Oct 2015

Related event
Kan indvendig isolering leve op til kravene om en robust løsning med styr på fugt og temperaturforholdene?

Period: 28 Oct 2015
Tommy Riviere Odgaard (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Invited by main sponsor to speak at VIP seminar
Documents:
Kan indvendig isolering leve op til kravene om en robust løsning med styr på fugt og temperaturforholdene?

Related event
Building Green '15
28/10/2015 → 29/10/2015
København, Denmark
Activity: Talks and presentations › Conference presentations

Kan Indvendig isolering leve op til kravene om en robust løsning med styr på fugt og temperaturforholdene

Period: 28 Oct 2015
Søren Peter Bjarløv (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Invited speaker at Building Green
Documents:
DTU præsentation på Building Green 2015

Related event
Building Green '15
28/10/2015 → 29/10/2015
København, Denmark
Activity: Talks and presentations › Conference presentations

EnergyLab Nordhavn: Sustainability through Certification
Period: 20 Oct 2015
Alfred Heller (Invited speaker)
Department of Civil Engineering
Section for Building Energy

Related event
SMART CITIES: Building the City 2.0
20/10/2015 → 21/10/2015
Stockholm, Sweden
Activity: Talks and presentations › Conference presentations

Smart Cities Live
Alfred Heller (Speaker)
Sustainability by certification - Experiences on the DGNB certification of the Nordhavn district in Copenhagen
Period: 20 Oct 2015
Alfred Heller (invited speaker)

Description
Invited talk at the conference: ECOLOGICAL STRATEGY OF MINING - INDUSTRY-FORMATION OF THE NEW WORLDVIEW IN NATURAL RESOURCES DEVELOPMENT, Kola Science Center, Apatity, Murmansk Region, Russia.

Suspended electrodialytic extraction of toxic elements for detoxification of three different mine tailings
Period: 15 Oct 2015
Pernille Erland Jensen (Lecturer)

Description
Invited talk at the conference: ECOLOGICAL STRATEGY OF MINING - INDUSTRY-FORMATION OF THE NEW WORLDVIEW IN NATURAL RESOURCES DEVELOPMENT, Kola Science Center, Apatity, Murmansk Region, Russia.
Activity: Attending an event › Participating in or organising a conference

**Dermal uptake of phthalates directly from air**
Period: 7 Oct 2015  
Gabriel Bekö (Invited speaker)  
Department of Civil Engineering  
Section for Indoor Climate and Building Physics

**Description**
Center for Endocrine Disruptors, Annual Information Day

**Unknown external organisation**
Activity: Talks and presentations › Conference presentations

**Taking the Temperature on the Arctic**
Period: 7 Oct 2015  
Kåre Hendriksen (Participant)  
Department of Civil Engineering

**Description**
Nordisk Ministerråd om økonomi og levevilkår i Arktis

Taking the Temperature on the Arctic

**Related event**
**Taking the Temperature on the Arctic**  
07/10/2015 → …  
Denmark  
Activity: Attending an event › Participating in or organising a conference

**100% Climate Neutrality**
Kyriaki Foteinaki (Participant)  
Department of Civil Engineering

**Description**
Poster presentation-Models for Flexible Operation of Buildings in the Smart Energy System in Nordhavn

**Related event**
**100% Climate Neutrality**  
06/10/2015 → 07/10/2015  
Sønderborg, Denmark  
Activity: Attending an event › Participating in or organising a conference

**Den digitale by**
Period: 6 Oct 2015  
Alfred Heller (Lecturer)  
Department of Civil Engineering  
Section for Building Energy

**Description**
Folkeuniversitet Århus, foredrag om den digitale by

**Related external organisation**
**Operations in Greenland: Challenged by the Sectorisation of Infrastructure**

*Period: 4 Oct 2015*

Kåre Hendriksen (Invited speaker)

Department of Civil Engineering

Documents:

150810 Abstract 2

**Related event**

**Indigenous Resources: Decolonization and Development**

*30/09/2015 → 04/10/2015*

Nuuk, Greenland

Activity: Talks and presentations › Conference presentations

**National requirements in Denmark, IFC, buildingSMART, Life cycle analysis**

*Period: 1 Oct 2015*

Jan Karlshej (Speaker)

Department of Civil Engineering

Section for Building Design

Links:


**Related event**

**BIM Regional Developments 2015, Vilnius**

*01/10/2015 → 01/10/2015*

Vilnius, Lithuania

Activity: Talks and presentations › Conference presentations

**Ph.d. interest Group: Urban environments around S-train stations. (External organisation)**

*Period: 1 Oct 2015 → 30 Sep 2018*

Sofie Kirt Strandbygaard (Member)

Department of Civil Engineering

Section for Building Design

**Description**

Interest Group of Hvidovre and Høje Tåstrup municipality, DSB and the Transport-, Building- and Housing Authority.

I organize the meeting and present the research material/findings in order to get feedback and comments from the municipalities and organisations involved in public transport

Body type: interest group. Public organisation

Degree of recognition: Regional

**Related external organisation**

**Ph.d. interest Group: Urban environments around S-train stations.**

Activity: Membership › Board duties in companies, associations, or public organisations

**PhD evaluation committee - Rimante Cox (External organisation)**

*Period: Sep 2015 → Nov 2015*

Alfred Heller (Chairman)

Department of Civil Engineering
Section for Building Energy

**Description**
Body type: Evaluation Committee

**Related external organisation**

**PhD evaluation committee - Rimante Cox**
Activity: Membership › Membership in review committee

**Nukissiorfiit Teknologidage**
Period: 22 Sep 2015 → 23 Sep 2015
Kåre Hendriksen (Participant)
Department of Civil Engineering

**Description**
Nukissiorfiit Teknologidage

**Related event**

**Nukissiorfiit Teknologidage**
22/09/2015 → 23/09/2015
Nuuk, Greenland
Activity: Attending an event › Participating in or organising a conference

**University of the Arctic Thematic Network on Arctic Sustainable Resources and Social Responsibility (External organisation)**
Period: 16 Sep 2015 → 31 Dec 2021
Kåre Hendriksen (Chairman)
Department of Civil Engineering
ARTEK, Section for Arctic Engineering and Sustainable Solutions

**Related external organisation**

**University of the Arctic Thematic Network on Arctic Sustainable Resources and Social Responsibility**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Hvordan arbejder vi med objekter?**
Period: 14 Sep 2015
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design

Links:

**Related event**

**BIM baglæns**
14/09/2015 → 14/12/2015
Nyborg, Denmark
Activity: Talks and presentations › Conference presentations

**EU-Israel Innovation (External organisation)**
Period: 10 Sep 2015
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Advisor for the EU-Israel Innovation Cooperation

Body type: Committee
Degree of recognition: International

**Related external organisation**

**EU-Israel Innovation**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**EU-Israel Innovation Seminar**
Period: 10 Sep 2015
Alfred Heller (Invited speaker)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Invited to provide recommendation and advices for innovation based on research in Smart Cities and Energy related issues.

**Related event**

**EU-Israel Innovation Seminar**
10/09/2015 → …
Tel Aviv, Israel
Activity: Talks and presentations › Conference presentations

**Nuuk som vækstmotor for Grønland**
Period: 8 Sep 2015 → 9 Sep 2015
Kåre Hendriksen (Participant)
Department of Civil Engineering

**Description**
Rambøll Roundtable

**Related event**

**Nuuk som vækstmotor for Grønland: Rambøll Roundtable**
08/09/2015 → 09/09/2015
Nuuk, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**WP3 CITIES Workshop on ‘Flexibility and Buildings’**
Period: 7 Sep 2015
Panagiota Gianniou (Organizer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

**Description**
WP3 CITIES Workshop on ‘Flexibility and Buildings’

**Related event**

**WP3 CITIES Workshop on ‘Flexibility and Buildings’**
07/09/2015 → 07/09/2015
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Nordic Climate KIC - CITIES workshop
Period: 1 Sep 2015
Alfred Heller (Organizer)
Centre for IT-Intelligent Energy Systems in Cities
Department of Civil Engineering
Section for Building Energy

Description
Organizer of workshop activities

Related event
Nordic Climate KIC - CITIES workshop
01/09/2015 → …
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

7PHN Sustainable Cities and Buildings
Period: 20 Aug 2015
Tessa Kvist Hansen (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Presentation in Building Physics: Moisture Safety session. Topic: Retrofitting with internal insulation: Actual research cases from Technical University of Denmark

7PHN Sustainable Cities and Buildings, participation and speaking at conference
Documents:
Preliminary measurements of temperature and relative humidity, DTU

Related event
7PHN Sustainable Cities and Buildings
20/08/2015 → 21/08/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

A new approach for heavy metals contaminated soil remediation - application of electrodialytic process
Period: 18 Jun 2015
Krzysztof Piotr Kowalski (Lecturer)
Department of Civil Engineering
Links:
http://iks.uz.zgora.pl/index_eng.html

Related event
Environmental Engineering and Design
18/06/2015 → 19/06/2015
Zielona Gora, Poland
Activity: Talks and presentations › Conference presentations

6th International Building Physics Conference (IBPC 2015)
Tommy Riviere Odgaard (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Presented conference article
Documents:
Building renovation with interior insulation on solid masonry walls in Denmark – A study of the building segment and possible solutions

Related event
6th International Building Physics Conference (IBPC 2015)
14/06/2015 → 17/06/2015
Torino, Italy
Activity: Talks and presentations › Conference presentations

TEMAMØDE FOR ANVENDELSE AF INVDENDIG EFTERISOLERING
Period: 11 Jun 2015
Søren Peter Bjørlov (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Anvendeligheden og Robustheden af Indvendig Isolering

TEMAMØDE FOR ANVENDELSE AF INVDENDIG EFTERISOLERING
Documents:
Presentation hos TI 11 juni 2015

Related event
TEMAMØDE FOR ANVENDELSE AF INVDENDIG EFTERISOLERING
11/06/2015 → 11/06/2015
HØJE TÅSTRUP, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

GTO - en sammenhængende infrastruktur som led i moderniseringen
Period: 10 Jun 2015
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering

Related event
GTO - en sammenhængende infrastruktur som led i moderniseringen

Nye perspektiver på Grønlands modernisering efter 1945
08/06/2015 → 11/06/2015
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

Fire Safety Day 2015
Period: 9 Jun 2015
Pierrick Anthony Mindykowski (Organizer)
Department of Civil Engineering
Section for Building Design

Description
The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The
conference language is English.
Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University.
At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management. Michael Havbro Faber, professor at DTU BYG will give the key lecture. Fire risk management will also be topic for one of the two workshops.

Related event

Fire Safety Day 2015
09/06/2015 → …
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Fire Safety Day 2015
Period: 9 Jun 2015
Rolff Ripke Leisted (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Experimental assessment of the suitability of monitors and tv-screens for placement in evacuation routes, Rolff Ripke Leisted, M.Sc, Rasmus Ellerbæk Hinge, Pierrick Anthony Mindykowski, Ph.D and Grunde Jomaas, Ph.D.

The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English. Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University. At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management.
Documents:
Leisted_Mindykowski_Hinge_Jomaas_Abstract_FSD_2015

Related event

Fire Safety Day 2015
09/06/2015 → …
Lyngby, Denmark
Activity: Other

Fire Safety Day 2015
Period: 9 Jun 2015
Pierrick Anthony Mindykowski (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Residual structural capacity of timber components after exposure to high temperatures. Morten Jørgensen, Pierrick Anthony Mindykowski, Staffan Svensson and Grunde Jomaas

The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English. Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University. At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management. Michael Havbro Faber, professor at DTU BYG will give the key lecture. Fire risk management will also be topic for one of the two workshops.

Related event
This is the announcement for the fifth Fire Safety Day on Tuesday June 9th 2015 at the Technical University of Denmark. The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English.

Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University.

At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management. Michael Havbro Faber, professor at DTU BYG will give the key lecture. Fire risk management will also be topic for one of the two workshops.

Related event

**Fire Safety Day 2015**
Period: 9 Jun 2015
Pierrick Anthony Mindykowski (Chairman)
Department of Civil Engineering
Section for Building Design

The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English.

Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University.

At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management. Michael Havbro Faber, professor at DTU BYG will give the key lecture. Fire risk management will also be topic for one of the two workshops.

Chairman for the session "Fire dYNAMICS"

Related event

**Fire Safety Day 2015**
Period: 9 Jun 2015
Pierrick Anthony Mindykowski (Chairman)
Department of Civil Engineering
Section for Building Design

The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English.

Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University.

At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management. Michael Havbro Faber, professor at DTU BYG will give the key lecture. Fire risk management will also be topic for one of the two workshops.

Chairman for the session "Fire dYNAMICS"
**Project evaluation committee for Technology Foundation STW**

*External organisation*

**Period:** 1 Jun 2015 → 1 Sep 2015

Lotte Bjerregaard Jensen (Participant)

Department of Civil Engineering

Section for Building Design

**Description**

Technology Foundation STW is a Dutch funding agency for academic research in the field of applied sciences. Scientific quality and substantial interest from third-parties, such as companies or non-profit organisations, to exploit the research results are both prerequisites. STW is financed by the Netherlands Organisation for Scientific Research (NWO) and the Dutch Ministry of Economic Affairs, Agriculture and Innovation. For the evaluation of research proposals we approach scientific as well as industrial experts in the field concerned.

**Related external organisation**

**Project evaluation committee for Technology Foundation STW**

Activity: Membership › Membership in review committee

**Aggregation of building energy demands – Sønderborg case**

*Period:* 26 May 2015

Panagiota Gianniou (Speaker)

Department of Civil Engineering

Section for Indoor Climate and Building Physics

**Related event**

**CITIES Second General Consortium Meeting**

26/05/2015 → 27/05/2015

Kgs. Lyngby, Denmark

Activity: Talks and presentations › Conference presentations

**How does the research centre CITIES contribute to Innovation**

*Period:* 22 May 2015

Alfred Heller (Invited speaker)

Department of Civil Engineering

Section for Building Physics and Services

Centre for IT-Intelligent Energy Systems in Cities

**Description**

Presentation at the annual meeting of the CLEAN innovation organisation.

Documents:


**Related external organisation**

**Unknown external organisation**

Activity: Talks and presentations › Conference presentations

**Buildings for Smart Energy Cities**

*Period:* 20 May 2015

Panagiota Gianniou (Speaker)

Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related event

**EuroTech PhD Workshop**
20/05/2015 → 21/05/2015
Eindhoven, Netherlands
Activity: Talks and presentations › Conference presentations

**Fib Symposium 2015**
Period: 20 May 2015
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design

**Description**
Presentation of the paper accepted in the conference proceedings with the title: "PERFORMANCE AND DAMAGES OF R.C. SLABS IN FIRE", authored by L. Giuliani (presenter) and Filippo Gentili

Participation and presentation of a contribution to the fib Symposium 2015, held in Copenhagen on 18-20 May 2015

Related event

**Fib Symposium 2015 : Concrete - Innovation and Design**
18/05/2015 → 20/05/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

**Det intelligente energisystem**
Period: 26 Mar 2015
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities
Documents:
Det intelligente energisystem - CITIES 26-04-2015

Related event

**Det intelligente energisystem**
26/03/2015 → …
Vejle, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

buildingSMART
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design

**Description**
Leader of the Building Room
Links:
http://iug.buildingsmart.org/resources/London

Related event

buildingSMART: International Standard Summit
23/03/2015 → 25/03/2015
London, United Kingdom
Activity: Attending an event › Participating in or organising a conference

**Nordisk Ministerråd**
Period: 11 Mar 2015
Kåre Hendriksen (Participant)
Department of Civil Engineering

**Description**
Grønlands bygder - økonomi og udviklingsdynamik

Nordisk Ministerråd - møde for samarbejdsministre
I Ilulissat
Min præsentation blev holdt af Birger Poppel

**Related event**

**Nordisk Ministerråd: Møde for samarbejdsministre**
12/03/2015 → …
Ilulissat, Ilulissat, Greenland
Activity: Attending an event › Participating in or organising a conference

**From Grid to Society: Some thoughts about Smart Cities**
Period: 10 Mar 2015
Alfred Heller (Lecturer)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Inspiration lecture for Arup University and Imperial Collage, UK.
Documents:
From Grid to Society - Arup University - 10-3-2015

**Related external organisation**

**Unknown external organisation**
Activity: Talks and presentations › Conference presentations

**PROJEKTKONFERENCE**
Period: 5 Mar 2015
Søren Peter Bjarløv (Invited speaker)
Department of Civil Engineering
Section for Building Design

**Description**
Anvendeligheden og Robustheden af Indvendig Isolering

**PROJEKTKONFERENCE**
Documents:
Presentation GI - Indvendig Isolering - 05032015

**Related event**

**PROJEKTKONFERENCE**
05/03/2015 → 05/03/2015
COPENHAGEN, Denmark
Activity: Talks and presentations › Conference presentations
**Energyforum Denmark**  
Period: 4 Mar 2015  
Alfred Heller (Invited speaker)  
Department of Civil Engineering  
Section for Building Physics and Services  
Centre for IT-Intelligent Energy Systems in Cities  
**Description**  
Bygninger – en aktiv del af fremtidens energiforsyning  
**Documents:**  
Presentation Alfred Heller DTU 04-03-2015

**Related event**

**Energyforum Denmark**  
03/03/2015 → 04/03/2015  
Nyborg, Denmark  
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

**Byg morgenmøde**  
Period: 2 Mar 2015  
Kåre Hendriksen (Speaker)  
Department of Civil Engineering  
**Description**  
Extreme Arctic engineering challenges  
**Related event**  
**Byg morgenmøde**  
02/03/2015 → …  
Lyngby, Denmark  
Activity: Other

**Smart City Think Tank (External organisation)**  
Period: 1 Mar 2015 → 31 Dec 2015  
Alfred Heller (Participant)  
Department of Civil Engineering  
Section for Building Physics and Services  
**Description**  
The Ministry for Cities, Buildings and Rural areas did point out a Smart City Think Tank that has to come up with a recommendation on subjects like smart cities, data in relation to smart technologies, privacy and such like.  
**Teknisk ekspert**  
**Body type:** Think Tank for Ministry  
**Documents:**  
Artikel JP smart city tænketank  
**Related external organisation**  
**Smart City Think Tank**  
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
De grønlandske bygder i ny belysning
Period: 26 Feb 2015
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering

Description
I aften får vi besøg af Kåre Hendriksen, lektor ved Center for Arktisk Teknologi og underviser i Sisimiut og ved DTU, som siden 1980’erne periodisk har været med til at udvikle de grønlandske erhvervsuddannelser, deltaget i miljø- og bæredygtighedsprojekter samt forsket i koblingen mellem bosted og erhvervsgrundlag i Grønland. I dette billede har der været en tendens til at opfatte i særdeleshed bygderne som en betydelig ekstraomkostning og dermed en barriere for udviklingen af det grønlandske samfund. Baseret på en systematisk analyse af bygderes samfundsøkonomiske betydning kan der nu præsenteres en væsentlig nuancering af problematikken. Foredraget krydres med en række smukke billeder fra de grønlandske bygder og mere personlige rejseberetninger.

Documents:
150120 Seniorklubben 2015

Related external organisation
Det Grønlandske Selskab
L E Bruuns Vej 10, 2920, Charlottenlund, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Phthalate intake of Danish children: Exposure pathways and potential health effects
Period: 13 Feb 2015
Gabriel Bekö (Invited speaker)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Description
Metalund seminar series, Lund University

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

EuroTech Winter School
Period: 5 Feb 2015 → 9 Feb 2015
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

Description
The winter school presents the participant in a wide range of energy technologies and issues. Working with the holistic topic of Smart Energy Cities brings up the question of "How do we design research in the holistic field of Smart Energy Cities?" The workshop will present some theoretical background and promote the students to define proposals in this agenda.

Related event
EuroTech Winter School: Smart Energy
02/02/2015 → 15/02/2015
Lausanne, Switzerland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Future Digital Cities - for and with citizens (External organisation)
Period: 1 Feb 2015 → 31 Dec 2031
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

**Description**
Ministerial think tank on cities, digital opportunities and services in the city perspective by the Ministry of Housing, Urban and Rural Affairs

Body type: Ministerial tænketank

**Related external organisation**

**Future Digital Cities - for and with citizens**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Energioptimering i Folkekirken**
Period: 27 Jan 2015
Tessa Kvist Hansen (Speaker)
Department of Civil Engineering

**Description**
Presentation on Thermal Insulation of Church vaults (incl. lime based insulation plaster)

**Related event**

**Energioptimering i Folkekirken: Temadag**
27/01/2015 → 27/01/2015
Odense, Denmark
Activity: Other

**The interdisciplinary aspect on resilience research: experience from Android project**
Period: 27 Jan 2015
Luisa Giuliani (Invited speaker)
Department of Civil Engineering
Section for Building Design

**Description**
Participation and presentation of an invited contribution in the ANDROID Baltic Symposium on Societal Resilience - Enhancing Societal Resilience to Disasters: research directions and implications for education, held at Riga Technical University on January 27, 2015

**Related event**

**Baltic Symposium on Societal Resilience: Enhancing Societal Resilience to Disasters: research directions and implications for education**
27/01/2015 → …
Riga, Latvia
Activity: Talks and presentations › Conference presentations

**Pels - liv og død**
Period: 21 Jan 2015
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
Debataten på Nationalmuseet

**Related event**

**Pels - liv og død: Paneldebatt om sælskind**

21/01/2015 → …

Copenhagen, Denmark

**Activity:** Talks and presentations › Conference presentations

**Qaasuitsup Kommunia- challenges of business development - and how to handle them**

**Period:** 12 Jan 2015

Kåre Hendriksen (Invited speaker)

Department of Civil Engineering

**Description**

Qaasuitsup Kommunia- challenges of business development - and how to handle them

**Related event**

**Arctic Must: North Greenland International Business Week**

12/01/2015 → 14/01/2015

Ilulissat, Greenland

**Activity:** Talks and presentations › Conference presentations

**Advisory group for Master of Civil Engineering study (External organisation)**

**Period:** 1 Jan 2015 → 31 Dec 2015

Jan Karlshøj (Participant)

Department of Civil Engineering

Section for Building Design

**Description**

Advisory group for Master of Civil Engineering study at the Technical University of Denmark

Body type: Advisory group

**Related external organisation**

**Advisory group for Master of Civil Engineering study**

**Activity:** Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**bips steering group (External organisation)**

**Period:** 1 Jan 2015 → 31 Dec 2015

Jan Karlshøj (Participant)

Department of Civil Engineering

Section for Building Design

**Description**

The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry

Body type: Steering group

**Related external organisation**

**bips steering group**

**Activity:** Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
**buildingSMART International Council (External organisation)**

*Period: 1 Jan 2015 → 31 Dec 2015*

Jan Karlshøj (Participant)

Department of Civil Engineering

Section for Building Design

**Description**

Member of buildingSMART Council

The International Council is the legal governing body of BuildingSMART International consisting of two representatives from each buildingSMART chapter. The Council meet once a year.

Body type: Not-for-profit

Degree of recognition: International

Links:

http://buildingsmart.org/about/community/international-council/ (Member of Council)

**Related external organisation**

buildingSMART International Council

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**buildingSMART Nordic Board (External organisation)**

*Period: 1 Jan 2015 → 31 Dec 2015*

Jan Karlshøj (Chairman)

Department of Civil Engineering

Section for Building Design

**Description**

buildingSMART Nordic is a member of buildingSMART International

buildingSMART Nordic consists of buildingSMART organisations in Denmark, Finland, and Sweden. Estonia, Lithuania, and Poland are observers.

Body type: Not-for-profit

Degree of recognition: International

Links:

http://buildingsmart.org/about/community/international-council/ (Member of Council)

**Related external organisation**

buildingSMART Nordic Board

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**CEN (External organisation)**

*Period: 1 Jan 2015 → 31 Dec 2015*

Jan Karlshøj (Participant)

Department of Civil Engineering

Section for Building Design

**Description**

CEN, the European Committee for Standardization, is an association that brings together the National Standardization Bodies of 33 European countries

Body type: TC 442

**Related external organisation**
**Danish Standard S-808 (External organisation)**

*Period:* 1 Jan 2015 → 31 Dec 2015  
*Jan Karlshøj (Participant)*  
*Department of Civil Engineering*  
*Section for Building Design*

**Description**
Structuring of information for the construction industry.

**Body type:** Mirror Committee

**Related external organisation**

**Danish Standard S-808**
*Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar*

**ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)**

*Period:* 1 Jan 2015 → 31 Dec 2015  
*Jan Karlshøj (Member)*  
*Department of Civil Engineering*  
*Section for Building Design*

**Description**
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)

**Body type:** Standardisation  
**Degree of recognition:** International

**Related external organisation**

**ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual**
*Activity: Membership › Membership of research networks or expert groups*

**3rd International Workshop on Design in Civil and Environmental Engineering**

*Period:* 2014  
*Kristoffer Negendahl (Speaker)*  
*Department of Civil Engineering*  
*Section for Building Energy*

**Related event**

**3rd International Workshop on Design in Civil and Environmental Engineering**  
21/08/2014 → 23/08/2014  
Kgs. Lyngby, Denmark  
*Activity: Talks and presentations › Conference presentations*

**BIM Europe**

*Period:* 2014  
*Erik Falck Jørgensen (Participant)*  
*Department of Civil Engineering*  
*Section for Building Design*
Related event

**BIM Europe**  
02/10/2014 → …  
Aarhus, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Building Research and Information (Journal)**  
Period: 2014 → …  
Arsen Krikor Melikov (Reviewer)  
Department of Civil Engineering  
Section for Indoor Environment

**Description**  
Building Research & Information

**Related journal**

**Building Research and Information**  
0961-3218  
Web of Science (2018): Indexed yes

**Central database**

Activity: Research › Peer review of manuscripts

**BVU*net**  
Period: 2014  
Erik Falck Jørgensen (Participant)  
Department of Civil Engineering  
Section for Building Design

**Related event**

**BVU*net**  
01/01/2014 → 31/12/2014  
Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Ceramic Art Installation at Birkerød Kræstegård**  
Period: 2014  
Anja Margrethe Bache (Participant)  
Department of Civil Engineering  
Section for Building Design

**Description**  
Ceramic Installation Ceramic Glazed Concrete: Visiting Ceramic

Ceramic Art Installation at Birkerød Præstegård

**Related event**

**Ceramic Art Installation at Birkerød Præstegård**  
01/01/2014 → 01/01/2014  
Birkerød, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**DanEDU Lokaliser: Technological tools for the AEC industry**  
Period: 2014  
Erik Falck Jørgensen (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Development and maintenance of tools for the AEC industry.
Head: Erik Falck Jørgensen
Links:
http://www.bim.byg.dtu.dk/DanEDU-Lokaliser (DanEDU Lokaliser)

**Related external organisation**
Various educational Institutions in Denmark
Denmark
Activity: Other

**Editorial Board Member - Indoor Air Journal (External organisation)**
Period: 2014 → …
Gabriel Bekö (Participant)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

**Related external organisation**
**Editorial Board Member - Indoor Air Journal**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Energi og Parametri**
Period: 2014
Kristoffer Negendahl (Organizer)
Department of Civil Engineering
Section for Building Energy

**Description**
This workshop was meant to increase building designers' (primarily architects) experience with energy simulations in the early design stage. During the workshop Termite was introduced and the participants had hands on with the plugin.

**Related event**
**Energi og Parametri**
07/05/2014 → …
Glostrup, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Environmental Research (Journal)**
Period: 2014 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

**Related journal**
**Environmental Research**
0013-9351
Central database
Activity: Research › Peer review of manuscripts
IACORDS (External organisation)
Period: 2014
Pernille Erland Jensen (Participant)
Department of Civil Engineering

Description
International Association for Cold Region Development Studies

Related external organisation
IACORDS
Activity: Membership › Membership of research networks or expert groups

Inno-SE Innovationsneværk - Evaluer af Innovationsprojekter (External organisation)
Period: 2014 → …
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Energy
Centre for IT-Intelligent Energy Systems in Cities

Description
Body type: Evaluering

Related external organisation
Inno-SE Innovationsneværk - Evaluer af Innovationsprojekter
Activity: Membership › Membership in review committee

International Conference on Education and research in Computer Aided Architectural Design in Europe
Period: 2014
Kristoffer Negendahl (Speaker)
Department of Civil Engineering
Section for Building Energy

Related event
International Conference on Education and research in Computer Aided Architectural Design in Europe
10/09/2014 → 12/09/2014
Newcastle, United Kingdom
Activity: Talks and presentations › Conference presentations

International Energy Systems Integration European Workshop 2014
Period: 2014
Kristoffer Negendahl (Speaker)
Department of Civil Engineering
Section for Building Energy

Related event
International Energy Systems Integration European Workshop 2014
27/05/2014 → 28/05/2014
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations
Journal of Building Performance Simulation (Journal)
Period: 2014
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Journal of Building Performance Simulation

Related journal

Journal of Building Performance Simulation
1940-1493
Central database
Activity: Research › Peer review of manuscripts

Member of the PhD Assessment Committee, Aalborg University (External organisation)
Period: 2014 → …
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Member of the PhD Assessment Committee, Aalborg University, Ellen Kathrine Hansen's PhD

Member of the PhD Assessment Committee, Aalborg University, Ellen Kathrine Hansen's PhD
Degree of recognition: International

Related external organisation

Member of the PhD Assessment Committee, Aalborg University
Activity: Membership › Membership in review committee

Member PhD assessment Committee Aalborg University (External organisation)
Period: 2014 → …
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Aalborg University, Ellen Kathrine Hansen’s PhD

Member of PhD Assessment committee Aalborg University, Ellen Kathrine Hansen's PhD
Degree of recognition: International

Related external organisation

Member PhD assessment Committee Aalborg University
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Ornamental Play 2: Specific Ceramic Glazed Concrete and wood
Period: 2014
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Ornamental Play 2: Specific Ceramic Glazed Concrete and wood


Artist-Material Scientist and Building Component designer, Posing Questions with the Art

A videofilm is made posing the same question; Video artistic fabulating about a Ceramic Installation Art Exhibition, posing questions to Ornament in Architecture. Video, Exhibition and Background Noise; Anja Margrethe Bache.


Links:
https://www.youtube.com/watch?v=kxYe6--y5xg&feature=youtu.be
http://kathrineschmeichel.dk/artikler/multimedia/udstillingen-ornamental-play-2-video/
http://www.anjabache.com/projects/ornamental-play-2014/ (Pictures from the exhibition)

Related event

Ornamental Play 2: Specific Ceramic Glazed Concrete and wood
01/01/2014 → …
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

P L o S One (Journal)
Period: 2014 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related journal

P L o S One
1932-6203
Indexed in DOAJ
Central database
Activity: Research › Peer review of manuscripts

Transformations
Period: 2014
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Transformations: Installation Ceramics that Question Renewal

At the exhibition TRANSFORMATIONS Grønbechs Gård, I examine what occurs when I juxtapose different areas of examination as a platform for my artistic work and display it as site-specific installation art.

The areas of examination that interest me are the town where the exhibition takes place, Hasle. It is its infrastructure, buildings, topology as well as the urban renewal that has taken place during the last four years, starting in 2009, where architects have attempted to connect the harbour with the town.

Furthermore, I am interested in the building technique of the buildings of the town of Hasle with its black, timbered structures and tiles in the form of boards, as well as Bornholm in general as the hub of Danish ceramic crafts and training of new ceramists.

How does urban renewal happen in a place such as this? How is a timbered house renewed when it requires an extra layer of insulation and upon that yet another façade, a mounted façade? How can ceramics be told of through the buildings, but also the urban space in general, and how can it be be incorporated as a narrative, which installation-wise affects and renews the whole area by referencing its previous history?
At the exhibition, I am not looking for the answers, but rather trying to get better at questioning.

Philosophy means reframing the same basic questions that have occupied thought since the antiquity. Not in the hopes of finding definitive answers, but rather in the hopes of questioning better than before. (Jørgensen, 2008, p. 193)

In terms of method, I take my starting point in architecture and its registration methodology, including in particular its sketching, use of overlayering techniques, and its drawing methods. I let the specific ceramic glazed concrete I have developed (Bache 2010, 2011, 2013, 2014) represent this new approach to ceramics. This is ceramics based in concrete and referencing concrete building, modular building design, and prefabrication, which are concepts that regularly are part of current urban renewal. (A book about this ceramic concrete and its artistic search is forthcoming from Polyteknisk Forlag, March, 2014)

This exhibition is part of a trilogy of exhibitions that begun with the ceramic sketch as ceramic spaces at Gallery Oxholm, “Ornamental Play” in December, 2013. The exhibition TRANSFORMATIONS at Gronbech’s Gård, April 2014, is the second one of these exhibitions and the third exhibition will take place at Officinet, Copenhagen, October, 2014. These are all exhibitions that examine ceramic as space.

The artist and material researcher: ANJA MARGRETHE BACHE Associate Professor, Technical University of Denmark, Dept. of Civil Engineering, Building Design Artist from The Royal Danish Academy of Fine Arts PhD in Architecture from Aarhus School of Architecture Master of Science Engineer from DTU a.m.bache@mail.dk www.anjabache.com

Documents:
Anja_Bache_Transformationer_Groenbechsgaard Links:
http://kathrinescmeichel.dk/artikler/multimedia/interview-med-anja-m-bache-video/
https://www.youtube.com/watch?v=32fsmTUu738
http://www.anjabache.com/ceramic-art-installation-gronbechsgad/ (Pictures from the Exhibition)

Related event
Transformations
01/10/2014 → 31/10/2014
Hasle, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

DTU Sustain Conference 2014
Period: 17 Dec 2014
Jakob Brinke Berg (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Links:
http://www.sustain.dtu.dk/

Related event
DTU Sustain Conference 2014
17/12/2014 → 17/12/2014
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

ISO TC59/SC13/WG2 Classification of the information on the construction industry (External organisation)
Period: 13 Dec 2014 → 31 Dec 2014
Jan Karlshej (Participant)
Department of Civil Engineering
Section for Building Design
Description
Building construction - Organization of information about construction works

Body type: Standardisation
Degree of recognition: International
Links:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?comid=49180

Related external organisation
ISO TC59/SC13/WG2 Classification of the information on the construction industry
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

EUDP/GI/Realdania workshop
Period: 12 Dec 2014
Tommy Riviere Odgaard (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Presentation for EUDP/GI/Realdania project participants

Related event

EUDP/GI/Realdania workshop
12/12/2014 → …
Kgs. Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Arctic Qaasuitsup Kommunia- challenges of business development - and how to handle them
Period: 10 Dec 2014 → 10 Feb 2015
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering

Description
Preparation, invited speaker and evaluation

Related event

Arctic Must: North Greenland International Business Week
12/01/2015 → 14/01/2015
Ilulissat, Greenland
Activity: Talks and presentations › Conference presentations

Journal of Computer and Concrete (Journal)
Period: Nov 2014
Luisa Giuliani (Reviewer)
Department of Civil Engineering
Section for Building Design

Related journal

Journal of Computer and Concrete
Local database
Activity: Research › Peer review of manuscripts

Big Data as a tool for controlling the cities energy: Data aspects and data management
Period: 27 Nov 2014
Alfred Heller (Invited speaker)
Description
Data are essential for smart cities research. How do we handle them? What kinds of data do we have, how do we manage them? ...

Documents:
Big data for Smart Energy Cities IDA Presentation 27-01-2014

Related event

Big Data som værktøj til at styre byens energi
27/11/2014 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

Documents:
Big data for Smart Energy Cities IDA Presentation 27-01-2014

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

buildingSMART Board Meeting and Specification Workshop
Period: 20 Nov 2014
Jan Karlshej (Participant)

Department of Civil Engineering

Section for Building Design

Links:
http://www.buildingsmartnordic.org/events/buildingsmart-board-meeting-and-specification-workshop

Related event

buildingSMART Board Meeting and Specification Workshop
19/11/2014 → 20/11/2014
Herlev, Denmark
Activity: Attending an event › Participating in or organising a conference

Idea catalogue by Vidensby Lyngby to Workshop Water DTU
Period: 29 Oct 2014
Alfred Heller (Invited speaker)

Department of Civil Engineering

Section for Building Physics and Services

Description
Presentation of the opportunities in the Lyngby Videnby cooperation, the Cities centre project and Water DTU - DTU internal workshop.

Documents:
Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

buildingSMART Technical and User Group meetings
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design
Links:
http://www.buildingsmart.org/event/toronto-techical-summit

Related event

buildingSMART Technical and User Group meetings
27/10/2014 → 29/10/2014
Toronto, Canada
Activity: Attending an event › Participating in or organising a conference

13th SCANVAC International Conference on Air Distribution in Rooms
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event

13th SCANVAC International Conference on Air Distribution in Rooms: New ventilation strategies based in active and passive technology in buildings and for comfort in airplanes
19/10/2014 → 22/10/2014
São Paulo, Brazil
Activity: Talks and presentations › Conference presentations

3rd International Conference on Salt Weathering of Buildings and Stone Sculptures
Inge Rörig-Dalgaard (Speaker)
Section for Construction Materials
Department of Civil Engineering
Documents:
Determination of the deliquescence point in salt mixtures and in in-situ multicomponent salts with DVS equipment

Related event

3rd International Conference on Salt Weathering of Buildings and Stone Sculptures
14/10/2014 → 16/10/2014
Brussels, Belgium
Activity: Talks and presentations › Conference presentations

International Conference on Solar Heating and Cooling for Buildings and Industry
Jakob Brinke Berg (Participant)
Department of Civil Engineering
Section for Building Physics and Services

Description
Præsentation af forskningsresultater i form af poster præsentation.
Related event

3rd International Conference on Solar Heating and Cooling for Buildings and Industry
13/10/2014 → 15/10/2014
Beijing, China
Activity: Attending an event › Participating in or organising a conference

International Conference on Solar Heating and Cooling for Buildings and Industry
Jianhua Fan (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Description
Participation of International Conference on Solar Heating and Cooling for Buildings and Industry, SHC, Beijing 2014

Related event

3rd International Conference on Solar Heating and Cooling for Buildings and Industry
13/10/2014 → 15/10/2014
Beijing, China
Activity: Talks and presentations › Conference presentations

International Conference on Solar Heating and Cooling for Buildings and Industry
Mark Dannemand (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Description
presented results on ongoing research
attending SHC 2014 conference

Related event

3rd International Conference on Solar Heating and Cooling for Buildings and Industry
13/10/2014 → 15/10/2014
Beijing, China
Activity: Talks and presentations › Conference presentations

Nordisk Forum for bygningskalk : Årsmøde 2014
Tessa Kvist Hansen (Participant)
Department of Civil Engineering

Description
Participant, poster, demonstration on ekskurion. Topic: Lime based insulation plaster.
Documents:
Poster Kalkforums årsmøde 2014 Lime plaster for insulation of vaults in Danish medieval churches

Related event

Nordisk Forum for bygningskalk : Årsmøde 2014
09/10/2014 → 11/10/2014
Helsingør, Denmark
Activity: Attending an event › Participating in or organising a conference
IEA Task 42 / Annex 29, 12th expert meeting  
Mark Dannemand (Speaker)  
Department of Civil Engineering  
Section for Building Physics and Services  

Description  
Presented status of research within the COMTES project and ideas for future research  
IEA Task 42 experts meeting on thermal energy storage  

Related event  
IEA SHC Task 42 / Annex 29, 12th Experts meeting: Experts meeting on thermal energy storage  
08/10/2014 → 10/10/2014  
Nagoya, Japan  
Activity: Talks and presentations › Conference presentations  

CAD erfa Øst  
Period: 7 Oct 2014  
Jan Karlshøj (Speaker)  
Department of Civil Engineering  
Section for Building Design  
Documents:  
Perspektiver fra udlandet  

Related event  
CAD erfa Øst  
07/10/2014 → …  
Hørsholm, Denmark  
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations  

CEN BT/WG215 London  
Period: 6 Oct 2014  
Jan Karlshøj (Participant)  
Department of Civil Engineering  
Section for Building Design  

Related event  
CEN BT/WG215: Building Information Modelling  
06/10/2014 → 07/10/2014  
London, United Kingdom  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.  

BIM Europe  
Period: 2 Oct 2014  
Jan Karlshøj (Participant)  
Department of Civil Engineering  
Section for Building Design  

Description  
Conference arranged by BIM Aarhus on international trends within BIM, Building Information Modelling.  
Links:  
http://bimaarhus.dk/bim-europe-konference
Related event

BIM Europe
02/10/2014 → …
Aarhus, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Glass Structures & Engineering (Journal)
Period: 1 Oct 2014
Jens Henrik Nielsen (Editor)
Department of Civil Engineering
Section for Structural Engineering

Description
Glass Structures & Engineering

A forum for developments in structural glass, offering a holistic approach to research, construction and engineering
Presents developments in structural glass research and their practical applications Covers a wide range of research on elements, assemblies, connections and material Benefits researchers in structural glass, as well as glass designers and manufacturers Free full-colour printing and possibility to publish your paper open access This journal provides an international forum for presentation and discussion of developments in structural glass research and their practical applications, offering a holistic approach to research, construction and engineering. Presenting review papers, technical notes, discussions, case studies and letters, the journal benefits researchers as well as designers and manufacturers of structural glass. The journal addresses all aspects of structural glass research including theoretical and experimental research on elements, assemblies, connections and material. Coverage includes Structural glass design philosophy & safety; Loads on glass structures; Stability of structural glass components; Glass in façades; Architectural geometries; IGUs, Automotive; Solar; Projects & case studies; Curved glass; Joints, fixings & adhesives; Strength & fracture mechanics; Laminated glass & composites; Post-fracture performance; Glass forensics and fractography; Post processing and more.

Editor-in-Chief, together with colleagues from TU Darmstadt, TU Delft, TU Gent and Cambridge University

Related journal

Glass Structures & Engineering
2363-5142
Central database
Activity: Research › Journal editor

Reviewer of grant application for Research Council of Norway (External organisation)
Jianhua Fan (Member)
Department of Civil Engineering
Section for Building Physics and Services

Description
Reviewer
Degree of recognition: International

Related external organisation

Reviewer of grant application for Research Council of Norway
Activity: Membership › Membership in review committee

BIM som produktionsværktøj
Period: 30 Sep 2014
Jan Karlshøj (Speaker)
Department of Civil Engineering
Indlæg om BIM i et internationalt perspektiv

**Related event**

**BIM som produktionsværktøj**
30/09/2014 → 30/09/2014
Gladsaxe, Denmark
Activity: Other

**buildingSMART products and methods**
Period: 29 Sep 2014
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

**Description**
Orientering om buildingSMARTs produkter, hvoraf de fleste er accepteret til ISO.

**Related external organisation**

**Aalborg University**
A.C. Meyers Vænge 15, 2450 Copenhagen SV, Aalborg, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

**10th European Conference on Product & Process Modelling**
Period: 17 Sep 2014 → 19 Sep 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Thomas Fænø Mondrup and Niels Treldal presented a paper written by Thomas Fænø Mondrup, Niels Treldal, Jan Karlshøj and Flemming Vestergaard

**Links:**
http://info.tuwien.ac.at/ecppm/

**Related event**

**Powerpoint - Introducing a new framework for using generic information delivery manuals**
Period: 17 Sep 2014 → 19 Sep 2014
Thomas Fænø Mondrup (Lecturer)
Department of Civil Engineering
Section for Building Design
Documents:
ECPPM 2014 NLST TFMO Presentation

**Related event**

**European Conference on Product and Process Modelling**
17/09/2014 → 19/09/2014
Wien, Austria
EuroSun 2014
Period: 16 Sep 2014 → 19 Sep 2014
Gerald Englmaier (Participant)
Department of Civil Engineering
Section for Building Energy

Related event
EuroSun 2014: International conference on solar energy and buildings
16/09/2014 → 19/09/2014
Aix-les-Bains, France
Activity: Attending an event › Participating in or organising a conference

buildingSMART FM Seminar
Period: 11 Sep 2014
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design

Description
OpenBIM FM solutions and projects in Denmark

openBIM Facility Management/Operation Seminar
Links:

Related event
buildingSMART FM Seminar: openBIM Facility Management/Operation Seminar
Oslo, Norway
Activity: Talks and presentations › Conference presentations

Vurdering af Qaanaaq distriktks udviklingsdynamik og potentialer - feltstudie
Period: 8 Sep 2014 → 29 Sep 2014
Kåre Hendriksen (Other)
Department of Civil Engineering

Description
Coordinated by Kåre Hendriksen

Related external organisation
Qaasuitsup Kommunia
Ilulissat, Greenland
Activity: Other

4th International Conference on Building Resilience
Period: 7 Sep 2014 → 11 Sep 2014
Luisa Giuliani (Participant)
Department of Civil Engineering
Section for Building Design
Description
Participation in the conference and presentation of a contribution

Related event

4th International Conference on Building Resilience
Salford Quays, United Kingdom
Activity: Attending an event › Participating in or organising a conference

3rd International Workshop on Design in Civil and Environmental Engineering
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services

Description
Presentation at conference

Related event

3rd International Workshop on Design in Civil and Environmental Engineering
Period: 21/08/2014 → 23/08/2014
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

3rd International Workshop on Design in Civil and Environmental Engineering
Period: 22 Aug 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design
Links:
http://www.conferencemanager.dk/DCEE3

Related event

3rd International Workshop on Design in Civil and Environmental Engineering
Period: 21/08/2014 → 23/08/2014
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Effect of individual and collective heat cost allocation on indoor environment in Danish apartments
Period: 4 Aug 2014
Rune Korsholm Andersen (Invited speaker)
Department of Civil Engineering
Section for Indoor Environment
Documents:
Abstract for OB-14 - Effect of heat cost allocation on indoor environment

Related event

Symposium on Occupant Behaviour
Period: 04/08/2014 → 06/08/2014
Nottingham, United Kingdom
Activity: Talks and presentations › Conference presentations

Smart City Network Denmark (External organisation)
Period: 1 Aug 2014 → …
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

Description
Network in the field of Smart Cities in Denmark under the Ministry for housing, cities and rural areas.

Body type: Network

Related external organisation

Smart City Network Denmark
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Journal of Structural Engineering (Journal)
Period: Jul 2014
Luisa Giuliani (Reviewer)
Department of Civil Engineering
Section for Building Design

Related journal

Journal of Structural Engineering
0733-9445
Central database
Activity: Research › Peer review of manuscripts

Fire Safety in Space—Beyond Flammability Testing of Small Samples
Period: 28 Jul 2014
Grunde Jomaas (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Plenary Lecture at Conference
Documents:
Jomaas_StPetersburg_July_28_2014
космич_конф_2014
Links:
http://sfs-2014.ru/structure/

Related event

International Symposium on Space Flight Safety
28/07/2014 → 31/07/2014
St. Petersburg, Russian Federation
Activity: Talks and presentations › Conference presentations

13th International Conference on Indoor Air Quality and Climate
Period: 7 Jul 2014 → 12 Jul 2014
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment
Related event

13th International Conference on Indoor Air Quality and Climate
07/07/2014 → 12/07/2014
Hong Kong, Hong Kong
Activity: Talks and presentations › Conference presentations

ASHRAE Annual Conference
Period: 1 Jul 2014
Angela Simone (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Description
2. Experimental Study including Subjective Evaluations of Mixing and Displacement Ventilation combined with Radiant Floor Heating/ Cooling System

SEMINAR 26 (INTERMEDIATE) Indoor Air Quality and Comfort: Ventilation and Air-Conditioning This session offers a select group of recently published papers from the ASHRAE HVAC&R Research Journal regarding new developments in ventilation and air-conditioning technology to include research of displacement ventilation with a radiant floor heating/cooling system and human response to convective and radiant cooling.

Related event

ASHRAE Annual Conference
28/06/2014 → 02/07/2014
Seattle, United States
Activity: Talks and presentations › Conference presentations

ASHRAE Standard Committee (External organisation)
Period: 1 Jul 2014 → 30 Jun 2018
Arsen Krikor Melikov (Participant)
Department of Civil Engineering
Section for Indoor Environment

Description
This Committee improves the standards developed and published by the American Society of Heating, Refrigerating and Air Conditioning Engineers

Related external organisation

ASHRAE Standard Committee
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

SDC Solar Energy Week
Period: 1 Jul 2014 → 5 Jul 2014
Jianhua Fan (Organizer)
Department of Civil Engineering
Section for Building Physics and Services

Description
I organized a Sino-Danish Solar Energy Workshop at University Chinese Academy Sciences in Beijing July 01-05 2014. The workshop was financed by the Sino-Danish Center for Research and Education in Denmark (www.sinodanishcenter.com). Researchers and experts from Technical University of Denmark, Aalborg Universiy, Roskilde University and from Chinese universities and research institutes were invited to present their research in the workshop.

Documents:
SDC Solar Workshop 2014 Summary
Links:
http://www.sinodanishcenter.com/ (Homepage of the SDC Center in Denmark)
Related event

SDC Solar Energy Week
01/07/2014 → 05/07/2014
Beijing, China
Activity: Attending an event › Participating in or organising a conference

IX International Conference on Structural Dynamics (EURODYN 2014)
Period: 30 Jun 2014 → 2 Jul 2014
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design
Description
Participation in international conference and presentation of a paper
Links:
http://paginas.fe.up.pt/~eurodyn2014/ (Conference website)

Related event

IX International Conference on Structural Dynamics (EURODYN 2014)
30/06/2014 → 02/07/2014
Porto, Portugal
Activity: Talks and presentations › Conference presentations

ASHRAE Annual Conference
Period: 29 Jun 2014
Angela Simone (Speaker)
Department of Civil Engineering
Section for Indoor Environment
Description
2. Evaluation of Different Concepts for Ventilative Night Cooling by Building Simulations (Angela Simone, Ph.D., Member)

SEMINAR 4 (ADVANCED)
Cooling Potential with Increased Night Ventilation in Low Energy Buildings

In post-occupancy studies of low energy buildings, elevated temperature levels is a commonly reported problem. Ventilative cooling can be an attractive and energy efficient solution to reduce peak load and energy use in new and existing residential buildings. Equipment required for ventilative cooling in residential buildings is available and has been shown to be cost-effective in many climates. The seminar presents the concept of ventilative cooling together with studies of the potential impact on energy consumption and indoor environment in different climatic regions.

Related event

ASHRAE Annual Conference
28/06/2014 → 02/07/2014
Seattle, United States
Activity: Talks and presentations › Conference presentations

IX International Conference on Structural Dynamics (EURODYN 2014)
Period: 29 Jun 2014 → 2 Jul 2014
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design
Description
Presentation of the paper: "Soil structure interaction in offshore wind turbine collisions"

Participation to conference and presentation of one contribution.

Related event
IX International Conference on Structural Dynamics (EURODYN 2014)
30/06/2014 → 02/07/2014
Porto, Portugal
Activity: Talks and presentations › Conference presentations

IDA møde om NSB2014
Period: 26 Jun 2014
Tommy Riviere Odgaard (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Presentation at IDA event, based on NSB 2014
Documents:
2. Tommy Odgaard hovedindtryk

Related event
IDA møde om NSB2014
26/06/2014 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Tekniske følgegruppe i BR inddragelsesproces (External organisation)
Søren Peter Bjarløv (Participant)
Department of Civil Engineering
Section for Building Design

Description
Kære Michael

Med lanceringen af strategi for energirenovation glæder vi os over, at vi skal i gang med at implementere strategiens mange initiativer.

Vi igangsætter nu implementeringsarbejdet for strategiens initiativer omkring bygningsreglementet, herunder justering af lavenergiklasserne og udviklingen af energiklasser for eksisterende bygninger.

Vi vil derfor gerne invitere jer til at deltage i en teknisk følgegruppe, hvor I får lejlighed til at give input til arbejdet, og hvor I kan følge processen om ændring af bygningsreglementet tæt.

Vi vil gerne invitere til det første møde den 25. juni d.å., kl. 10-12 i Energistyrelsen, Amaliegade 44. Vi har planer om at den tekniske følgegruppe mødes fire gange fra juni til oktober 2014.

Vi skal bede om, at modtage oplysninger om, hvorvidt I ønsker at deltage i følgegruppen, og hvem der vil deltage. Det er tale om en teknisk følgegruppe, og det er derfor ønskeligt, at deltagerne i følgegruppen har byggetekniske kvalifikationer.

På det første møde i den tekniske følgegrupperne vil vi orientere om processen for arbejdet, herunder omkring sideelementer, branchebestemte kategorier og deltagelse af relevante medlemmer af følgegruppen. Endvidere vil vi på mødet fremføre oplæg til de temaer, som følgegruppen foreslås at behandle.

I bedes sende tilmelding med navn til Niels Bruus Varming, nbv@ens.dk senest den 20. juni.

I vil inden mødet modtage dagsorden og deltagerliste.

Vi håber, at I vil deltage i arbejdet, og at vi sammen får en god proces og goderesultater.
Med venlig hilsen
Mette

Janne Gress Sørensen (Lecturer)
Department of Civil Engineering
Section for Building Design

Can blind and visually impaired people evacuate safely in case of fire

Related event

**Inclusive project - For accessibility and safety**
16/06/2014 → 16/06/2014
Venice, Italy
Activity: Talks and presentations  Conference presentations

**10th Nordic Symposium on Building Physics**
Period: 15 Jun 2014 → 19 Jun 2014
Tommy Riviere Odgaard (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Participation in the 10th Nordic Symposium on Building Physics.
Did not present anything.

Related event

**10th Nordic Symposium on Building Physics**
15/06/2014 → 19/06/2014
Lund, Sweden
Activity: Attending an event  Participating in or organising a conference

**Powerpoint - Building performance simulation software for planning of energy efficiency retrofits**
Period: 15 Jun 2014 → 19 Jun 2014
Thomas Fænø Mondrup (Lecturer)
Department of Civil Engineering
Section for Building Design
Documents:
RetrofittingOfBuildingsII_ThomasFænøMondrup_Wednesday20June

Related event

**10th Nordic Symposium on Building Physics**
15/06/2014 → 19/06/2014
Lund, Sweden
Activity: Talks and presentations  Conference presentations

**Dansk Keramisk selskab temamøde: Fra Affald til ressource**
Period: 12 Jun 2014
Louise Josefine Belmonte (Lecturer)
Department of Civil Engineering
Section for Geotechnics and Geology

**Description**
Incorporating waste materials in the production of Greenlandic bricks
Links:
http://danskkeramiskelskab.teknologisk.dk/media/10246/Abstracts%20juni%202014.pdf

Related external organisation

**Unknown external organisation**
Activity: Talks and presentations  Conference presentations
Fire Safety Day 2014
Period: 12 Jun 2014
Luisa Giuliani (Participant)
Department of Civil Engineering
Section for Building Design

Description
Conference participation
Links:
http://www.conferencemanager.dk/FSD14/fire-safety-day-2014.html (Conference website)

Related event
Fire Safety Day 2014
12/06/2014 → …
Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Seminar om isoleringsløsninger i eksisterende byggeri
Period: 28 May 2014
Tommy Riviere Odgaard (Participant)
Department of Civil Engineering
Section for Building Design

Related event
Seminar om isoleringsløsninger i eksisterende byggeri
28/05/2014 → 28/05/2014
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

CITIES Annual Conference
Period: 26 May 2014 → 28 May 2014
Alfred Heller (Organizer)
Department of Civil Engineering
Centre for IT-Intelligent Energy Systems in Cities

Description
Organisation of CITIES Annual Conference 2014.

Related event
CITIES Annual Conference
26/05/2014 → 28/05/2014
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Grønlands bygder – økonomi og udviklingsdynamik
Period: 23 May 2014 → 25 May 2014
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
Documents:
Program dk vers 20052014

Related event
Udviklingskonference for de mindre bosteder: Grønlands Selvstyre Bygdekonference
23/05/2014 → 25/05/2014
Ilulissat, Greenland
Activity: Talks and presentations › Conference presentations

International Congress of Arctic Social Sciences VIII 2014
Period: 22 May 2014 → 26 May 2014
Kåre Hendriksen (Organizer)
Department of Civil Engineering

Description
Session: Sustainable Development of Arctic Communities
Documents:
140417 Program vor session

Related event
International Congress of Arctic Social Sciences VIII 2014
22/05/2014 → 26/05/2014
Prince Georg, Britisk Columbia, Canada
Activity: Attending an event › Participating in or organising a conference

buildingSMART Council Meeting Beijing
Period: 19 May 2014
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Participation in buildingSMART Council meeting
Links:

Related event
buildingSMART Council Meeting Beijing
19/05/2014 → 21/05/2014
Beijing, China
Activity: Talks and presentations › Conference presentations

Comprehensive Sustainable Development in Arctic Societies
Period: 12 May 2014 → 15 May 2014
Kåre Hendriksen (Organizer)
Department of Civil Engineering
Documents:
Programme_SummerSchool_Sisimiut 12-15May2014_v4

Related event
Comprehensive Sustainable Development in Arctic Societies: Summer school within the social and human sciences
12/05/2014 → 15/05/2014
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising a conference

"Comprehensive Sustainable Development in Arctic Societies:" "Summer school within the social and human sciences"
Period: 12 May 2014 → 15 May 2014
Kåre Hendriksen (Lecturer)
Department of Civil Engineering
Documents:
Programme_SummerSchool_Sisimiut 12-15May2014_v4
Related event

**Comprehensive Sustainable Development in Arctic Societies: Summer school within the social and human sciences**
12/05/2014 → 15/05/2014
Sisimiut, Greenland
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**Urbanisation and infrastructure in the Arctic – Challenges to sustainability**
Period: 7 May 2014 → 9 May 2014
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities
Documents:
Paper_MRKO_Submission

Related event

**Urbanisation and infrastructure in the Arctic – Challenges to sustainability**
07/04/2014 → 09/04/2014
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising a conference

**4th International Conference on Building Resilience (Journal)**
Period: Apr 2014
Luisa Giuliani (Reviewer)
Department of Civil Engineering
Section for Building Design

Related journal

**4th International Conference on Building Resilience**
Local database
Activity: Research › Peer review of manuscripts

**Fire Safety Journal (Journal)**
Period: Apr 2014
Luisa Giuliani (Reviewer)
Department of Civil Engineering
Section for Building Design

Related journal

**Fire Safety Journal**
0379-7112
Central database
Activity: Research › Peer review of manuscripts

**IEA Task 42 / Annex 29, 11th expert meeting**
Period: 28 Apr 2014 → 30 Apr 2014
Mark Dannemand (Speaker)
Department of Civil Engineering
Section for Building Physics and Services
Introduction of flexible monitoring equipment into the Greenlandic building sector

Period: 8 Apr 2014

Alfred Heller (Lecturer)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

Description
Greenlandic winters are long and cold so living inside a heated and properly ventilated space requires quite some energy. It is assumed that in mechanically ventilated buildings, significant amounts of energy for heating can be conserved by adjusting ventilation flow rates according to the actual demand of occupants. Traditional solutions available on a market consist of a controller and the sensors in a living space detecting occupancy and activity (movement sensors, CO2 sensors, Humidity sensors, etc.). The controller needs to be programmed and maintained by an expert and the sensors need to be hardwired to the controller. In Greenland where price of labor is very high and availability of experts is limited, installation of such control system becomes expensive. Particularly in case of renovation of existing buildings the costs of hardwiring the sensors can be very high. One possible solution to the above is to use wireless sensor network (WSN) technologies. A prototype wireless monitoring and control system is demonstrated on a renovation of a ventilation system in the new dormitory Apsisseq in Sisimiut, Greenland. The existing mechanical ventilation was running at a constant air flow even during unoccupied hours which resulted in a very high heat demand. It was estimated that installing the WSN system will bring annual savings of 1,600 € at the investment of 8,000 €. This paper describes a setup of the system and discusses its advantages and drawbacks.

Documents:
Grønland Presentation WSN 08-04-2014_mrko
Section for Building Design

Campus Service

Description
Markus Lampe/DTU Campus Service and Niels Treidel/DTU Byg/Rambøll participated also in the planning.

Innovation platform

Related event

21th meeting Innovation platform
07/04/2014 → 08/04/2014
Kongens Lyngby, Ørestad, Denmark
Activity: Attending an event › Participating in or organising a conference

Nordic Built 2.0 Workshop
Period: 2 Apr 2014
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design

Related event

Nordic Built 2.0 Workshop
02/04/2014 → …
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

CEN/BT/WG215
Period: 1 Apr 2014 → 2 Apr 2014
Jan Karlshej (Participant)
Department of Civil Engineering
Section for Building Design

Description
CEN/BT/WG 215 meeting

Related event

CEN/BT/WG215: Building Information Modelling
01/04/2014 → 02/04/2014
Oslo, Norway
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

European Workshop 2014 International Institute for Energy System Integration
Alfred Heller (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Centre for IT-Intelligent Energy Systems in Cities

Related event

European Workshop 2014 International Institute for Energy System Integration
27/05/2014 → 28/05/2014
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference
Nordic Built Debatmøde
Period: 26 Mar 2014
Peter Andreas Sattrup (Invited speaker)
Department of Civil Engineering
Section for Building Design
Documents:
140326_NBC-ENS_04-min

Related event
Nordic Built Debatmøde
26/03/2014 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

buildingSMART Summit
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design
Links:
http://iug.buildingsmart.org/resources/itm-and-iug-meetings-2014-stockholm (Presentation from buildingSMART Summit)

Related event
buildingSMART Summit: Technical and User Group meeting
17/03/2014 → 19/03/2014
Sweden
Activity: Attending an event › Participating in or organising a conference

Grønlands bygder - økonomi og udviklingsdynamik
Period: 13 Mar 2014
Kåre Hendriksen (Lecturer)
Department of Civil Engineering
Description
Det Grønlandske Selskab
Documents:
Grønlands bygder – økonomi og udviklingsdynamik | Det Grønlandske Selskab

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

IT i FM
Period: 12 Mar 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design
Department of Management Engineering
Description
Workshop about IT in FM
Related event

IT i FM
12/03/2014 → …
Kongens Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

CEN (External organisation)
Period: 1 Mar 2014 → 31 Dec 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
CEN, the European Committee for Standardization, is an association that brings together the National Standardization Bodies of 33 European countries
Proposal for implementing BIM-standardization in CEN
Body type: TC 442
Degree of recognition: International

Related external organisation

CEN
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Masseeksperimentet 2014
Period: 1 Mar 2014 → 1 Nov 2014
Birgitte Andersen (Organizer)
Department of Systems Biology
Fungal Physiology and Biotechnology
Department of Civil Engineering
Section for Indoor Environment
Links:
http://masseeksperimentet.danishsciencefactory.dk/

Related event

Masseeksperimentet 2014
15/09/2014 → 03/10/2014
Denmark
Activity: Attending an event › Participating in or organising a conference

10th International Symposium on Hazard, Prevention and Mitigation of Industrial Explosions (ISI conference) (Journal)
Period: Feb 2014
Luisa Giuliani (Reviewer)
Department of Civil Engineering
Section for Building Design

Description
Review of two papers

Related journal

10th International Symposium on Hazard, Prevention and Mitigation of Industrial Explosions (ISI conference)
Local database
Activity: Research › Peer review of manuscripts
Scientific Committee member for the international conference "Challenging Glass" (External organisation)
Period: 6 Feb 2014
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International
Links:
http://www.challengingglass.com

Related external organisation

Scientific Committee member for the international conference "Challenging Glass"
Activity: Membership › Membership in review committee

ESR workshop 2014
Period: 3 Feb 2014
Jens Henrik Nielsen (Lecturer)
Department of Civil Engineering
Section for Structural Engineering

Description
Course lecturer
Links:
http://www.glassnetwork.org/workshops/esr-workshop-2014

Related event

ESR workshop 2014
03/02/2014 → 05/02/2014
Lausanne, Switzerland
Activity: Talks and presentations › Conference presentations

Censor ved "Ledelse og informatik i byggeriet"
Period: 15 Jan 2014
Jan Karlshøj (External examiner)
Department of Civil Engineering
Section for Building Design
Activity: Examinations and supervision › External examination

3rd International Workshop on Design in Civil and Environmental Engineering
Period: 1 Jan 2014 → 1 Nov 2014
Lotte Bjerregaard Jensen (Organizer)
Department of Civil Engineering
Section for Building Design

Related event

3rd International Workshop on Design in Civil and Environmental Engineering
21/08/2014 → 23/08/2014
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Advisory group for Master of Civil Engineering study (External organisation)
Period: 1 Jan 2014 → 31 Dec 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Advisory group for Master of Civil Engineering at the Technical University of Denmark

Body type: Advisory group

**Related external organisation**

Advisory group for Master of Civil Engineering study
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ARTEK Event 2014**
Period: 1 Jan 2014 → 1 May 2014
Lotte Bjerregaard Jensen (Organizer)
Section for Building Design
Department of Civil Engineering

**Related event**

ARTEK Event 2014: Urbanisation and infrastructure in the Arctic
07/04/2014 → 09/04/2014
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**bips Steering committee (External organisation)**
Period: 1 Jan 2014 → 31 Dec 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry

The steering committee is responsible for initiation and coordination of projects.

Body type: Steering committee

**Related external organisation**

bips Steering committee
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Danish Standard S-808 (External organisation)**
Period: 1 Jan 2014 → 31 Dec 2014
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

**Description**
Structuring of information for the construction industry.

Udvalget arbejder med standarder inden for strukturering af informationer og modeller for bygge- og anlægsarbejde.
Related external organisation

Danish Standard S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 1 Jan 2014 → 31 Dec 2015
Jan Karlshøj (Member)

Department of Civil Engineering
Section for Building Design

Description
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)

Coordination of ISO 29481 Part 1

Body type: Standardisation
Degree of recognition: International

Related external organisation

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Ledelses- og samarbejdsudvalg (External organisation)
Period: 1 Jan 2014 → 31 Dec 2014
Jan Karlshøj (Participant)

Department of Civil Engineering
Section for Building Design

Description
Ledelses- og samarbejdsudvalg på DTU Byg

Body type: Udvalg

Related external organisation

Ledelses- og samarbejdsudvalg
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Ceramic on Tour: Between the Constructed and Reality
Period: 2013
Anja Margrethe Bache (Participant)

Department of Civil Engineering
Section for Building Design

Description
Ceramic on Tour: Between the Constructed and Reality

The exhibition CERAMIC ON TOUR is a collision of the past and the present, pockets of time, as constructed reality asking into a being and a discursive approach to dialogue. Installation ceramic
Red casting clay
Ceramic glazed concrete
Wood and steel.
Artist-Material Scientist and Building Component designer, Posing Questions with the Art

Documents:
Anja_Bache_Ceramic_on_tour_Catalogue_low_Mba
Links:
http://www.anjabache.com/ceramic-on-tour-2013/ (Pictures from the exhibition)

Related event

Ceramic on Tour: Between the Constructed and Reality
13/01/2013 → 03/02/2013
Malmö, Sweden
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Concrete ceramic: Facades
Period: 2013
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
ARTICLES WRITTEN ABOUT MY WORK OTHER AUTHORS
Lorentzen, Helle, 2013, Betonkeramik facader, Design Magasinet Inform 01/2013
Interview person.

Related external organisation

Magazine Inform
Copenhagen, Denmark
Activity: Other

Craft Biennale
Period: 2013
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Craft Biennale: Censored Exhibition
Craft Biennalen 2014, Copenhagen
Participated with ceramic art, a textile fabulation on the curtain wall facade system, made in ceramic glazed concrete, 160-50-1-2 cm, aiming at making large scale, kissable facades in the future with fantastic aesthetic potentials, transforming concrete to ceramic.

Related event

Craft Biennale
01/01/2013 → …
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Danish Concrete and Construction Institute, Educational committee (External organisation)
Period: 2013 → …
Per Goltermann (Participant)
Department of Civil Engineering
Section for Structural Engineering

Related external organisation
Danish Concrete and Construction Institute, Educational committee
Activity: Membership › Board duties in companies, associations, or public organisations

Environmental Science & Technology (Washington) (Journal)
Period: 2013 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics
Related journal
Environmental Science & Technology (Washington)
0013-936X
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Environmental Simulation and Software (Journal)
Period: 2013 → …
Peter Andreas Sattrup (Reviewer)
Department of Civil Engineering
Section for Building Design
Related journal
Environmental Simulation and Software
Local database
Activity: Research › Peer review of manuscripts

Member of the PhD Assessment Committee, DTU Representative. (External organisation)
Period: 2013 → …
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design
Description
Member of the PhD Assessment Committee, DTU Representative, Niels Andreas Castberg's PhD
Member of the PhD Assessment Committee, DTU Representative, Niels Andreas Castberg's PhD
Related external organisation
Member of the PhD Assessment Committee, DTU Representative.
Activity: Membership › Membership in review committee

Ornamental Play 1: The Meeting as Ceramic Sketch, Ceramic Spaces
Period: 2013
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design
Description
Ornamental Play 1: The Meeting as Ceramic Sketch, Ceramic Spaces
ORNAMENTAL PLAY
The meeting as ceramic sketch, ceramic spaces
In the years 2009-2013, I developed specific ceramic glazed concrete in a project sponsored by The Realdania
Foundation and in my role as associate professor at DTU BYG, the section of Architectural Engineering. I did this by synthesizing material and process technology as well as art, design, and architecture and also by combining technical research and artistic research with practice.

In this project as well as in my interdisciplinary work in general, I develop art that interrogates the world that surrounds it, hereby acquiring factual and explicit knowledge, including the tacit knowledge we acquire by acting, and experiencing through both our senses and emotions.

The exhibition at Gallery Oxholm consists of a meeting between my works of specific ceramic glazed concrete that arise from architecture and approaches installation art, as well as the craft works of ceramic artist Ane-Katrine von Bülow. Here, I display ceramics based on concrete created at the Danish Art Workshops during 2013 as well as pegs painted grey that form a ceramic sketch, which overtly and curiously, but also being integrated into the ornamental structures, interrogates the ceramic spaces when encountering Gallery Oxholm and Ane-Katrine von Bülow triangular and decorated pots.

Artist-Material Scientist and Building Component designer, Posing Questions with the Art
Documents:
Katalogue ornamental play
Links:
http://www.anjabache.com/projects/ornamental-play/

Related event

Ornamental Play 1: The Meeting as Ceramic Sketch, Ceramic Spaces
01/01/2013 → …
Frederiksberg, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Risk Analysis (Journal)
Period: 2013
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Risk analyses journal

Related journal
Risk Analysis
0272-4332
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 2.21 SJR 0.955 SNIP 1.458, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Science of the Total Environment (Journal)
Period: 2013
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Science of the Total Environment

Related journal
Science of the Total Environment
0048-9697
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts
Signs and the Signed: Between Representation and Presentation

Period: 2013

Anja Margrethe Bache (Participant)

Department of Civil Engineering

Section for Building Design

Description

As individuals, we each construct our own separate reality, and inscribe them in layers of referential systems. We move in a virtual and actual reality simultaneously, and decode related signs and acts to understand and communicate them. At Marsden Woo Gallery in London I wish to thematize this with installation art that consists of ceramic glazed concrete, conventional concrete, wood, and drawings.

I wish to unfold installation art based on the architectural use of the sign and the signed, working with the inside and the outside, with shape and content. As the architect who assembles her building from pre-made elements, I will utilize repetition with the possibility of variation, combinatorics, juxtaposition, and orientation to achieve spatial, material cohesion, but also disorder. With this I want to question space and the relationship between representation and presentation. Is the installation its own space, reality, or does it refer to that which exists in or outside the gallery, to something that will be completed in the future, a reference to a virtual world or something completely different?

Artist-Material Scientist and Building Component designer, Posing Questions with the Art Documents:
Katalog Marsden Woo Udstilling London lav opløsning til mailudsendelse
Links:
http://www.anjabache.com/signs-and-the-signed-2/ (Pictures from the exhibition)
Related event

Signs and the Signed: Between Representation and Presentation
08/05/2013 → 15/06/2013
London, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Statens Byggeforskningsinstitut (Publisher)
Period: 2013
Jan Karlshøj (Reviewer)
Department of Civil Engineering
Section for Building Design

Description
Digitale leverancer ved aflevering af byggerier

Udredningsrapport om bygherrekrav efter IKT-bekendtgørelserne for offentlig og alment byggeri.

Fagfællesbedømmelse
Links:

Related Publisher

Statens Byggeforskningsinstitut

Local database
Activity: Research › Peer review of manuscripts

The Spring Exhibition 2013
Period: 2013
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Charlottenborg Spring Exhibition, Censured: Censured International Art Exhibition

Censured Art Exhibition, participated with three large scale ceramic glazed concrete facades, as a artistic textile fabulation on the curtain wall system that is used very often in prefabricated Building systems.

Artist-Material Scientist and Building Componentdesigner, Posing Questions with the Art

Related event

The Spring Exhibition 2013
01/03/2013 → 12/05/2013
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

ISO TC59/SC13/WG2 Classification of the information on the construction industry (External organisation)
Period: 13 Dec 2013 → 31 Dec 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Building construction - Organization of information about construction works

Body type: Standardisation
Degree of recognition: International
Links:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?comid=49180

Related external organisation
ISO TC59/SC13/WG2 Classification of the information on the construction industry
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Principle coordinator on Solar Energy in the SDC Center, Denmark (External organisation)
Period: 1 Dec 2013 → …
Jianhua Fan (Member)
Section for Building Physics and Services
Department of Civil Engineering

Description
Principle coordinator of the Solar Energy theme within SDC (Sino-Danish Center for Research and Education)
Degree of recognition: International
Links:
http://www.sinodanishcenter.com/ (Homepage of the SDC Center in Denmark)

Related external organisation
Principle coordinator on Solar Energy in the SDC Center, Denmark
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Android Research Network - Disaster Resilience (External organisation)
Period: Nov 2013 → Nov 2014
Luisa Giuliani (Participant)
Department of Civil Engineering
Section for Building Design

Description
Body type: Erasmus Academic Network
Degree of recognition: International

Related external organisation
Android Research Network - Disaster Resilience
Activity: Membership › Membership of research networks or expert groups

Digital Infrastructure
Period: 19 Nov 2013
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Introduction to the national Digital Infrastructure project.
Links:

Related event
InfraFINBIM
19/11/2013 → …
Espoo, Finland
Visions of Infra BIM
Period: 19 Nov 2013
Jan Karlshøj (Panel member)
Department of Civil Engineering
Section for Building Design

Description
Kort indlæg om Infra BIM og deltagelse i paneldebatt
Links:

Related event

InfraFINBIM
19/11/2013 → …
Espoo, Finland
Activity: Talks and presentations › Conference presentations

Daylight & Sustainable Transformation Conference
Period: 18 Nov 2013
Peter Andreas Sattrup (Organizer)
Department of Civil Engineering
Section for Building Design

Description
Initiativetager, arrangør, bevillingshaver.
Documents:
Daylight-and -Transformation-Conference
Links:
http://www.dtu.dk/Service/Kalender/2013/11/dagslys-og-renovering

Related event

Daylight & Sustainable Transformation Conference: Sharing Northern Experiences In Architecture, Engineering and Urban Design
18/11/2013 → 18/11/2013
Kongens Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Innovation i bæredygtig byudvikling og renovering med fokus på energi og dagslys
Period: 18 Nov 2013
Peter Andreas Sattrup (Keynote speaker)
Department of Civil Engineering
Section for Building Design
Documents:
Daylight-and -Transformation-Conference

Related event

Daylight & Sustainable Transformation Conference: Sharing Northern Experiences In Architecture, Engineering and Urban Design
18/11/2013 → 18/11/2013
Kongens Lyngby, Denmark
Activity: Talks and presentations › Conference presentations
TEK 4 - Sustainability and Energy - Keys to design quality
Period: 14 Nov 2013
Peter Andreas Sattrup (Lecturer)
Department of Civil Engineering
Section for Building Design

Related external organisation
Royal Danish Academy of Fine Arts School of Architecture Design and Conservation
København, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

ISES Solar World Congress
Period: 6 Nov 2013
Mark Dannemand (Chairman)
Department of Civil Engineering
Section for Building Physics and Services

Description
Chairman for Technical session on Theme: SOLAR HEATING AND COOLING.
Session: Thermal Storages II.

Related event

ISES Solar World Congress
04/11/2013 → 07/11/2013
Cancun, Mexico
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

ISES Solar World Congress
Period: 5 Nov 2013
Mark Dannemand (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Description
Presenting the paper: "Validation of a CFD model simulating charge and discharge of a small heat storage test module based on a sodium acetate water mixture".

Related event

ISES Solar World Congress
04/11/2013 → 07/11/2013
Cancun, Mexico
Activity: Talks and presentations › Conference presentations

buildingSMART products and methods
Period: 25 Oct 2013
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Information on IFC, bSDD, MVD, IDM, and Certification developed by buildingSMART.

Related external organisation
Aalborg University
BuildingSMART products and methods  
Period: 25 Oct 2013  
Jan Karlshøj (Speaker)  
Department of Civil Engineering  
Section for Building Design  

**Description**  
Orientering om buildingSMARTs produkter, hvoraf de fleste er accepteret til ISO.

**Related external organisation**  
Aalborg University  
A.C. Meyers Vænge 15, 2450 Copenhagen SV, Aalborg, Denmark  
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Fire safety design of steel structures  
Period: 17 Oct 2013  
Luisa Giuliani (Speaker)  
Department of Civil Engineering  
Section for Building Design  

**Description**  
Invited lecture in the course of Advanced Steel Construction (Costruzioni Metalliche), responsible Prof. F. Bontempi

**Related external organisation**  
University of Rome La Sapienza  
Italy  
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Bygdens og fangersamfunds betydning i et moderne mine - Grønland  
Period: 9 Oct 2013  
Kåre Hendriksen (Lecturer)  
Department of Civil Engineering  

**Description**  
Hareskov medborgerhus  
Documents:  
DEBATFORUM 8  

**Related external organisation**  
Unknown external organisation  
Activity: Talks and presentations › Conference presentations

buildingSMART  
Jan Karlshøj (Organizer)  
Department of Civil Engineering  
Section for Building Design  

**Description**  
Planlægning af Process Room workshops  
Links:

Related event

buildingSMART
07/10/2013 → 10/10/2013
München, Germany
Activity: Attending an event › Participating in or organising a conference

IEA Task 42 / Annex 29, 10th experts meeting
Period: 2 Oct 2013 → 4 Oct 2013
Mark Dannemand (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related event

IEA Task 42 / Annex 29, 10th experts meeting: Experts meeting on thermal energy storage
02/10/2013 → 04/10/2013
Ljubljana, Slovenia
Activity: Talks and presentations › Conference presentations

Selvstyrets workshop om videregående uddannelser
Period: 24 Sep 2013 → 25 Sep 2013
Kåre Hendriksen (Participant)
Department of Civil Engineering
Documents:
Program for workshop 2 om videregående uddannelser - revideret

Related event

Selvstyrets workshop om videregående uddannelser
24/09/2013 → 25/09/2013
Nuuk, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Grønlands bygder – økonomi og udviklingsdynamik
Period: 14 Sep 2013 → 15 Sep 2013
Kåre Hendriksen (Keynote speaker)
Department of Civil Engineering
Documents:
130830 Progr bosteder 20130830 dk

Related event

Siumukarneq – aamma inoqarfinni minnerusuni : Fremgang – også i de mindre bosteder
14/09/2013 → 15/09/2013
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

DTU International Energy Conference 2013
Period: 11 Sep 2013
Mark Dannemand (Speaker)
Section for Building Physics and Services
Department of Civil Engineering

Description
Participation and presenting poster.
Related event

DTU International Energy Conference 2013: Sustainable energy for green economic growth  
10/09/2013 → 12/09/2013  
Lyngby, Denmark  
Activity: Talks and presentations › Conference presentations

Ongoing Danish InfraBIM Activities
Period: 11 Sep 2013  
Jan Karlshøj (Lecturer)  
Department of Civil Engineering  
Section for Building Design

Related event

RoadBIM Seminar  
11/09/2013 → …  
Tallinn, Estonia  
Activity: Talks and presentations › Conference presentations

Renovering med dagslys  
Period: 2 Sep 2013  
Peter Andreas Sattrup (Lecturer)  
Department of Civil Engineering  
Section for Building Design

Links:
https://arkitektforeningen.dk/artikel/nyheder/morgenklog-helhedsorienteret-renovering

Related event

Morgenklog - Helhedsorienteret Renovering  
02/09/2013 → …  
København, Denmark  
Activity: Talks and presentations › Conference presentations

5th International Conference on Structural Engineering, Mechanics and Computation  
Period: 1 Sep 2013 → 4 Sep 2013  
Luisa Giuliani (Chairman)  
Department of Civil Engineering  
Section for Building Design

Description
The role of collapse safety in the design of sustainable structures (SS16)

Member of the International Advisory Board.

Related event

5th International Conference on Structural Engineering, Mechanics and Computation  
02/09/2013 → 04/09/2013  
Cape Town, South Africa  
Activity: Attending an event › Participating in or organising a conference

University of Pennsylvania - Scandinavian Sustainable Summer School  
Period: 18 Jul 2013  
Peter Andreas Sattrup (Invited speaker)  
Department of Civil Engineering
Description
Organizer and guide to site visit: Radiohuset - The Royal Danish Academy of Music
Documents:
KADK_WEEK_3_2013_version_01
Links:
http://www.karch.dk/cinark/Menu/Nyheder/Scandinavian+Sustainable+Summer+Course_2013

Related event
University of Pennsylvania - Scandinavian Sustainable Summer School
03/06/2013 → 21/06/2013
Copenhagen (Oslo, Stockholm), Denmark
Activity: Talks and presentations › Conference presentations

Radiohuset and The Royal Danish Academy of Music - Transformation in a sustainable perspective
Period: 17 Jul 2013
Peter Andreas Sattrup (Invited speaker)
Department of Civil Engineering
Section for Building Design
Description
Discussion of the project and process of transformation of Vilhelm Lauritzen's iconic Radiohuset building (1938-1945) in order to house the Danish Academy of Music (Vilhelm Lauritzen Arkitekter 2008). Analysis of cultural heritage values, original design philosophy and functional hierarchies of the building in order to establish a design approach for the transformation of the building. Presentation of an lifecycle based design method for sustainable building transformation, based on the insights gained from this project and the doctoral thesis 'Sustainability - Energy Optimization - Daylight and Solar Gains'.
Links:
http://www.karch.dk/cinark/Menu/Nyheder/Scandinavian+Sustainable+Summer+Course_2013 (Summer course website.)
http://www.design.upenn.edu/architecture/study-abroad-travel-fellowships (www.design.upenn.edu)

Related event
University of Pennsylvania - Scandinavian Sustainable Summer School
03/06/2013 → 21/06/2013
Copenhagen (Oslo, Stockholm), Denmark
Activity: Talks and presentations › Conference presentations

Ny Arkitekturpolitik
Period: 12 Jul 2013
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design
Description
præsenterede bidrag til fokus på forskning, innovation og undervisning til ny arkitekturpolitik
Documents:
Grupper workshop 1 DOK1784086

Related event
Ny Arkitekturpolitik
12/06/2013 → …
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
One of four temporary dome structures
Period: 24 Jun 2013
Henrik Almegaard (Lecturer)
Department of Civil Engineering
Section for Structural Engineering
Documents:
Keywords Nordic Meeting 2013

Related event
1st Nordic Symposium on Structures in Architecture
24/06/2013 → 25/06/2013
Hven, Sweden
Activity: Talks and presentations › Conference presentations

Compact seasonal heat storage using sodium acetate
Period: 18 Jun 2013
Mark Dannemand (Invited speaker)
Department of Civil Engineering
Section for Building Physics and Services
Description
The presentation will describe the basic principle of a seasonal heat storage utilizing supercooling of a sodium acetate water mixture. Basic material properties of the salt water mixture are given along with the theoretical concept. The design principle for the storage under development is presented and the status on the development is presented.

Related event
Intersolar
17/06/2013 → 20/06/2013
Münich, Germany
Activity: Talks and presentations › Conference presentations

Clima 2013
Period: 16 Jun 2013 → 19 Jun 2013
Peter Strøm-Tejsen (Participant)
Department of Civil Engineering
Section for Indoor Environment
Related event
Clima 2013: 11th REHVA World Congress & 8th International Conference on IAQVEC
16/06/2013 → 19/06/2013
Prague, Czech Republic
Activity: Attending an event › Participating in or organising a conference

Bæredygtigt byggeri
Period: 15 Jun 2013
Peter Andreas Sattrup (Invited speaker)
Department of Civil Engineering
Section for Building Design
Description
Oplæg om bæredygtigt byggeri for Dagbladet Informations læsere arrangeret ifbm. Dagbladet Information og Danmarks Radios kampagne om bæredygtig omstilling: “Hvad gør vi nu?”
Links:
http://www.brk.dk/folkemoedet/program/sider/default.aspx
Related event

Folkemødet 2013
13/06/2013 → 16/06/2013
Allinge, Denmark
Activity: Talks and presentations › Conference presentations

8th International OpenFOAM Workshop
Period: 14 Jun 2013
Tian Tang (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Description
Presentation on "A Finite Volume Method (FVM) solver for non-linear soil stress analysis using OpenFOAM"
Documents:
TianTang-OFW8-presentation

Related event

8th International OpenFOAM Workshop
11/06/2013 → 14/06/2013
Jeju, Korea, Republic of
Activity: Talks and presentations › Conference presentations

Forskning på farten - Bæredygtig byudvikling: Dagslys og Energi
Period: 24 May 2013
Peter Andreas Sattrup (Lecturer)
Department of Civil Engineering
Section for Building Design
Description
Forskningsformidling ombord på offentlige transportmidler, busser og metro arrangeret af Wonderful Copenhagen
Links:
https://www.facebook.com/dirdage
http://www.dirdage.dk

Related event

Forskning på Farten: Wonderful Copenhagen
24/05/2013 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

Konference om ny arkitekturpolitik
Period: 21 May 2013
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design
Links:
http://kum.dk/Temaer/Ny-arkitekturpolitik/Konference-/
Dansk Byggeris årsdag 2013
Period: 16 May 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Related event
Dansk Byggeris årsdag 2013: Byggeehvervet i en globaliseret verden
16/05/2013 → …
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Velux Daylight Symposium
Period: 15 May 2013 → 16 May 2013
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design

Description
Projektet ’Hvad med Dagslys?’ blev præsenteret af Signe Kongebro, Henning Larsen Architects
Documents:
Signe Kongebro - What about daylight in building renovation
Links:
http://thedaylightsite.oxmond.com/events/presentation/

Related event
Velux Daylight Symposium: New Eyes on Existing Buildings
15/05/2013 → 16/05/2013
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

Grønlands bygder – økonomi og udviklingsdynamik
Period: 14 May 2013
Kåre Hendriksen (Lecturer)
Department of Civil Engineering

Description
Foredrag i Nuuks kulturhus Katuaq
Documents:
130508 Ilisimatoq naapiguk Kåre Henriksen

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Royal Danish Academy of Fine Arts (External organisation)
Period: 1 May 2013 → 31 May 2013
Peter Andreas Sattrup (Member)
Department of Civil Engineering
Section for Building Design

Description
Associate Professorship in Building Technology - Assessment Committee
Bedømmelseskomite for lektorat i byggeteknik.

Body type: Royal Danish Academy of Fine Arts School of Architecture Design and Conservation

Related external organisation

Royal Danish Academy of Fine Arts
Denmark
Activity: Membership › Membership in review committee

COST-Action TU0905, TG7: Numerical know how and validation of numerical work. (External organisation)
Period: 18 Apr 2013 → 7 Apr 2014
Jens Henrik Nielsen (Chairman)
Department of Civil Engineering
Section for Structural Engineering

Description
Leading TG7 for creating an educational pack related to numerical modeling for structural glass.
Degree of recognition: International
Links:
http://www.glassnetwork.org/working-groups/working-group-3

Related external organisation

COST-Action TU0905, TG7: Numerical know how and validation of numerical work.
Activity: Membership › Membership of research networks or expert groups

Fire Safety Day 2013
Period: 17 Apr 2013
Luisa Giuliani (Participant)
Department of Civil Engineering
Section for Building Design

Description
Chairing of the session "Structure on Fire".

Related event

Fire Safety Day 2013
17/04/2013 → …
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising a conference

Fire Safety Day 2013
Period: 17 Apr 2013
Rolff Ripke Leisted (Participant)
Department of Civil Engineering
Section for Building Design

Related event

Fire Safety Day 2013
17/04/2013 → …
Kgs. Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Status of openBIM usage in Denmark
Period: 17 Apr 2013
Jan Karlshøj (Lecturer)
Department of Civil Engineering
Section for Building Design

**Description**
Information on usage of open BIM standards in Denmark

Role as Chairman of buildingSMART Nordic

Links:
http://www.buildingsmartnordic.org/resources/client-workshop-in-helsinki

**Related event**
buildingSMART Nordic, Client workshop in Helsinki
17/04/2013 → …
Helsinki, Finland
Activity: Talks and presentations › Conference presentations

**IEA Task 42 / Annex 29 9th experts meeting**
Period: 15 Apr 2013 → 17 Apr 2013
Mark Dannemand (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

**Description**
Presented ideas for the COMTES project

**Related event**
IEA SHC Task 42 / Annex 29, 9th Experts meeting: Experts meeting on thermal energy storage
15/04/2013 → 17/04/2013
Freiburg, Germany
Activity: Talks and presentations › Conference presentations

**Sustainability in mining in the Arctic**
Period: 10 Apr 2013
Kåre Hendriksen (Speaker)
Department of Civil Engineering

**Documents:**
121220 Abstract endelige BH + KRH

**Related event**
ARTEK Event 2013: Sustainability in mining in the Arctic
09/04/2013 → 11/04/2013
Sisimiut, Greenland
Activity: Talks and presentations › Conference presentations

**buildingSMART Danmark netværksmøde**
Period: 5 Apr 2013
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design

**Description**
builtSMART Workshop focusing on software development and education in open standards

**Related event**
buildingSMART Danmark netværksmøde
05/04/2013 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

buildingSMART International Meetings Spring 2013
Period: 13 Mar 2013
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design
Description
Process Room meeting which is a part of buildingSMART International
Links:

Related event
buildingSMART International Meetings Spring 2013
11/03/2013 → 15/08/2013
Waltham, United States
Activity: Attending an event › Participating in or organising a conference
Thermal Tempering Simulation
Period: 13 Mar 2013
Jens Henrik Nielsen (Invited speaker)
Department of Civil Engineering
Section for Structural Engineering
Links:
http://bauingenieurkongress.de/2013

2. Darmstädter Ingenieurkongress Bau und Umwelt
12/03/2013 → 13/03/2013
Darmstadt, Germany
Activity: Talks and presentations › Conference presentations

Ledelses- og samarbejdsudvalg (External organisation)
Period: 12 Mar 2013 → 31 Dec 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design
Description
Ledelses- og samarbejdsudvalg på DTU Byg
Body type: Udvalg

Related external organisation
Ledelses- og samarbejdsudvalg
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Fremtidens Bæredygtige Almene Bolig
Period: 6 Mar 2013 → 7 Mar 2013
Peter Andreas Sattrup (Participant)
Related event

Fremtidens Bæredygtige Almene Bolig
06/03/2013 → 07/03/2013
Skovshoved, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Grønlands bygder – økonomi og udviklingsdynamik
Period: 5 Mar 2013
Kåre Hendriksen (Guest lecturer)
Department of Civil Engineering

Description
Gæsteforelæsning

Gæsteforelæsning
Documents:
130305 Annonce gæsteforelæsning Nuuk

Related external organisation
Ilisimatusarfik, University of Greenland
Greenland
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

buildingSMART products and methods
Period: 19 Feb 2013
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design

Related external organisation
Aalborg University
A.C. Meyers Vænge 15, 2450 Copenhagen SV, Aalborg, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Journal of Building Performance Simulation (Journal)
Period: 13 Feb 2013 → 13 Mar 2013
Peter Andreas Sattrup (Reviewer)
Department of Civil Engineering
Section for Building Design

Related journal
Journal of Building Performance Simulation
1940-1493
Central database
Activity: Research › Peer review of manuscripts
Dialogmøde om Renoveringskompetencer
Period: 5 Feb 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Workshop on the needs for skills in renovation
Links:
http://www.frinet.dk/media/431400/invitation_kompetencem%C3%B8de.pdf

Related event
Dialogmøde om Renoveringskompetencer
05/02/2013 → …
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Nordic buildingSMART Workshop
Period: 31 Jan 2013
Jan Karlshøj (Organizer)
Department of Civil Engineering
Section for Building Design

Description
openBIM for a Nordic Sustainable Building Industry

Nordic buildingSMART Workshop
The Danish Association of Construction Clients, buildingSMART Nordic and buildingSMART Norway invited desicionmakers, managing directors and managers to an informal Nordic Workshop for stakeholder clients.
Links:
http://www.buildingsmartnordic.org/resources/openbim-for-a-nordic-sustainable-building-industry-1

Related event
Nordic buildingSMART Workshop
31/01/2013 → 31/01/2013
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Dagslysberegninger i praksis - workshop 2
Period: 24 Jan 2013
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design

Related event
Dagslysberegninger i praksis - workshop 2
24/01/2013 → …
Hørsholm, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Censor ved "Ledelse og informatik i byggeriet"
Period: 10 Jan 2013
Jan Karlshøj (External examiner)
Department of Civil Engineering
Informations Medieskole
Period: 7 Jan 2013 → 4 Mar 2013
Peter Andreas Sattrup (Participant)
Department of Civil Engineering
Section for Building Design

Description
Kursus om forskningsformidling i massemedierne arrangeret af Dagbladet information i samarbejde med Danmarks Radio

Links:
http://phdcup.dk/informations-medieskole/

Related event
Informations Medieskole
07/01/2013 → 04/03/2013
København, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

bips Steering committee (External organisation)
Period: 1 Jan 2013 → 31 Dec 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
he association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry

The steering committee is responsible for initiation and coordination of projects.

Body type: Steering committee

Related external organisation

bips Steering committee
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Danish Standards S-808 (External organisation)
Period: 1 Jan 2013 → 31 Dec 2013
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Structuring of information, documentation and graphical symbols

Body type: Committee
Links:
http://www.ds.dk/da/udvalg/kategorier/byggeri-og-anlaeg/informationsstrukturering-og-modellering-inden-for-bygge_-og-anlaegsarbejder (Danish Standards)
Related external organisation

Danish Standards S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 1 Jan 2013 → 31 Dec 2013
Jan Karlshøj (Member)
Department of Civil Engineering
Section for Building Design

Description
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)

Coordination of ISO 29481 Part 1

Body type: Standardisation
Degree of recognition: International

Related external organisation

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

BIPS Conference 2012
Period: 2012
Kristoffer Negendahl (Speaker)
Department of Civil Engineering
Section for Building Energy

Related event

BIPS Conference 2012
10/09/2012 → 11/09/2012
Nyborg, Denmark
Activity: Talks and presentations › Conference presentations

Cement and Concrete Research (Journal)
Period: 2012 → …
Alexander Michel (Reviewer)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International

Related journal

Cement and Concrete Research
0008-8846
Central database
Activity: Research › Peer review of manuscripts

International Journal of Environmental Research and Public Health (Journal)
Period: 2012 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related journal

International Journal of Environmental Research and Public Health
1661-7827
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 2.38 SJR 0.82 SNIP 1.044, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Indexed in DOAJ
Central database
Activity: Research › Peer review of manuscripts

Materials and Structures (Journal)
Period: 2012 → …
Alexander Michel (Reviewer)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International

Related journal

Materials and Structures
1359-5997
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 2.09 SJR 1.129 SNIP 1.533, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Materials Characterization (Journal)
Period: 2012 → …
Alexander Michel (Reviewer)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International

Related journal

Materials Characterization
1044-5803
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 2.75 SJR 1.24 SNIP 1.54, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Membership PhD Assessment Committee, The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation (External organisation)
Period: 2012 → …
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Membership PhD Assessment Committee, Peter Andreas Sattrup's PhD
The Royal Danish Academy of Fine Arts
Schools of Architecture, Design and Conservation

Membership PhD Assessment Committee, Peter Andreas Sattrup's PhD
Degree of recognition: International
Related external organisation

Membership PhD Assessment Committee, The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation
Activity: Membership › Membership in review committee

Nordic Concrete Research (External organisation)
Period: 2012 → …
Per Goltermann (Member)
Department of Civil Engineering
Section for Structural Engineering

Description
Reviewer

Related external organisation

Nordic Concrete Research
Activity: Membership › Membership in review committee

Smartgeometry
Period: 2012
Kristoffer Negendahl (Participant)
Department of Civil Engineering
Section for Building Energy

Related event

Smartgeometry: Material intensities
19/03/2012 → 24/03/2012
Troy, New York, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Textile Research Journal (Journal)
Period: 2012 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Textile Research Journal

Related journal

Textile Research Journal
0040-5175
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.42 SJR 0.552 SNIP 1.06, Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

ISO TC59/SC13/WG2 Classification of the information on the construction industry (External organisation)
Period: 13 Dec 2012 → 31 Dec 2012
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Building construction - Organization of information about construction works


Body type: Standardisation
Degree of recognition: International
Links:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?comid=49180

Related external organisation

ISO TC59/SC13/WG2 Classification of the information on the construction industry
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Deformation ved aflastning og genbelastning - og de tilknyttede termer
Period: 15 Nov 2012
Anette Krogsbøll (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology

Description
Foredrag ved møde i Geoteknisk forening om Palaeogent ler, og de specieller egenskaber det har. Fokus på deformationsegenskaber i aflastning tæt på brud.

Oplæg til diskussion om Palaeogent lers egenskaber. Ved mødet blev forskellige holdninger repræsenteret.

Related event

Geoteknisk Forenings møde: Kan du drikke mere end Palaeogent ler?
15/11/2012 → …
Odense, Denmark
Activity: Talks and presentations › Conference presentations

Boligfonden Kuben Masterclass 2012
Period: 6 Sep 2012
Peter Andreas Sattrup (Invited speaker)
Department of Civil Engineering
Section for Building Design

Description
Blandt deltagerne i Master Class 2012 var Peter A. Sattrup, lektor, DTU Byg. Han sagde: "Dagslys øger herlighedsværdien markant. Derfor giver det rigtig god mening at indtænke dagslys som et vigtigt parameter i energirenoveringer." Peter A. Sattrup fortsatte: "Ved at benytte de rigtige metoder - for eksempel punktvis nedrivning - kan man skabe mere tæthed og mere dagslys."

Links:
http://www.presswire.dk/default.asp?o=1&pid=62904

Related event

Boligfonden Kuben Masterclass 2012
06/09/2012 → …
Horsens, Denmark
Activity: Talks and presentations › Conference presentations

Environmental Modelling & Software (Journal)
Period: 29 Aug 2012 → …
Peter Andreas Sattrup (Reviewer)
Department of Civil Engineering
Section for Building Design

Description
Environmental Modelling & Software

Scientific Journal peer review
Links:

Related journal
Environmental Modelling & Software
1364-8152
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Fifteenth International Specialty Conference on Cold Regions Engineering
Frederik Ancker Agergaard (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre, ARTEK

Description
Presentation of conference paper

Conference participation

Related event
Fifteenth International Specialty Conference on Cold Regions Engineering
19/08/2012 → 22/08/2012
Quebec City, Canada
Activity: Talks and presentations › Conference presentations

Powerpoint - Communicate and collaborate by using building information modeling
Thomas Fænø Mondrup (Lecturer)
Department of Civil Engineering
Section for Building Design
Documents:
CIB - PP - Paper#43

Related event
CIB W078 2012 Conference : The 29th International Conference on Applications of IT in the AEC Industry
17/10/2012 → 19/10/2012
Beirut, Lebanon
Activity: Talks and presentations › Conference presentations

Powerpoint - Information delivery manuals to facilitate it supported energy analysis
Thomas Fænø Mondrup (Lecturer)
Department of Civil Engineering
Section for Building Design
Related event

CIB W078 2012 Conference : The 29th International Conference on Applications of IT in the AEC Industry
17/10/2012 → 19/10/2012
Beirut, Lebanon
Activity: Talks and presentations › Conference presentations

7th Windsor Conference 2012
Period: 14 Aug 2012
Rune Korsholm Andersen (Organizer)
Department of Civil Engineering
Section for Indoor Environment

Description
Invited Chair of Workshop on Personal Control and Occupant behaviour in office buildings

Related event

7th Windsor Conference 2012: The changing context of comfort in an unpredictable world
12/04/2012 → 15/04/2012
London, United Kingdom
Activity: Attending an event › Participating in or organising a conference

6th International Conference on Bridge Maintenance, Safety and Management
Period: 8 Jul 2012 → 12 Jul 2012
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Member of the National Organizing Committee.
Organizer and chairman of the special session on “Vulnerability of bridges to fire and explosions” (SS05).

Related event

6th International Conference on Bridge Maintenance, Safety and Management
08/07/2012 → 12/07/2012
Stresa, Lake Maggiore, Italy
Activity: Talks and presentations › Conference presentations

10th International Conference on Permafrost
Frederik Ancker Agergaard (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre, ARTEK

Description
Presentation of extended abstract
Conference participation and session co-chair

Related event

10th International Conference on Permafrost: Resources and Risks of Permafrost Areas in a Changing World
Structural Frameworks for Open, Digital Research
Period: 11 Jun 2012 → 13 Jun 2012
Alfred Heller (Organizer)
Department of Civil Engineering
Section for Building Physics and Services

Description
Scientific advisor, member of scientific committee

Related event
Structural Frameworks for Open, Digital Research
11/06/2012 → 13/06/2012
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

Research activities with DTU's Department of Civil Engineering of relevance for CHAMPS Development and Application
Period: 1 Jun 2012 → 3 Jun 2012
Carsten Rode (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Description
Invited Lecture

Related event
9th International Forum and Workshop on Combined Heat, Air, Moisture and Pollutant Simulation
01/06/2012 → 03/06/2012
Tokyo, Japan
Activity: Talks and presentations › Conference presentations

Electrodialytic upgrading of MSWI APC residue in pilot scale as function of time and current density
Period: 21 May 2012
Pernille Erland Jensen (Lecturer)
Department of Civil Engineering
Section for Geotechnics and Geology

Description
Oral presentation

Related event
Symposium of Urban Mining
21/05/2012 → 23/05/2012
Bergamo, Italy
Activity: Talks and presentations › Conference presentations

Nordic Geotechnical Meeting
Period: 9 May 2012 → 12 May 2012
Frederik Ancker Agergaard (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre, ARTEK

Description
Presentation of conference paper

Conference participation

Related event

**Nordic Geotechnical Meeting**
09/05/2012 → 12/05/2012
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

**Fire Safety Day 2012**
Period: 18 Apr 2012
Rolff Ripke Leisted (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Experimental Study of the Effects of Flame Retardants Applied to Chipboard, Rolff Ripke Leisted, Hjalte Bengtsson, Grunde Jomaas, Ph.D

The Fire Safety Day is an event carried by the Fire Safety Group at the Technical University of Denmark. The day will put focus on fire research in Scandinavia. Contributions from other countries are more than welcome. The conference language is English. Fire Safety Day shall be a meeting point for all of you who are interested in and work with different aspects of fire. The day shall give a lot of opportunities to tie band between fire industry, municipalities and University. At Fire Safety Day you will have the opportunity to get information on different aspects within fire research. The topic of this years event is fire risk management.

Documents:
Fire Safety Day 2012 - An Experimental Study of the Effects of Flame Retardants Applied to Chipboard

Related event

**Fire Safety Day 2012**
18/04/2012 → 18/04/2012
Lund, Sweden
Activity: Other

Building(s) for occupants?
Period: 16 Apr 2012 → 17 Apr 2012
Rune Korsholm Andersen (Organizer)
Department of Civil Engineering
Section for Indoor Environment

Description
International workshop aimed at young researchers in the field of occupant behaviour, thermal comfort and indoor air quality and their relation to energy usage.

Organization of international workshop
Documents:
Flyer
Links:
http://prezi.com/zclf9t9pddpa/buildings-for-occupants-contents/?auth_key=a4cf2cfb61272fd366272daf29e8c5b2a61651f (Link)
Building(s) for occupants?: Discussing methodologies to investigate and model the occupant's needs and actions
16/04/2012 → 17/04/2012
Karlsruhe, Germany
Activity: Attending an event › Participating in or organising a conference

Design Fires and Flashover in Modern Building Design
Period: 12 Apr 2012
Grunde Jomaas (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Invited lecture/presentation at Johns Hopkins University.
Links:

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

What happened to ventilation and our environment?
Period: 4 Apr 2012
Gabriel Bekö (Lecturer)
Department of Civil Engineering
Section for Indoor Environment

Description
Guest lecture at the Slovak University of Technology

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Building Services, Indoor Climate and Us
Period: 3 Apr 2012
Gabriel Bekö (Lecturer)
Department of Civil Engineering
Section for Indoor Environment

Description
Guest lecture at the Slovak University of Technology

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Numerical modeling of glass components
Period: 2 Apr 2012 → 6 Apr 2012
Jens Henrik Nielsen (Lecturer)
Department of Civil Engineering
Section for Structural Engineering
Links:
http://www.glassnetwork.org/training-schools/training-school-2012
Related event

COST Training school "structural glass"
02/04/2012 → 06/04/2012
Gent, Belgium
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Bosætning og erhvervsgrundlag i Grønland. - Nye og overraskende tal, og også lidt fra sundhedsøkonomien
Period: 24 Mar 2012
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering

Related event

Grønlandsmedicinsk selskab
24/03/2012 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

Udstilling af keramisk glaseret beton
Period: 1 Feb 2012
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Helsides Annoncering af udstilling i Magasinet Beton, 1 2012, 1.februar 2012

Jan Broch Nielsen har opslået en helsides annoncering a udstilling på Danmarks keramikmuseum

Related external organisation

Beton
Denmark
Activity: Other

Ceramic Spaces, Displacements, Ceramic Galzed Concrete
Period: 22 Jan 2012 → 22 Apr 2012
Anja Margrethe Bache (Participant)
Department of Civil Engineering
Section for Building Design

Description
Ceramic Spaces, Displacements, Ceramic Galzed Concrete: Exhibition at the International Museum of Ceramic Art Grimmerhus

Exibition of my invented specific ceramic Glazed Concrete for Large scale Constructions
Documents:
Keramiske Rum, Forskydninger, Keramisk Glaseret Beton
Links:
http://www.out-form.com

Related event

Ceramic Spaces, Displacements, Ceramic Galzede Concrete
22/01/2012 → 22/04/2012
Middelfart, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
Ceramic Spaces, Displacements, Ceramic Glazed Concrete  
Period: 22 Jan 2012 → 22 Apr 2012  
Anja Margrethe Bache (Participant)  
Department of Civil Engineering  
Section for Building Design  
Description  
Ceramic Spaces, Displacements, Ceramic Glazed Concrete  
An art exhibition at the Museum Of International Ceramic Art, Grimmerhus  
An exhibition og my new invented specific ceramic glazed concrete for large scale thin constructions, unfolded as installation art posing quition and looking for a dialogue in relation to, space, kontext and time  
Documents:  
Keramiske Rum, Forskydninger, Keramisk glaseret beton  
Links:  
http://www.out-form.com  
Related event

Ceramic Spaces, Displacements, Ceramic Glazed Concrete  
22/01/2012 → 22/04/2012  
Denmark  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.  

Automated Transfer Vehicle Material Flammability Experiment  
Period: 9 Jan 2012 → 12 Jan 2012  
Grunde Jomaas (Speaker)  
Department of Civil Engineering  
Section for Building Design  
Description  
Note: Invited talk  
Place: 50th AIAA Aerospace Sciences Meeting and Exhibit, Nashville Tennessee  
Documents:  
prod21326926620553.AIAA.pdf  
Related external organisation
bips Steering committee (External organisation)
Period: 1 Jan 2012 → 31 Dec 2012
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry.

The steering committee is responsible for initiation and coordination of projects.

Body type: Steering committee

Related external organisation
bips Steering committee
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Danish Standards S-808 (External organisation)
Period: 1 Jan 2012 → 31 Dec 2012
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Structuring of information, documentation and graphical symbols

Body type: Committee
Links:
http://www.ds.dk/da/udvalg/kategorier/byggeri-og-anlaeg/informationsstrukturering-og-modellering-inden-for-bygge_-og-
anlaegsarbejder (Danish Standards)

Related external organisation
Danish Standards S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 1 Jan 2012 → 31 Dec 2012
Jan Karlshøj (Member)
Department of Civil Engineering
Section for Building Design

Description
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)

Coordination of ISO 29481 Part 1

Body type: Standardisation
Degree of recognition: International

Related external organisation
Applied Thermal Engineering (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Applied Thermal Engineering

Related journal
Applied Thermal Engineering
1359-4311
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Building and Environment (Journal)
Period: 2011 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal
Building and Environment
0360-1323
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 4.51 SJR 2.015 SNIP 2.198, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Journal editor

Building Simulation (Journal)
Period: 2011 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Building Simulation – An International Journal

Related journal
Building Simulation
1996-3599
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.56 SJR 0.784 SNIP 0.936, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

International Journal of Industrial Ergonomics (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
International Journal of Industrial Ergonomics

Related journal
International Journal of Industrial Ergonomics
0169-8141
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.66 SJR 0.564 SNIP 1.51, ISI indexed (2013): ISI indexed yes
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual (External organisation)
Period: 2011 → 31 Dec 2011
Jan Karlshøj (Member)
Department of Civil Engineering
Section for Building Design

Description
Working Group responsible for standardisation of the methodology of Information Delivery Manuals (IDM)
Coordination of ISO 29481 Part 1
Body type: Standardisation
Degree of recognition: International

Related external organisation
ISO/TC 59/SC 13/WG 8 Building information models - Information delivery manual
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Journal of Aerospace Engineering (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Journal of aerospace engineering

Related journal
Journal of Aerospace Engineering
0893-1321
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.16 SJR 0.325 SNIP 0.934, ISI indexed (2013): ISI indexed yes
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Journal of Healthcare Engineering (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal
Journal of Healthcare Engineering
2040-2295
Scopus rating (2016): CiteScore 1.12 SJR 0.276 SNIP 0.492, Web of Science (2018): Indexed yes
Indexed in DOAJ
Local database
Activity: Research › Peer review of manuscripts

Journal of Renewable and Sustainable Energy (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment
Description
Journal of Renewable and Sustainable Energy
Related journal
Journal of Renewable and Sustainable Energy 1941-7012
Central database
Activity: Research › Peer review of manuscripts

Journal of the Air and Waist Management Association (Journal)
Period: 2011
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment
Description
Journal of the Air and Waist Management Association
Related journal
Journal of the Air and Waist Management Association 1096-2247
Scopus rating (2016): CiteScore 1.73 SJR 0.669 SNIP 0.826, Web of Science (2018): Indexed yes
Local database
Activity: Research › Peer review of manuscripts

Nordic Forum for Roads and bridges (External organisation)
Period: 2011 → …
Per Goltermann (Participant)
Department of Civil Engineering
Section for Structural Engineering
Related external organisation
Nordic Forum for Roads and bridges
Activity: Membership › Board duties in companies, associations, or public organisations

Nordic Network of Concrete Teachers (External organisation)
Period: 2011 → …
Per Goltermann (Chairman)
Department of Civil Engineering
Section for Structural Engineering

Related external organisation

Nordic Network of Concrete Teachers
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ISO TC59/SC13/WG2 Classification of the information on the construction industry (External organisation)
Period: 13 Dec 2011 → 31 Dec 2011
Jan Karlshej (Participant)
Department of Civil Engineering
Section for Building Design

Description
Building construction - Organization of information about construction works


Body type: Standardisation
Degree of recognition: International
Links:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?com
mid=49180

Related external organisation

ISO TC59/SC13/WG2 Classification of the information on the construction industry
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Building and Environment (Journal)
Period: 30 Nov 2011 → 30 Dec 2011
Elsa Andersen (Reviewer)
Department of Civil Engineering
Section for Building Physics and Services

Related journal

Building and Environment
Local database
Activity: Research › Peer review of manuscripts

Scientific Committee member for the international conference "Engineered Transparency" (External organisation)
Period: 25 Nov 2011
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering
Degree of recognition: International
Links:
http://www.engineered-transparency.eu

Related external organisation

Scientific Committee member for the international conference "Engineered Transparency"
Activity: Membership › Membership in review committee

Examiner for Katrin Zass’s Ph.D. defence
Period: 11 Nov 2011
Simon Furbo (External examiner)  
Department of Civil Engineering  
Section for Building Physics and Services  
Activity: Examinations and supervision › External examination

**Polarforskerdag 2011**  
Period: 8 Nov 2011  
Kåre Hendriksen (Speaker)  
Department of Civil Engineering  
Documents:  
111012 Abstrakt

**Related event**  
*Polarforskerdag 2011*  
08/11/2011 → …  
Lyngby, Denmark  
Activity: Talks and presentations › Conference presentations

**2011 Pan-Am CGS Geotechnical Conference**  
Frederik Ancker Agergaard (Speaker)  
Department of Civil Engineering  
Section for Geotechnics and Geology  
Arctic Technology Centre, ARTEK

**Description**  
Presentation of conference paper

**Related event**  
*2011 Pan-Am CGS Geotechnical Conference*  
02/10/2011 → 06/10/2011  
Toronto, Canada  
Activity: Talks and presentations › Conference presentations

**Member of scientific committee of Healthy Buildings 2012 conference (External organisation)**  
Period: 1 Oct 2011 → 12 Jul 2012  
Gabriel Bekö (Member)  
Department of Civil Engineering  
Section for Indoor Environment  
Degree of recognition: **International**

**Related external organisation**  
**Member of scientific committee of Healthy Buildings 2012 conference**  
Activity: Membership › Membership in review committee

**Arctic Dialogue-Greenland**  
Period: 24 Sep 2011 → 25 Sep 2011  
Kåre Hendriksen (Participant)  
Department of Civil Engineering

**Related event**
Arctic Dialogue-Greenland  
Nuuk, Greenland  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Joining Forces 2011  
Period: 21 Sep 2011 → 22 Sep 2011  
Kåre Hendriksen (Participant)  
Department of Civil Engineering

Related event

Joining Forces 2011  
21/09/2011 → 22/09/2011  
Nuuk, Greenland  
Activity: Attending an event › Participating in or organising a conference

Universite Laval  
Period: 5 Sep 2011 → 21 Dec 2011  
Frederik Ancker Agergaard (Visiting researcher)  
Section for Geotechnics and Geology  
Arctic Technology Centre, ARTEK  
Department of Civil Engineering

Description
Research stay at Laval University: Visiting PhD-student at Laval University, Quebec, Canada  
The research stay was hosted by Professor Guy Doré of the Department of Civil Engineering  
Activity: Visiting an external institution › Visiting another research institution

International Congress of Arctic Social Sciences  
Kåre Hendriksen (Speaker)  
Department of Management Engineering  
Department of Civil Engineering

Description
Globalization and climate change challenges the Arctic communities adaptability and increases vulnerability  
Documents:  
Abstract 458

Related event

International Congress of Arctic Social Sciences  
23/06/2011 → 27/06/2011  
Akureyri, Iceland  
Activity: Talks and presentations › Conference presentations

7th International CDIO Conference  
Period: 19 Jun 2011 → 22 Jun 2011  
Anette Krogsbøll (Organizer)  
Department of Civil Engineering  
Section for Geotechnics and Geology

Description
Medarrangør og bidragyder
Related event

7th International CDIO Conference
20/06/2011 → 23/06/2011
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

Vestnorden 2030 – bygdernes fremtidsvisioner (VNF-2030) workshop
Period: 3 Jun 2011 → 4 Jun 2011
Kåre Hendriksen (Participant)
Department of Civil Engineering

Related event

Vestnorden 2030 – bygdernes fremtidsvisioner (VNF-2030) workshop
03/06/2011 → 04/06/2011
Nuuk, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Design for fully developed fire and advanced modeling of structural response to fire
Period: May 2011
Luisa Giuliani (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Lecture in the Ph.D. course: “Performance-based design of steel structures in case of fire”, responsible Prof. O. Bursi
Mechanical and Structural Engineering Department, Trento University, 6 May 2011

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Visit of Chinese researchers at Risø: Solar heating research at the technical University of Denmark
Period: 9 May 2011
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation

RISØ
Denmark
Activity: Other

International Conference on Application of Structural Fire Design
Period: 29 Apr 2011
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Partecipation in international conference and presentation of a paper
Links:
http://fire.fsv.cvut.cz/ASFE11/ (Conference website)

Related event
**InnoByg forårskonference 2011: Solfangere integreres i taget. Udvikling af tagintegreret solfanger i samarbejde med Komproment**

*Period:* 23 Mar 2011  
*Simon Furbo* (Speaker)

Department of Civil Engineering

Section for Building Physics and Services

**Related external organisation**

Tåstrup

Activity: Talks and presentations › Conference presentations

**ISES Solar World Congress 2011 (Journal)**

*Period:* 22 Mar 2011 → 20 Apr 2011  
*Elsa Andersen* (Reviewer)

Department of Civil Engineering

Section for Building Physics and Services

**Related journal**

ISES Solar World Congress 2011

Local database

Activity: Research › Peer review of manuscripts

**Hvordan funderes den næste generation af havvindmøller?:**

*Period:* 12 Mar 2011  
*Rasmus Tofte Klinkvort* (Speaker)

Department of Civil Engineering

Section for Geotechnics and Geology

**Description**

Danmark har i mange år været førende inden for produktion af vindmøller. Hvis vi i fremtiden vil fortsætte med at fastholde denne position, er det vigtigt, at vi bliver ved med at udvikle og forske i vindmølleteknologi. Rasmus Tofte Klinkvort fortæller, hvordan de på DTU Byg udvikler de ingeniør-værktøjer, som skal bruges til at konstruere fundamenter til fremtidens hav-vindmøller.

Links:


**Related external organisation**

Danskernes Akademi, DR

Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

**IEA Task 45 meeting: Collectors and collector loop**

*Period:* 5 Mar 2011  
*Simon Furbo* (Other)

Department of Civil Engineering

Section for Building Physics and Services

**Description**

Organizer
Related external organisation

Barcelona, Spain
Activity: Other

Structural modeling in case of fire
Period: 4 Mar 2011
Luisa Giuliani (Lecturer)
Department of Civil Engineering
Section for Building Design

Related event

Professional course "Fire safety design of steel structures"
04/03/2011 → …
Rome, Italy
Activity: Talks and presentations › Conference presentations

Keramiske Teknikker skaber helt nye udtryk for betonoverflader
Period: 3 Mar 2011
Anja Margrethe Bache (Other)
Department of Civil Engineering
Section for Building Design

Description
Artikel i magasinet Beton 3 2011, s. 30-31, Chefredaktør Jan Broch Nielsen interviewer Anja Margrethe Bache om arbejdet med keramisk glaseret beton og undervisning på Bygningsdesign

Jeg blev interviewet til artiklen.
Documents:
Keramiske Teknikker skaber helt nye udtryk for betonoverflader

Related external organisation

Magasinet Beton 3 2011
Denmark
Activity: Other

Member of Scientific Committee of Building Simulation Conference, Sydney, 2011 (External organisation)
Period: Feb 2011 → 16 Nov 2011
Rune Korsholm Andersen (Participant)
Department of Civil Engineering
Section for Indoor Environment
Degree of recognition: International

Related external organisation

Member of Scientific Committee of Building Simulation Conference, Sydney, 2011
Activity: Membership › Membership in review committee

IDA meeting: Solvarme og solvarmeforskning
Period: 10 Feb 2011
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation
Haslev
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Informationsmøde i Dansk Solvarme Forening: Faktiske energibesparelser
Period: 25 Jan 2011
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation
Dansk Solvarme Forening
2900, Hellerup, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

bips Steering committee (External organisation)
Period: 1 Jan 2011 → 31 Dec 2011
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
The association bips (the initials standing for - in English - construction, information technology, productivity and collaboration) was established in 2003 with the merger of the associations BPS, ibb and IT-Bygge-Net (IT Construction Network). The idea of bips is to consolidate the forces of the construction sector in a visible and powerful association. Working under one umbrella, bips prioritises development needs and initiatives for common methodology and tools across the industry.

The steering committee is responsible for initiation and coordination of projects.

Body type: Steering committee

Related external organisation
bips Steering committee
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Danish Standards S-808 (External organisation)
Period: 1 Jan 2011 → 31 Dec 2011
Jan Karlshøj (Participant)
Department of Civil Engineering
Section for Building Design

Description
Structuring of information, documentation and graphical symbols

Body type: Committee
Links:
http://www.ds.dk/da/udvalg/kategorier/byggeri-og-anlaeg/informationsstrukturering-og-modellering-inden-for-bygge-_og-anlaegsarbejder (Danish Standards)

Related external organisation
Danish Standards S-808
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

A S H R A E Journal (Journal)
Period: 2010
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal
ASHRAE Journal
0001-2491
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 0.16 SJR 0.277 SNIP 0.772, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

BVU*net (External organisation)
Period: 2010 → …
Jan Karlshej (Participant)
Department of Civil Engineering
Section for Building Design

Description
BVU*net er en åben forening for Byggeriets Videns- og Uddannelsesinstitutioner, som skal styrke forskning, undervisning
og formidling indenfor produktivitet, digitalisering og kvalitetsudvikling i byggesektoren. BVU*net skal medvirke til, at denne
viden forankres lokalt i bygge erhvervet og i grund- og efteruddannelser, så byggeriets effektivitet og kvalitet forbedres.

Kasserer
Body type: Bestyrelse

Related external organisation
BVU*net
Activity: Membership › Membership of research networks or expert groups

Journal of Hazardous Materials (Journal)
Period: 2010
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Journal of Hazardous Materials

Related journal
Journal of Hazardous Materials
0304-3894
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

Review of scientific articles for the journal Atmospheric Environment (Journal)
Period: 20 Dec 2010
Gabriel Bekô (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal
Review of scientific articles for the journal Atmospheric Environment
Local database
Activity: Research › Peer review of manuscripts

**Indeklima Forum 2010**
Period: 11 Nov 2010
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Environment

**Description**
Place: Lyngby, Denmark

**Related external organisation**
Unknown external organisation
Activity: Talks and presentations › Conference presentations

**Dealing with exceptions in structural design: Structural safety in case of fire, explosion and other failures**
Period: 9 Nov 2010
Luisa Giuliani (Invited speaker)
Department of Civil Engineering
Section for Building Design

**Description**
Invited talk at the BRE Centre for Fire Safety Engineering, Institute for Infrastructure and Environment, School of Engineering, University of Edinburgh

**Related external organisation**
Unknown external organisation
Activity: Talks and presentations › Conference presentations

**Arbejdsmiljøkonference 2010**
Period: 8 Nov 2010 → 9 Nov 2010
Kåre Hendriksen (Organizer)
Innovation and Sustainability
Department of Civil Engineering

**Related event**
**Arbejdsmiljøkonference 2010**
09/11/2010 → 10/11/2010
Nyborg, Denmark
Activity: Attending an event › Participating in or organising a conference

**Sustainable Buildings II**
Period: 7 Oct 2010 → 8 Oct 2010
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Environment

**Related event**
**Sustainable Buildings II**
07/10/2010 → 08/10/2010
Eindhoven, Netherlands
Activity: Talks and presentations › Conference presentations

**Member of scientific committee of Indoor Air 2011 conference (External organisation)**
Period: 1 Oct 2010 → 10 Jun 2011
Gabriel Bekö (Participant)

Department of Civil Engineering
Section for Indoor Environment

**Related external organisation**

**Member of scientific committee of Indoor Air 2011 conference**
Activity: Membership › Membership in review committee

**Working on Safety 2010**
Period: 8 Sep 2010
Kåre Hendriksen (Speaker)

Innovation and Sustainability
Department of Civil Engineering

**Related event**

**Working on Safety 2010**
08/09/2010 → 11/09/2010
Røros, Norway
Activity: Talks and presentations › Conference presentations

**4th International Conference on Structural Engineering, Mechanics and Computation**
Period: 6 Sep 2010 → 8 Sep 2010
Luisa Giuliani (Speaker)

Department of Civil Engineering
Section for Building Design

**Description**
Organization and chairing of a special session on “Fire Safety Engineering” (W1F) in the 4th International conference on Structural Engineering, Mechanics and Computation (SEMC10), Cape Town, South Africa, 6-8 September 2010

**Related event**

06/09/2010 → 08/09/2010
Cape Town, South Africa, South Africa
Activity: Talks and presentations › Conference presentations

**UDTU**
Period: 1 Sep 2010 → 1 Jan 2013
Jens Henrik Nielsen (Participant)

Department of Civil Engineering
Section for Structural Engineering

**Related event**

**UDTU: Education In University Teaching at DTU**
01/09/2010 → 01/01/2013
Lyngby, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Arbejdsmiljøcertificering
Period: 17 Jun 2010
Kåre Hendriksen (Invited speaker)
Innovation and Sustainability
Department of Civil Engineering
Documents:
Program arbmiljo_certificering_print1 (4)

Related event
Arbejdsmiljøcertificering
17/06/2010 → …
Helsingør, Denmark
Activity: Talks and presentations › Conference presentations

Arctic Engineering Student Challenge
Period: 14 Jun 2010 → 18 Jun 2010
Hans Peter Christensen (Organizer)
Department of Civil Engineering
Arctic Technology Centre
Description
A 4-day international workshop for 10 invited professors from engineering education institutions with a special interest and expertise in active teaching and learning with the objective to discuss the challenge of educating people from population groups with no tradition for higher education and to suggest ideas to enhance the educational process for these students. The workshop output is a report including a catalogue of directly useful ideas and how to implement these in the curriculum.
Documents:
Final report AESC ws2010.pdf

Related event
Arctic Engineering Student Challenge: Workshop Sisimiut June 2010
14/06/2010 → 18/06/2010
Sisimiut, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

3rd European Conference on Permafrost
Period: 13 Jun 2010 → 17 Jun 2010
Frederik Ancker Agergaard (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre, ARTEK
Description
Poster presentation
Conference participation

Related event
3rd European Conference on Permafrost
13/06/2010 → 17/06/2010
Svalbard, Norway
Activity: Talks and presentations › Conference presentations
5-års seminar om Lavenerghuset i Sisimiut
Period: 2 Jun 2010
Carsten Rode (Organizer)
Department of Civil Engineering
Section for Building Physics and Services
Arctic Technology Centre
Links:

Related event

5-års seminar om Lavenerghuset i Sisimiut
02/06/2010 → 02/06/2010
DTU Mødecenter
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

5-års seminar om Lavenerghuset i Sisimiut
Period: 2 Jun 2010
Arne Villumsen (Organizer)
Department of Civil Engineering
Section for Arctic Technology
Arctic Technology Centre
Links:

Related event

5-års seminar om Lavenerghuset i Sisimiut
02/06/2010 → 02/06/2010
DTU Mødecenter
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

5-års seminar om Lavenerghuset i Sisimiut
Period: 2 Jun 2010
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services
Arctic Technology Centre
Links:

Related event

5-års seminar om Lavenerghuset i Sisimiut
02/06/2010 → 02/06/2010
DTU Mødecenter
Activity: Other

5-års seminar om Lavenerghuset i Sisimiut
Period: 2 Jun 2010
Egil Borchersen (Speaker)
Department of Civil Engineering
Section for Building Design
Arctic Technology Centre

Links:

Related event

5-års seminar om Lavenerghuset i Sisimiut
02/06/2010 → 02/06/2010
DTU Mødecenter
Activity: Other

Arbejdsmiljøcertificering som tilsynsredskab og -strategi: Hvad med det psykiske arbejdsmiljø når vi har certificering, standarder og systemer på dagsordenen?
Period: 18 May 2010
Kåre Hendriksen (Invited speaker)

Innovation and Sustainability
Department of Civil Engineering

Related event

Hvad med det psykiske arbejdsmiljø når vi har certificering, standarder og systemer på dagsordenen?
19/05/2010 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

10th Rehva World Congress "Sustainable Energy Use in Buildings"
Period: 9 May 2010 → 12 May 2010
Pawel Wargocki (Chairman)

Department of Civil Engineering
Section for Indoor Environment

Related event

10th Rehva World Congress "Sustainable Energy Use in Buildings"
09/05/2010 → 12/05/2010
Antalya, Turkey
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

10th Rehva World Congress "Sustainable Energy Use in Buildings"
Period: 9 May 2010 → 12 May 2010
Pawel Wargocki (Speaker)

Department of Civil Engineering
Section for Indoor Environment

Related event

10th Rehva World Congress "Sustainable Energy Use in Buildings"
09/05/2010 → 12/05/2010
Antalya, Turkey
Activity: Talks and presentations › Conference presentations

Architectural Engineering
Period: 2 May 2010
Pawel Wargocki (Speaker)

Department of Civil Engineering
Section for Indoor Environment
**Description**
Miljømedicinske forlæsninger

**Related external organisation**

**Aarhus University**
Inge Lehmanns Gade 10, 8000, Aarhus C, Denmark
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

**Review of scientific articles for the journal Indoor Air (Journal)**
Period: 20 Apr 2010
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

**Related journal**

**Review of scientific articles for the journal Indoor Air**
Local database
Activity: Research › Peer review of manuscripts

**COST Action TU0905 : STRUCTURAL GLASS - Novel Design Methods and Next Generation Products (External organisation)**
Period: 7 Apr 2010 → 7 Apr 2014
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering

**Description**
The research network focuses on the development of improved design methods and novel high performance structural glass products that will lead to a safer and energy efficient use of glass in buildings. The network supports researcher mobility and is developing a glass educational pack for universities curricula across Europe. These aims are channelled through the activities of the four working groups:

- WG1 Predicting complex loads on glass structures
- WG2 Material characterization and material improvement
- WG3 Post-fracture performance
- WG4 Novel glass assemblies

Member of Management committee
Degree of recognition: International
Links:
http://www.glassnetwork.org

**Related external organisation**

**COST Action TU0905 : STRUCTURAL GLASS - Novel Design Methods and Next Generation Products**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**OH&S Certification as Tool and Strategy in Labour Inspection**
Period: 18 Mar 2010
Kåre Hendriksen (Speaker)
Innovation and Sustainability
Department of Civil Engineering

**Description**
Foretræde for Nordisk Ministerråds arbejdsmiljøudvalg om samspillet mellem arbejdsmiljøcertificering og arbejdsmiljøregulering i de nordiske lande
Activity: Other
12th Biennial ASCE International Conference on Engineering, Construction, and Operations in Challenging Environments
Period: 14 Mar 2010 → 17 Mar 2010
Luisa Giuliani (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Participation to the conference and presentation of a paper
Links:
http://content.asce.org/conferences/earthspace2010/ (Conference website)

Related event
12th Biennial ASCE International Conference on Engineering, Construction, and Operations in Challenging Environments
14/03/2010 → 17/03/2010
Honolulu, HI, United States
Activity: Talks and presentations › Conference presentations

Aerosol Science and Technology (Journal)
Period: 2009 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Aerosol Science and Technology

Related journal
Aerosol Science and Technology
0278-6826
BFI (2018): BFI-level 1, Scopus rating (2016): CiteScore 1.88 SJR 0.943 SNIP 0.853, ISI indexed (2013): ISI indexed yes,
Web of Science (2018): Indexed yes
Central database
Activity: Research › Peer review of manuscripts

DataCite (External organisation)
Period: 2009 → 2011
Alfred Heller (Member)
Section for Building Physics and Services
Department of Civil Engineering

Description
10 years of DataCite - DOI registry infrastructure for research data.

Member of board
Body type: International Research Infrastructure Provider
Degree of recognition: International
Documents:
DataCite 10 year D-Lib Magazine
Links:
http://www.dlib.org/dlib/january15/brase/01brase.print.html (Article)

Related external organisation
DataCite
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Elected member of Board of Education (External organisation)
Period: 2009 → 2018
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Elected member of Board of Education, Department of Civil Engineering, Technical University of Denmark

Related external organisation
Elected member of Board of Education
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Membership PhD Assessment Committee, The Oslo School of Architecture and Design (External organisation)
Period: 2009 → …
Lotte Bjerregaard Jensen (Participant)
Department of Civil Engineering
Section for Building Design

Description
Membership PhD Assessment Committee, The Oslo School of Architecture and Design, Johan Bettum's PhD
Degree of recognition: International

Related external organisation
Membership PhD Assessment Committee, The Oslo School of Architecture and Design
Activity: Membership › Membership in review committee

Study Board Chairman, DTU Civil Engineering (DTU Byg) (External organisation)
Period: 2009 → …
Per Goltermann (Chairman)
Department of Civil Engineering
Section for Structural Engineering

Related external organisation
Study Board Chairman, DTU Civil Engineering (DTU Byg)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Propagation and Stability of Spherical Flames – Experimental Observations
Period: 9 Dec 2009
Grunde Jomaas (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Place: Haldor Topsøe

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations
12th CECOST Seminar 2009
Period: 8 Dec 2009
Grunde Jomaas (Participant)
Department of Civil Engineering
Section for Building Design
Links:

Related event
12th CECOST Seminar 2009
08/12/2009 → 08/12/2009
Activity: Attending an event › Participating in or organising a conference

Indeklima Forum 2009
Period: 12 Nov 2009
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Description
Place: Ballerup, Denmark

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Arbejdsmiljøkonference 2009
Period: 10 Nov 2009
Kåre Hendriksen (Organizer)
Innovation and Sustainability
Department of Civil Engineering
Documents:
090607 revideret abstrakt uden markeringer ws74[2]

Related event
Arbejdsmiljøkonference 2009
Nyborg, Denmark
Activity: Attending an event › Participating in or organising a conference

1st Joint Meeting of the Scandinavian-Nordic and French Sections of the Combustion Institute
Period: 9 Nov 2009 → 10 Nov 2009
Grunde Jomaas (Participant)
Department of Civil Engineering
Section for Building Design

Related event
1st Joint Meeting of the Scandinavian-Nordic and French Sections of the Combustion Institute
Snekkersten, Denmark
Activity: Attending an event › Participating in or organising a conference
Prevention of fire on board ships: Performance based building regulations in Denmark, concept and experience
Period: 9 Nov 2009 → 19 Nov 2009
Annemarie Poulsen (Speaker)
Department of Civil Engineering
Section for Building Design

Related external organisation
The Danish Society of Engineers, IDA
Kalvebod Brygge 31-33, DK-1780, Copenhagen V, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Understanding Small Enterprises
Period: 21 Oct 2009
Kåre Hendriksen (Speaker)
Department of Civil Engineering

Description
OH&S certification as a tool for managing the effort in small enterprises

Related event
Understanding Small Enterprises: a healthy working life in a healthy business
21/10/2009 → 24/10/2009
Helsingør, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

The 2009 Society of Fire Protection Engineers (SFPE) Annual Meeting, Professional Development Conference and Exposition
Grunde Jomaas (Participant)
Department of Civil Engineering
Section for Building Design
Links:

Related event
The 2009 Society of Fire Protection Engineers (SFPE) Annual Meeting, Professional Development Conference and Exposition
18/10/2009 → 23/10/2009
Scottsdale, Arizona, USA
Activity: Attending an event › Participating in or organising a conference

National Air Filtration Association annual convention 2009
Period: 16 Sep 2009 → 18 Sep 2009
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Description
Place: Toronto, Canada

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations
9th International Healthy Building Conference and Exhibition 2009
Period: 13 Sep 2009 → 17 Sep 2009
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event
9th International Healthy Building Conference and Exhibition 2009
Syracuse, NY, United States
Activity: Talks and presentations › Conference presentations

Experimental Observations of Propagation and Stability of Spherical Flames
Period: 26 Aug 2009
Grunde Jomaas (Speaker)
Department of Civil Engineering
Section for Building Design

Description
Place: University of Edinburgh
Links:

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

LavEByg Konference: Konference om energirenovering af bygninger til lavenerginiveau
Period: 22 Apr 2009
Gregor Albrecht Scheffler (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Description
Moisture problems at wooden beam ends after building renovation
Place: Konferencecenter Søhuset, Scion DTU, Hørsholm
Links:
http://www.lavebyg.dk/Moder/Netvaerkskonferencer/Konference%20om%20strategi%20for%20lavenergirenovering.aspx (EXT-OA)

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Kan arbejdsmiljøsystemer og certificering erstatte lovgivning og tilsyn?
Period: 17 Apr 2009
Kåre Hendriksen (Invited speaker)
Innovation and Sustainability
Department of Civil Engineering
Documents:
090417 MEM konference 2009, Program final uden tilmeldingsblanket
Related event

MEM Konference 2009: Skaber ledelsessystemer og certificering bedre miljø/arbejdsmiljø - kan de erstatte lovgivning og tilsyn?
17/04/2009 → …
Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

Review of scientific articles for the journal Building and Environment (Journal)
Period: 1 Jan 2009 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal

Review of scientific articles for the journal Building and Environment
Local database
Activity: Research › Peer review of manuscripts

Syns- og skønserklæring, B-1906-07: Vedr. varmtvandsforsyning til ejerlejlighed - Ejerforeningen Løvparken ff od Ulla og Lasse Sørensen
Period: 1 Jan 2009 → …
Elsa Andersen (Other)
Department of Civil Engineering
Section for Building Physics and Services

Description
Coordinated by Elsa Andersen

Related external organisation

Strubjerg 382, 9400 Nørresundby
Activity: Other

Energy and Buildings (Journal)
Period: 2008 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Energy and Buildings

Related journal

Energy and Buildings
0378-7788
Central database
Activity: Research › Peer review of manuscripts

Indoor Air (Journal)
Period: 2008 → …
Gabriel Bekö (Reviewer)
Department of Civil Engineering
Section for Indoor Climate and Building Physics

Related journal

Indoor Air
0905-6947
Central database
Activity: Research › Peer review of manuscripts

Solar/electric heating systems for the future energy system
Period: 16 Dec 2008
Simon Furbo (Lecturer)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation

COWI A/S
Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Marie Curie Research Training Network, NANOCEM
Period: 8 Dec 2008 → 10 Dec 2008
Mette Rica Geiker (Organizer)
Department of Civil Engineering
Section for Construction Materials

Related event

Marie Curie Research Training Network, NANOCEM: Course 5, Sustainability of cementitious materials, 08/12/2008 → 10/12/2008
Düsseldorf, Germany
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

IFC, datudveksling
Period: 4 Dec 2008
Jan Karlshej (Speaker)
Department of Civil Engineering
Section for Building Design
Documents:
IFC_dataudveksling.pdf

Related event

IFC, datudveksling
04/12/2008 → 04/12/2008
Københavns Lufthavn
Activity: Talks and presentations › Conference presentations

Prøvning og levetid for solfangere
Period: 3 Dec 2008
Simon Furbo (Participant)
Department of Civil Engineering
Section for Building Physics and Services
Towards tailoring the nanostructure of concrete

Period: 2 Dec 2008
Mette Rica Geiker (Speaker)
Department of Civil Engineering
Section for Construction Materials
Center for Nanoteknologi

Description
Concrete is an artificial rock of stone and sand glued together by cement paste. Since Roman times almost all cementitious binders are based on calcium silicates which with water to form nanoporous reactions products. The nanoporosity and the nanostructure of the reaction products have a major impact on the engineering properties of the hardened concrete. Addition of micro and nanosized particles to cementitious mixtures may result in a more homogeneous and finer pore structure leading to among others improved durability. The cement paste structure and porosity can e.g. be engineered by addition of non-pozzolanic layer silicates (clay) having specific particle shapes and surface properties (e.g., charge and specific surface area). This seems mainly to be due to the growth of calcium-silicate hydrates (C-S-H) on the clay particle surfaces where the nanostructure of the C-S-H seems to depend on the size, shape and charge of the clay particles. Also, the clay particles act as nucleation sites and increase the cement’s reaction rate (Lindgreen et al., 2008).
Concrete is the most widely used construction material because it is an inexpensive and low energy product, and can be made from local materials; approximately 1.6 tons of structural concrete are produced per capita each year. Due to the extensive use of concrete, even minor improvements have a large impact on the sustainability of construction. Lindgreen H, Geiker M, Krøyer H, Springer S, Skibsted J (2008), Microstructure engineering of Portland cement pastes and mortars through addition of ultrafine layer silicates. Cement & Concrete Composites, 30, 686–699, doi:10.1016/j.cemconcomp.2008.05.003
Place: DTU NanoDag

Geofysiske undersøgelser af saltholdig permafrost ved Ilulissat, Grønland: Dansk Geoteknisk Forening Medlemsmøde: Geoteknologi under Arktiske forhold
Period: 13 Nov 2008
Thomas Ingeman-Nielsen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Dansk Geoteknisk Forening

Geofysiske undersøgelser af saltholdig permafrost ved Ilulissat, Grønland: Dansk Geoteknisk Forening Medlemsmøde: Geoteknologi under Arktiske forhold
Period: 13 Nov 2008
Niels Nielsen Foged (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Dansk Geoteknisk Forening

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Geotekniske undersøgelser ved lufthavnen i Ilulissat, Grønland: Dansk Geoteknisk Forening Medlemsmøde: Geoteknologi under Arktiske forhold
Period: 13 Nov 2008
Niels Nielsen Foged (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Dansk Geoteknisk Forening

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Geotekniske undersøgelser ved lufthavnen i Ilulissat, Grønland: Dansk Geoteknisk Forening Medlemsmøde: Geoteknologi under Arktiske forhold
Period: 13 Nov 2008
Thomas Ingeman-Nielsen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Dansk Geoteknisk Forening

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Indeklima Forum 2008
Period: 12 Nov 2008
Gabriel Bekö (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Description
Place: Indeklima Forum - NFA, Copenhagen

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations
Permafrost
Period: 7 Nov 2008
Thomas Ingeman-Nielsen (Lecturer)
Arctic Technology Centre
Department of Civil Engineering
Section for Geotechnics and Geology

Description
Note: Educational Outreach: Seminar om permafrost for HTX klasse på frederiksværk gymnasium

Related external organisation
Technical University of Denmark
Kgs. Lyngby, Denmark
Activity: Other

Permafrost
Period: 7 Nov 2008
Anders Stuhr Jørgensen (Lecturer)
Section for Geotechnics and Geology
Arctic Technology Centre
Department of Civil Engineering

Description
Note: Educational Outreach: Seminar om permafrost for HTX klasse på frederiksværk gymnasium

Related external organisation
Technical University of Denmark
Kgs. Lyngby, Denmark
Activity: Other

Hygrothermal material modelling and its validation
Period: 23 Oct 2008
Gregor Albrecht Scheffler (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation
Eindhoven University of Technology
Netherlands
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Electrokinetics in Civil and Environmental Engineering
Mette Rica Geiker (Participant)
Section for Construction Materials
Department of Civil Engineering

Description
Course lecturer
Lecture 2: Concrete chemistry and porosity
Lecture 3: Chloride ingress and carbonation

Related event
Electrokinetics in Civil and Environmental Engineering: DTU - RILEM Course
7th International Thermal Manikin and Modelling Meeting
Period: 3 Sep 2008 → 5 Sep 2009
Peter Strøm-Tejsen (Participant)
Department of Civil Engineering
Section for Indoor Environment

Related event
7th International Thermal Manikin and Modelling Meeting
03/09/2008 → 05/09/2008
Coimbra, Portugal
Activity: Attending an event › Participating in or organising a conference

IFC
Period: 1 Sep 2008
Jan Karlshøj (Speaker)
Department of Civil Engineering
Section for Building Design
Documents:
C2_Jan_Karlshoej.pdf

Related event
IFC: Nu et krav fra regeringerne
01/09/2008 → 01/09/2008
Hotel Nyborg Strand
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Thermal solar energy activities
Period: 20 Aug 2008
Simon Furbo (Lecturer)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation
Unknown external organisation
Activity: Other

11th International Conference on Indoor Air Quality and Climate
Peter Strøm-Tejsen (Organizer)
Department of Civil Engineering
Section for Indoor Environment

Related event
11th International Conference on Indoor Air Quality and Climate
17/08/2008 → 22/08/2008
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference
**Advanced water stores**
Period: 11 Jun 2008
Simon Furbo (Keynote speaker)
Department of Civil Engineering

**Description**
Keynote presentation ved Solar Thermal Industry Forum
Place: München, Tyskland

**Related external organisation**
Unknown external organisation
Activity: Talks and presentations › Conference presentations

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**Teacher-training workshop on active learning: Aspectos curriculares y metodológicos para la formación de ingenieros de calidad**
Period: 4 Jun 2008 → 6 Jun 2008
Hans Peter Christensen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology

**Related external organisation**
Escuela de ingenieria de antioquia, Medellin, Colombia
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

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**Advanced solar heating systems. Solar domestic hot water systems. Solar combi systems. Solar heating plants**
Simon Furbo (Speaker)
Section for Building Physics and Services
Department of Civil Engineering

**Description**
Keynote presentation at Solar Innovations and Investment Conference
Place: London, UK

**Related external organisation**
Unknown external organisation
Activity: Talks and presentations › Conference presentations

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**Solvarmeanlægs energibesparelser**
Period: 17 May 2008
Simon Furbo (Participant)
Section for Building Physics and Services
Department of Civil Engineering

**Related event**
Solvarmeanlægs energibesparelser
17/05/2008 → 17/05/2008
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

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**Informationsmøde om people, EUs 7. rammeprogram**
Period: 29 Apr 2008
Mette Rica Geiker (Speaker)
Department of Civil Engineering
Permafrost og klimaændringer; Forsknings Døgn
Period: 26 Apr 2008
Thomas Ingeman-Nielsen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Lyngby Stadsbibliotek

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Permafrost og klimaændringer; Forsknings Døgn
Period: 26 Apr 2008
Niels Nielsen Foged (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Place: Lyngby Stadsbibliotek

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Engineering geological studies of Greenlandic permafrost areas
Period: 2 Apr 2008
Thomas Ingeman-Nielsen (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Arctic Technology Centre

Description
Greenland is very sparsely inhabited, with a population of only about 56,000. Nevertheless, over the past decades, the Greenlandic society has undergone rapid development. Airports have been constructed in all major towns, and presently several larger road construction projects are under planning, as mineral exploration, hydropower exploitation and growing tourism poses a demand for better infrastructure. The main concerns when constructing such structures in permafrost terrain are the presence of fine grained sediments, their ice contents and pore water chemistry, due to the impact on ground stability upon thawing. In this presentation we will discuss current knowledge about the distribution and properties of permafrost around mainly urban areas in South-Central West Greenland from Nuuk to Ilulissat. Results of engineering geological and technical investigations will be presented with a focus on applied geophysical methods, especially geoelectrical and georadar measurements, which have proven useful in mapping frozen ground and active layer thickness.
Related event

Engineering geological studies of Greenlandic permafrost areas: IARC Seminar
02/04/2008 → 02/04/2008
International Arctic Research Center, University of Alaska Fairbanks
Activity: Talks and presentations › Conference presentations

Maintenance, Repair and Strengthening
Period: 5 Mar 2008 → 6 Mar 2008
Mette Rica Geiker (Participant)
Section for Construction Materials
Department of Civil Engineering

Description
Lecture A: Basic deterioration mechanisms; Lecture B: Porosity and transport mechanisms
Course lecturer

Related event

Maintenance, Repair and Strengthening
05/03/2008 → 06/03/2008
DTU, Kgs. Lyngby
Activity: Other

Ph.D. course Thermal Stratification in Solar Storage Tanks
Period: 3 Mar 2008
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related event

Ph.D. course Thermal Stratification in Solar Storage Tanks
03/03/2008 → 03/03/2008
Milan, Italy
Activity: Other

Det Digitale Byggeri; 1: Det digitale Fundament, 3D bygherrekrav
Period: 27 Feb 2008
Flemming Vestergaard (Lecturer)
Department of Civil Engineering
Section for Building Design

Description
Introduction to the danish project Digital Construction and the Building Information Model concept. Part of course 2802: Opbygning af bygnings- og bebyggelsesmodeller

Related external organisation

Kunstakademiets Arkitektskole, Copenhagen
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

Regional Planning in Greenland
Period: 23 Jan 2008 → 24 Jan 2008
Kåre Hendriksen (Participant)
Department of Civil Engineering

Related event
Regional Planning in Greenland: International Polar Year
24/01/2008 → 25/01/2008
Nuuk, Greenland
Activity: Attending an event › Participating in or organising a conference

Regional Planning in Greenland
Period: 23 Jan 2008 → 24 Jan 2008
Kåre Hendriksen (Participant)
Department of Management Engineering
Department of Civil Engineering

Related event

Regional Planning in Greenland
23/01/2008 → 24/01/2008
Nuuk, Greenland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Assistance til udvikling af nye/bedre anlæg
Period: 22 Jan 2008
Simon Furbo (Participant)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation

Copenhagen
Activity: Other

Eksperimentelle undersøgelser af små low flow solvarmeanlæg til brugsvandsopvarmning baseret på kappebeholdere
Period: 22 Jan 2008
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services

Related external organisation

Copenhagen
Activity: Other

Fordelte ved ny Grundfos cirkulationspumpe, type SOLAR 15-65
Period: 22 Jan 2008
Simon Furbo (Speaker)
Department of Civil Engineering
Section for Building Physics and Services
Activity: Other

Prediction of chloride binding
Period: 16 Jan 2008
Mette Rica Geiker (Speaker)
Department of Civil Engineering
Section for Construction Materials
Center for Nanoteknologi
Related event

**NanoCem Workshop: Transport Properties of Cementitious Materials**
16/01/2008 → …
Activity: Talks and presentations › Conference presentations

**DANVAK dagen 2008**
Period: 1 Jan 2008 → …
Rune Korsholm Andersen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

**Integrated materials–structural models**
Period: 1 Jan 2008 → …
Mette Rica Geiker (Speaker)
Department of Civil Engineering
Section for Construction Materials

**Occupant behaviour and control of the indoor environment**
Period: 1 Jan 2008 → …
Rune Korsholm Andersen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

**ASHRAE Technical Committee 2.1 "Physiology and Human Environment" (External organisation)**
Period: 2007 → 2016
Arsen Krikor Melikov (Participant)
Department of Civil Engineering
Section for Indoor Environment

**Description**

Place: Bella Center

**Related external organisation**

Unknown external organisation
Activity: Talks and presentations › Conference presentations

**Related external organisation**

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Place: Concrete modelling – CONMOD’08, Delft, The Neherlands

**Related external organisation**

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Place: DTU

**Related external organisation**

Unknown external organisation
Activity: Talks and presentations › Conference presentations

**Description**

Voting Member
Degree of recognition: International
Related external organisation

ASHRAE Technical Committee 2.1 "Physiology and Human Environment"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ASHRAE Technical Committee 5.3 "Room Air Distribution" (External organisation)
Period: 2007 → 2011
Arsen Krikor Melikov (Participant)
Department of Civil Engineering
Section for Indoor Environment
Description
Voting Member
Degree of recognition: International

Related external organisation

ASHRAE Technical Committee 5.3 "Room Air Distribution"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

HVAC & R Research (Journal)
Period: 2007 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment
Description
International Journal of HVAC&R Research Technical
Related journal
HVAC & R Research
2374-4731
Central database
Activity: Research › Peer review of manuscripts

Nonlinear finite element analysis
Period: 2007
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering
Related event
Nonlinear finite element analysis
29/09/2007 → 02/10/2007
Austin, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Short course on The modified CamClay model - a simple elasto plastic model for soil
Ole Hededal (Speaker)
Department of Civil Engineering
Section for Geotechnics and Geology
Introduction
The theory of plasticity has gained a wide application within constitutive modelling of soils. The Critical State Soil Mechanics (CSSM) framework developed by Schofield & Wroth in the 1960ies has proved a powerful basis for the development of elasto-plastic models for soils. One of the most popular models based on the CSSM concepts is the so-called modified CamClay model, which even today is available in most finite element codes for geotechnical analysis. Even though simple, the CamClay model is still able to capture the principle response of a soil sample subjected to various types of loading - drained or undrained - in the triaxial test apparatus. The model may thus be used to enhance the understanding of soil behaviour and serve as an introduction to elasto-plastic modelling of soils. Course objective The aim of this short course is to present a simple elasto-plastic model for soil and demonstrate the application of the model to standard laboratory tests in soil mechanics.

Related external organisation
ENS Cachan, Paris, France
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

The Political Economy of Northern Regional Development
Period: 1 Nov 2007 → 3 Nov 2007
Kåre Hendriksen (Speaker)
Department of Civil Engineering

Description
IPY Workshop

Related event
The Political Economy of Northern Regional Development: International Polar Year
Skagen, Denmark
Activity: Talks and presentations › Conference presentations

FSD Årsmøde 2007 (FSD): Foreningen af Sygehusmaskinmestre i Danmark
Period: 4 Oct 2007
Flemming Vestergaard (Keynote speaker)
Department of Civil Engineering
Section for Planning and Management of Building Processes

Description
Det Digitale Byggeri. Anvendelse, visioner og muligheder

Related external organisation
Pejsegården, Brædstrup
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

10th International Conference on Air Distribution in Rooms
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event
Roomvent - 10th International Conference on Air Distribution in Rooms
13/06/2007 → 15/06/2007
Helsinki, Finland
Activity: Talks and presentations › Conference presentations
Clima 2007 WellBeing Indoor Congress  
Period: 10 Jun 2007 → 14 Jun 2007  
Peter Strem-Tejsen (Participant)  
Department of Civil Engineering  
Section for Indoor Environment  

Related event  
Clima 2007 WellBeing Indoor Congress  
10/06/2007 → 14/06/2007  
Helsinki, Finland  
Activity: Attending an event › Participating in or organising a conference  

Mechanical modelling of Materials in Civil Engineering  
Ole Hededal (Participant)  
Section for Geotechnics and Geology  
Department of Civil Engineering  

Description  
Material models from a soil mechanics perspective: Basic introduction to soil behaviour and requirements to the constitutive models to be applied. Presentation of critical state models and more advanced soil models. Course lecturer.  

Related event  
Mechanical modelling of Materials in Civil Engineering  
04/06/2007 → 09/06/2007  
DTU  
Activity: Other  

Partnering in Theory and Practice  
Period: 9 May 2007  
Stefan Christoffer Gottlieb (Speaker)  
Department of Civil Engineering  
Section for Planning and Management of Building Processes  

Related external organisation  
Københavns Tekniske Skole  
Denmark  
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities  

PhD. day, Department of Civil Engineering, Technical University of Denmark, DTU  
Period: 1 Jan 2007 → …  
Mariana Moreira Cavalcanti Canut (Participant)  
Department of Civil Engineering  
Section for Construction Materials  

Description  
PhD. day at BYG Department: Pore structure and state of water in blended cement  

Related event  
PhD. day, Department of Civil Engineering, Technical University of Denmark, DTU  
01/01/2007 → …  
Kgs. Lyngby, Denmark  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.
6th Glass Stress Summerschool  
Period: 2006  
Jens Henrik Nielsen (Participant)  
Department of Civil Engineering  
Section for Structural Engineering  
Links:  
http://www.glasstress.com/gsss.htm

Related event

6th Glass Stress Summerschool  
01/06/2016 → 02/06/2016  
Tallinn, Estonia  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Computational Contact Mechanics  
Period: 2006  
Jens Henrik Nielsen (Participant)  
Department of Civil Engineering  
Section for Structural Engineering  
Links:  
http://www.cism.it/courses/c0610/

Related event

Computational Contact Mechanics  
Udine, Italy  
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Journal of the Royal Society. Interface (Journal)  
Period: 2006  
Arsen Krikor Melikov (Reviewer)  
Department of Civil Engineering  
Section for Indoor Environment

Description
Journal of the Royal Society Interface

Related journal

Journal of the Royal Society. Interface  
1742-5689  
Central database  
Activity: Research › Peer review of manuscripts

Journal of Ventilation (Journal)  
Period: 2006  
Arsen Krikor Melikov (Reviewer)  
Department of Civil Engineering  
Section for Indoor Environment

Related journal
Healthy Buildings 2006
Period: 4 Jun 2006 → 8 Jun 2006
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event
Healthy Buildings 2006
04/06/2006 → 08/06/2006
Lisbon, Portugal
Activity: Talks and presentations › Conference presentations

International Polar Year
Period: 19 May 2006 → 21 May 2006
Kåre Hendriksen (Speaker)
Innovation and Sustainability
Department of Civil Engineering

Description
Oplæg: Bygdernes betydning - en problematisering

Related event
International Polar Year: Regionaikonference Nuuk 2006
20/05/2006 → 22/05/2006
Nuuk, Greenland
Activity: Talks and presentations › Conference presentations

Abaqus training courses I & II
Period: 2005
Jens Henrik Nielsen (Participant)
Department of Civil Engineering
Section for Structural Engineering

Related event
Abaqus training courses I & II
20/10/2005 → ...
Roskilde, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Building Services Engineering Research & Technology (Journal)
Period: 2005
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Description
Building Services Engineering Research and Technology (CIBSE)

Related journal
Danish Concrete Association, Seminar organisation (External organisation)
Period: 2005 → …
Per Goltermann (Participant)
Department of Civil Engineering
Section for Structural Engineering

Description
Chairman 2007-2013

Related external organisation
Danish Concrete Association, Seminar organisation
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

10th International Conference on Indoor Air Quality and Climate
Period: 4 Sep 2005 → 9 Sep 2005
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event
10th International Conference on Indoor Air Quality and Climate
04/09/2005 → 09/09/2005
Beijing, China
Activity: Talks and presentations › Conference presentations

9th International Conference on Air Distribution in Rooms
Period: 5 Sep 2004 → 8 Sep 2004
Peter Strøm-Tejsen (Participant)
Department of Civil Engineering
Section for Indoor Environment

Related event
9th International Conference on Air Distribution in Rooms
05/09/2004 → 08/09/2004
Coimbra, Portugal
Activity: Attending an event › Participating in or organising a conference

7th International Conference on Healthy Buildings 2003
Period: 7 Dec 2003 → 11 Dec 2003
Peter Strøm-Tejsen (Speaker)
Department of Civil Engineering
Section for Indoor Environment

Related event
7th International Conference on Healthy Buildings 2003
07/12/2003 → 11/12/2003
Singapore, Singapore
Substitution of Volatile Organic Compounds in the graphic industries – possibilities and barriers
Period: 24 Nov 2003
Kåre Hendriksen (Invited speaker)
Department of Civil Engineering
Documents:
030712 Abstract and biographical KKH eng

Related event

Closing Event of the European Week 2003: European Agency for Safety and Health at Work
Bilbao, Spain
Activity: Talks and presentations › Conference presentations

9th International Conference on Indoor Air Quality and Climate
Period: Jul 2002
Peter Strem-Tejsen (Participant)
Department of Civil Engineering
Section for Indoor Environment

Related event

9th International Conference on Indoor Air Quality and Climate
30/06/2002 → 05/07/2002
Monterey, CA, United States
Activity: Attending an event › Participating in or organising a conference

ASHRAE Technical Committee 5.3 "Room Air Distribution" (External organisation)
Period: 2000 → 2004
Arsen Krikor Melikov (Participant)
Department of Civil Engineering
Section for Indoor Environment

Description
Voting Member
Degree of recognition: International

Related external organisation

ASHRAE Technical Committee 5.3 "Room Air Distribution"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

International Journal on Architectural Science (Journal)
Period: 2000 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

Related journal

International Journal on Architectural Science
Local database
Activity: Research › Journal editor
**Building and Environment (Journal)**

Period: 1998 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

**Description**
Building and Environment

**Related journal**

**Building and Environment**
0360-1323
Central database
Activity: Research › Peer review of manuscripts

**TC177/WG2 Prefabricated Components of Lightweight Aggregate Concrete (External organisation)**

Period: 1998 → …
Per Goltermann (Chairman)
Department of Civil Engineering
Section for Structural Engineering

**Related external organisation**

**TC177/WG2 Prefabricated Components of Lightweight Aggregate Concrete**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**Indoor Air Online (Journal)**

Period: 1995 → …
Arsen Krikor Melikov (Reviewer)
Department of Civil Engineering
Section for Indoor Environment

**Description**
Indoor Air Journal

**Related journal**

**Indoor Air Online**
1600-0668
Central database
Activity: Research › Peer review of manuscripts

**DS/S282 Lightweight concrete structures (External organisation)**

Period: 1989 → …
Per Goltermann (Chairman)
Department of Civil Engineering
Section for Structural Engineering

**Description**
Chairman of DS/S282 Code Committee

**Related external organisation**

**DS/S282 Lightweight concrete structures**
Prizes:

**Best Lecture Award**  
Jesper Harrild Sørensen (Recipient)  
Department of Civil Engineering, Section for Structural Engineering

Details  
Awarded date: 31 Aug 2016  
Degree of recognition: International  
Granting Organisations: The International Federation for Structural Concrete  
event: 11th fib International PhD Symposium in Civil Engineering  
Prize: Prizes, scholarships, distinctions

**Best oral presentation at Electrochemical Science & Technology Conference 2017**  
Bente Højlund Hyldegaard (Recipient)  
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description  
My presentation entitled 'Electrochemically induced reduction and oxidation of chlorinated solvents in groundwater' was elected as best presentation given by PhD fellows and Postdocs.

Details  
Awarded date: Nov 2017  
Degree of recognition: International  
Granting Organisations: Danish Electrochemical Society  
event: Electrochemical Science & Technology Conference  
Prize: Prizes, scholarships, distinctions

**Best Ph.D. presentation award**  
Dorte Skaarup Østergaard (Recipient)  
Department of Civil Engineering, Section for Building Energy

Details  
Awarded date: 26 Aug 2015  
Prize: Prizes, scholarships, distinctions

**Best Presentation Award in senior category**  
Svend Svendsen (Recipient)  
Department of Civil Engineering, Section for Building Energy

Details  
Awarded date: 13 Sep 2017  
Degree of recognition: International  
Granting Organisations: Aalborg University  
event: 3rd International Conference on Smart Energy Systems and 4th Generation District Heating  
Prize: Prizes, scholarships, distinctions

**Best Reviewer 2015 Award of Materials and Structures**  
Alexander Michel (Recipient)  
Department of Civil Engineering, Section for Structural Engineering

Details  
Awarded date: 2016  
Degree of recognition: International  
Prize: Prizes, scholarships, distinctions

**buildingSMART Fellow**  
Jan Karlshøj (Recipient)  
Department of Civil Engineering, Section for Building Design
Description
The contribution must have been substantial and of a quality that brought buildingSMART considerably forward.

Details
Awarded date: 3 Apr 2017
Degree of recognition: International
Granting Organisations: buildingSMART International Council
event: buildingSMART: International Standard Summit
Prize: Prizes, scholarships, distinctions

DTU Award for Development of Teaching & Learning
Gunvor Marie Kirkelund (Recipient)
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Received for the case "Project families: How to improve learning in thesis works and increase impact on research" together with 6 colleagues at DTU Civil Engineering.

Details
Awarded date: 4 Dec 2017
Degree of recognition: Local
Prize: Prizes, scholarships, distinctions

DTU Award for Development of Teaching and Learning 2017
Per Goltermann (Recipient)
Department of Civil Engineering, Section for Structural Engineering

Description
The award is granted to teachers who have made a special effort to initiate, investigate, document, and share experiences about development of their teaching and their students’ learning. The objectives are to encourage DTU teachers to systematically and continuously investigate how various teaching methods support their student learning, to make special efforts to develop teaching and learning methods at DTU visible, and hereby to support the ongoing enhancement of the quality of teaching, learning and education at DTU

Details
Awarded date: 4 Dec 2017
Degree of recognition: Local
Granting Organisations: Technical University of Denmark
Prize: Prizes, scholarships, distinctions

DTU-Byg Ph.D. thesis of the year
Jens Henrik Nielsen (Recipient)
Department of Civil Engineering, Section for Structural Engineering

Details
Awarded date: 10 Apr 2009
Prize: Prizes, scholarships, distinctions

DTU Internationalization Award
Gunvor Marie Kirkelund (Recipient)
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Description
Awarded for establishing and coordinating the Nordic Master in Cold Climate Engineering in the Nordic Five Tech-alliance.

Details
Awarded date: 28 Apr 2017
Degree of recognition: Local
Granting Organisations: Technical University of Denmark
Prize: Prizes, scholarships, distinctions
Freescale Semiconductor Prize  
Alexander Michel (Recipient)  
Department of Civil Engineering, Section for Structural Engineering  

Details  
Awarded date: 2008  
Degree of recognition: National  
Granting Organisations: University of the West of Scotland  
Prize: Prizes, scholarships, distinctions  

Geosyntec Student Paper Competition 2015  
Bente Højlund Hyldegaard (Recipient)  
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions  

Description  
The paper entitled 'Assessment of Electrokinetically Enhanced Delivery of Lactate and Bacteria in 1,2-cis-DCE contaminated Limestone' was awarded with a 2nd place in performing cutting-edge research related to assessment and treatment of chemical contaminants in groundwater or soil.  

Details  
Awarded date: Apr 2015  
Degree of recognition: International  
Granting Organisations: Geosyntec Consultants Inc.  
Prize: Prizes, scholarships, distinctions  

REHVA Young Scientist Award  
Gabriel Bekö (Recipient)  
Department of Civil Engineering, Section for Indoor Environment  

Details  
Awarded date: 8 May 2010  
Granting Organisations: Antalia, Turkey  
Prize: Prizes, scholarships, distinctions  

Teacher of the year at DTU  
Per Goltermann (Recipient)  
Department of Civil Engineering, Section for Structural Engineering  

Description  
Teacher of the year at the Technical University of Denmark  

Details  
Awarded date: 3 May 2013  
Degree of recognition: Regional  
Prize: Prizes, scholarships, distinctions  

The Idella Foundation Travel Scholarship  
Frederik Ancker Agergaard (Recipient)  
Department of Civil Engineering, Section for Geotechnics and Geology, Arctic Technology Centre, ARTEK  

Description  
Travel scholarship of DKK 30,000 granted for research stay at Laval University, Quebec, Canada hosted by Professor Guy Doré.  
Visiting phd-student at Laval University during the autumn semester 2011.  

Details  
Awarded date: 5 Sep 2011  
Prize: Prizes, scholarships, distinctions  

The Outstanding Paper Award 2009 (IABSE)  
Jens Henrik Nielsen (Recipient)  
Department of Civil Engineering, Section for Structural Engineering
Description
Together with A.B. Ølgaard and J.F. Olesen

Details
Awarded date: 22 Sep 2010
Prize: Prizes, scholarships, distinctions

Yaglou Award
Gabriel Bekö (Recipient)
Department of Civil Engineering, Section for Indoor Climate and Building Physics

Details
Awarded date: Jul 2014
Degree of recognition: International
Granting Organisations: International Society of Indoor Air Quality and Climate – ISIAQ
Prize: Prizes, scholarships, distinctions

Press clippings:

Forsker og fanger ser masser af muligheder i Qeqertat
Kåre Hendriksen
07/03/2018

Description
Interview i KNR (Grønlands radio og TV) 7. marts 2018
Der er gode muligheder for fangst i området omkring Qeqertat, der kan se frem til at opnå bygdestatus indenfor få år. Det fortæller en forsker og en fanger, der begge har været på besøg i den kommende bygd.
Department of Civil Engineering, Section for Building Design

Media contribution (1)
Forsker og fanger ser masser af muligheder i Qeqertat
07/03/2018
Denmark
Interview i KNR

Wind farms: harvesting energy on shaky grounds and in stormy seas
Evangelos Katsanos & Sebastian Thöns
02/10/2017
Department of Civil Engineering, Section for Structural Engineering

Media contribution (1)
Moving on dangerous grounds – wind power and earthquake exposures in China
02/10/2017
Denmark
Evangelos Katsanos & Sebastian Thöns
Department of Civil Engineering, Section for Structural Engineering

Insuring wind power in China against typhoons and earthquakes
Evangelos Katsanos & Sebastian Thöns
14/09/2017

Description
Les Rendez-Vous de Septembre 2017 (Monte Carlo, Monaco)
Department of Civil Engineering, Section for Structural Engineering
Media contribution (1)

Moving on dangerous grounds – wind power and earthquake exposures in China
14/09/2017
Evangelos Katsanos & Sebastian Thöns
Department of Civil Engineering, Section for Structural Engineering
Press / Media

Ekspert: Sådan overlever en bygd
Kåre Hendriksen
30/05/2017
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Ekspert: Sådan overlever en bygd
30/05/2017
KNR (National), Greenland, Web
Thomas Munk Veirum, Sara K. Jakobsen
http://knr.gl/da/nyheder/sådan-overlever-en-bygd
Kåre Hendriksen
Press / Media

Erhvervsudvikling i bygderne
Kåre Hendriksen
30/05/2017
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Erhvervsudvikling i bygder
30/05/2017
KNR TV Qanorooq (National), Greenland, Television
http://knr.gl/da/tv/qanorooq-daily-news/qanorooq-30052017
Kåre Hendriksen
Press / Media

In Greenland's northernmost village, a melting Arctic threatens the age-old hunt
Kåre Hendriksen
30/04/2017
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

In Greenland's northernmost village, a melting Arctic threatens the age-old hunt
30/04/2017
Washington Post (International), United States, Print
Chris Mooney
6 p.
After being displaced from their native village, a Greenlandic Inugguit community faces a new threat: climate change
Kåre Hendriksen
Press / Media

In Greenland's northernmost village, a melting Arctic threatens the age-old hunt
Kåre Hendriksen
30/04/2017

Description
After being displaced from their native village, a Greenlandic Inugguit community faces a new threat: climate change
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

In Greenland's northernmost village, a melting Arctic threatens the age-old hunt
Kåre Hendriksen
30/04/2017
After being displaced from their native village, a Greenlandic Inughuit community faces a new threat: climate change.

Kåre Hendriksen

Press / Media
Fremtiden byder på flere digitale services i byggebranchen
Alfred Heller
01/01/2017
Department of Civil Engineering, Centre for IT-Intelligent Energy Systems in Cities

Eksperter: Politikere har prioriteret de større byer
Kåre Hendriksen
19/10/2016

Ekspert: Redegørelse kan ikke bruges som grundlag for prioritering
Kåre Hendriksen
17/10/2016

Flere bygder vil lukke
Kåre Hendriksen
14/10/2016
Bygden Kulusuk har som resten ag Grønland store potentialer; Østkystens bedste skole, egen lufthavn og daglige afgange til Island. Så hvorfor er det, at næsten ingen af de lokale forsøger at tjene penge på turisterne?

Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)
Et nyt håb på Grønlands ‘bagside’?
18/05/2016
Information, Print
Emil Rottbøll
Kåre Hendriksen
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Press / Media

Eksperter: Kontrolfirma skulle have fjernet Siemens’ kronesmiley
Kåre Hendriksen
18/05/2016
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Eksperter: Kontrolfirma skulle have fjernet Siemens’ kronesmiley
18/05/2016
Avisen DK, Print
Michael Bræmer og Gitte Redder
Kåre Hendriksen
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Press / Media

Arbejdsmiljøcertificering og fritagelse for Arbejdstilsynets almindelige tilsyn
Kåre Hendriksen
12/05/2016
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Arbejdsmiljøcertificering og fritagelse for Arbejdstilsynets almindelige tilsyn
12/05/2016
DR P1 Orientering, Radio
Jesper Tynell
15 min
Kåre Hendriksen
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Press / Media

Siemens Wind Power’s arbejdsmiljøproblemer og Kronesmiley
Kåre Hendriksen
03/05/2016

Description
Om Siemens Wind Power, arbejdsmiljøcertificering og Kronesmily
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Siemens Wind Power’s arbejdsmiljøproblemer og Kronesmiley
03/05/2016
DR TV Avisen, Television
Kåre Hendriksen
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions
Press / Media

Siemens undgik besøg af Arbejdstilsynet med elitesmiley
Kåre Hendriksen
02/05/2016
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Siemens undgik besøg af Arbejdstilsynet med elitesmiley
Tilbage til start - Grønlands unge: Måske skal de blive i bygderne
Kåre Hendriksen
12/03/2016

Description
Baggrundsartikel i serie om Grønlands unge
Department of Civil Engineering, ARTEK, Section for Arctic Engineering and Sustainable Solutions

Media contribution (1)

Intelligens i væggene og elektronik på byggepladsen
Jan Karlshøj
19/02/2016

Description
Article in an advertising supplement on construction to Jyllands-posten, which is a national distributed newspaper.

Subject
Use of sensors in buildings.
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Erhvervsudvikling i Qaanaaq
Kåre Hendriksen
31/01/2016

Subject
Erhvervsudvikling i Qaanaaq
Department of Civil Engineering

Media contribution (1)
Regionalisering af sundhedsvæsenet og udfordringer i Qaanaaq
Kåre Hendriksen
25/01/2016

Description
Regionalisering af sundhedsvæsenet og udfordringer i Qaanaaq
Department of Civil Engineering

Media contribution (1)

Regionalisering af sundhedsvæsenet og udfordringer i Qaanaaq
25/01/2016
KNR Qanorooq, Television
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Langzeitspeicherung von Wärme mittels Phasenwechselmaterialen
Gerald Englmair
01/01/2016

Subject
Thermal Storage
Department of Civil Engineering, Section for Building Energy

Media contribution (1)

Langzeitspeicherung von Wärme mittels Phasenwechselmaterialen
01/01/2016
Erneuerbare Energie, Web
AEE
http://www.aee.at/aee/index.php?option=com_content&view=article&id=936&Itemid=113
Gerald Englmair
Department of Civil Engineering, Section for Building Energy
Press / Media

Debat om bosætningsmønsteret i Grønland
Kåre Hendriksen
31/10/2015
Department of Civil Engineering

Media contribution (1)

Debat om bosætningsmønsteret i Grønland
31/10/2015
KNR TV, Television
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Mennesker hæmmer it-vækst
Jan Karlshøj
10/09/2015
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Mennesker hæmmer it-vækst
10/09/2015
Børsen, Print
Børsen
http://borsen.dk/nyheder/avisen/artikel/11/120810/artikel.html
Jan Karlshøj
Department of Civil Engineering, Section for Building Design
De kloge flygter fra Grønlands problemer
Kåre Hendriksen
28/02/2015
Department of Civil Engineering

Media contribution (1)

De kloge flygter fra Grønlands problemer
28/02/2015
Ritzau, Print
Kåre Hendriksen
Department of Civil Engineering

Et kar med salt er fremtidens oliefyr
Jakob Brinkø Berg
05/01/2015

Subject
Solvarme, Faseskifte varmelagring
Department of Civil Engineering, Section for Building Physics and Services

Media contribution (1)

Et kar med salt er fremtidens oliefyr
05/01/2015
DTU Avisen, Print
Bertel Henning Jensen
http://emagstudio.win.dtu.dk/E-books/DTU-Avisen/DTUavisen0115_2/#/4/
Jakob Brinke Berg
Department of Civil Engineering, Section for Building Physics and Services

Media coverage on benefit quantification for condition monitoring of offshore wind parks in Eneuerbare Energien, Issue 26, Volume 7 and 8, August 2015, in German.
Sebastian Thöns
01/01/2015

Description
The media coverage is based on interviews of David McMillan, Alan May (Strathclyde University, Glasgow, UK) and Sebastian Thöns.
Department of Civil Engineering, Section for Structural Engineering

Media contribution (1)

Media coverage on benefit quantification for condition monitoring of offshore wind parks in Eneuerbare Energien, Issue 26, Volume 7 and 8, August 2015, in German.
01/01/2015
Eneuerbare Energien, Issue 26, Volume 7 and 8, August 2015, in German., Print
Sun/Media Verlags GmbH, Hannover, Germany
Sebastian Thöns
Department of Civil Engineering, Section for Structural Engineering

Relations
Research outputs:
Economic analysis of condition monitoring systems for offshore wind turbine sub-systems

I laksebygden truer frygten for Inter
Kåre Hendriksen
26/11/2014
Subject
Grønlands bygder
Department of Civil Engineering

Media contribution (1)

I laksbygden truer frygten for inter
26/11/2014
Politiken, Print
adam Hannestad
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Novel ventilation reduces infections in hospitals
Arsen Krikor Melikov
12/11/2014
Department of Civil Engineering, Section for Indoor Environment

Media contribution (1)

Novel ventilation reduces infections in hospitals
12/11/2014
TV2 Nyhederne, Television
Friederike Naja Vageler Felbo (Journalist)
3 min
https://www.dropbox.com/s/nk1dl8vdffqy3/TV2_22-nyhederne_141112.mp4? dl=0
Arsen Krikor Melikov
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Luften i flyet er bedre end sit rygte
Arsen Krikor Melikov
11/11/2014
Department of Civil Engineering, Section for Indoor Environment

Media contribution (1)

Luften i flyet er bedre end sit rygte
11/11/2014
Jyllands-Posten, Print
Oliver Batchelor
http://jyllands-posten.dk/rejser/ECE7185995/Luften-i-flyet-er-bedre-end-sit-rygte/
Arsen Krikor Melikov
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Vinder af Video Research Competition 2014: Storing solar energy using sodium acetate trihydrate and graphite
Jakob Brinke Berg
29/10/2014
Department of Civil Engineering, Section for Building Physics and Services

Media contribution (1)

Vinder af Video Research Competition 2014: Storing solar energy using sodium acetate trihydrate and graphite
29/10/2014
Solarthermalworld.org, Web
Baerbel Epp
http://solarthermalworld.org/content/denmarkbelgium-winner-video-research-competition-2014
Jakob Brinke Berg
Department of Civil Engineering, Section for Building Physics and Services
Press / Media
Storing solar energy using sodium acetate trihydrate and graphite
Jakob Brinke Berg
09/10/2014
Department of Civil Engineering, Section for Building Physics and Services

Media contribution (1)

Storing solar energy using sodium acetate trihydrate and graphite
09/10/2014
YouTube, Web
SolarthermalResearch
http://www.youtube.com/watch?v=sLPrfG9btH0&feature=youtu.be
Jakob Brinke Berg
Department of Civil Engineering, Section for Building Physics and Services

Virksomheder med kronesmiley undgår tilsyn
Kåre Hendriksen
01/09/2014
Department of Civil Engineering

Media contribution (1)

Arbejdsmiljøcertificering
Kåre Hendriksen
01/09/2014
Department of Civil Engineering

Media contribution (1)

Det grønlandske bosætningsmønster
Kåre Hendriksen
10/06/2014

Subject
De økonomiske omkostninger relateret til det grønlandske bosætningsmønster
Department of Civil Engineering

Media contribution (1)
Den arktiske ingeniøruddannelse og råstofudvinding
Kåre Hendriksen
09/06/2014
Department of Civil Engineering

Media contribution (1)

Den arktiske ingeniøruddannelse og råstofudvinding
09/06/2014
Orientering i P1, Radio
Karen Hjulmann
7 min
Kåre Hendriksen
Department of Civil Engineering

Fire Experiments with Sandwich Panels
Grunde Jomaas
01/01/2014
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Fire Experiments with Sandwich Panels
01/01/2014
Print
Grunde Jomaas
Department of Civil Engineering, Section for Building Design

Press / Media

Parametrisk designproces sikrer højere kvalitet i byggeriet
Kristoffer Negendahl
01/01/2014

Description
Interview on the design process of Nordfløjen, a large addition to the hospital Rigshospitalet in central Copenhagen. The interview revolves around the methods and models used to optimize daylight, energy and indoor environment in the building during the early design stage.
Department of Civil Engineering, Section for Building Energy

Media contribution (1)

Parametrisk designproces sikrer højere kvalitet i byggeriet
01/01/2014
LYS (03-2014), Print
Gram, Dorte
http://www.centerforlys.dk/lys.php
The online version of the magazine "LYS"
Kristoffer Negendahl
Department of Civil Engineering, Section for Building Energy

Press / Media

DR2 Morgen: Industriel arkitektur skal genbruges til kulturformål: Musikfest i rå rammer
Peter Andreas Sattrup
03/09/2013

Subject
Industriel arkitektur.
Department of Civil Engineering, Section for Building Design

Media contribution (1)

DR2 Morgen: Industriel arkitektur skal genbruges til kulturformål: Musikfest i rå rammer
DR2 Deadline: Detroit - and sustainable urban development
Peter Andreas Sattrup
25/07/2013
Department of Civil Engineering, Section for Building Design

Media contribution (1)

DR2 Deadline: Detroit - and sustainable urban development
25/07/2013
DR2 Deadline, Television
Martin Krasnik
10min
http://www.dr.dk/tv/se/deadline/deadline-326
Peter Andreas Sattrup
Department of Civil Engineering, Section for Building Design
Press / Media

PhD studie udfordrer den gængse opfattelse af, at de grønlandske bygder er 'dyre'
Kåre Hendriksen
17/04/2013

Subject
Klumme til hjemmesiden
Department of Civil Engineering

Media contribution (1)

PhD studie udfordrer den gængse opfattelse af, at de grønlandske bygder er 'dyre'
17/04/2013
NORA hjemmeside, Web
Jan Mørch Pedersen
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Bygderne ingen belastning
Kåre Hendriksen
19/03/2013
Department of Civil Engineering

Media contribution (1)

Bygderne ingen belastning
19/03/2013
Polarfronten, Print
Poul-Erik Philbert
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Den grønlandske ulighed
Kåre Hendriksen
09/03/2013
Department of Civil Engineering
Den grønlandske ulighed
09/03/2013
Information, Print
Naimah Hussain
Kåre Hendriksen
Department of Civil Engineering
Press / Media

Bygder ikke dyrere end byer
Kåre Hendriksen
07/03/2013
Department of Civil Engineering

Om bygderne økonomi og udvikling
Kåre Hendriksen
06/03/2013
Department of Civil Engineering

Bygderne får mæle
Kåre Hendriksen
01/02/2013
Department of Civil Engineering

Innovation Award FH Wels: Master Thesis
Gerald Englmaier
01/01/2013
Description
2nd place
Department of Civil Engineering
Selvstyrets boliger i miserabel stand
Carsten Rode
06/09/2012

Description

Subject
Siden 1. august har beboerne i det grønlandske selvstyres lejeboliger måttet gribe dybere i lommerne for at betale deres varmeregning. Og der skal skrues godt op for varmen, for en stor del af selvstyrets lejligheder er utætte og plaget af skimmelsvamp.

To ph.d-projekter sætter fokus på grønlandsk byggeri og skimmelsvamp
Når tusinder af lejeboliger i Grønland ikke er bedre end at rive ned, så skyldes det især slid og dårligt vedligehold. Sidste år blev 101 boliger i og uden for Nuuk skimmelrenoveret. Der er også fundet skimmelsvamp i andre bebyggelser. Der er altså nok at tage fat på i Grønland med at renovere, rive ned og bygge nyt. Men måske er der hjælp på vej fra DTU i Danmark, som lige nu søger penge til to ph.d. projekter. Hvoraf det ene skal se på det byggetekniske.

Department of Civil Engineering, Section for Building Physics and Services

Media contribution (1)

Selvstyrets boliger i miserabel stand
06/09/2012
DR P1 - Orientering, Radio
Birgitte Gadegaard
10:31
http://www.dr.dk/P1/orientering/indslag/2012/09/06/154016_1_1_1_1_1_1_1_1.htm
Radioindslag
Carsten Rode
Department of Civil Engineering, Section for Building Physics and Services

Sattrups fornemmelse for dagslys
Peter Andreas Sattrup
21/08/2012

Description
Interview on the key conclusions of my PhD dissertation: Sustainability - Energy Optimization - Daylight and Solar Gains
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Sattrups fornemmelse for dagslys
21/08/2012
arkitektforeningen.dk, Web
Cæcilie Skovmand
http://arkitektforeningen.dk/artikel/nyheder/sattrups-fornemmelse-for-dagslys
Peter Andreas Sattrup
Department of Civil Engineering, Section for Building Design

Danmark forpassede chance for at bygge bæredygtigt
Peter Andreas Sattrup
29/07/2012
Department of Civil Engineering, Section for Building Design

Media contribution (1)
Danmark forpassed chance for at bygge bæredygtigt
29/07/2012
Information, Print
Emil Rottbøll
http://www.information.dk/306981
Peter Andreas Sattrup
Department of Civil Engineering, Section for Building Design
Press / Media

Anja Bache Betonkeramik: Concrete ceramics
Anja Margrethe Bache
01/07/2012
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Anja Bache Betonkeramik: Concrete ceramics
01/07/2012
Arkitektur, Print
Arkitektens forlag
s. 66-72
Anja Margrethe Bache
Department of Civil Engineering, Section for Building Design
Press / Media

Brandsikkerhed ved brug af flammehæmmere
Grunde Jomaas
01/01/2012
Department of Civil Engineering, Section for Building Design

Media contribution (1)

Brandsikkerhed ved brug af flammehæmmere
01/01/2012
Print
Grunde Jomaas
Department of Civil Engineering, Section for Building Design
Press / Media

Smartgeometry
Kristoffer Negendahl
01/01/2012

Description
Interview on the workshop SmartGeometry in New York, Troy
Department of Civil Engineering, Section for Building Energy

Media contribution (1)

Smartgeometry
01/01/2012
Arkitekten (07.2012), Print
Peters, Terri
http://architecturewriter.weebly.com/smartgeometry.html
Kristoffer Negendahl
Department of Civil Engineering, Section for Building Energy
Press / Media

Solvarme skal hjælpe mod høje varmepriser: Jyllands-Posten
Simon Furbo
15/10/2011
Department of Civil Engineering, Section for Building Physics and Services
Media contribution (1)

Solvarme skal hjælpe mod høje varmepriser: Jyllands-Posten
15/10/2011
Print
Simon Furbo
Department of Civil Engineering, Section for Building Physics and Services
Press / Media

Nu tjener husejere på solenergi: Politiken
Simon Furbo
13/08/2011
Department of Civil Engineering, Section for Building Physics and Services
Press / Media

Media contribution (1)

Smiley dækker over ringe arbejdsmiljø
kåre Hendriksen
01/07/2011
Innovation and Sustainability, Department of Civil Engineering

Media contribution (1)

Smiley dækker over ringe arbejdsmiljø
01/07/2011
Fagbladet FOA, Print
Martin Hammer
Kåre Hendriksen
Department of Civil Engineering, Innovation and Sustainability
Press / Media

Krone-smiley skjuler elendigt arbejdsmiljø
kåre Hendriksen
29/05/2011
Innovation and Sustainability, Department of Civil Engineering

Media contribution (1)

Arbejdsmiljøcertificering – udfordringer og muligheder
kåre Hendriksen
01/04/2011

Subject
Arbejdsmiljøcertificering – udfordringer og muligheder
Innovation and Sustainability, Department of Civil Engineering

Media contribution (1)

Arbejdsmiljøcertificering – udfordringer og muligheder
Øje på arbejdsmiljøet april 2011, Print
Marianne Schjøtt Rohweder
Kåre Hendriksen
Innovation and Sustainability, Department of Civil Engineering
Press / Media

Bedre økonomi i private solfangere: Politiken
Simon Furbo
24/01/2011
Department of Civil Engineering, Section for Building Physics and Services
Press / Media

Media contribution (1)

Bedre økonomi i private solfangere: Politiken
24/01/2011
Politiken, Print
Simon Furbo
Department of Civil Engineering, Section for Building Physics and Services
Press / Media

Media contribution (1)

Expert Contribution to article in Urban
Gabriel Bekö
22/11/2010
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Media contribution (1)

Ny DTU-opfindelse stopper smittespredning på hospitaler: Succesfulde forsøg har fået DTU-forskere til at søge patent på et nyt ventilationssystem til hospitalssenge, hvor to bokse med UV-lys indfanger vira og gør den uskadelig. Flere firmaer har vist interesse for systemet.
Zhecho Dimitrov Bolashikov
04/10/2010
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Media contribution (1)

Ny DTU-opfindelse stopper smittespredning på hospitaler: Succesfulde forsøg har fået DTU-forskere til at søge patent på et nyt ventilationssystem til hospitalssenge, hvor to bokse med UV-lys indfanger vira og gør den uskadelig. Flere firmaer har vist interesse for systemet.
04/10/2010
Ingenøren, Print
Freja Czajkowski
http://ing.dk/artikel/ny-dtu-opfindelse-stopper-smittespredning-pa-hospitaler-112591
Zhecho Dimitrov Bolashikov
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Media contribution (1)

Luftrenser på senge stopper smitte
Arsen Krikor Melikov
04/10/2010
Department of Civil Engineering, Section for Indoor Environment
Press / Media

Media contribution (1)
Ny DTU-opfindelse stopper smittespredning på hospitaler
Arsen Krikor Melikov
04/10/2010
Department of Civil Engineering, Section for Indoor Environment

Luftrenser på senge stopper smitte: Forskere har fundet på et nyt ventilationssystem til hospitalssenge - det skal forhindre smitte i at brede sig fra den ene patient til den anden.
Zhecho Dimitrov Bolashikov
10/04/2010
Department of Civil Engineering, Section for Indoor Environment

62-årig fik hånden revet af i godkendt maskine
Kåre Hendriksen
29/01/2010
Innovation and Sustainability, Department of Civil Engineering

Certifikat ikke garanti for at lov overholdes
Kåre Hendriksen
29/01/2010
Innovation and Sustainability, Department of Civil Engineering
Certifikat ikke garanti for at lov overholdes
29/01/2010
Fyns Stifttidende, Print
Peter Welander
Kåre Hendriksen
Innovation and Sustainability, Department of Civil Engineering
Press / Media

Centrifuge på DTU tester møllefundamenter ved 50 g: Ingeniøren
Rasmus Tofte Klinkvort
01/01/2010
Department of Civil Engineering, Section for Geotechnics and Geology

Media contribution (1)

Centrifuge på DTU tester møllefundamenter ved 50 g: Ingeniøren
01/01/2010
Ingeniøren, Print
http://ing.dk/artikel/113038-centrifuge-paa-dtu-tester-moellefundamenter-ved-50-g
DOC-OA
Rasmus Tofte Klinkvort
Department of Civil Engineering, Section for Geotechnics and Geology
Press / Media

Solar energy
Simon Furbo
27/08/2008
Department of Civil Engineering, Section for Building Physics and Services

Media contribution (1)

Solar energy
27/08/2008
Television
Simon Furbo
Department of Civil Engineering, Section for Building Physics and Services
Press / Media

it-standard til byggeriet skal være tvang
Jan Karlshøj
18/01/2008

Description
Artikle about use of IT in construction.

Subject
Interview about mandating use of IFC in state projects in Denmark.
Department of Civil Engineering, Section for Building Design, Rambøll Danmark A/S

Media contribution (1)

Ingeniøren
18/01/2008
Ingeniøren (National), Denmark, Print
Ingeniøren
https://ing.dk/artikel/it-standard-til-byggeriet-skal-vaere-tvang-84748
Weekly journal for engineers
Jan Karlshøj
Rambøll Danmark A/S
Press / Media

BBC - Programme 3: Nightwaves
Maj-Britt Quitzau
Description
The Romans were very interested in it, the Vikings much less so and many think we’re obsessed with it today. Cleanliness is central to religious ceremony, ideas about morality as well as health and the way we order our lives. Night Waves investigates what our relationship with cleanliness says about us in the twenty-first century and examines whether our attitudes are about to change again as water becomes a precious commodity.

Section for Planning and Management of Building Processes, Department of Civil Engineering

Media contribution (1)

BBC - Programme 3: Nightwaves
21/05/2007
Danmarks Radio, København, Radio
Maj-Britt Quitzau
Department of Civil Engineering, Section for Planning and Management of Building Processes

Press / Media

DR P1, Harddisken: Fremtidens arkitekt er (også) programmør
Kristoffer Negendahl
31/03/2007

Description
Interview as part of the national Radio show, Harddisken
Sendt første gang 31. marts kl. 13:30
Arkitekter formgiver de store rammer for vores hverdag - de bestemmer, hvordan vores bygninger ser ud, og hvordan vi indretter og bruger dem. I disse år fokuserer arkitekter mere og mere på at digitalisere designprocessen. Det har mange fordele, men i sidste ende drejer det sig om at kunne skubbe grænser og finde på nye former for byggeri. Harddisken ser nærmere på, hvordan avanceret software hjælper arkitekter med at skabe fremtidens byggeri.
Tilrettelæggelse: Henrik Bo Føhns og Chris Lehmann.
www.dr.dk/harddisken
(Sendt første gang 31. marts).

Subject
National Radio show about technology, design, robots, simulations and architecture

Department of Civil Engineering, Section for Building Design

Media contribution (1)

The future architect is (also) a programmer
31/03/2007
DR P1 Harddisken (National), Denmark, Radio
Henrik Bo Føhns and Chris Lehmann.
30 min
http://www.dr.dk/tjenester/radio/p1/harddisken/harddisken-2017-03-31/
In danish: Arkitekter formgiver de store rammer for vores hverdag - de bestemmer, hvordan vores bygninger ser ud, og hvordan vi indretter og bruger dem. I disse år fokuserer arkitekter mere og mere på at digitalisere designprocessen. Det har mange fordele, men i sidste ende drejer det sig om at kunne skubbe grænser og finde på nye former for byggeri. Harddisken ser nærmere på, hvordan avanceret software hjælper arkitekter med at skabe fremtidens byggeri.
Tilrettelæggelse: Henrik Bo Føhns og Chris Lehmann.
www.dr.dk/harddisken
(Sendt første gang 31. marts).
Kristoffer Negendahl
Press / Media