Precast Pearl-Chain concrete arch bridges - DTU Orbit (08/12/2018)

**Precast Pearl-Chain concrete arch bridges**

A Pearl-Chain Bridge is a closed-spandrel arch bridge consisting of a number of straight pre-fabricated so called Super-Light Deck elements put together in an arch shape by post-tensioning cables. Several Pearl-Chain arches can be positioned adjacent to each other by a crane to achieve a bridge of a desired width. On top of the arch is a filling material to level out the surface of the above road. The filling only transfers vertical loads to the arch. The geometry and material properties of Super-Light Decks are presented, and we refer to several fullscale tests of Pearl-Chain arches where the technology was used. We also study other important components and details in the Pearl-Chain Bridge concept and review the effects of different types of loads. A theoretical case study of a circular 30 m span Pearl-Chain Bridge is presented showing the influence of a number of parameters: The number of post-tensioning cables, the rise to span ratio, the height of the filling, and the height of the Super-Light Decks. We find that Pearl-Chain Bridges can be adjusted to resist specific moment loads by changing the normal force in the arch cross section by altering the above parameters. It is also found that the negative bending moment capacity starts decreasing before the positive bending moment capacity does, when the normal force in the cross section is increased. This is because of the cross section of the Super-Light Decks include a combination of normal concrete and light aggregate concrete with light aggregate concrete blocks in the bottom of the cross section.

The positive bending moment capacity is therefore often larger than the negative, and that corresponds well with the required capacities when a concentrated load close to the quarter point of the span is applied. Such load is critical for arches, and gives a large positive bending moment below the load and a smaller negative bending moment in the unloaded side.

When the Pearl-Chain Bridge concept is compared to other pre-fabricated arch bridge solutions we find a number of advantages when using Pearl-Chain Bridges: Straight elements, combination of normal concrete and light aggregate concrete, flexible design control, and joint details.

**General information**

State: Published
Organisations: Department of Civil Engineering, Section for Building Design
Contributors: Halding, P. S., Hertz, K. D., Schmidt, J. W.
Number of pages: 14
Pages: 214-227
Publication date: 2015
Peer-reviewed: Yes

**Publication information**

Journal: Engineering Structures
Volume: 103
ISSN (Print): 0141-0296
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.32 SJR 1.69 SNIP 2.165
Web of Science (2017): Impact factor 2.755
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.93 SJR 1.547 SNIP 2.037
Web of Science (2016): Impact factor 2.258
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.59 SJR 1.631 SNIP 2.15
Web of Science (2015): Impact factor 1.893
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.4 SJR 1.701 SNIP 2.488
Web of Science (2014): Impact factor 1.838
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.69 SJR 1.967 SNIP 2.799
Web of Science (2013): Impact factor 1.767
ISI indexed (2013): ISI indexed yes