D5.4 Guidelines for interaction between seabed and support structure - DTU Orbit
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Geotechnical aspects of MUPs have been researched as part of the MERMAID project, with particular focus on the stability of foundation soils and their necessary scour protection. Details of this work are published in a number of publications as provided in the reference list. Practitioners will be particularly drawn to the book “Liquefaction around Marine Structures” which covers many of the aforementioned subjects researched within MERMAID regarding liquefaction issues of platform designs (Sumer, 2014). The principal guidelines emerging from the complete body of work are:

Sandy soils have a high liquefaction potential, the effect of which must be accounted for in foundation design. The presence of small quantities of fines within a sandy soil can act to increase the potential for wave-induced liquefaction. For the soils studied, this occurred for fine fractions up to 30% of total mass. Sandy soils with larger quantities of fines, or sandy clays, were less susceptible as the clay behaviour dominates above this fraction.

Liquefaction risk under gravity base foundations should be screened properly in the light of in-situ and lab tests of the seabed soil. The preliminary screening methods in the literature (some of which cited here) can be used as a first assessment. If these assessments indicate any risks, detailed analyses and models should be applied for liquefaction assessment.

When it comes to wave-induced liquefaction, standing waves would be seen in the vicinity of reflecting boundaries of platform foundations. Liquefaction under Standing waves, although qualitatively similar, show features different from that caused by progressive waves. The pore pressure accumulation and liquefaction starts at the nodal section, and progresses towards anti-nodal section due to a diffusion mechanism. The rate of liquefaction at the nodal section seems to be the same with the progressive wave case. Thus, mathematical models for progressive waves would also work for standing waves as far as the nodal section is concerned.

Rock berms (protection cover) on pipelines and power transmission cables are essential to protect the structure from floating to the seabed surface due to liquefaction, and strongly suggested to be constructed. However, once the rock berm is constructed, care must be exercised on backfilling the excavated soil into the trench intentionally or due to sediment transport.

Studies showed that a cover of stones constructed around the platform foundations for scour protection purpose would also serve for increasing the liquefaction resistance of surrounding soil. However, the stability of such stones against sinkage must also be assured, and studies are ongoing to provide guidelines for this too, which should be ready before the completion of the project (before M48).

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