Technische Universiteit Delft

Offshore & Dredging Engineering

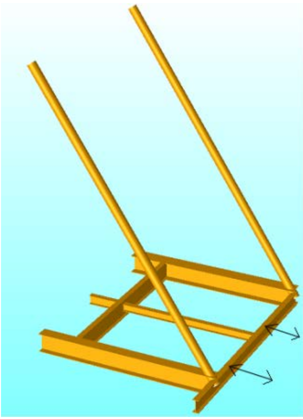
Defining a solid approach for designing a bridge landing against fatigue

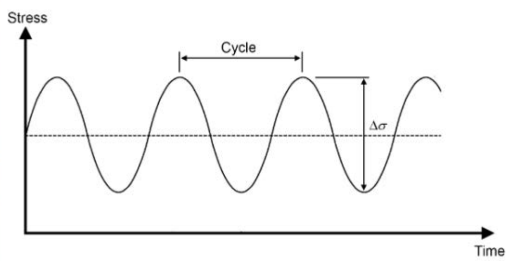
Offshore oil and gas projects usually require the presence of more than one facilities. These need to be connected with each other in order to enable the transfer of personnel. Hence, bridges are implemented, with their ends supported at extensions of the connected platforms, known as bridge landings. The bridge shall be able to follow the excitations that are imposed from the responses of the connected platforms. Thus, its one end should be pinned-supported and the other sliding-supported in order to be able to follow the continuously varying relative movement that is induced by the motion of the two platforms. As a result, friction is generated at the sliding supports of the bridge.

Similarly to any other structure, a bridge landing must be able to withstand the maximum operating loads and its configuration shall be checked against the different limit states. Although a jacket substructure is commonly analysed against the serviceability, ultimate and fatigue limit states, a bridge landing is usually checked against the first two. However, the generated friction induces varying stresses at the corresponding landing. Therefore, it is recommended to verify if the bridge landing is sensitive to fatigue.

This is the motivation behind this thesis, which intends to clarify the sensitivity of a bridge landing into the varying dynamic load of the generated friction. The analysis comprises examining three limit states (SLS, ULS, FLS) in order to highlight the governing one. The fatigue analysis was conducted using a simplified approach that enables to assess it in a straightforward way. This comprises the base case approach, through which assumptions are made regarding the wave and friction main characteristics.

After proving that fatigue is the governing state for such a design, a review of the base case approach was performed. This was achieved through examining the sensitivities of the friction coefficient and the directionality of the incoming waves. Although incorporating wave directionality in the approach does not appear to have a satisfactory impact on the results, a more accurate consideration of the friction coefficient seems a promising improvement. Finally, enhancement of structure is investigated in order to be sufficient against the fatigue requirements. This is achieved through examining four different options, the three of which were efficient.





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