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Dynamic Analysis of Submerged Floating Tunnel Subjected to Hydrodynamic and Seismic Loadings

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Abstract : Submerged floating tunnel (SFT) is a new solution for the transportation infrastructure through sea straits, fjords, and inland waters, and can be a good alternative to long span suspension bridges. SFT is a massive cylindrical structure that floats at a certain depth below the water surface and subjected to extreme environmental conditions. The identification of dominant structural response of SFT becomes more important due to intended environmental conditions for the design of SFT. The time domain dynamic problem of SFT moored by vertical and inclined mooring cables/anchors is formulated. The dynamic time history analysis of SFT subjected to hydrodynamic and seismic excitations is performed. The SFT is modeled by finite element 3D beam, and the mooring cables are modeled by truss elements. Based on the dynamic time history analysis the displacements and internal forces of SFT were calculated. The response of SFT is presented for hydrodynamic and seismic excitations. The transverse internal forces of SFT were the maximum compared to vertical direction, for both hydrodynamic and seismic cases; this indicates that the cable system provides very small stiffness in transverse direction as compared to vertical direction of SFT.

Keywords : submerged floating tunnel, hydrodynamic analysis, time history analysis, seismic response
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