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Dynamics Analyses of Swing Structure Subject to Rotational Forces

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Abstract : Large-scale swing has been used in entertainment and performance, especially in circus, for a very long time. To increase the safety of this type of structure, a thorough analysis for displacement and bearing stress was performed for an extreme condition where a full cycle swing occurs. Different masses, ranging from 40 kg to 220 kg, and velocities were applied on the swing. Then, based on the solution of differential dynamics equation, swing velocity response to harmonic force was obtained. Moreover, the resistance capacity was estimated based on ACI steel structure design guide. Subsequently, numerical analysis was performed in ABAQUS to obtain the stress on each frame of the swing. Finally, the analysis shows that the expansion of swing structure frame section was required for mass bigger than 150kg.

Keywords : swing structure, displacement, bearing stress, dynamic loads response, finite element analysis
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