



Response of a Nuclear Containment with Soil Underneath Under Earthquake Excitation

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Abstract

It aims to study the response of a Nuclear Containment Plant under earthquake excitation resting on stiff soil, hard soil and rock and its behaviour is compared to fix base condition. The NCP is about 67 m high, with an outer diameter of 42 m and a wall thickness of 1.2 m (Cervera ¹). Thus, the overall weight of the structure is very large. To ensure safety against seismic force, there is a need to study the details of seismic analysis.

Linear and Nonlinear behaviour of the model under earthquake loading is being analysed when the reinforced concrete (RC) is modelled both for compression damage and tension strain hardening using Concrete Damage Plasticity Model (ABAQUS). The results obtained is validated with the results presented by Guo-Qiang Liu [3]. The fundamental time period obtained for the structure lying under different types of soil are determined and it is observed that the fundamental time period for a structure lying over rock is almost equal to fixed base which gradually decreases as the soil properties varies. As referred by Guo-Qiang Liu the sine sweep equivalent to El-Centro earthquake [8] is considered for analysis.

The soil is modelled both for finite and infinite domains. It is observed that for a limited soil domain the displacement response is larger than the case where infinite domain is included particularly for lesser stiff soil than rock. With inclusion of infinite element, it is concluded that the displacement response of NC is the least for Stiff Soil whereas for rock it is maximum.

Keywords: SSI, Nuclear containment plant, Finite and infinite soil element, Linear and non-linear analysis, Stress