

## Numerical Verification of a Backfill-Rectangular Tank-Fluid System

**Authors :** Ramazan Livaoğlu, Tufan Çakır

**Abstract :** The performance of rectangular tanks during earthquakes has been observed to depend significantly on the existence of water in the container and the presence of the backfill acting on tank wall. Therefore, in design of rectangular tanks, the topics of fluid-structure-backfill interactions and determination of modal characteristics of the interaction system have traditionally been one of the great theoretical and practical controversy. Although finite element method has been and will continue to be used to a significant extent in treating the response of the system, experimental verification of numerical models remains prerequisite for their adoption and reliable application in practice. Thus, in this study, the numerical and experimental investigations were performed on the backfill-exterior wall-fluid interaction system. Firstly, three dimensional finite element model (3D-FEM) was developed to acquire modal frequencies and mode shapes of the system by means of ANSYS. Secondly, a series of in-situ tests were fulfilled to define modal characteristics of same system to determine the applicability of the FEM to a real physical situation under field conditions. Finally, comparing the theoretical predictions from the model to results from experimental measurement, a close agreement was found between theory and experiment. Thus, it can be easily stated that experimental verification provides strong support for the use of proposed model in further investigations.

**Keywords :** fluid-structure interaction, modal analysis, rectangular tank, soil structure interaction

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