Investigation of buckling in thin-walled steel tanks with different thicknesses under seismic loading

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Abstract

The high-volume reservoirs of fluids used for storage today are very important given the importance of storing oil and water. In this study, the finite element method using Abaqus software has been used to examine the buckling in the sewage steel tanks with different thicknesses under seismic loading. The results showed that the maximum force formed on the wall was 20 mm thick and then the maximum force created was 18 and 22 mm thick, respectively. Therefore, it can be stated that in the design of thin-walled tanks under all-round stresses, the thickness of shell-shaped elements has an effect on the buckling shape and the final behavior of these structures is exposed to earthquake loads.

Keywords: Thin-wall steel tank, Finite element method, Buckling behavior, Wall thickness

1-Introduction

High liquid reservoirs used to store oil and water are of great importance today due to the importance of storing oil and water. These reservoirs are divided into two types of steel and concrete. One reservoir should be designed in terms of gravity, snow, earthquake, hydrostatic loads, and how to observe its health and environmental considerations. Since these reservoirs usually contain a large amount of liquid, so in all stages, special arrangements must be made considering the location of the existing structure and the existing regulations.

Figure (1) Use of steel reservoirs in oilfield plants and refineries