SEISMIC BEHAVIOR OF FIXED OFFSHORE PLATFORM DESIGNED FOR FLOAT-OVER INSTALLATION – CASE STUDY

Yusef JAVADI SINA
Senior Structural Engineer, Pars Oil and Gas Company
y.javadisina@gmail.com

Akbar VASSEGHI
Associate Professor, IIEES, Tehran, Iran
vasseghi@iiees.ac.ir

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Fixed offshore platforms are usually constructed for development of oil and gas fields in relatively shallow water depth. Water depth in the Persian Gulf is less than 100 meters and many such platforms have been installed there. Recently in Persian Gulf and other places with relatively calm environmental conditions, a special method called "float-over" is used to install very large platforms. In this method the substructure called jacket is first installed at the desired location. The barge carrying the topside is passed through the jacket legs and the topside which usually weighs more than 5000 tons is placed on top of the jacket. Pictures showing float-over installation of platform's topside is shown in Figure 1.

(a) (b)

Figure 1. a) Float-over installation of topside; b) Platform after topside installation

The jacket is a pace structure with 4 or 6 legs and horizontal and diagonal members which connect the legs at different levels. The float-over installation requirement for the barge to pass through the jacket dictates no framing members from 8 meter below to 12 meter above the sea level in one of the major directions. Such framing configuration would significantly affect seismic behavior of the platform. This report presents the results of an analytical study on seismic behavior of a platform which has been installed in the Persian Gulf using float-over method.

The seismic behavior of the platform is studied by nonlinear static and dynamic analyses using sap2000 computer program. Three time history records are used for the dynamic analyses. Soil-pile interaction is included in the analytical model using nonlinear soil springs and dashpots as proposed by Matlok et al. (1978) and Naggar and Novak (1996). Results of the analyses indicate that jacket legs just below the topside are vulnerable to seismic loading and there is potential for formation of soft story at this level. The results also indicate that sequence of plastic hinge formation could be properly

estimated by nonlinear static analysis of the platform. The platform is also analysed using the API-PR2A recommended equivalent pile fixed at the base. This model which does not include soil-pile interaction gives a reasonable estimate of the seismic response as compared to the other models.

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