Blast analysis on a liquefied gas storage tank

Marcel ’t Hart,
RoyalHaskoning/PSE, The Netherlands

ABSTRACT

A study of a concrete outer structure of a full-containment liquefied natural gas (LNG) tank is designed for all kinds of emergency cases. Special cases like liquid spill, fire loads as well as earthquake loads are analysed during the static analysis of these tanks.
A special load case is the blastload on the tank. In these circumstances an explosion is assumed close to the tank, severe damage is not allowed in these situations. Gas may not leak and preferable the tank has only local damage or no damage at all.
For the analysis the client specified a general explosion which might occur close to the tank. From this starting point, the analysis is carried out. The tank itself was already modeled during the static stage. Geometrically, no changes were made to the model. The mesh was made coarser than the original mesh to have less elements in the model.
The blast load specification was converted to a DIANA input, with which a time history analysis was carried out. In the model Rayleigh Damping was applied to meet the dynamic specifications. After the calculations have been done, the model was checked with the envelopes to meet the ULS requirements.