CI-T 2 (Mar. 2008) Approval of high density cargo limitation on max filling height

Rule Section

7/4	Sloshing and impact loads
8/2	Cargo Tank Region
App. B	Structural Strength Assessment
App. C	Fatigue Strength Assessment

Description

What calculation procedure applies for approval of high density cargo with restriction on max filling height?

Common Procedure

Filling height of high density liquid cargo, h_{HL}, is not to exceed the following:

$$h_{HL} = h_{tk}\left(\frac{\rho_{appd}}{\rho_{HL}}\right)$$

where,

h_{tk}: tank height
ρ_{appd}: maximum density approved for full filling
ρ_{HL}: density of intended high density cargo

LSM/PSM pres. requirements (Sec.8/2)
no additional checks (assuming ρ_{HL} results in bottom pressures equal to that resulting from density of sea water)

Sloshing(7/4)
- Density of intended high density cargo at maximum filling height and below to be used
- If multiple densities of heavy cargo are intended, it may be necessary to assess sloshing with multiple densities with each corresponding maximum filling height.

Fatigue assessment
Sec.2/3.1.8.2 cargo density of homogeneous fulload condition at full load design draught, T_{full}, minimum 0.9tonnes/m^3.
The cargo density of 0.9 tonnes/m^3 or the cargo density of homogeneous full load design draught, T_{full}, whichever is greater, is to be used. 2. As specified in Section 2/3.1.10.1.(g), higher cargo density for fatigue evaluation for ships intended to carry high density cargo in part load conditions on a regular basis is an owner's extra. Such owner's extra is not covered by the Rules, and need not be considered when evaluating fatigue strength unless specified in the design documentation.

FE assessment
Additional load cases for reduced filling height of a tank are to be based on the standard load cases (full tank) with the density modified as:
$\rho_{appd} = \rho_{HL} \times (h_{HL} / h_{tk})$

Loading Manual
Maximum permissible filling height of high density liquid cargo is to be indicated in the loading manual.

Implementation date

This CI is effective from 1 April 2008.

Background

LSM/PSM pres. requirements (Sec.8/2):
Based on density of sea water, which gives same pressures (within a small margin) as that of reduced filling, hence no additional calculations necessary

Sloshing
HL filling will give increased sloshing pressures, hence need to be checked

Fatigue assessment
Requirement is given in Sec.2/3.1.8.2. Is normally based on cargo density from loading manual, however it is shown that increased density have no effect on fatigue life (dominated by ballast condition below NA) except from uppermost stiffeners in cargo tank, which will not be subject to pressure due to reduced filling.

FE assessment
The principle in CSR is that there are predefined load cases and additional load cases need to be added if the loading manual shows more severe conditions than that assumed in the CSR load cases.