

## « Cargo hold data and prescriptive requirements for CSR BC ships (BC-A and BC-B) »

Recent examinations of structural design on bulk carriers have highlighted some lacks while applying the CSR Rules.

We have the following example. The concerned ship is a panamax vessel of BC-A type built for a dry cargo density of  $3 \text{ t/m}^3$ . During the approval we checked the structure for the low density (less than  $1 \text{ t/m}^3$ ) in homogeneous loading condition and for the maximum density (ore conditions with a density equal to  $3 \text{ t/m}^3$ ) in alternate loading conditions. This was made according to CSR Rules.

Then the shipyard added additional cement cases for a density corresponding to  $1.38 \text{ t/m}^3$ . We do believe that for the authors of URS25, completely introduced in the CSR BC, the conditions imposed through  $M_{\text{Full}}$  in homogeneous loading and through  $M_{\text{HD}}+0.1M_{\text{H}}$  in alternate loading with the maximum density ( $=3 \text{ t/m}^3$ ) cover the worst cases the ship has to sustain. Actually it is not the case. The cement case was more severe than those obtain in homogeneous loading ( $M_{\text{Full}}$ ) or in alternate loading condition with a density equal to  $3 \text{ t/m}^3$ .

For the alternate conditions with a high cargo density, for the same mass in cargo hold (the one imposed by the Rules for the calculations, i.e.  $M_{\text{HD}}+0.1M_{\text{H}}$ ), if the cargo density is progressively reduced from  $3 \text{ t/m}^3$ , the cargo hold is at the same time progressively loaded at a higher level. Consequently the upper part of the cargo hold, mainly the transverse bulkhead, becomes loaded with cargo having a higher density than the  $M_{\text{Full}}$  condition (In  $M_{\text{Full}}$ , the max cargo density should be  $1 \text{ t/m}^3$ ).

So it exists a density for which the cargo hold could be completely full with the required calculation mass,  $M_{\text{HD}}+0.1M_{\text{H}}$ . This density called “minimum high density” is around  $1.3$  to  $1.5 \text{ t/m}^3$ .

BV propose to consider this “minimum high density” in the alternate loading condition for the structural check for avoiding that even if the ship has been verified for the highest density ( $3 \text{ t/m}^3$ ), another lower density could produced higher demand scantling for the structure somewhere in the cargo hold.

The attached file (CargoHoldData Prescriptive Requirements.pdf) is the interpretation we submit for agreement as well as the comparative study made for 2 BC-A ships: one panamax and one cape size (see attached file “Tests CSR MARS - Panamax and Capesize.pdf”).