CI-T 6 (Mar. 2008) Prescriptive scantling calculation of deck transverse fitted above deck

Rule Section

8/2.6.1	Primary Support Members/General
8/2.6.4	Deck transverses
8/7	Application of scantling requirements to other structure

Description

Procedure for the prescriptive scantling calculations of deck transverses fitted above upper deck

Common Procedure

The section modulus and shear area criteria as given in Sections 8/2.6.4.3 and 2.6.4.4 are not applicable to the deck transverses fitted above the upper deck. They are to be obtained by the calculation methods as described in Section 8/7 with the following procedure/guidance:

A. Bending Moment and Shear Force:

1. In general Load Model A (fbdg=12, fshr=0.5) in Table 8.7.1 may be used to calculate the bending moment and shear forces at the ends provided that the connection structure between the deck transverse and side transverse (e.g. overlap length and bracket sizes) is considered to be reasonably rigid.

2. If the connection structure between the deck transverse and side transverse (e.g. overlap length and bracket sizes) is not considered to be rigid enough, Load Model B (fbdg=8, fshr=0.63) in Table 8.7.1 may need to be applied to calculate the bending moment and shear forces at the ship centreline end. At the ship side end, Load Model A (fbdg=12, fshr=0.5) is to be applied.

3. Bending moment as calculated in item 1 or 2 may be reduced by 20% to make the bending moment compatible with that required in Section 8/2.6.4.3.

4. The required section modulus and shear area as calculated in item 3 may be reduced to 85% provided that the reduced scantlings comply with the FE cargo tank structural analysis.

5. As an alternative to using Section 8/7, the required section modulus and shear area may be obtained by finite element method (FEM). In this connection, finite element analysis as indicated in Section 9/2 and Appendix B may be used with the following corrections to align with loads used in Section 8/2.6:
   - ship draught of 1.0Tsc to have an envelope value of the green sea pressure. For this purpose, Loading Patters of A1 and A2 in Table B.2.3 and B1 and B2 in Table B.2.4 may be used with modifying the draught from 0.9Tsc to 1.0Tsc.

     Note: Part load conditions (e.g. A4 and A6 in Table B.2.3 and B4 through B6 in Table B.2.4) may create slightly greater internal pressures than that obtained by A1, A2, B1 and B2. However, these part load conditions need not be performed for simplification of the procedure since the differences are negligible.

- cargo density of 1.025 tonnes/m3. For this purpose, ρ_{max_LM} as defined in B/2.4.7.2 is to be taken as 1.025.

B. Distribution of the required scantlings:

1. Deck transverses are forming “transverse ring” of the hull structure together with other transverse primary support members in one cross section. Therefore, in general, the required section modulus and shear area for deck transverses in accordance with Sections 8/2.6.4.3 and 2.6.4.4 are to be constantly applied over the clear of end brackets, i.e. no reduction of the requirements is allowed towards the mid-span except the following cases:
   - In way of centreline, where the scantlings are determined based on the above A.2.
   - Reinforcements are locally applied based on FE cargo tank structural analysis defined in Section 9.2 and Appendix B.

C. Other Criteria:

1. In addition to the section modulus and shear area requirements, the following criteria in Sections 8/2 and 10/2.3 are applicable, and are to be complied with:
   - Minimum thickness (Section 8/2.1.6)
   - Web depth (Section 8/2.6.4.1) (see Note below)
   - Moment of inertia (Section 8/2.6.4.2)
   - Proportion requirements (Section 10/2.3)

2. With regard to the “web depth” requirement (Section 8/2.6.4.1) in item C.1, where it is impractical to fit a deck transverse with the required web depth, then it is permissible to fit a member with reduced depth provided that the fitted member has an “equivalent inertia/stiffness” to that of the required member in accordance with Section 3/5.3.3.4. This “equivalent inertia/stiffness” can be also demonstrated by "equivalent maximum deflection". See separate Common Interpretation / Procedure” for this process.

Implementation date

This CI is effective from 1 April 2008.

Background

According to Section 8/2.6.1.2, the section modulus and shear area criteria for primary support members contained in Section 8/2.6 apply only to the structural elements listed therein. The section modulus and shear area criteria of other primary support members (including deck transverses fitted above upper deck) are to be obtained by calculation methods as described in Section 8/7, which is a “tool box” type section, and is generally applicable where the basic structural configurations or strength models assumed in Section 8/2 to 8/5 are not appropriate.

Consequently, Section 8/2.6.4.3 (bending requirement) and Section 8/2.6.4.4 (shear requirement) do not apply to the deck transverses fitted above upper deck. The following are the main reasons of not applying the bending and shear requirements in 8/2.6.4.3 and Section 8/2.6.4.4:

1. Section 8/2.6.4.3 includes the considerations for “carry-over” bending moment transmitted from the side transverse or vertical web on longitudinal bulkhead to the deck transverse. Since the deck transverses fitted above the deck has in general less degree of connectivity between the deck transverse and side transverse compared with ordinary deck transverses fitted below the deck, the carry-over bending based requirement is not suitable.

2. For shear, in addition to the local pressure based shear force, there is a consideration against hull deformation is included in Section 8/2.6.4.4. This requirement has been calibrated with the ordinary deck transverses fitted below the deck, but not calibrated with the one fitted above the deck. Therefore, the shear requirement in Section 8/2.6.4.4 is not applicable.