SECTION 5 BOTTOM STRUCTURE

1 General

1.1 Application

1.1.1 The requirements of this Section apply to longitudinally or transversely framed single and double bottom structures.

1.1.2 The requirements of the present section are given for guidance. Any other arrangement may be considered.

1.2 General arrangement

1.2.1 The bottom structure is to be checked by the Designer to make sure that it withstands the loads resulting from the dry-docking of the ship or the lifting by crane.

1.2.2 In case of a charter yacht of more than 12 passengers being considered by the Flag Administration as a passenger ship, it might be necessary to provide a continuous double bottom. In such a case, the relevant requirements of the Ship Rules, are applicable.

1.2.3 Adequate tapering is to be provided between double bottom and adjacent single bottom structures. Similarly, adequate continuity is to be provided in the case of height variation in the double bottom. Where such a height variation occurs within 0,6 L amidships, the inner bottom is generally to be maintained continuous by means of inclined plating.

1.2.4 Provision is to be made for the free passage of water from all parts of the bottom to the sections, by means of scallops in floors and bottom girders.

2 Single bottom

2.1 Longitudinal framing

2.1.1 As a general rule, longitudinally framed single bottom yachts are to be fitted with a centre girder formed by a vertical continuous or intercostal web plate and a horizontal face plate continuous over the floors.

Intercostal web plates are to be aligned and welded to floors.

2.1.2 Where side girders are fitted in lieu of centre girder, the scarfing is to be adequately extended and additional stiffening of the centre bottom may be required. Arrangements similar to [2.1.1] are to be provided.

2.1.3 Where face plates of floors and girders are at same level, the face plate of the stiffer member is generally to be continuous. Butt welds of faces plates is to provide strength continuity.

2.1.4 Centre and side girders are to be extended as far aft and forward as practicable.

2.1.5 As a rule, longitudinal girders are to be fitted in way of each line of pillars.

If not, pillars are to be located in way of a local longitudinal member.

2.1.6 Longitudinal ordinary stiffeners are generally to be continuous when crossing primary members.

2.1.7 Cut-outs fitted in web of floors for bottom ordinary longitudinals are to be taken into account for shear analysis of floors.

2.2 Transverse framing

2.2.1 For guidance, the height, in m, of floors at the centreline should not less than B/16. In the case of ships with considerable rise of floor, this height may be required to be increased so as to assure a satisfactory connection to the frames.

2.2.2 The ends of floors at side are to be located in line with side transverse members.

In some particular cases, it may be accepted that floors end at side on a longitudinal member of the side shell or the bottom.

2.2.3 Openings and cut-outs in web of floors are to be taken into account for shear analysis of floors.

3 Double bottom

3.1 Double bottom height

3.1.1 The double bottom height is to be sufficient to ensure access to all parts and, in way of the centre girder, is to be not less than 0,7 m.

3.1.2 Where the height of the double bottom varies, the variation is generally to be made gradually and over an adequate length; the knuckles of inner bottom plating are to be located in way of plate floors.

Where this is impossible, suitable longitudinal structures such as partial girders, longitudinal brackets etc., fitted across the knuckle are to be arranged.

3.2 Floors

3.2.1 Plate floors are to be fitted:

- in way of transverse watertight bulkheads
- in way of double bottom steps.

3.2.2 Where the double bottom height exceeds 0,9 m, plate floors are to be fitted with vertical stiffeners spaced not more than 1 m apart.

These stiffeners may consist of:

- either longitudinal girders welded to floors
- or flat bars with a width equal to one tenth of the floor depth and a thickness equal to the floors thickness.

3.2.3 Plate floors are generally to be provided with stiffeners in way of longitudinal ordinary stiffeners.

3.2.4 Where the double bottom height exceeds 0,9 m, watertight floors are to be fitted with stiffeners having a net section modulus not less than that required for tank bulkhead vertical stiffeners.

3.2.5 In case of open floors consisting of a frame connected to the bottom plating and a reverse frame connected to the inner bottom plating, the construction principle shown on Fig 1.

3.3 Bottom and inner bottom longitudinal ordinary stiffeners

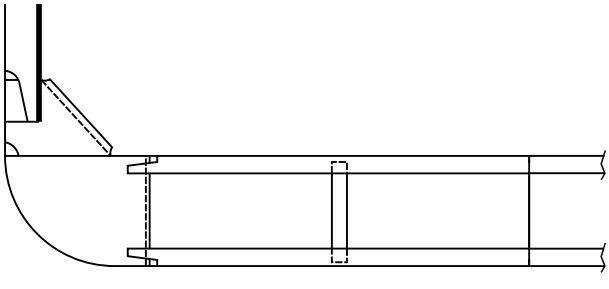
3.3.1 Bottom and inner bottom longitudinal ordinary stiffeners are generally to be continuous through the floors.

4 Bottom structure in way of bulb keel of sailing yachts

4.1 General

4.1.1 The loads induced by the bulb keel on the bottom structure are given in Ch 10, Sec 7.

Figure 1 : Open floor



4.1.2 As a rule, all the reinforced structural members of the bottom in way of the bulb keel are to be double continuous welded.

4.1.3 As a rule, the reinforced structural members of the bottom in way of the bulb keel are checked by direct calculations.

4.2 Keel welded to the bottom structure

4.2.1 Bottom structure is to be locally fitted with longitudinal structure members aligned with side platings of keel fin.

This local reinforcement of bottom structure is to be designed to transfer the tensile/compression forces induced by the sids platings of the keel fin to the floors.

4.2.2 Floors located at fore end and aft end of the keel fin are to be designed to sustain the loads defined in Ch 10, Sec 7 and corresponding to the load case of keel grounding.

4.2.3 As a rule, bottom plate rule thickness calculated according to Ch 8, Sec 3 is to be increased by 50% in way of keel fin.

5 Bilge keel

5.1 Arrangement, scantlings and connections

5.1.1 Arrangement

Bilge keels may not be welded directly on the shell plating. An intermediate flat, or doubler, is required on the shell plating.

The ends of the bilge keel are to be sniped at an angle of 15° or rounded with large radius. They are to be located in way of a transverse bilge stiffener. The ends of the intermediate flat are to be sniped at an angle of 15°.

The arrangement shown in Fig 2 is recommended.

The arrangement shown in Fig 3 may also be accepted.

5.1.2 Materials

The bilge keel and the intermediate flat are to be made of steel or aluminium with the same yield stress and grade as that of the bilge strake.

5.1.3 Scantlings

The thickness of the intermediate flat is to be equal to that of the bilge strake.

5.1.4 Welding

Welding of bilge keel and intermediate plate connections is to be in accordance with Ch 11, Sec 2 for steel structure and Ch 11, Sec 3 for aluminium structure.

Figure 2 : Bilge keel arrangement

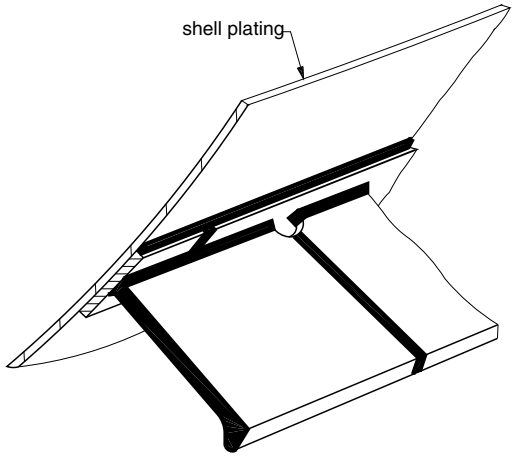


Figure 3 : Bilge keel arrangement