

## 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, Part B, 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 suction, 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.

Intercostal centre girders are to be aligned and bounded 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** When the heights of floors and girders are the same, the web and flange of the stiffer member are generally to be continuous.

**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.

These openings are to be protected as described on Ch 9, Sec 4, [1.4].

### 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.

These openings are to be protected as described in Ch 9, Sec 4, [1.4].

### 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 laminated 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** Laminate 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, watertight floors are to be fitted with stiffeners having a scantling not less than that required for tank bulkhead vertical stiffeners.

### **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.

Openings in floors are to be protected throughout floor thickness.

## **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.

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

### **4.2 Keel bolted to the bottom structure**

**4.2.1** As a rule, bottom laminate rule scantling calculated according to Ch 9, Sec 3 is to be increased by 50% in case of keel fin bolted to bottom structure.

**4.2.2** Bolts are to be high strength bolts.

**4.2.3** Sizing of bolts is to be designed according to Ch 10, Sec 7.

**4.2.4** 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, [2] and corresponding to the load case of keel grounding, as defined in Ch 10, Sec 7, [4].