

# Chapter 3

## Structures

### 3.1 General

This chapter covers those elements of hull and superstructure, which provide longitudinal and other primary and local strength of the craft as a whole and also other important components such as foils and skirts which are directly associated with the hull and superstructure.

*To determine whether the proposals relating to the construction of the ship comply with the requirements of the Regulations the surveyor should obtain from the shipbuilder, owner, or his consultant, all plans and particulars necessary for the consideration of the case. See also Survey and Certification Instructions - Part covering "Fee estimation".*

*All plans, particulars and calculations should be in the English language, or should include an adequate English translation. Measurements should be in metric units.*

*The plans and particulars to be submitted should include the procedures and calculation methods used to justify the arrangements, materials, constructional methods, scantling and closures proposed.*

### 3.2 Materials

Materials used for the hull and superstructure and the other features referred to in 3.1 should be adequate for the intended use of the craft.

*The quality, strength and testing of materials and constructional methods proposed for the hull, bulkheads, decks, superstructures and deckhouses; and any attachments thereto, are to be in accordance with recognised standards such as the requirements of a recognised Classification Society on BSI/ISO. Otherwise particulars on Para 3.1 are to be provided for considerations.*

### 3.3 Structural strength

The structure should be capable of withstanding the static and dynamic loads which can act on the craft under all operating conditions in which the craft is permitted to operate, without such loading resulting in inadmissible deformation and loss of watertightness or interfering with the safe operation of the craft.

*Structural plans:- All plans should identify the nature and physical properties of the materials being used and their means of connection.*

*Where the craft is classed with one of the following Classification Society, namely Lloyds Register of Shipping or the British Committees of Bureau Veritas, Det Norske Veritas, Germanischer Lloyd or Registro Italiano Navale or the British Technical Committee of the American Bureau of Shipping, it will be sufficient for the surveyor to obtain from the shipbuilder or consultant stamped approved copies of the drawings submitted to the Classification Society together with that Society's approval. The surveyor should ensure that the scantlings are*

approved for the proposed subdivision draught and that the strength is sufficient for the intended service. In particular, watertight bulkheads are to be of sufficient strength and construction to withstand, with an adequate margin of resistance, the pressure due to the maximum head of water which may be sustained following damage to the ship, or the pressure due to a head of water up to the margin line or top of the air/overflow pipe, whichever is greater. Such maximum head shall include any additional head which may result from flooding or heeling.

Where a ship is not classed with one of the aforementioned classification societies the owners proposed structural arrangements attachments and means of closure should be examined locally and forwarded to HQ with comments for approval.

### **Requirements for Side Scuttles and Windows - General**

The approach to be taken when considering the acceptance of windows or side scuttles shall depend upon the basis upon which these items have been constructed.

They may be of a type which has previously been “Type Approved” by the certifying authority, they may be constructed to the rules of a recognised classification society or they may have been designed and constructed on a “one-off” basis, in which case approval shall be by reconstruction . See below.

### **Type Approved Side Scuttles and Windows**

Where Side Scuttles and Windows are constructed in accordance with a Type Approved design, then their frames should be marked in accordance with the applicable standard under which such type approval was given. Recognised standards are BSMA24 and BSMA25 and their ISO equivalents, namely ISO 1751 and ISO 3903.

In addition, glasses used in the construction of Side Scuttles and Windows should also comply with the relevant requirements of BSMA24 and BSMA25 or their ISO equivalents, namely ISO 1095 and ISO 614 or ISO 3254 and ISO 614, relating to size and strength of toughened glass panes. Where glass panes used in the construction of Side Scuttles and Windows meet the requirements of one of the above standards for strength, they should be marked in accordance with the provisions of BSMA24, BSMA25 or ISO 614 as appropriate.

Additional checks should be undertaken during plan and as fitted approval, are comparison of the frames and fitting with the requirements of the applicable standard. Where there is any doubt, further comparison would need to be made with the approved drawings cited in the Approval Certificate (or attached Schedules) before any referral was made to headquarters for advice regarding non-compliance of the frame with the approved design or of the approved design in relation to the applicable standard.

Note that the type approved frames of BSMA type should be marked with the thickness of the glass which they are designed to accept. For “double glazed” units, this thickness shall include the full depth of both panes and the intermediate air gap.

### **Class Approved Side Scuttles and Windows**

Where Side Scuttles and Windows are constructed in accordance with the requirements of a recognised classification society, then the surveyor should approach the builders to provide

*supporting documentation in the form of copies of the approved construction drawings stamped and endorsed by the class society.*

*It is of particular importance in such cases that the surveyor should satisfy himself that approval of both the frame and the glasses is given with respect to construction rules which are fully appropriate for the design the proposed protection and the service of the vessel.*

#### ***Side Scuttles and Windows of Non-Approved Type***

*Where Side Scuttles and Windows presented for survey are not of a type previously approved in accordance with the requirements of a recognised standard, then the surveyor should undertake approval of the such items on an individual basis for the vessel concerned (see Para 3.1).*

*The surveyor should assess the materials and construction against a recognised standard appropriate to the proposed application noting that strength tests may be required on sample panes on frame materials to confirm compliance where documentary evidence is not available, and that glass thicknesses are appropriate to the position and size of the each side scuttle or window under consideration, (see under type approval, Para above).*

*Where the design of proposed frames and glasses is shown to comply with the requirements of the applicable standard the frames should be marked during manufacturing in accordance with the provisions of the standard, where such markings are specified, and formal notification of the approval should be given to the builders.*

*In cases where non-approved frames presented for survey do not conform to any recognised standard, or are not in full accordance with the provisions of the applicable standard, full details including supporting documentation regarding the chemical composition and mechanical strength of the materials used should be referred to HQ for consideration of acceptance as an “equivalent” to the requirements of a relevant standard.*

#### ***Side Scuttles and Windows - Glazing Materials other than Glass***

*The material used for side scuttles, windows and for enclosing promenades and deck spaces should normally be heat treated toughened safety glass. However, the use of other materials may be considered provided that these fulfil relevant provisions for strength, stiffen structural fire protection, visibility and location and suitability for use in escapes.*

### **3.4 Cyclic loads**

Cyclic loads, including those from vibrations which can occur on the craft should not:

- .1 impair the integrity of structure during the anticipated service life of the craft or the service life agreed with the Administration;
- .2 hinder normal functioning of machinery and equipment; and
- .3 impair the ability of the crew to carry out its duties.

### 3.5 Design criteria

The Administration should be satisfied that the choice of design conditions, design loads and accepted safety factors corresponds to the intended operating conditions for which certification is sought.

### 3.6 Trials

If the Administration consider it necessary it should require full-scale trials to be taken in which loadings are determined. Cognisance should be taken of the results where these indicate that loading assumptions of structural calculations have been inadequate.

*In general, where it is proposed to use materials other than toughened safety glass panes, their use should be in accordance with the requirements of an acceptable standard appropriate to the proposed Class and service of the vessel. Otherwise, full details of the proposed materials and their use should be submitted to HQ for consideration of acceptance as an 'equivalent' to the requirements of a relevant standard.*

#### ***Internal Glazing of Windows and other Translucent Divisions***

*Where it is proposed to fit internal glazed divisions in a vessel then application of BSMA25, or its equivalent ISO 3903, may not be appropriate.*

*Whilst such internal divisions should be glazed using heat treated toughened safety glass, the use of other materials will be accepted provided that these comply with the requirements of an acceptable standard. Such standards may be those of a recognised classification society, appropriate for the Class and service of the vessel, or other national or international standards applicable to such divisions, provided that they are appropriate to the application under consideration.*

*In such cases the surveyor should satisfy himself that any such division is constructed in a manner which shall afford passengers and crew the maximum protection in the event of breakage.*

*An appropriate standard for such consideration would be BS6206:1981 which relates to the "impact" testing of glazed constructions used in land based applications. This standard grades glazing arrangements in three strength bands A to C, where A affords the highest impact resistance. Glazing arrangements (such as a door or window unit) shall pass the test if the pane "breaks safely" or does not break during the test.*

*It is recommended that only units which meet Class A, and are marked as such, are accepted for marine use, noting that in the case of plastics and laminated glasses, preference should be given to constructions which did not break during impact testing. Copies of test certificates specifying the test result should be available from the manufacturers on request.*

*Alternatively, appropriately marked toughened glass panes, strength tested in accordance with BSMA25 or ISO 614, or another applicable standard, may be accepted for use in*

*internal screens/divisions with the recommendation that panes which exceed 0.75 sq.m in area have a minimum thickness of 10 mm and those smaller than 0.75 sq.m have a minimum thickness of 6 mm.*

*In cases where the surveyor is unsure as to the acceptability of proposed internal glazing arrangements, they should refer the case to MSAS(b) for consideration giving comments and as much detail as possible with respect to the position, construction and glazing of each item, along with details of any markings or certification supplied by the manufacturer/shipbuilder in support of the proposed construction.*