

Uniform Shipping Laws Code 2008

**Section 5C: Construction - Watertight subdivision of
Passenger Vessels
(CTH, NSW, NT, QLD, SA, TAS, VIC & WA)**

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SUB-SECTION C

Watertight subdivision of Passenger Vessels

This section is divided into Parts, as follows:

- Part I: Class 1 Vessels 35 metres and over in measured length
- Part II: Class 1 Vessels less than 35 metres in measured length
- Part III: Provisions applicable to all Class 1 Vessels

Part I Class 1 Vessels 35 metres and over in measured length

C.1 Definitions

- C.1.1 *Criterion numeral* means the criterion numeral of the vessel determined in accordance with such of the provisions of Appendix One of this Sub-section as apply to the vessel.
- C.1.2 *Deepest sub-division load line* means the deepest sub-division load line marked on the vessel in accordance with clause C.60 of this Sub-section.
- C.1.3 *Deepest sub-division load waterline* means the load waterline that corresponds to the greatest drafts determined in accordance with such of the provisions of Appendix One of this Sub-section as apply to the vessel.
- C.1.4 *Draught* means the vertical distance from the base line amidships to a sub-division load waterline.
- C.1.5 *Factor of sub-division* in relation to a vessel or a portion of a vessel means the factor of sub-division for the vessel or that portion of the vessel, as the case may be, determined in accordance with such of the provisions of Appendix One of this Sub-section as apply to that vessel or that portion of the vessel as the case may be.
- C.1.6 *Floodable length*, in relation to a point along the length of a vessel at a draft, means the maximum portion of the vessel having its centre at that point which, at that draft, under the assumption that the vessel has no list, and under such of the assumptions of permeability set out in Appendix One of this Sub-section as are applicable to that portion, can be flooded without submerging any part of the margin line of the vessel.
- C.1.7 *Length* for sub-division purposes means the length measured between the perpendiculars at the extremities of the deepest sub-division load waterline of the vessel.
- C.1.8 *Margin line* means a line drawn at least 76 mm below the upper surface of the bulkhead deck at the side of the vessel and assumed for the purpose of determining the floodable length of the vessel.
- C.1.9 *Permeability* in relation to a space in a vessel, means the percentage of the space below the margin line of the vessel which, on the assumption that it is equipped for the purpose for which it is intended, can be occupied by water.
- C.1.10 *Sub-division load waterline* means a waterline assumed in determining the sub-division of a passenger vessel, in accordance with this Sub-section.

C.2 Watertight sub-division

- C.2.1 A vessel shall be sub-divided below the bulkhead deck into compartments by bulkheads.
- C.2.2 The length of a compartment shall not exceed the permissible length ascertained for that compartment in accordance with Appendix One of this Sub-section.
- C.2.3 Each bulkhead shall be water-tight up to the bulkhead deck.
- C.2.4 Every other portion of the internal structure of the vessel which affects the efficiency of the sub-division of the vessel shall be watertight and of a design which will maintain the integrity of the sub-division.

C.3 Collision Bulkhead

- C.3.1 A vessel shall be provided with a collision bulkhead.
- C.3.2 The collision bulkhead shall be watertight up to the bulkhead deck.
- C.3.3 The distance between the collision bulkhead and the vessel's forward perpendicular shall be not less than 5 per cent of the length of the vessel and not more than 3.05 metres plus 5 per cent of the length of the vessel.
- C.3.4 If the vessel has a long forward superstructure, the collision bulkhead shall be extended to the deck next above the bulkhead deck.
- C.3.5 Where an extension of the collision bulkhead is required by the last preceding subclause:
- (a) the extension shall be weathertight; and
 - (b) if the extension is not fitted directly over the bulkhead below:

- (i) The distance between the extension and the vessel's forward perpendicular shall be not less than 5 per cent of the length of the vessel; and
- (ii) The part of the bulkhead deck which forms the step shall be made weathertight.

C.3.6 The plating and stiffeners of the extension required by sub-clause C.3.4 shall be constructed in accordance with the provisions of the Construction Section appropriate to the material of construction as if the extension formed part of a bulkhead immediately below the bulkhead deck.

C.3.7 Except as provided in the next succeeding sub-clause the collision bulkhead may be pierced below the margin line by not more than one pipe for dealing with fluid in the forepeak tank, if the pipe is fitted with a screwdown valve capable of being operated from above the bulkhead deck and the valve chest is secured inside the forepeak tank to the collision bulkhead.

C.3.8 Where the forepeak is divided to hold two different kinds of liquids the Authority may allow the collision bulkhead to be pierced below the margin line by two pipes, each of which is fitted in accordance with the last preceding sub-clause, if the Authority is satisfied that there is no practical alternative to the fitting of such a second pipe and that, having regard to the additional subdivision provided in the forepeak, the safety of the vessel is maintained.

C.4 Afterpeak and Machinery Space Bulkheads

C.4.1 A vessel shall be provided with a watertight afterpeak bulkhead and with watertight bulkheads dividing the space appropriated to the main and auxiliary propelling machinery, the boilers, if any, and the permanent coal bunkers, if any, from other spaces.

C.4.2 Subject to the next succeeding sub-clause, the bulkheads referred to in the last preceding sub-clause shall be watertight up to the bulkhead deck.

C.4.3 The afterpeak bulkhead may be stopped below the bulkhead deck if the safety of the vessel is not thereby impaired.

C.5 Stern Gland and Stern Tube Compartments

C.5.1 The stern gland of a vessel shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such a volume that, if the tunnel or space is flooded, the margin line will not be submerged.

C.5.2 The stern tube of a vessel shall be enclosed in a watertight compartment the volume of which shall be the smallest compatible with the proper design of the vessel.

C.6 Double Bottom

C.6.1 A vessel the length of which is 50 metres or more but less than 61 metres shall be fitted with a watertight double bottom extending from the machinery space to, or as near as is practicable to, the collision bulkhead.

C.6.2 Subject to the next succeeding sub-clause, a vessel the length of which is 61 metres or more shall be fitted with a watertight double bottom extending from, or from as near as is practicable to, the collision bulkhead to, or as near as is practicable to, the afterpeak bulkhead.

C.6.3 The last preceding sub-clause does not require a double bottom to be fitted in the machinery space of a vessel the length of which is less than 76 metres.

C.7 Inner Bottom of Double Bottom

C.7.1 Where a double bottom is fitted to a vessel in pursuance of the last preceding clause its depth shall not be less than that determined by the Authority and its inner bottom shall be continued out to the sides of the vessel in such a manner as to protect the vessel to the turn of the bilge.

C.7.2 The inner bottom shall be deemed to comply with the last preceding subclause if the line of intersection of the outer edge of the margin plate of the inner bottom with the shell plating of the vessel is not lower at any point than a horizontal plane passing through the point of intersection of the frame line amidships with a line inclined at an angle of twenty-five degrees to the base line amidships and cutting that base line at a point one half of the vessel's moulded breadth from the middle line. See Figure 1

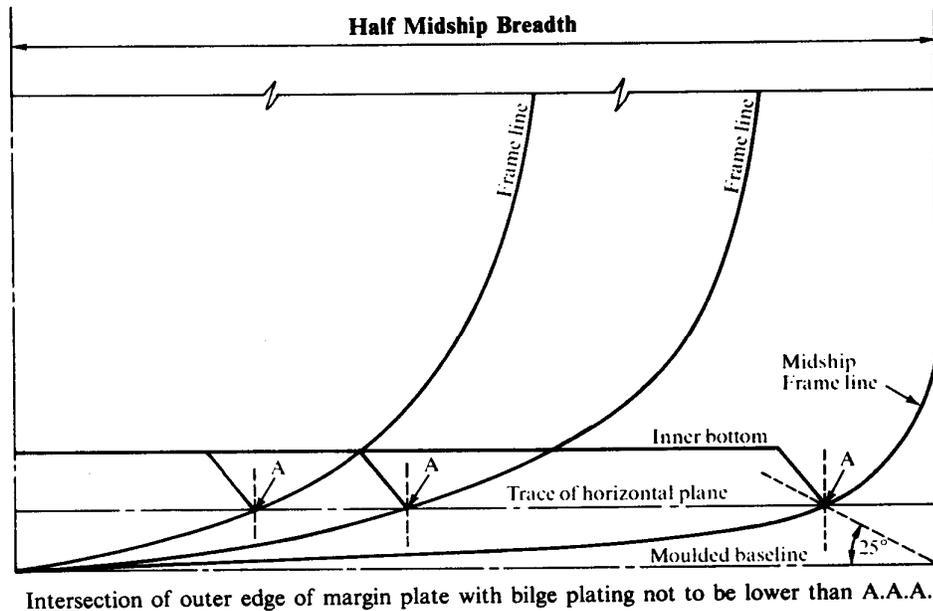


Figure 1

C.8 Well not to be Constructed in Double Bottom

- C.8.1 Subject to sub-clause C.8.3, a well shall not be constructed in a double bottom fitted to a vessel in pursuance of this Sub-section unless the Authority exempts the vessel from the requirements of this sub-clause.
- C.8.2 The Authority shall not exempt a vessel from the requirements of the last preceding sub-clause unless it is satisfied that the protection given to the vessel by the double bottom will not be diminished by reason of the exemption.
- C.8.3 A well may be constructed in the double bottom of a vessel for the purposes of drainage in the after end of the shaft tunnel, if the vessel is a screw vessel and in any other position, if-
- (a) the well is not larger, and does not extend downwards further, than is necessary for that purpose;
 - (b) the depth of the well is not, except in the case of a well at the after end of the shaft tunnel, more than the depth less 457 mm of the double bottom at the centreline; and
 - (c) the well does not, except in the case of a well at the after end of the shaft tunnel, extend below the horizontal plane referred to in sub-clause C.7.2.

C.9 Double Bottom not Required

- C.9.1 Nothing in this Sub-section requires a double bottom to be fitted in a part of a vessel in way of a watertight compartment used exclusively for the carriage of liquids if, in the event of bottom or side damage to that part of the vessel, the safety of the vessel will not be impaired by reason of the absence of the double bottom.

C.10 Determination of Stability in Damaged Condition

- C.10.1 For the purposes of this Sub-section sufficiency of the intact stability of a vessel shall be determined in accordance with the provisions of Appendix Two.

C.11 Intact Stability

- C.11.1 A vessel shall be so constructed as to provide intact stability in all service conditions—
- (a) to enable the vessel to withstand the final flooding of any one of the main compartments into which the vessel is sub-divided in accordance with clause C.2;
 - (b) if two adjacent main compartments of the vessel are separated by a bulkhead which is stepped-to enable the vessel to withstand the final flooding of those compartments;

- (c) if the vessel's factor of sub-division is .5 or less but more than .33-to enable the vessel to withstand the final flooding of any two of the main compartments which are adjacent to each other;
- (d) if the vessel's factor of sub-division is .33 or less-the intact stability shall be adequate to withstand the flooding of any three adjacent main compartments; and
- (e) to meet the requirements of clause C.1 of the Stability Section.

C.12 Unsymmetrical Flooding

- C.12.1 So far as is practicable, a vessel shall be so constructed as to keep at a minimum unsymmetrical flooding when the vessel is in a damaged condition.
- C.12.2 If the margin line of a vessel may become submerged during the flooding assumed for the purposes of the calculation referred to in the Appendix Two the Authority may, after such investigations as it considers necessary, require that the construction of the vessel shall be such that it will be possible to ensure—
- (a) that the maximum angle of heel during any stage of the flooding will not be such as will endanger the safety of the vessel; and
 - (b) that the margin line will not be submerged in the final stage of flooding.
- C.12.3 Where it is necessary to correct large angles of heel, the means adopted shall be self-acting or, if cross-flooding fittings are used, the controls for those fittings shall be capable of being operated from above the bulkhead deck and the time that those fittings take for equalization shall not exceed fifteen minutes.
- C.12.4 If cross-flooding fittings are provided they shall be readily accessible for maintenance.
- C.12.5 The fittings and the maximum heel of the vessel before equalization shall be such as will not endanger the safety of the vessel.

C.13 Information as to Cross-flooding Fittings and Stability To Be Carried on Vessels

- C.13.1 The master or owner of a vessel shall not take the vessel to sea, or permit the vessel to be taken to sea, unless there is provided in the vessel for the use of the master, in writing—
- (a) information as to the use of any cross-flooding fittings provided in the vessel;
 - (b) such information as is necessary for the maintenance of sufficient intact stability under service conditions to enable the vessel to withstand damage to the extent specified in Appendix Two; and
 - (c) in the case of vessels provided with cross-flooding fittings, information as to the conditions of stability on which the calculations of heel have been based, together with the warning that excessive heeling may result should the vessel sustain damage under less favourable conditions.

C.14 Damage Control Plans

- C.14.1 The master or owner of a vessel shall not take the vessel to sea, or permit the vessel to be taken to sea, unless—
- (a) there are permanently exhibited in the wheelhouse or charthouse plans showing clearly for each deck and hold the boundaries of the watertight compartments, the openings in those compartments, the means of closure and the arrangements for the correction of any list due to flooding; and
 - (b) there is on board, in booklet form, a number at least equal to the number of officers normally carried in the vessel, of copies of the information referred to in the last preceding paragraph.

C.15 Exemptions

- C.15.1 The Authority may, by instrument in writing, grant in relation to a vessel (other than a nuclear vessel), subject to such conditions, if any, as it thinks necessary, an exemption from compliance with a requirement of this Sub-section if, in its opinion—
- (a) the intact metacentric height of the vessel in any service condition necessary to meet the requirements of this Sub-section is excessive for the service for which the vessel is intended;

- (b) the proportions, arrangements and other characteristics of the vessel are the most favourable to stability after damage that can practically and reasonably be adopted in the particular circumstances; and
- (c) in all the circumstances it would be unreasonable to require compliance with the requirement.

C.16 Construction of Watertight Bulkheads

C.16.1 Where, by this Section, a bulkhead or other portion of the internal structure of a vessel is required to be watertight, the construction of the bulkhead or other portion of the vessel shall comply with such of the requirements specified in the provisions of the Construction Section appropriate to the material of construction as are applicable to the bulkhead or other portion of the vessel.

C.17 Tanks for Storing Liquids To Be Adequately Constructed

C.17.1 A tank forming part of the structure of a vessel and intended for storing oil fuel or other liquids shall comply with such of the requirements specified in the provisions of the Construction Section appropriate to the material of construction as are applicable.

C.18 Openings In Watertight Bulkheads And Other Structures

C.18.1 The number of openings in a watertight bulkhead, or other internal structure that is required by this Sub-section to be watertight, shall be the minimum compatible with the design and proper working of the vessel and satisfactory means shall be provided for closing those openings.

C.19 Watertight Bulkheads not to be Pierced by Trunkways

C.19.1 Unless the Authority otherwise determines, a watertight bulkhead shall not be pierced by a trunkway or tunnel installed in connexion with a ventilation, forced draught or refrigeration system.

C.20 Doorways in Watertight Bulkheads in Machinery Spaces

C.20.1 The number of doorways (other than bunker or tunnel doorways) which pierce a main transverse watertight bulkhead in the machinery space of a vessel shall not exceed one.

C.20.2 Where a main transverse watertight bulkhead in the machinery space of a vessel is pierced by a doorway, the doorway shall be placed so that the sill of the doorway is as high as possible in the vessel, and the door shall be a sliding door.

C.21 Certain Openings in Watertight Bulkheads not to be Made

C.21.1 A watertight bulkhead outside the machinery space of a vessel shall not be pierced by an opening which may be closed only by a portable bolted plate or plates.

C.22 Doorways, Manholes or Access Openings in Collision Bulkheads

C.22.1 Subject to the next succeeding sub-clause, a doorway, manhole or access opening shall not be fitted-

- (a) in the collision bulkhead of a vessel below the margin line; or
- (b) in any other transverse watertight bulkhead which divides a cargo space from another cargo space or from a permanent or reserve bunker in the vessel.

C.22.2 The Authority may approve of a bulkhead referred to in the last preceding sub-clause which divides two 'tween-deck cargo spaces being fitted with doorways and doors if—

- (a) it is satisfied that the doorways are necessary for the proper working of the vessel;
- (b) the outboard vertical edge of each doorway is as far as practicable from the shell plating of the vessel and, in any case, is not less than one-fifth of the breadth of the vessel, measured at right angles to the centreline of the vessel at the level of the deepest sub-division load waterline, from that plating;
- (c) the doorways are fitted so that the sills of the doorways are as high as possible in the vessel; and
- (d) the doors so fitted are hinged, rolling or sliding doors, the doors are not remotely controlled and the doors are fitted with a device that prevents unauthorised opening.

C.23 Tunnels Passing Through Watertight Bulkheads

- C.23.1 Where a tunnel in a vessel, other than a tunnel running beneath the inner bottom, if any, of the vessel passes through a watertight bulkhead, the tunnel shall be watertight.
- C.23.2 Where a tunnel required by the last preceding sub-clause to be watertight is intended for use as a passage at sea—
- (a) the means of access at one end of the tunnel shall be through a watertight trunkway extending to a height sufficient to permit access above the margin line; and
 - (b) the means of access at the other end of the tunnel shall be through a watertight door.
- C.23.3 A tunnel shall not extend through the first watertight sub-division bulkhead abaft the collision bulkhead.

C.24 Connection of Shaft Tunnels

- C.24.1 Where two or more shafts are fitted in a vessel the tunnels shall be connected by an intercommunicating passage.
- C.24.2 Where two shafts are fitted in a vessel, there shall be only one door between the machinery space and the tunnel spaces.
- C.24.3 Where more than two shafts are fitted in a vessel, there shall be only two doors between the machinery space and the tunnel spaces.

C.25 Openings in Watertight Bulkheads

- C.25.1 If a pipe, scupper, electric cable or other equipment is carried through a watertight sub-division bulkhead, such provisions as are necessary to ensure that the bulkhead is watertight shall be made.
- C.25.2 Valves and cocks not forming part of a piping system shall not be placed in a watertight sub-division bulkhead.
- C.25.3 Lead or other heat sensitive materials shall not be used in a system which penetrates a watertight sub-division bulkhead if deterioration in that system in the event of fire would impair the watertightness of the bulkhead.

C.26 All Openings in Watertight Bulkheads to be Closed by Means of Watertight Doors

- C.26.1 An opening in a watertight bulkhead or other watertight structure shall be provided with a watertight door or other watertight covering by means of which the opening may be closed and made watertight.
- C.26.2 The means of operation of any watertight door, whether power operated or not, shall be capable of closing the door with the vessel listed to fifteen degrees either way.

C.27 Sliding Doors to be Fitted

- C.27.1 A door fitted to an opening referred to in the last preceding clause shall be a sliding door having a horizontal or a vertical motion, a hinged door or a door of an equivalent type, but shall not be a plate door secured only by bolts.
- C.27.2 A hinged door may be fitted to an opening-
- (a) in a bulkhead, not being a collision bulkhead, which divides one 'tweendeck cargo space from another 'tween-deck cargo space; or
 - (b) in a bulkhead or other structure in a passenger space, crew space or working space above a deck the underside of which at its lowest point at side is at least 2.13 metres above the deepest sub-division load waterline,
- but not otherwise.
- C.27.3 A hinged door referred to in the last preceding sub-clause shall be fitted with catches or other quick action closing devices capable of being operated from each side of the bulkhead in which the door is fitted.

C.28 Construction and Fitting of Watertight Doors Generally

- C.28.1 A watertight door shall be of such design, material and construction as will maintain the integrity of the watertight bulkhead in which it is fitted.

C.29 Material of Watertight Doors

- C.29.1 Subject to the next succeeding sub-clause, a watertight door, and the frame of a watertight door, shall be made of cast steel, mild steel or cast iron.
- C.29.2 A watertight door, and the frame of a watertight door, which gives direct access to a space which may contain bunker coal shall not be made of cast iron.

C.30 Closing of Watertight Doors

- C.30.1 A watertight door shall be closed by means other than gravity or a dropping weight.

C.31 Rubbing Faces to be Fitted to Watertight Doors

- C.31.1 A sliding watertight door, or the frame of a sliding watertight door, shall be fitted with rubbing faces of brass or similar material.
- C.31.2 If the width of the rubbing faces is less than 25 mm the rubbing faces shall be fitted in recesses.

C.32 Screw Gear on Watertight Doors

- C.32.1 If a screw gear is used for operating a sliding watertight door, the nut in which the screw works shall be made of a suitable non-corrodible metal.

C.33 Frame of Watertight Doors

- C.33.1 The frame of a watertight door shall be properly fitted to the bulkhead in which the door is situated and the jointing material between the frame and the bulkhead shall be of a type which will not deteriorate or be injured when subject to heat.
- C.33.2 The frame of a vertically sliding watertight door shall be so constructed—
 - (a) that there is no groove in the bottom of the frame in which dirt may lodge; and
 - (b) if the frame is of skeleton form—that dirt cannot lodge in the frame.

C.34 Vertically Sliding Watertight Doors

- C.34.1 The bottom edge of a vertically sliding watertight door shall be tapered or bevelled.
- C.34.2 A vertically sliding watertight door which is operated by power shall be so constructed and fitted that, if the power supply ceases when the door is raised, the door will not drop.

C.35 Horizontally Sliding Watertight Doors

- C.35.1 A horizontally sliding watertight door shall be so installed as to prevent it moving if the vessel rolls and, if necessary, a clip or other suitable device shall be provided to prevent the door from so moving.
- C.35.2 A clip or device referred to in the last preceding sub-clause shall not interfere with the closing of the door when the door is required to be closed.

C.36 Coal-bunker Watertight Doors

- C.36.1 A watertight door which is a coal-bunker door shall be provided with screens or other devices to prevent coal from interfering with the closing of the door.

C.37 Means of Operating Sliding Watertight Doors

- C.37.1 Watertight doors the sills of which are above but not more than 2.13 m above the deepest sub-division load line shall be sliding doors, which may be hand operated.
- C.37.2 Where, in a vessel
 - (a) a trunkway which is part of a refrigeration, ventilation or forced draught system is carried through more than one transverse watertight bulkhead; and
 - (b) the sill of the opening by which the trunk-way is carried through such a bulkhead is not more than 2.13 m above the deepest sub-division load water-line of the vessel,a power operated sliding door shall be fitted to that opening.
- C.37.3 Watertight doors which may, in the normal working of the vessel, be required to be opened at sea, and the sills of which are below the deepest sub-division load line, shall be sliding doors.

- C.37.4 Where the number of the doors referred to in the last preceding sub-clause (excluding doors at entrances to shaft tunnels) exceeds five, they shall be power operated and capable of being simultaneously closed from a central station on the bridge.
- C.37.5 Subject to the next succeeding sub-clause, where—
- (a) the number of doors referred to in sub-clause C.37.3 (excluding doors at entrances to shaft tunnels) is two or more but does not exceed five; and
 - (b) the vessel has passenger spaces below the bulkhead deck,
- those doors shall be power operated and shall be capable of being simultaneously closed from a central station situated on the bridge.
- C.37.6 Where the number of doors referred to in sub-clause C.37.3 is two and they are into or within a machinery space, those doors may be hand operated.
- C.37.7 All doors at the entrances to shaft tunnels or ventilation or forced draught ducts shall be power operated and capable of being simultaneously closed from a central station on the bridge.
- C.37.8 A sliding watertight door—
- (a) which is fitted between bunkers in the 'tween-decks of a vessel below the bulkhead deck; and
 - (b) which may be required to be opened at sea for the purposes of trimming coal,
- shall be power operated.

C.38 Control of Power Operated Sliding Watertight Doors

- C.38.1 Where sliding watertight doors in a vessel are required by this Sub-section to be power operated from a central station on the bridge—
- (a) the gearing shall be so arranged that each door can be operated by power also at the door itself from both sides;
 - (b) the arrangement shall be such that each door will close automatically if opened by local control after being closed from the central station, and also such that each door can be kept closed by local systems which will prevent the door from being opened from the central station;
 - (c) local control handles in connexion with the power gear shall be provided on each side of the bulkhead and shall be so arranged as to enable persons passing through the doorway to hold both handles in the open position without being able to set the closing mechanism in operation accidentally;
 - (d) the doors may have a horizontal or a vertical motion;
 - (e) the vessel shall be provided with at least two independent sources of power for opening and closing those doors;
 - (f) each of those sources of power shall be controlled from the central station on the bridge and shall be capable of operating all those doors simultaneously;
 - (g) indicators shall be fitted on the bridge of the vessel to show whether sufficient power is available from each of those sources for operating the doors;
 - (h) in the case of hydraulic operation, each power source shall consist of a pump capable of closing all the doors in not more than sixty seconds;
 - (i) in the case of hydraulic operation, the whole installation shall have hydraulic accumulators of sufficient capacity to operate all the doors at least three times, that is to say, to close, open, and re-close the doors;
 - (j) the fluid, if any, used for the purpose of operating the doors shall be incapable of freezing at temperatures likely to be encountered on the voyages on which the vessel is, or will be, engaged; and
 - (k) the mechanism for closing the doors shall be so timed that the time taken for a door to close is sufficient to ensure the safety of persons in or near the doorway.
- C.38.2 All power operated watertight doors shall be provided with an approved hand gear workable at the door itself on either side and from an accessible position above the bulkhead deck.

C.39 Control of Sliding Watertight Doors not Power Operated

- C.39.1 Where a sliding watertight door in a vessel is not required by this Sub-section to be operated by power, it may have a horizontal or a vertical motion and shall be provided with an approved hand operated mechanism at the door itself capable of being operated from either side, and from an accessible position above the bulkhead deck.
- C.39.2 The requirement in the last preceding sub-clause that the mechanism at the door is to be capable of being operated from either side does not apply if the layout of the spaces on either side of the door makes compliance with that requirement impossible.
- C.39.3 The mechanism referred to in sub-clause C.39.1 shall be capable of completely closing the door, with the vessel upright, in less than ninety seconds.
- C.39.4 Where a sliding watertight door is in a machinery space of a vessel, the gear by which the door can be operated by hand from above the bulkhead deck shall be situated outside the machinery space unless there is no position outside that space in which the controls can be placed without interfering with the efficiency of that gear.

C.40 Watertight Doors-Indicators

- C.40.1 Each watertight door in a vessel shall be connected with an indicator at each position at which the door may be operated, other than at the door itself, showing whether the door is open or closed.

C.41 Watertight Doors-Communication

- C.41.1 A control of a sliding watertight door in a vessel being a control which operates the door by power, shall be connected to a warning device which, upon any movement of the control to close the door, will give an audible warning at the door in sufficient time before the closing of the door to enable the movement of persons and articles away from the door.
- C.41.2 If a watertight door in a vessel is not capable of being operated from a central control, there shall be installed in the vessel a telegraph, telephone or other means of communication by means of which an order to close the door may be promptly communicated from the bridge.

C.42 Openings-Generally

- C.42.1 The number of openings, and the number of each class of opening in the shell plating of a vessel below the margin line shall be the minimum compatible with the design and proper working of the vessel.
- C.42.2 Such an opening shall be provided with a watertight covering, or other device, by means of which the opening may be closed and made watertight.
- C.42.3 In this clause 'opening' includes a side scuttle (whether opening or non-opening), a port, a scupper and a sanitary discharge opening.
- C.42.4 Side scuttles, their glasses and deadlights shall comply with the requirements of British Standard MA24.

C.43 Side Scuttles not to be Capable of Being Opened

- C.43.1 Where a side scuttle in a vessel is fitted in a 'tween-deck the sill of that side scuttle, and of every other side scuttle in that 'tween-deck, shall be above a line drawn parallel to the bulkhead deck at side, and having its lowest point 2.5 per centum of the breadth of the vessel or 500 mm above the load waterline which ever is the greater distance.
- C.43.2 A side scuttle fitted below the bulkhead deck may be of the opening type if it can be opened only with the consent of the master by means of a key or special tool which does not form part of the scuttle.

C.44 Side Scuttle to be fitted with Watertight Deadlight

- C.44.1 Subject to the next succeeding sub-clause, a side scuttle which is fitted below the margin line of a vessel shall be fitted with a watertight hinged deadlight which shall be permanently attached to the scuttle.
- C.44.2 Where-
- (a) a side scuttle is fitted below the margin line of a vessel in a crew space or in a passenger space; and

- (b) the side scuttle is—
 - (i) abaft a point which is distant one-eighth of the length of the vessel from the forward perpendicular of the vessel; and
 - (ii) above a line drawn parallel to the bulkhead deck at side and having its lowest point at a distance equal to 3.66m plus two and one-half per centum of the breadth of the vessel above the deepest sub-division load waterline of the vessel,

the side scuttle may be provided with a portable watertight deadlight stowed adjacent to the side scuttle, unless the Load Lines Section requires the deadlight in such a case to be permanently attached.

C.45 Position of Side Scuttles

- C.45.1 A side scuttle shall not be fitted below the margin line of a vessel in a space intended solely for the carriage of cargo or coal.
- C.45.2 A side scuttle may be fitted below the margin line of a vessel in a space used alternatively for the carriage of passengers or cargo, if it is so designed and fitted that it, or the deadlight attached to it, can not be opened without the consent of the master of the vessel.
- C.45.3 A side scuttle for automatic ventilation shall not be fitted below the margin line of a vessel.

C.46 Discharges and Inlets to Prevent Accidental Admission of Water

- C.46.1 Each inlet and discharge led through the shell plating of a vessel below the margin line of the vessel shall be fitted with efficient and readily accessible means for preventing the accidental admission of water into the vessel and, in particular, a discharge led through the shell plating of the vessel from space below the margin line of the vessel, not being a discharge in connexion with machinery, shall be provided with—

- (a) one automatic non-return valve fitted with—
 - (i) means by which the valve can be closed from a readily accessible position above the bulkhead deck of the vessel; and
 - (ii) an indicator at the position from which the valve can be closed to show whether the valve is open or closed; or
- (b) two automatic non-return valves the upper of which—
 - (i) shall be of a horizontal balanced type which is normally closed; and
 - (ii) shall be so situated above the vessel's deepest sub-division load waterline as to be always accessible for examination under service conditions.

- C.46.2 Where a valve fitted to a discharge in pursuance of the last preceding subclause is—

- (a) a geared valve; or
- (b) the lower of two non-geared valves, the valve shall be secured to the shell plating of the vessel.

- C.46.3 Lead or other heat sensitive materials shall not be used for pipes fitted outboard of shell valves in inlets or discharges, or any other application, if the deterioration of the pipes in the event of fire would give rise to the danger of flooding.

C.47 Material for Cocks and Valves

- C.47.1 Where—

- (a) a cock or valve is fitted to an inlet or discharge in a vessel;
- (b) the inlet or discharge is not connected with machinery; and
- (c) the cock or valve is situated below the margin line of the vessel or the failure of the cock or valve could affect the sub-division of the vessel,

the cock or valve shall be made of steel, bronze or other approved ductile material.

C.48 Inlets or Discharges Connected with Machinery

- C.48.1 A main or auxiliary inlet or discharge in a vessel, being an inlet or discharge-connected with machinery, shall be fitted with a cock or valve which—
- (a) shall be situated between the pipe connected with the inlet or discharge and the shell plating of the vessel or between that pipe and a fabricated box attached to the shell plating of the vessel;
 - (b) shall be made of steel, bronze or other approved ductile material;
 - (c) if the cock or valve is made of steel—shall be protected against corrosion; and
 - (d) shall be readily accessible.

C.49 Discharge Pipes

- C.49.1 A discharge pipe led through the shell plating of a vessel below the margin line shall not be fitted in a direct line between the outboard opening and the connexion with the deck, water closet or other thing to which the pipe is connected, but shall have a bend or elbow of steel, bronze or other approved ductile material.
- C.49.2 A discharge pipe led through the shell plating of a vessel below the margin line, and the valve or valves fitted to it, shall be protected from damage.

C.50 Bolts Connecting Fittings to Shell Plating

- C.50.1 A bolt which connects a cock, valve, discharge or inlet pipe, or other similar equipment, to the shell plating of a vessel below the margin line of the vessel shall—
- (a) have its head outside the shell plating of the vessel; and
 - (b) be either countersunk or cup-headed.

C.51 Watertight Decks to be Drained

- C.51.1 A drainage system shall be provided for the drainage of each watertight deck of a vessel below the margin line of the vessel and, where drainage pipes are used for that purpose, they shall be so fitted with valves, or otherwise so constructed, as to prevent the passage of water from one to another of the watertight compartments into which the vessel is sub-divided in pursuance of this Sub-section.

C.52 Ash-chutes, Rubbish-chutes

- C.52.1 The inboard opening of an ash-chute, rubbish-chute or other similar chute in a vessel (not being an ash ejector or expeller to which sub-clause C.52.3 applies) shall be fitted with—
- (a) a watertight cover; and
 - (b) where the opening is below the margin line of the vessel—an automatic non-return valve in a readily accessible position above the deepest subdivision load waterline of a vessel.
- C.52.2 The valve referred to in the last preceding sub-clause shall be of a horizontal balanced type which is normally closed and shall be provided with a control at the valve for securing it in a closed position.
- C.52.3 An ash ejector or expeller, the inboard opening of which is in the stokehold of a vessel and below the deepest sub-division load waterline of the vessel, shall be fitted with equipment which will prevent water entering the vessel through the ejector or expeller.

C.53 Ports

- C.53.1 Where a gangway port, cargo port or coaling port is fitted below the margin line of a vessel—
- (a) the port shall be of adequate strength; and
 - (b) the lowest point of the port shall be above the deepest sub-division load waterline of the vessel.

C.54 Openings Above the Bulkhead Deck

- C.54.1 All measures necessary to limit the entry and spread of water above the bulk-heads deck, including the provision of partial watertight bulkheads or webs, shall be taken.

C.54.2 A side scuttle, gangway port, cargo port, coaling port or other fitting for closing an opening in the shell plating above the margin line of a vessel shall be of an approved design, construction and strength, having regard to the space in which it is fitted and its position relative to the deepest sub-division load line.

C.54.3 Where partial watertight bulkheads and webs are fitted on the bulkhead deck, above or in the immediate vicinity of main sub-division bulkheads, they shall have watertight shell and bulkhead deck connections so placed that they restrict the flow of water along the deck when the vessel is in a heeled damaged condition.

C.54.4 If the partial watertight bulkhead does not line up with the bulkhead below, the bulkhead deck between shall be made watertight.

C.55 Bulkhead Deck to be Weathertight

C.55.1 The bulkhead deck, and every deck above the bulkhead deck, of a vessel shall be weathertight and provided with freeing ports, open rails or scuppers capable of rapidly clearing the deck of water under all weather conditions.

C.56 Openings in Weathertight Deck

C.56.1 An opening in a weathertight deck shall have a coaming of adequate height and strength and shall be provided with a weathertight cover by means of which the opening may be rapidly closed.

C.57 Deadlights

C.57.1 Efficient inside deadlights, arranged so that they can be easily and effectively closed and secured watertight, shall be provided for all side scuttles to spaces below the first deck above the bulkhead deck.

C.58 Assignment of Sub-division Load Lines

C.58.1 The Authority shall, having regard to the extent to which a vessel is sub-divided and to the calculations made in accordance with Appendix One in respect of the vessel, determine sub-division draughts for the vessel and shall assign to the vessel sub-division load lines that, subject to the next succeeding sub-clause correspond to the draughts so determined.

C.58.2 The last preceding sub-clause does not authorise the assignment of a sub-division load line that is higher than the load line in salt water assigned to the vessel in accordance with the Load Lines Section.

C.59 Marking of Sub-division Load Lines

C.59.1 A vessel to which sub-division load lines have been assigned in pursuance of the last preceding clause shall be marked on its sides amidships, in accordance with the next succeeding clause, with the sub-division load lines so assigned.

C.59.2 The master or owner of a vessel shall not take the vessel to sea, or permit the vessel to be taken to sea, unless the vessel is marked as required by the last preceding sub-clause.

C.60 Dimensions of Marks

C.60.1 A mark indicating the position of a sub-division load line assigned to a vessel shall—

(a) be placed at a distance below the deck-line marked in the vessel in accordance with clause 52 of the Load Lines Section equal to the freeboard that corresponds to that sub-division load line; and

(b) consist of a horizontal line 25 mm in breadth and 230 mm in length.

C.60.2 A mark referred to in the last preceding sub-clause-

(a) shall be painted in white or yellow on a dark ground or in black on a light ground; and

(b) shall be cut in or centre-punched on steel vessels or cut to a depth of at least 3 mm into the planking on wooden vessels.

C.60.3 The marks referred to in sub-clause C.60.1 shall be identified with the letter C and, in addition, if more than one sub-division load line has been assigned to the vessel, with consecutive numbers beginning from the mark indicating the position of the deepest sub-division load line assigned to the vessel, which shall be identified with the letter and number 'C1'.

- C.60.4 An identifying letter or number referred to in the last preceding sub-clause shall be painted and cut or centre-punched, as the case may be, on the sides of the vessel in the same manner as the mark to which the letter or number relates.

Part II-Class 1 Vessels less than 35 metres in measured length

C.61 Definitions

- C.61.1 Cockpit means an exposed recess in the weather deck of a vessel, extending not more than one-half the length of the vessel. An exposed recess which extends more than one-half of the length of the vessel shall be considered as a well deck. A recess is considered to be exposed unless it is completely enclosed by a superstructure which is weathertight.
- Cockpit decks shall be located as high above the designed load waterline as is practicable. This height shall not be less than 250 mm.
- C.61.2 Damaged stability means the ability of a vessel to attain a position of equilibrium either in the upright or at some specified angle of heel when subjected to the damage specified in Appendix Three.
- C.61.2a Designed load waterline means the deepest load waterline at which the vessel will meet the requirements of clauses C.62, C.63 and C.64 and Part I of SubSection E, Passengers, Passenger Accommodation, Guard Rails and Bulwarks of this Section.
- C.61.3 Flush deck is a continuous weather deck located at the uppermost sheerline of the hull and on which no superstructures are located.
- C.61.3a Length for the purposes of this Part means measured length unless otherwise stated.
- C.61.4 Open vessel for the purposes of this Section is a vessel not protected from entry of water by means of a complete deck or by a combination of a partial weather deck and a weathertight superstructure or deckhouse.
- C.61.5 Well deck is a weather deck, watertight against a head of 1.2 metres of seawater, which is fitted with solid bulwarks such as would impede the drainage of solid water over the sides. If the freeboard to this deck, measured from the designed load waterline is less than 250 mm the vessel shall be considered as an open vessel for the purposes of sub-division, stability and drainage requirements. The deck within the bulwarks is considered to be a weather deck unless it is completely enclosed by a weathertight superstructure.

C.62 Watertight Bulkheads

- C.62.1 Vessels shall comply with one compartment subdivision standards, provided that the Authority, taking into consideration the size, area and duration of operations may exempt a passenger vessel operating solely on smooth water from the requirements of this clause.
- C.62.2 As an alternative to the provision of one compartment sub-division, vessels of less than 15 metres in length may be fitted with sufficient approved internal buoyancy to maintain the fully loaded vessel afloat at an angle of heel not greater than 10° and with a positive metacentric height of not less than 50 millimetres when in the flooded condition. Additionally, the fully loaded vessel should not trim so that any of the following, as appropriate, are submerged:
- (a) a line drawn at least 76 mm below the upper surface of the bulkhead deck at the side of the vessel,
 - (b) in the case of a vessel with a raised deck forward, the line referred to in sub-clause C.63.1, or
 - (c) where the Authority has permitted a vessel to be fitted with side scuttles of the opening type, the line referred to in sub-clause C.63.1.
- C.62.3 All vessels 12.5 metres in length and over shall have 2 machinery space bulkheads, except that where the machinery space is located at one end of the vessel then only the after or forward machinery space bulkhead as appropriate need be provided.
- C.62.4 A combination of one compartment sub-division and approved internal buoyancy may be acceptable to the Authority.
- C.62.5 Air tanks not forming part of the vessel's structure shall not be 'approved internal buoyancy'.

C.63 Location of Watertight Bulkheads

- C.63.1 The transverse bulkheads required to achieve one compartment sub-division shall, subject to clause C.65, be so located that the length of the compartments so produced do not exceed the maximum permissible lengths determined according to the following formula:

$$\text{maximum permissible length } y = F \times f \times \frac{L_5}{D_5}$$

where

y = maximum permissible length of the compartment in metres, except that, in no case is this length to exceed one-third of the length of the vessel measured over the bulkhead deck.

f = effective freeboard in metres. This is the mean of the freeboards measured from the designed load waterline to the top of the bulkhead deck at the side in way of the bulkheads bounding the compartment concerned.

For vessels having a raised deck forward the height measurement in way of bulkheads forward of the break shall be taken to a straight line extending from the break to the raised deck at the bow.

Where the Authority has permitted a vessel to be fitted with side scuttles of the opening type, the height measurement in way of the bulkheads shall not be taken higher than up to a line at least 76 mm below the side scuttles in way thereof, and thence extending straight to the bulkhead deck at the bow and at the stern.

$\frac{L_5}{D_5}$ = Length-Depth Factor. This is the ratio between the length of the vessel in metres, measured over the bulkhead deck, and the depth in metres, measured amidships at a point one-quarter of the beam off the centreline, from the inside of the planking or plating to the level of the top of the bulkhead deck at side

F = Floodable Length Factor for the compartment as given in Table 1.

TABLE 1

Floodable Length Factor

<i>Midpoint of compartment in percentum of length from forward</i>	<i>Floodable Length Factor</i>
0-10	0.33
15	0.33
20	0.34
25	0.36
30	0.39
35	0.43
40	0.48
45	0.54
50	0.61
55	0.63
60	0.58
65	0.53
70	0.48
75	0.44
80	0.40

85	0.37
90-100	0.34

Note:

1. Intermediate values of floodable length factor can be obtained by linear interpolation.
 2. *Forward* means the forward end of the length measured over the bulkhead deck.
- C.63.2 In lieu of complying with sub-clause C.63.1, an owner may, if he so desires, determine compliance with the sub-division requirements by direct calculation, in accordance with Appendix One taking into account the form and proportions of the hull. These calculations and the supporting data shall be submitted to the Authority for approval.
- C.63.3 In exceptional circumstances where due to the form or design of the vessel or where the Authority considers the provisions of sub-clause C.63.1 to be insufficient it may require submission of direct calculations as prescribed in sub-clause C.63.2.

C.64 Stability

- C.64.1 The intact stability shall meet the requirements of clause C.1 of the Stability Section.
- C.64.2 In the case of vessels which are subject to the Load Lines Section, the Authority shall require evidence that the stability in a damaged condition has been calculated by the designer of the vessel. In the case of other vessels this evidence may be required by the Authority. The type of information to be submitted is given in Appendix Three.

C.65 Collision Bulkhead

- C.65.1 All vessels of 15 metres length on the designed load waterline and over are to have a collision bulkhead.
- C.65.2 Subject to C.65.2.1 the collision bulkhead shall be located not less than 5 per centum of the length or 750 mm, whichever is the greater, and not more than 15 per centum of the length abaft the stem measured at the designed load waterline.
- C.65.2.1 For vessels of less than 20 metres in measured length a stepped collision bulkhead may, at the discretion of the Authority, be fitted. The bulkhead below the step shall be positioned not less than 5 per centum of the length abaft the stem at the designed load waterline. The top of the step shall be not less than 2.5 per centum of the length above the designed load waterline and the continuation of the bulkhead to the bulkhead deck above the step shall be positioned at a distance not less than 1.5 per centum of the length abaft the stem measured at the top of the step.
- C.65.3 The collision bulkhead shall be constructed in accordance with the provisions of sub-clause C.66.1 and C.66.2 except that it shall extend to the weather deck and that it shall not be fitted with a watertight door. A watertight manhole cover may be fitted if permitted by the Authority.
- C.65.4 Double-ended ferries shall be fitted with a collision bulkhead at each end.

C.66 Construction of Watertight Bulkheads

- C.66.1 All bulkheads required to be watertight shall be in accordance with the provisions of the Construction Section appropriate to the material of construction, constructed and capable of remaining watertight at least against a head of water to the top of the bulkhead plus any additional head which may arise due to flooding or heeling.
- C.66.2 Watertight bulkheads except those subject to sub-clause C.65.3 shall extend to the bulkhead deck.
- C.66.3 Bulkheads should be installed in one plane without steps or recesses.
- C.66.4 Where a watertight bulkhead is recessed or stepped an equivalent plane bulkhead shall be assumed in determining the sub-division.
- C.66.5 If a watertight bulkhead is stepped, additional sub-division shall be provided in way of the step to maintain the same measure of safety as that secured by a plane bulkhead.
- C.66.6 A main transverse watertight bulkhead may be recessed, but if any part of the recess lies outside vertical surfaces situated at a distance from the shell plating equal to or less than one-fifth of the

breadth of the vessel and measured at right angles to the centreline at the level of the designed sub-division load waterline the whole of the recess shall be deemed to be a step in the bulkhead.

- C.66.7 The number of penetrations in a watertight bulkhead shall be reduced to a minimum. Penetrations shall be as high and as far inboard as practicable. Satisfactory means shall be provided to make such penetrations watertight and to prevent progressive flooding.
- C.66.8 Sluice valves shall not be fitted in watertight bulkheads, except that where the permission of the Authority has been obtained, self-closing drain valves may be fitted to drain small buoyancy compartments.
- C.66.9 A watertight door may be permitted in a watertight bulkhead (except the collision bulkhead) provided the Authority is satisfied that any alternative access would interfere with the proper functioning of the vessel. The door shall be operable from both sides.
- C.66.10 A door fitted in accordance with sub-clause C.66.9 shall be a sliding door having a horizontal or vertical motion, a hinged door or a door of an equivalent type.
- C.66.11 A hinged door may be fitted to an opening-
- (a) in a bulkhead not being a collision bulkhead in vessels less than 25 metres length;
 - (b) in a bulkhead not being a collision bulkhead in vessels of classes 1D and 1E.
- C.66.12 A hinged door referred to in sub-clause C.66.11 shall be fitted with catches or other quick action closing devices capable of being operated from each side of the bulkhead in which the door is fitted and shall be marked on each side in bold and permanent lettering—
"THIS DOOR TO BE KEPT CLOSED AND SECURED".
- C.66.13 Sliding watertight doors shall be capable of being operated when the vessel is listed 15 degrees and trimmed 3 degrees either way.
- C.66.14 Sliding watertight doors may be power or manually operated and shall be capable of being operated from each side of the bulkhead in which the door is fitted. Where a door is operated by remote control an audible alarm shall be fitted in each adjacent compartment and an indicator fitted at each remote control station to show whether the door is open or closed.

C.67 Drainage

- C.67.1 The weatherdeck on a flush decked vessel shall be weathertight.
- C.67.2 Flush decked vessels may have solid bulwarks in the forward one-third of the vessel provided such bulwarks do not form a well enclosed on all sides, and provided that the foredeck has sufficient sheer to ensure drainage aft.
- C.67.3 On vessels which are subject to the Load Lines Section, there shall be provided in the after two-thirds length of the vessel, not less than the amount of freeing port area specified in that Section.
- C.67.4 In a flush decked vessel, where a deckhouse or a trunk of at least the same height as the bulwarks, the breadth of which is at least 80 per cent of the breadth of the vessel is fitted, and where the passages along the side of the deckhouse or trunk do not exceed 1.5 incites in width or where a screen bulk-head is fitted at the forward end of the deckhouse or trunk extending completely across the vessel, then that length of the bulwark in way of the deckhouse or trunk need not be taken into account in calculating the required freeing port areas.
- C.67.5 Cockpits shall be weathertight except that the companionways may be installed within the cockpit if they are fitted in accordance with clause C.68.
- C.67.6 Cockpits shall be self-draining. The scupper installed for this purpose shall be located so as to be effective with the vessel trimmed 5° and heeled 15°.
- C.67.7 The minimum combined area of the scuppers referred to in sub-clause C.67.6 shall be 700 mm² per square metre of cockpit deck area.
- C.67.8 On vessels which are not subject to the Load Lines Section, freeing ports shall be provided in accordance with sub-clauses C.67.9 and C.67.10.
- C.67.9 Where bulwarks in the weather portion of the weather deck form wells, there shall be provided on each side of the vessel, in each well a minimum freeing port area of:
- (a) Where the vessel is less than 12.5 metres measured length

$$A = \frac{2 \times m \times h}{100}$$

where A = area in square metres
 m = length of well in metres
 h = height of bulwark in metres

(b) Where the vessel is 12.5 metres and over measured length

$$A = \frac{(1.0 + 3.5h) \times m \times h}{100}$$

The area A may include openings cut in the transom.

- C.67.10 Freeing ports shall be so arranged throughout the length of the bulwark as to provide an effective means of freeing the deck of water. Lower edges of freeing ports shall be as near to the deck as is practicable. Freeing ports greater than 230 mm in depth shall be fitted with bars spaced not more than 230 mm apart.
- C.67.11 The freeing ports shall be located so as to be effective having regard to a trim of 5° and heel of 15°.
- C.67.12 If the vessel is of such design that there is no free drainage from the foredeck aft, then freeing ports shall be provided for the entire length of bulwark fitted.

C.68 Hatches and Coamings

- C.68.1 Unless otherwise provided in the Load Lines Section of these Uniform Requirements, the height above deck of the coamings of hatchways and the permanent weathertight sills of openings in deckhouses or companionways which give access into spaces below the weatherdeck, shall be in accordance with Table 2 and associated notes:

TABLE 2

<i>Class</i>	<i>Length of Vessel</i>	<i>Height of Coaming or Sill</i>
A,B, & C	$\left\{ \begin{array}{l} 10 \text{ m and over but less than 18m} \\ 18 \text{ m and over but less than 24 m} \\ 24 \text{ m and over} \end{array} \right.$	300mm
		300 + 50(L—18) mm
		600mm
D	$\left\{ \begin{array}{l} \text{less than 10 m} \\ 10 \text{ m and over but less than 18 m} \\ 18 \text{ m and over} \end{array} \right.$	150mm
		200mm
		250mm
E	All lengths	150mm

Notes:

- In vessels of Class A, B and C where the openings in deckhouses or companionways referred to in this sub-clause are situated so as to be shielded from the full force of the sea, the permanent watertight sills required to be provided for such openings may be reduced in height but shall not in any case be less than 150 mm for vessels less than 18 metres in length, 150 + 37.5 (L—18) mm for vessels of 18 metres in length and over but not exceeding 24 metres in length and 375mm for vessels exceeding 24 metres in length.
 - In vessels of Class 1D & 1E sills may be omitted from the openings to deckhouses, provided that in the case of Class 1D vessels sills having a height in accordance with the above table are provided at each access into spaces below the weatherdeck.
 - Where, in Class 1D & 1E vessels, accesses into spaces below the weatherdeck are situated within the mid half beam of the vessel, and are of a width less than half the beam of the vessel and the Authority is satisfied that the safety of the vessel will not be impaired by so doing, the Authority may determine that sills for such accesses may be omitted.
- C.68.2 Openings in deckhouses or companionways which give access into spaces below the weatherdeck and which are located in cockpits, wells or in exposed positions on the weatherdeck, shall be fitted with weathertight doors.

- C.68.3 Subject to the following sub-clause in vessels of Class 1A, 1B and 1C, all hatches exposed to the weather shall be of weathertight construction.
- C.68.4 In vessels of Class 1A, 1B and 1C hatches on watertight trunks extending not less than 600 mm above the weatherdeck and hatches in cabin tops, and in vessels of Class 1D and 1E, hatches in any position may be weathertight.
- C.68.5 Covers or closures for all hatches on weatherdecks, trunks or cabin tops shall be fitted with securing devices and shall be attached to the hatch coaming or frame by hinges, captive chains or other devices to prevent their coming adrift.
- C.68.6 Securing devices for escape hatches which lead to living quarters or passenger accommodation shall be such that each hatch is capable of being opened from both sides.

C.69 Hull Penetrations and Shell Connections

- C.69.1 The number of openings in a vessel's sides below the weather deck shall be kept to a minimum.
- C.69.2 Subject to sub-clause C.69.3 all side scuttles fitted in the side of vessels of Class 1A, 1B and 1C shall be fixed, and shall not be fitted in such a position that their sills are below a line drawn parallel to the bulkhead deck at side and having their lowest point 500 mm above the designed load waterline.
- C.69.3 Where vessels are required to meet one compartment sub-division standards, the Authority may permit the installation of opening side scuttles with deadlights provided that:
 - (a) the lowest point of the rim of each side scuttle is at least 750 mm above the designed load waterline, and
 - (b) the side scuttles are treated in accordance with the provisions of subclause C.63.1.
- C.69.4 Deadlights shall be fitted to all side scuttles in the sides of vessels of Class 1A, 1B and 1C.
- C.69.5 Side scuttles, their glasses and deadlights shall comply with the requirements of British Standard MA24.
- C.69.6 All inlets and discharges led through a vessel's hull shall comply with the relevant provisions of the Load Lines Section.
- C.69.7 Stern tubes must comply with the requirements contained in the *National Standard for Commercial Vessels* (NSCV) Part C Section 5 Subsection A, Clause 3.14 (which in part replaces Section 9 of the USL Code).

(Amendment dated 1 October 2008)

C.70 Ventilators in Class 1 Vessels Not Subject to the Load Lines Section

- C.70.1 The height above deck of ventilator coamings, shall be as follows:

<i>Length of vessel</i>	<i>Height above deck of ventilator coaming</i>	
	<i>On weather deck (mm)</i>	<i>On super-structure deck (mm)</i>
less than 25 metres	600	375
25 metres and over but less than 35 metres.....	760	450

- C.70.2 Ventilators shall be of substantial construction and of equivalent strength to the structure to which they are attached and shall be capable of being closed weathertight by devices permanently attached to the ventilator or adjacent structure provided that closing appliances need not be fitted to ventilators:
 - (a) Where the length of the vessel is less than 10 metres and the vessel is a Class 1C vessel.
 - (b) Where the length of the vessel is less than 15 metres and the height of the ventilator is not less than 1.0 metres above the weather deck and positioned not more than 0.25 of the moulded breadth from the centreline of the vessel.
 - (c) Where the length of the vessel is less than 25 metres and the height of the ventilator is not less than 2.0 metres above the weather deck and positioned not more than 0.25 of the moulded breadth from the centreline of the vessel.
 - (d) Where the height of the ventilator exceeds 4.5 metres above the weather deck.

Wood plugs and canvas covers or equally effective closing appliances may be used on all Class 1C vessels less than 15 metres.

Where the coaming of any ventilator exceeds 900 mm in height it shall be specially supported.

C.71 Air Pipes in Class 1 Vessels Not Subject to the Load Lines Section

C.71.1 Where air pipes to tanks and other spaces extend above the weather or superstructure deck the exposed parts of the pipes shall be of substantial construction. Where the diameter of the pipe exceeds 30 mm bore the pipe shall be provided with efficient means of closing watertight permanently attached to the pipe or adjacent structure.

C.71.2 The height of air pipes above deck to the point where water may have access below shall be at least 760 mm on the weather deck and at least 450 mm on the superstructure deck. The Authority may allow reduction of the height of an air pipe to avoid interference with the operation of a vessel.

C.72 Scuppers, Inlets and Discharges In Class 1 Vessels Not Subject to the Load Lines Section

C.72.1 All sea inlets are to be fitted with valves of steel or material of equivalent strength attached direct to the hull or to skin fittings in accordance with the Engineering Section.

C.72.2 Scuppers and discharge pipes which pass through the side of the vessel shall comply with the following:

Scupper and discharge pipes, excluding machinery exhaust systems, shall be fitted with valves or cocks in an easily accessible position against the vessel's side, except where approved bilge alarms are fitted. Such valves or cocks shall not be required in the case of discharge not exceeding 50 mm internal diameter, the lowest point of which is not less than 225 mm above the designed load waterline. Waste and soil discharges greater than 50 mm internal diameter from spaces above the freeboard deck which are led through the vessel's side more than 225 mm above the designed load waterline may be fitted with an automatic non-return valve in lieu of a valve or cock.

Main propulsion machinery exhaust systems shall be fitted with an approved hull fitting, the lower edge of which shall be as high as practicable, above the designed load waterline.

Such systems may pass through watertight bulkheads aft of the machinery space provided that:

- (a) the system is passed through the bulkhead or bulkheads as close to the underside of the weatherdeck as practicable; and
- (b) an approved bulkhead fitting is provided at each watertight bulkhead through which the system passes.

PART III-Provisions Applicable to all Class 1 Vessels**C.73 Wheelhouse and Deckhouse Windows**

- C.73.1 Wheelhouse windows should be so located as to afford, where practicable, an all round arc of visibility.
- C.73.2 The maximum size of windows to be fitted in wheelhouses and deckhouses of seagoing vessels should not exceed 0.6 m² (and the length to width ratio should not exceed 2 to 1).
- C.73.3 Subject to C.73.9 window openings of wheelhouses and deckhouses shall be fitted with laminated or toughened safety glass. Wheelhouse window-panes shall be of clear glass. Plate glass shall not be used.
- C.73.4 Details of window frames and supporting structure are to be submitted to the Authority for approval.
- C.73.5 Window glasses fitted in rubber or synthetic rubber mouldings are to be afforded continuous internal support against the impact of wind and water.
- C.73.6 Vessels which operate solely in sheltered waters may have windows fitted in accordance with sub-clause C.73.8 but with 25 per centum reduction in the design head values given in Table 2.
- C.73.7 The thickness of glass to be used in the windows of wheelhouses and deckhouses of seagoing vessels shall be determined in accordance with sub-clause C.73.8.
- C.73.8 The thickness of glass is to be determined from the following formula:

$$t = \sqrt{\frac{10\beta H b^2}{\sigma}} \text{ mm}$$

- where t = thickness mm
- β = non-dimensional coefficient determined from Table 1.
- H = design pressure head in metres determined from Table 2 and associated notes.
- b = length in mm of the short dimension of the window
- σ = allowable working stress of glass in kPa determined from Table 3.

In no case should the glass thickness fitted be less than 6 mm.

TABLE 1

Values for β and α for aspect ratio $\frac{a}{b}$

(Where a = long dimension of window, b = short dimension of window)

$\frac{a}{b}$	1.0	1.2	1.4	1.6	1.8	2.0	3.0	4.0	5.0	∞
β	.2874	.3762	.4530	.5172	.5688	.6102	.7134	.7410	.7476	.750
α	.0444	.0616	.0770	.0906	.1017	.1110	.1335	.1400	.1417	.1421

TABLE 2

Design Pressure Head

Forward Facing 1st Tier Windows

<i>L.W.L.</i> (m)	<i>Design Head</i> (m)	<i>L.W.L.</i> (m)	<i>Design Head</i> (m)
5	0.27	18	1.82
6	0.32	19	2.02

7	0.40	20	2.22
8	0.48	21	2.42
9	0.58	22	2.63
10	0.69	23	2.86
11	0.79	24	3.10
12	0.90	25	3.37
13	1.03	26	3.59
14	1.17	27	3.85
15	1.33	28	4.12
16	1.48	29	4.40
17	1.65	30	4.70

Notes:

- Design pressure heads for a vessel having a waterline length greater than 30 metres should be determined from Appendix E of British Standard MA 25: October 1973, Ships' Windows.
- Design pressure heads for windows in other positions shall be the following percentages of the design heads given in the table:
 - For side and after windows in 1st tier deckhouses 70%
 - For forward windows in second tier deckhouses 70%
 - For side and after windows in second tier deckhouses and for windows in third and higher tier deckhouses 40%

TABLE 3
Allowable Working Stress (σ) and Youngs Modulus (E)

Material	$\sigma(kPa)$	E (kPa)
Laminated float glass	27.6×10^3	69×10^6
Toughened glass.....	58×10^3	69×10^6

(Amendment dated 15 March 1996)

Deflection (d) determined in accordance with the following formula is not to exceed 1/100 span of the short dimension of the pane.

$$d = \frac{10\alpha Hb^4}{Et^3} \text{ mm}$$

- where
- d = deflection mm
 - α = non-dimensional coefficient determined from Table 1
 - H = design pressure head in metres determined from Table 2 and associated notes
 - b = length in mm of the short dimension of the window
 - E = Young's modulus of material in kPa determined from Table 3

t = thickness of glass in mm.

C.73.9 Window panes of material other than glass will be specially considered by the Authority.

C.73.10 The following points concerning glazing of the windows are to be observed.

- (a) Toughened glass having chipped edges or surface damage shall not be used.
- (b) Edge clearance must be allowed and insulation shall be used to prevent direct contact between toughened glass and hard materials. In general the edge clearance should be not less than one half the thickness of the glass.
- (c) Windows are to be mounted using suitable resilient gaskets of neoprene rubber or synthetic compounds.
- (d) The support to be afforded in the frames shall not be less than 1.5 times the thickness of the glass.

APPENDIX ONE

CALCULATION OF PERMISSIBLE LENGTH OF WATERTIGHT COMPARTMENTS

1. General

- 1.1 Vessels shall be as efficiently sub-divided as possible having regard to the nature of the service for which they are intended. The degree of sub-division shall vary with the length of the vessel and with the service, in such manner that the highest degree of subdivision corresponds with the vessels of greatest length, primarily engaged in the carriage of passengers.
- 1.2 For the purposes of this Appendix, unless the contrary intention appears-
- (a) all linear measurements shall be in metres;
 - (b) all volumes shall be in cubic metres and all areas shall be in square metres and both shall be calculated from measurements taken to moulded lines; and
 - (c) the symbol 'L' denotes the length of the vessel as defined in sub-clause C.1.7.

2. Permissible Length

- 2.1 Subject to item 7 of this Appendix, the permissible length of a compartment having its centre at any point in the vessel's length shall be ascertained by multiplying the floodable length at that point, ascertained in accordance with the next succeeding item, by the factor of sub-division applicable to the vessel, ascertained in accordance with item 5 of this Appendix.

3. Floodable Length

- 3.1 The floodable length at any point along the length of a vessel shall be ascertained by a method of calculation that takes into consideration the form, draught and other characteristics of the vessel.
- 3.2 The floodable length at any point along the length of a vessel is the maximum portion of the length of the vessel having its centre at that point that can be flooded under the definite assumptions set out in the next succeeding item, without the vessel being submerged—
- (a) in the case of a vessel having a continuous bulkhead deck-beyond the margin line; or
 - (b) in the case of a vessel not having a continuous bulkhead deck-beyond an assumed continuous margin line that, at any point, is not less than 76 mm below the top of the deck at side to which the bulkheads concerned and the shell are carried watertight.
- 3.3 Where a portion of an assumed margin line referred to in the last preceding sub-item is, in the opinion of the Authority, appreciably below the deck to which the bulkheads are carried, the Authority may permit a limited relaxation in the watertightness of those portions of the bulkheads that are above the margin line and immediately under the higher deck.

4. Permeability

- 4.1 The definite assumptions referred to in sub-item 3.2 relate to the permeabilities of the spaces below the margin line.
- 4.2 For the purpose of ascertaining the floodable length at any point along the length of a vessel, there shall be assumed, and ascertained in accordance with the provisions of this item, a uniform average permeability throughout each of the following portions of the vessel below the margin line—
- (a) the machinery space;
 - (b) the portion forward of the machinery space; and
 - (c) the portion abaft the machinery space.
- 4.3 Subject to the next succeeding sub-item, the uniform average permeability throughout the machinery space in a vessel shall be ascertained in accordance with the formula -

$$85 + 10 \frac{(a - c)}{v}$$

where -

- a is the volume of the passenger spaces and crew spaces below the margin line within the limits of the machinery space;

- c is the volume of the 'tween-deck spaces below the margin line within the limits of the machinery space that are appropriated to cargo, coal or stores; and
- v is the volume of the machinery space below the margin line.

4.4 Where the uniform average permeability throughout the machinery space in a vessel ascertained by a detailed calculation based on the assumptions—

- (a) that the permeability of passenger spaces and crew spaces is 95;
- (b) that the permeability of spaces appropriated to cargo, coal or stores is 60; and
- (c) that the permeability of double-bottom, oil-fuel and other tanks is 95, or such lesser figure as the Authority may approve in any particular case,

is less than that ascertained in accordance with the formula set out in the last preceding sub-item, the uniform average permeability ascertained by the detailed calculation may be substituted for that ascertained in accordance with the formula.

4.5 Subject to the next succeeding sub-item, the uniform average permeability throughout the portion forward of, or abaft, the machinery space in a vessel shall be ascertained in accordance with the formula -

$$63 + 35 \frac{a}{v}$$

where

- a is the volume of the passenger spaces and crew spaces below the margin line and forward of, or abaft, the machinery space, as the case may be; and
- v is the volume of the portion of the vessel below the margin line and forward of, or abaft, the machinery space, as the case may be.

4.6 The Authority may, not later than forty days after it has received a plan showing the watertight sub-division of a vessel, determine that the uniform average permeability of the portion of the vessel forward of, or abaft, the machinery space shall not be ascertained in accordance with the formula set out in the last preceding sub-item but shall be ascertained by a detailed calculation based on the assumptions—

- (a) that the permeability of passenger spaces and crew spaces is 95;
- (b) that the permeability of spaces appropriated to machinery is 85;
- (c) that the permeability of spaces appropriated to cargo, coal or stores is 60; and
- (d) that the permeability of double-bottom, oil-fuel and other tanks is 95, or such lesser figure as the Authority may approve in any particular case.

4.7 For the purposes of this item, if a 'tween-deck space between two watertight transverse bulkheads contains any passenger space or crew space the whole of that 'tween-deck space (other than any space completely enclosed within permanent steel bulkheads and appropriated for purposes other than passenger space or crew space) shall be deemed to be passenger space.

4.8 For the purposes of this item, if a 'tween-deck space between two watertight transverse bulkheads contains any passenger space or crew space and the whole of that passenger space and crew space is completely enclosed with permanent steel bulkheads, only the space so enclosed shall be deemed to be passenger space.

5. Factor of Sub-division

5.1 The factor of sub-division shall depend on the length of the vessel and for a given length shall vary according to the nature of the service for which the vessel is intended. It shall decrease in a regular and continuous manner—

- (a) as the length of the vessel increases; and
- (b) From a factor A applicable to vessels primarily engaged in the carriage of cargo to a factor B applicable to vessels primarily engaged in the carriage of passengers.

5.2 For the purposes of this item, the factors A and B shall be determined by the following formulae:

$$A = \frac{5.82}{L - 60} + .18 \text{ (where } L = 131 \text{ metres and over)}$$

$$B = \frac{30.3}{L - 60} + .18 \text{ (where } L = 79 \text{ metres and over)}$$

- 5.3 Subject to sub-items 5.5 and 5.8 in the case of a vessel the length of which is 131 metres or more, the factor of sub-division shall be determined by the following formula:

$$F = A - \frac{(A - B)(C_s - 23)}{100}$$

where A and B are respectively determined in accordance with the provisions of sub-item 5.2 and C_s is the criterion numeral determined in accordance with the provisions of item 6 of this Appendix.

- 5.4 In the case of a vessel the length of which is 131 metres or more and which has a criterion numeral equal to 45 or more and simultaneously the computed factor of sub-division as given by the formula -

$$F = A - \frac{(A - B)(C_s - 23)}{100}$$

is .65 or less but more than .50, then the sub-division abaft the forepeak shall be governed by the factor of .50.

- 5.5 Where, in the case of a vessel referred to in sub-item 5.3 the factor F is less than .4 and the Authority is satisfied that it is impracticable to apply the factor F in determining the permissible length of a compartment appropriated for machinery, the Authority may allow an increase factor not exceeding .4 to be applied to that compartment.

- 5.6 Subject to the provisions of sub-item 5.8, in the case of a vessel the length of which is less than 131 metres but not less than 79 metres having a criterion numeral of not less than:

$$\frac{3574 - 25L}{13}$$

(hereinafter in this item referred to as S), the factor of subdivision F shall be determined by the following formula:-

$$F = 1 - \frac{(1 - B)(C_s - S)}{123 - S}$$

where B is the factor determined in accordance with the provisions of sub-item 5.2 and C_s is the criterion numeral determined in accordance with the provisions of sub-item 5.2.

- 5.7 In the case of a vessel the length of which is less than 131 metres but not less than 79 metres and having a criterion numeral less than S, or in the case of a vessel the length of which is less than 79 metres, the factor of sub-division shall be unity or such lower factor as the Authority determines.

- 5.8 In the case of a vessel of any length which is intended to carry a number of passengers exceeding 12 but not exceeding

$$\frac{L^2}{650} \text{ or } 50$$

whichever is the lower, the factor of sub-division shall be determined in the manner provided in the last preceding sub-item.

6. Criterion of Service Numeral

- 6.1 For a vessel of given length the appropriate factor of sub-division shall be determined by the Criterion of Service Numeral (hereinafter called the Criterion Numeral) as given by whichever of the following formulae is applicable -

when P_1 is greater than P

$$C_s = 72 \frac{M + 2P_1}{V + P_1 - P}$$

and in all other cases

$$C_s = 72 \frac{M + 2P}{V}$$

where

- C_s = the criterion numeral;
- M = the volume of the machinery space, with the addition thereto of the volume of any permanent oil-fuel bunkers which may be situated above the inner bottom and before or abaft the machinery space;
- P = the volume of the passenger spaces and crew spaces below the margin line;
- V = the volume of the vessel below the margin line;
- N = number of passengers which the vessel is intended to carry; and
- P_1 = $.056LN$

but so that -

- (a) where the value of $.056LN$ is greater than the sum of P and the whole volume of the passenger spaces above the margin line, the figure to be taken as P_1 shall be that sum or $2/3 \times .056LN$, whichever is the greater;
- (b) values of C_s less than 23 shall be taken as 23; and
- (c) values of C_s greater than 123 shall be taken as 123.

6.2 For vessels not having a continuous bulkhead deck the volumes are to be taken up to the actual margin lines used in determining the floodable lengths.

7. Special Rules for Sub-division

7.1 Compartments exceeding the permissible length:

- (a) A compartment may exceed its permissible length provided that the combined length of each pair of adjacent compartments to which the compartment in question is common does not exceed either the floodable length or twice the permissible length, whichever is the less.
- (b) If one compartment of either of the pairs of adjacent compartments is situated inside the machinery space, and the other compartment of the pair is situated outside the machinery space, the combined length of the two compartments shall be adjusted in accordance with the mean average permeability of the two portions of the vessel in which the compartments are situated.
- (c) Where the lengths of two adjacent compartments are governed by different factors of sub-division the combined length of the two compartments shall be determined proportionately.
- (d) Where in any portion of the vessel watertight bulkheads are carried to a higher deck than in the remainder of the vessel, separate margin lines may be used for calculating the floodable length of that portion of the vessel if—
 - (i) the two compartments adjacent to the resulting step in the bulkhead deck are each within the permissible length corresponding to their respective margin lines, and in addition, their combined length does not exceed twice the permissible length determined by reference to the lower margin line of such compartments; and
 - (ii) the sides of the vessel are extended throughout the vessel's length to the deck corresponding to the uppermost margin line and all openings in the shell plating below that deck throughout the length of the vessel comply with the requirements of clauses C.42 to C.53 inclusive as if they were openings below the margin line.

7.2 Additional sub-division at forward end: In vessels 100 metres in length and upwards, a watertight bulkhead abaft the collision bulkhead shall be fitted at a distance from the forward perpendicular which is not greater than the permissible length appropriate to a compartment bounded by the forward perpendicular and the bulkhead.

7.3 Steps in bulkheads: If a watertight bulkhead is stepped, it shall comply with one of the following conditions:

- (a) In vessels having a factor of sub-division not greater than $.9$, the combined length of the two compartments separated by such bulkhead shall not exceed 90 per centum of the

floodable length or twice the permissible length, whichever is the less. In vessels having a factor of sub-division greater than .9, the combined length of the two compartments shall not exceed the permissible length.

- (b) Additional sub-division is provided in way of the step to maintain the same measure of safety as that secured by a plane bulkhead.
 - (c) The compartment over which the step extends does not exceed the permissible length corresponding to a margin line taken 76 mm below the step.
- 7.4 Recesses in bulkheads: A main transverse bulkhead may be recessed but, if any part of a recess lies outside vertical surfaces on both sides of the vessel situated at a distance from the shell plating equal to one-fifth of the breadth of the vessel and measured at right angles to the centre line at the level of the deepest sub-division load waterline, the whole of the recess shall be deemed to be a step in a bulkhead for the purpose of the last preceding sub-item.
- 7.5 Equivalent plane bulkheads: Where a watertight bulkhead is recessed or stepped an equivalent plane bulkhead shall be assumed in determining the sub-division.
- 7.6 Minimum spacing of bulkheads: If the distance between two adjacent watertight bulkheads, or their equivalent plane bulkheads, or the distance between transverse planes passing through the nearest stepped portions of the bulkheads, is less than $.03L + 3.05$ metres or 10.67 metres, whichever is the less, only one of those bulkheads shall be regarded as forming part of the sub-division of the vessel.
- 7.7 Allowance for local sub-division: Where in any vessel a main transverse watertight compartment contains local sub-division and the Authority or a person authorised by the Authority for the purposes of this item is satisfied that, after any assumed side damage extending over a length of $.03L + 3.05$ metres or 10.67 metres, whichever is the less, the whole volume of the main compartment will not be flooded, a proportionate allowance may be made in the permissible length otherwise required for such compartment. In such a case, the volume of effective buoyancy assumed on the undamaged side shall not be greater than that assumed on the damaged side.
- 7.8 Where the required factor of sub-division is .50 or less, the combined length of any two adjacent compartments shall not exceed the floodable length.

APPENDIX TWO**Class 1 Vessels 35 metres and over in measured length****STABILITY IN DAMAGED CONDITION****1. Calculations of Stability in Damaged Condition**

The sufficiency of intact stability of a vessel shall be determined by a calculation which has regard to the design and construction of the vessel and the damaged compartments and is in accordance with the following assumptions:

- (a) The vessel shall be assumed to be in the worst condition as regards stability which is likely to be experienced having regard to the intended service of the vessel.
- (b) The volume permeabilities and surface permeabilities shall be assumed to be as follows:

Spaces	Permeability
Appropriated to cargo, coal or stores	60
Appropriated to accommodation for passengers and crew .	95
Appropriated to machinery	85
Appropriated to liquids	0 or 95, whichever results in the more onerous requirements

Higher surface permeabilities are to be assumed in respect of spaces which in the vicinity of the damage waterplane contain no substantial quantity of accommodation or machinery and spaces which are not generally occupied by any substantial quantity of cargo or stores.

- (c) The extent of damage shall be assumed to be as follows:
 - (i) Longitudinal extent 3.05 metres plus 3 per centum of the length of the vessel or 10.67 metres, whichever is the less, and where the required factor of sub-division is .33 or less the assumed longitudinal extent of damage shall be increased as necessary so as to include any two consecutive main transverse watertight bulkheads.
 - (ii) Transverse extent 20 per centum of the breadth of the vessel (measured inboard from the vessel's side at right angles to the centre line at the level of the deepest sub-division load waterline).
 - (iii) Vertical extent from the base line upwards without limit.
 - (iv) If any damage of lesser extent than that indicated in the last three preceding subparagraphs would result in a more severe condition regarding heel or loss of metacentric height, that damage shall be assumed for the purpose of the calculation.
- (d) Where the vessel is fitted with decks, inner skins or longitudinal bulkheads of sufficient tightness to restrict the flow of water, regard shall be had to such restrictions in the calculation.

2. Sufficiency of Stability in Damaged Condition

- 2.1 The stability required in the final condition after damage, and after equalization where provided, shall be determined as follows:
 - 2.1.1 The positive residual righting lever curve shall have a minimum range of 15° beyond the angle of equilibrium.
 - 2.1.2 The area under the righting lever curve shall be least 0.015 m-rad, measured from the angle of equilibrium to the lesser of:
 - .1 the angle at which progressive flooding occurs;
 - .2 22° (measured from the upright) in the case of one-compartment flooding, or 27° (measured from the upright) in the case of the simultaneous flooding of two or more adjacent compartments.

- 2.1.3 A residual righting lever is to be obtained within the range specified in 2.1.1, taking into account the greatest of the following heeling moments:
- .1 the crowding of all passengers towards one side;
 - .2 the launching of all fully loaded davit-launched survival craft on one side;
 - .3 due to wind pressure as calculated by the formula:

$$GZ \text{ (in metres)} = \frac{\text{heeling moment}}{\text{displacement}} + 0.04$$

However, in no case is this righting lever to be less than 0.10 m.

- 2.1.4 For the purpose of calculating the heeling moments in paragraph 2.1.3, the following assumptions shall be made:

- .1 Moments due to crowding of passengers:
 - .1.1 four persons per square metre;
 - .1.2 a mass of 75 kg for each passenger;
 - .1.3 passengers shall be distributed on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment.
 - .2 Moments due to launching of all fully loaded davit-launched survival craft on one side:
 - .2.1 all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;
 - .2.2 for lifeboats which are arranged to be launched fully from the stowed position, the maximum heeling moment during launching shall be taken;
 - .2.3 a fully loaded davit-launched liferaft attached to each davit on the side to which the ship was heeled after having sustained damage shall be assumed to be swung out ready for lowering;
 - .2.4 persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment;
 - .2.5 life-saving appliances on the side of the ship opposite to the side to which the ship has heeled shall be assumed to be in a stowed position.
 - .3 Moments due to wind pressure:
 - .3.1 a wind pressure of 120 N/m² to be applied;
 - .3.2 the area applicable shall be the projected lateral area of the ship above the waterline corresponding to the intact condition;
 - .3.3 the moment arm shall be the vertical distance from a point at one half of the mean draught corresponding to the intact condition to the centre of gravity of the lateral area.
- 2.2 In intermediate stages of flooding, the maximum righting lever shall be at least 0.05m and the range of positive righting levers shall be at least 7°. In all cases, only one breach in the hull and only one free surface need be assumed.
- 2.3 In the case of unsymmetrical flooding, the angle of heel for one-compartment flooding shall not exceed 7°. For the simultaneous flooding of two or more adjacent compartments, a heel of 12° may be permitted by the Authority.

APPENDIX THREE

Class 1 Vessels Less than 35 metres in Measured Length

Damage and Damaged Stability

1. The minimum extent of damage shall be assumed to be as follows:
 - (a) longitudinal extent-10 per cent of the length of the vessel.
 - (b) transverse extent-20 per cent of the breadth of the vessel (measured inboard from the vessel's side at right angles to the centre line at the level of the deepest subdivision load waterline).
 - (c) vertical extent-from the baseline upwards without limit.
 - (d) if any damage of lesser extent than that indicated in (a), (b) and (c) would result in a more severe condition regarding heel or loss of metacentric height, such damage shall be assumed for the purposes of the calculation.
2. Where the vessel is fitted with decks, inner skins or longitudinal bulkheads of sufficient tightness to restrict the flow of water, regard shall be had to such restrictions in the calculation.
3. The vessel shall be assumed to be in the worst condition as regards stability which is likely to be experienced having regard to the intended service of the vessel.
4. The volume permeabilities and surface permeabilities shall be assumed to be as follows:

<i>Spaces</i>	<i>Permeability</i>
Cargo, stores	60
Accommodation for passengers and crew	95
Machinery	85
Liquids	0 or 95 (whichever results in the more onerous requirements)

5. The intact stability of the vessel shall be deemed to be sufficient if the aforesaid calculation shows that, after the assumed damage and after equalisation measures have been taken, the final condition of the vessel is as follows:
 - (a) in the event of symmetrical flooding the metacentric height is positive and is not less than fifty mm;
 - (b) in the event of unsymmetrical flooding the heel does not exceed 10 degrees;
 - (c) in the event of unsymmetrical flooding the bulkhead deck is not less than seventy-six mm above the water at all points along its length.