K. Timber

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K.1 General

This section applies to all vessels that are no more than 35 meters in length, vessels that are greater than 35 meters in length will be subject to special consideration by the governing authority.

K.1.1 Materials

All material used shall conform with the Australian standard AS1738-1975, Timber for Marine Craft, and shall not contain rot, sap shakes, objectional knots and any other defects that may reduce the quality of timber. All timber shall be adequality seasoned.

Marine plywood used in the construction of vessels shall comply with the Australian Standards AS2272-1972, Timber for Marine Craft, and special attention needs to be given during the installation process of marine carpet, as the edges and any holes in the sheet will allow moisture to enter the plywood increasing the deterioration of the timber. The deterioration of ply may not be visible on the surface veneers but still may be present.

All metals used in construction shall be appropriate for the marine environment and protected against corrosion, care should be taken to reduce the effects of electro-chemical corrosion when several different metals are used.

Glues for construction and lamination of structural members shall be gap-filling resorcinol or phenolic type epoxy resin that comply with BS1204, Synthetic Resin Adhesives for Wood, or other equivalent adhesives that have a WBP bond and similar durability. Modified urea-formaldehydes may be used in internal structures that are not subject to the weather and moisture frequently, the space must also be well ventilated. All glues shall be mixed and applied in the manner specified in the manufacturer's instructions. The workspace shall be in the expectable range of humidity and temperature stated by the manufacture before the application of glue can commence. Special attention shall be given when two different types of wood are being glued together and the manufacturers instruction shall be followed including the preparations of the timber and degreasing of oily or resinous timbers.

The dimensions of scantlings given in this section are for stock milled sizes of Australian hardwood where the mass is 960kg/m^3 at a moisture content of 12%. If the actual density of the timber is less then 800g/m^3, then the following ratio shall be used to increase the timber dimensions.

$\frac{960}{W}$ where W =1 the actual density of timber per cubic meter at 12% moisture ratio. The density of timber shall be found in the Australian Standard AS 1738-1975. If the required dimension lies in between tow consecutives material dimensions, the larger sized timber shall be used or interpolated.

K.1.2 Alternative Methods of Construction

Vessels constructed with different scantlings than the framing system described herein shall be determine on the basis of the midship section modulus and shall be equivalent to similar vessels midships section modulus from the application of this sub-section. The stresses of individual members shall be to requirements. Data that indicates the midship section modulus obtained and the stresses involve may be required to be submitted for approval by AUSCLASS.

K.1.3 Fastenings

Fastenings may be of copper, gunmetal, silicon bronze, mild steel, stainless steel or monel metal. They shall be in accordance with table M.26.

All ferrous fastenings shall be suitable protected.

Dumps shall have the same cross-sectional area when used in place of bolts.

Fastenings may be increased in size larger than that stated in the table, but not to be increased as to weaken the member.

Fastenings made from stainless steel shall be type 316 material

Iron fastenings shall not be used in the underwater portion of the vessel where a copper of other non-ferrous metals is used to sheathe the vessel.

All through fastenings expect nails shall be required to be fixed through the use of rivets, washers, or nuts of the same material compatible with the though fastener used.

Dump fastenings may be used as hog to keel fastenings between floors for vessels that are 15 metres or less.

In vessels of 15 meters length and over these fastenings shall be though fastenings.

There shall be at a minimum one fastener between every floor for ever $0.1m^2$ of faying surface between keel and hog.

K.1.4 Floors

Floors shall be though bolted to the keel and hog, and where practicable through the extremities of the arms to the stringer planking.

Clamps and stringers shall be though fastened at every alternative frame.

The beam shelf shall be through fasteners to the sheer clamp with a maximum spacing between fastenings to be no greater than twice the frame spacing.

The fastening dimensions for hull plating shall be determined from table M.26

Plank fastenings to bent frames shall be through nails, screws, bolts or wood screws. Through nails shall be riveted on roves or clenched and thought fastenings must be used when the frames are laminated and not glued.

Clenched nails shall not be used wherever the single moulding of a laminated framing member is less than 15 mm.

Plank fastenings into the forward and aft deadwoods and the horn timbers shall be double reeled.

All butt straps in the hull planking shall be through fastened with nails, rivetted on roves or clenched, bolted or screwed.

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K.2 Scantlings for Round Bilge Vessels

K.2.1 Keel and Hog or Keelson

A keel shall be sided and moulded as indicated by table M.1, the minimum hog siding and moulding shall also be as shown in table m.1. where a keelson is used in place of a hog is associated with a rabbeted keel, the keelson's sectional area and sided and moulded in accordance with table M.1, there may be variance with keel, hog and keelson in accordance with the notes in the table.

The keel, hog, keelson in a vessel of less than 10 meters in length shall be in one length.

For vessels 10 meters or over that contain a keel, hog or keelson produced from more than one piece shall be efficiently scarphed. Any plans shall be clearly indicated in the submitted plans.

The keel and hog or keelson may be scarphed at one third of their length, and at a minimum of 10 times the frame spacing as shown in table M.6 between the extremities of the scarphs. All scarphs should be avoided in way of a machinery space.

Keel and hog or keelson scarphs shall be at a minimum 6 times the moulding of the keel and hog or keelson respectively and nibs of the following depth:

- 0.25 times depth or keelson scarphs shall for a moulding up to 200mm in depth
- 0.125 times depth of scarph divided by 255mm for a moulding exceeding 200mm in depth

Stopwaters shall be fitted to all centreline construction joints where they intercept the rabbet line.

A rabbeted keel, where the keel and hog are made out of one piece of timber or are of laminated construction, may be reduced in cross sectional area by up to 15% of the total combined areas for the keel and hog obtained from the addition of the sectional areas shown in table M.1.

K.2.2 Stem

Stem scantlings shall be determined from table M.2.

The stern moulding at the heel may be larger than that of the keel in order to permit the butting of docking keel against the scarph end.

The scarph of the stem of the keel shall be no less than 2.5 times the keel moulding in length. The face of the stem may be reduced in siding below the deck line in order to conform to a suitable stem band.

K.2.3 Apron and Forward Deadwood

The apron and forward deadwood shall be sided and moulded to permit a double row of fastenings in the planking hood ends.

The outer rabbet line is to be such as to permit a faying surface of twice the planking thickness.

The forward deadwood at the hog position shall be sided not less than the hog.

The forward deadwood knee shall have the same siding as the stem while the moulding in the throat should be not less than 1.5 times the siding.

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K.2.4 Stern Post Aft Deadwood Shaft Log

The stern or propeller post shall have a minimum siding equal to that of the keel and be in one piece throughout its length the stern post is to be connected to the keel by a mortice and tenon joint and also be a devil plate or other equivalent connection on both sides in addition to the fastenings (refer to M.8.3). scantlings are shown with a minimum faying surface of 3 times the planking thickness.

The inner posts, deadwoods, and/or shaft logs shall be substantially moulded to permit a double row of fastenings in the hood ends, coupled with a minimum faying surface of 3 times the planking thickness.

The thickness of timber on each side of the shaft tube shall be no less than 0.25 times the keel siding. Where the diameter of the shaft tube is such that there is less than this siding the timber scanting shall be increased to the required dimension in this area.

Inner posts, deadwoods and/or shaft logs run either horizontally or vertically.

K.2.5 Horn Timber Assembly

The horn timber assembly sectional areas are shown in table M.4.

The horn timber if cut from a solid timber beam shall be locked in the stern post with the use of a large tenon and mortice. If the horn timber used is a single piece, its cross-sectional area may be reduced in accordance to table M.4 and may be reduced to up to 15%.

At the end of the horn timber towards the aft, the horn fashion piece can be reduced up to a maximum of 0.8 of its original cross-sectional area.

The top edge of the side horn timber shall not be lower than the top edge of the middle horn when moulded and shall be notched at least 12mm from the aft of the deadwood and proceed from the transom to the forward end of the aft deadwood.

Side horn pieces shall have sides that are 1.25 times the hull planking thickness and allow the planking to be fastened with a double row of fastenings.

The cantilever length of the horn timber assembly shall be at maximum 60% of the overall length of the side horn timbers.

K.2.6 Transom

Transom planking thickness in single thickness form shall be determined from table M.5.

All transoms shall have stiffeners at a spacing of no more that 450mm centres with substantial margins. The stiffeners and margins shall have scantlings derived from table M.5.

There shall be a substantial grown knee, chock or bracket fitted between the vessel's transom and horn timber. Grown knees and chocks shall have a siding if 2.5 times the tabular transom thickness and the moulding in the throat of a grown knees shall be no less than such siding.

All vertical stiffeners shall be in line with stringers to allow the fitting of the stringer to transom knees, chocks and brackets as required.

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K.2.7 Bent or Laminated Frames

The scantlings required for bent or laminated frames shall be obtained from table M.6.

Frames shall be constant in moulding and siding throughout their lengths, this may be checked and if desired by the surveyor into the hog apron, horn timbers, forward and aft deadwoods.

If the basic frame spacing shown in table M.7 is not adopted, the scantling of the frame shall be adjusted by maintaining the section modulus of the frame per millimetre of frame spacing.

K.2.8 Web Frames

Web frame scantlings shall be obtained from table M.7. If the basic web frame spacing specified in table M.7 is not used, the scantlings shall be adjusted to ensure that the section modulus (Z) of the frame per millimetre of frame spacing is maintained.

When a notch in a web frame exceeds 12.5% of its depth to allow for longitudinals. The moulding of the web frame shall be increased to maintain the required sectional area in the way of the notch.

A floor timber of siding equal to that of the web frame, shall be used to connect the web frame members across the top of the keel and hog.

The bilge and topside sections of web frames shall be fitted through the use of gussets of chocks of sufficient scantling and to be through bolted. Where web frames are not of a single piece, there shall be strengthening provided in the way of any joints.

Where web frames are used, intermediate frames of dimensions and spacing determined for bent frames are required to be fitted between the web frames.

K.2.9 Floors

Floors shall comply with table M.8 and the associated notes.

The spacing of floors from centre to centre shall be as the following:

- For machinery spaces, there shall be either no more than twice the bent frame adopted or the spacing may be three times the frame spacing where the floor siding is increased by 30% of normal floors determined from table M.8.
- All other spaces shall have a maximum spacing of no more than three time the bent frame spacing.

Special consideration must be given if the engine sump and/or gearbox are in close proximity of the hog. Details of the instillation of machinery shall be provided to AUSCLASS for special consideration.

Floors in the way of machinery beds shall support the machinery beds and all floors shall have arm lengths no less than three times the normal frame from the centreline and fastened to the lower bilge stringers.

Where practicable the moulding of the stringer floor should be sufficient for the arms to cover and be fastened to the lower bilge stringers.

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K.2.10 Floors in Web Framed Vessels

Web framed vessels shall have floors sided at twice the single planking thickness as sheen in table M.11 and shall be fitted between web frames at a maximum of 450mm between centres.

Floors which connect to web frames across in the way of engine rooms, the siding shall be at least that of the intermediate floors fitted between the web frames.

Where practicable, floors should be of sufficient depth to connect with and be through fastened to lower bilge stringers.

K.3 Longitudinal Members

K.3.1 Stringers

- For bilge stringers, the number and scantling on each side of the vessels hull shall be obtained from table M.9.
- If the stringers are laminated, each lamination should be no less than 12mm thick, with end joints in the lamination at least 9 frame spacings apart.
- Stringers which are made of more than one length may be either scarphed or lapped. Scarphed stringers shall require the scarph joint to be no less than 6 times the dimensions of the face or edge scarphed. The scarph shall be though bolted. If the stinger is lapped then the overlap length, side by side, shall be no less than 9 frae spacing (10 frames).
- In 'wet well' vessels stringers details shall be specially considered by AUSCLASS.

K.3.2 Shear clamps

- For shear clamps the recommended scantling are found in table M.10 and the siding should not be less than 1.5 time the plank thickness and the moulding should generally not be any less than 2 time the tabular moulding of deck beam ends found in table M.12.
- Shear clamps may be scarphed if not in one length with the scarph being no less than 6 tie the moulding of the sheer fitted and shall be edge bolted.

K.3.3 Beam Shelf

- The beam shelf scantlings are given in table M.10.

Fitting of longitudinal members:

- Beyond 0.6L amidships the scantling of stingers, sheer clamps and beam shelves may be reduced up to a maximum 20% of the cross-section area obtained from the tables. The reduction shall be a uniform taper in bot moulding and siding.
- Scarphs in stinger, sheer clamps, beam shelves, etc., shall not be located closer than three times the length of the scarph between the closest extremities of two scarphs. Scarphs shall not be used in the way of bulkheads, web frames, masts or in line with any keel scarphs. Sheer clamps scarphs shall not be closer than 6 times the frame spacing used to the butt in sheer strake.
- Sheer clamps and beam shelves shall have similar scantling as obtained from table M.19 when located in the way of raised forecastle decks.
- Bilge stringers and sheer clamps shall be connected to transom and stern of the vessel by either a grown knee, suitable chock or bracket.

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- Breasthooks of grown timber, chooks of straight grain or brackets shall be fitted at the forward end of the hull between the stern and sheer clamp and every stringer.
- Grown knees, solids chocks or brackets shall be required to be fitted between the transom and sheer clamps, every stringer and hog.
- The siding of the breasthook, chocks and knees required for previous, shall be no less than the least dimension connected member at that section. The length of the arms should be no less than 6 times the siding of the knee or connection. Bracket scantlings should be specified on plans submitted for approval.

K.4 Hull planking

K.4.1 Timber

Planking shall have scantlings obtained from table M.11 and associated notes. Bent frame systems shall have no plank that is less than in metres, the actual frames spacing in millimetres divided by 80. There is an exception for the transom to the next butt forward where the plank length may be reduced if approved by AUSCLASS.

The minimum plank length for longitudinally planked web framed system shall be obtained using the previous method and by assuming the frame spacing required for a bent framed vessel of the same length.

Butts shall not be located in the same plane unless there is at minimum 3 passing strakes between the butts.

Butts in garboard stakes shall be clear of keel and hog scarphs.

Vessels which are longitudinally planked shall have butt blocks fitted in close proximity to frames and adjacent to the butt. The thickness shall be equal to the hull planking and a width of overlap on the adjacent strakes of planking by an amount equal t half the thickness of the butt block. The but block shall be positioned so that the grain runs in the longitudinal direction of the vessel.

Openings located in the hull planking of diameter greater than one third of the planking shall require strengthening by either internal doubling or compensator strake in the same manner as directly previously stated. If more than one plank is cut, then the vessel shall require special consideration by AUSCLASS.

Unless AUSCLASS is satisfied by virtue of frame siding and spacing with considerations of fastenings and frame scantling, butts in hull planking shall not be located on frames.

The strake off hull planking shall have a width no less than twice the tabular plank thickness but the 3 strakes in way of the bilge at amidships shall not exceed 4 times the tabular plank thickness. The plank widths shall be assigned by AUSCLASS where edge glue or cold moulded construction is used.

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K.5 Deck

K.5.1 Deck beams

All scantlings of ordinary deck beams are to be at a minimum of that determined from table M.12 including the associated notes.

The size of the scantling in the table for deck beams indicates the thickness at the centreline of the vessel and the moulding may be reduce up to a maximum of 50% at the beam ends but must not be less than the siding of the beam.

Hatch end beams and carlings are to be sided 30% in excess of the tabular siding for ordinary deck beams where two or more ordinary deck beams are cut.

Carlings shall have sidings equal to deck beam at the end of deck openings and mouldings shall be equal to the deck beam to which the carling is attached.

Tie bolts of diameters determined from table M.26 shall be fitted at side decks between the carlings and sheer clamp where:

- The length of deck opening exceeds 1.8 meters
- The width of such opening exceeds beam
- 3 or more normal deck beams are cut
- Otherwise as required by AUSCLASS

Where beams are fitted in association with pillars and fore and aft girders the length of beam used for table M.12 shall be the distance between girders of the girder and the side of the vessel.

Where concentrated deck loads or above normal loads occur, such as winches and mast, strong beams or equivalent strengthening shall be fitted in way and hanging knees or brackets shall be fitted at the end of all such beams.

Lodging knees or brackets shall be fitted at the end of all main deck beams or beams providing stiffening as described previously and also the corners of deck openings providing the carlings and main beams where such openings come within the scope of M.17.1. (e).

Notch or housing on the upper side of a deck beam shall be no greater than the scantling thickness of plywood decking when derived from table M.13.

Notches on the underside of the end of deck beams shall be no greater the 1/5 of the beam moulding (or depth) at the end.

K.5.2 Deck planking

The thickness of deck planking shall be obtained from table M.13 and shall generally have a siding no greater than twice the obtained thickness. Coverboards and king planks shall be of thickness 1,5 times that of the siding and deck ends shall be jogged int the cover boards.

A sift of butts if required should be obtained.

Deck openings referred to in the previous sub-clause may be required by AUSCLSS to be stiffened or increased deck frame scantlings.

K.5.3 Hanging and lodging knees

Hanging knees are to be fitted in the following positions:

- At the ends of all deck beams in way of the deck openings
- At the ends of strong beams
- At the ends of other beams as required by AUSCLASS

Hanging knees shall be grown timber, laminated timber or fabricated brackets, the arms shall be no less than 3 time the centre line depth of the beam in table M.12. the throat and moulding when grown timber are used shall be 40% of the arm length.

The hanging knee arms shall be attached to the deck beams and hull frame with at a minimum of 3 bolts with a diameter as determined by table M.26 in each arm. Such fastenings shall not pass through the decking or planking.

Lodging knees shall be fitted as a requirement in the following positions:

- At the ends of all deck beams in way of the deck openings as described previously
- At the ends of carlings in way of deck openings

The proportion and fastening of loading knees shall be as for hanging knees and described previously and table M.26, respectively.

K.6 Watertight Bulkheads

K.6.1 General

Every vessel must comply wand provided watertight bulkheads as required in subsections C and D of the construction section.

Watertight bulkheads may be constructed from steel or wood or other material is given special consideration by the authority.

Watertight bulkhead shall contain the minimum required cut-outs needed with special consideration provided for maintaining the watertight integrity.

Access openings in watertight bulkheads may be permitted by AUSCLASS if the openings comply with the requirements of this set of rules. Openings in water-tight bulkheads shall be framed and bracketed in order to maintain the bulkheads strength, where stiffeners are cut in way of such openings.

K.6.2 Timber bulkheads

Timber bulkheads shall be constructed to the scantlings shown in table M.25.

Such bulkheads shall have vertical stiffeners fastened into the grounds and to the deck beams.

Bulkheads shall be fitted on substantial timber grounds or as permitted under the steel bulkhead clause. The timber grounds shall be effectively bedded into a non-setting or similar approved material for this purpose and shall be through fastened to the hull planking.

Planking on timber bulkheads shall either be fitted into rabbets or on to the face of the bulkhead grounds. It may also be fitted to the face of deep or web frames where such frames are fitted and fastened to the planking and are no less than the required size of scantlings show in table M.7 for web frames.

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Planed bulkheads shall be laid diagonally with two equal thicknesses having a material between these layers approved by AUSCLASS.

K.6.3 Steel bulkheads

The scantlings of steel bulkheads shall be determined in the steel section of the code.

Steel bulkheads may be fitted to the faces of hull grounds and deck beams either in the same vertical plans by means of a boundary angle or directly fastened flat upon the vertical faces. A mastic sealant shall be used between the bulkhead, grounds and deck beams.

Where steel bulkheads are attached to the face of the grounds and deck beams or by a boundary angle. The grounds shall have siding of at least 2 times the flange length of the boundary angle, and the moulding shall equal to that for a timber bulkhead of similar height.

K.7 Pillars or stanchions

K.7.1 Pillar load

The load on a pillar shall be obtained from the following equation:

$$W = 0.715\ bhs\ tonnes$$

Where

W loads in tonnes

b mean breadth in metres of area supported

s spacing of pillars in metres

h height in metres above the deck supported, as defined below:

- for a pillar below an exposed deck on which cargo is carried, h is the distance from the deck supported, to a point 3.65 metres above the exposed deck. Where it is intended to carry deck cargoes in excess of 26440 kg/m^2 this head shall be increased in proportion to the added loads which will be imposed on the structure.
- Where tweendeck cargo is carried and its mass is greater or less than 2640 kg/m^2, h shall be suitably adjusted.
- h for a pillar below the freeboard deck shall be measured to a point no less than 0.02L+0.75 metres above the freeboard deck.
- h for a pillar below the superstructure deck shall be measured to a point no less than 0.02L+0.50 metres above the superstructure deck

K.7.2 Permissible load

The permissible load a pillar can carry is to be equal to or greater than the pillar load was determined above. The permissible load may be obtained from the equation:

$$wa = \frac{A}{1000}\left(L - 17\left(\frac{1}{a}\right)\right) tonnes$$

Where:

wa permissible load on the pillar in tonnes

A Area of the pillar in square millimetres

L the unsupported length of the pillar in meters

a the diameter of a circular pillar or thee shorter side of a rectangular pillar in millimetres.

Table M.14 gives pillar loadings for a representative selection of round and rectangular pillars.

K.7.3 The scantlings of pillars and stanchions of a material other than timber shall be determined from the appropriate sub-section of the construction section.

Pillars and stanchions may be located directly under beams, deck openings, corners or deck longitudinals. Pillars which are fitted under longitudinals, shall be spaced between bulkheads and shall not be greater than 5 time the beams spacing = 500mm in the fore or aft direction, they shall also not be placed more than 25% of the vessels beam from the centreline.

K.7.4 The supports located under pillars and stanchions shall have adequate strength to distribute the loads effectively.

K.8 Engine Seatings

K.8.1 The engine seatings shall have dimensions which are proportionate with the power of the machinery fitted. They should:

- Be of a length not less than twice the distance between the extreme holding down bolts
- Distributes the load over as many transverses as possible
- Terminate on a substantial transverse member
- Be checked over a securely fastened through all the transverse floors and the hull planking

Where the maximum timber engine seating height above the required floors is in excess of 3 times the siding of the seating, the seating shall be stiffened and support by side brackets located on every second floor. Side brackets shall be used as support between the seatings.

K.9 Deckhouse

Timber framed deckhouses require substitutional scantlings and fastened to ensure weathertightness.

They should be constructed on trunks or coamings efficiently fastened to carlings and/or deck beams.

Coamings to framed deckhouses shall be no less than 225mm in height and sided no less than the moulding of the deckhouse framing.

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Timber deckhouse planking shall be at minimum that obtained from able M.15. all planking which is rabbeted into the deckhouse framing shall be bedded into a mastic sealant.

Top beams and coverings of the deckhouse shall be in accordance with table M.15.a top plate of siding and moulding equal to the side stiffeners shall be affixed to the length of the deckhouse.

Deckhouse scantlings constructed of materials other than wood shall comply with the appropriate sub-section under the construction code section or determined by AUSCLASS if such material is not mentioned. These materials shall be through fastened to the coamings, decking or carlings after bedding in a mastic sealant.

K.10 Scantlings for Hard Chine Vessels

Note: Scantlings for double planked vessels shall be considered under this part.

K.10.1 Keel and Hog

The keel shall be sided and moulded as determined in table M.17 for all vessels except single planked hard chine displacement vessels, these vessels shall be in accordance with table M.1. There may be alterations in the siding and moulding in accordance with the notes associated with the tables.

The hog shall have a minimum siding and moulding as determined from table M.17 for all vessels except single planked hard chine displacement vessels, these vessels shall be in accordance with table M.1. There may be alterations in the siding and moulding in accordance with the notes associated with the tables.

The construction of the keel and hog may either be of solid timber or laminated. Vessel which utilise solid time construction and are less than 10 metres in length shall require the hog and keel to be on one length of timber. Vessels that are 10 metres or greater that have a keel or hog that's is not of one length shall ensure that is sufficiently scarphed.

Where a keel or hog is scarphed, such scarphs shall meet all requirements in this sub-section.

Where the keel and hog are constructed of a single piece of solid or laminated timer, the cross-sectional area may be reduced up to 15% of the total combined area of the keel and hog, that may be obtained from table M.1.

Stopwaters shall be fitted to all centreline construction joints where they intercept the rabbet line.

K.10.2 Stem

The siding and moulding of stem scantlings shall be no less than that of the keel scantlings determined from tables M.22 and M.17.

The scarph of the stem to keel shall not be less than 2.5 times the keel moulding in length.

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K.10.3 Transom

The trans of all vessels shall be obtained from table M.8 except single planked hard chine displacement vessels, these vessels shall be in accordance with table M.5.

Transom stiffener shall be spaced at a maximum of 450mm centres, together with margins. The stiffener and margin scantlings shall be derived from table M.18 except single planked hard chine displacement vessels, these vessels shall be in accordance with table M.5.

A substantial knee shall be fitted and though bolted through the transom and the hog.

K.10.4 Web Frames

The scantlings for web frames shall be derived from table M.7.

K.10.5 Intermediate frames in longitudinally planked hard chine hulls

Intermediate frames shall be of same dimensions and spacings as determined for frames in round bilge hulls having the same measured length, shall be fitted between web frames. Intermediate frames shall be housed in the chine no greater than 10mm for full cross-sectional area and dead nailed to the shear.

K.10.6 Floors

Floors shall be fitted at each transverse web frame and between web frames at not more than 450mm centres.

The siding and moulding of floors shall be determined from table M.19.

Where floors which are fitted in the throat of a web frame, the siding may be reduced to that of the web frame if the moulding is increased to maintain the section area t the vessels centreline.

Intermediate floors between web frames shall extend and be fastened to a stringer.

K.10.7 Stringers

The scantlings of bottom stringers shall be determined from table M.20 and associated notes.

A reduction in scantlings to 60% of the scantlings determined from table M.20 may be made for side stringers.

Stingers shall run the full length of the vessel where possible and where practical shall be in one length, stringers that are not in one length shall be scarphed. When stringers are scarphed, scarphs shall be not less in length than 6 times the dimension of the edge or face scarphed, and suitably fastened.

Feather edge scarphs shall be suitably fastened and glued.

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K.10.8 Chines

The minimum scantlings for chines shall be determined from table M.21.

In general, the ratio of siding to moulding of chines should not be greater than 1 to 2. The siding shall be in all cases be sufficient to provide a fraying surface which is 2.5 times the thickness of the bottom planking.

Where chines are scarphed, scarphs shall be at a minimum 6 times the length of the siding and suitably fastened.

The ends of diagonal planking and plywood shall be protected at the chine edge.

K.10.9 Chines for Single Planked Vessels

The dimensions of chines are to be determined from table M.9 and where practicable, chines should be in one length, but may be scarphed, in which case the scarphs shall be not less in length than 6 times the moulding ad be edge bolted.

K.10.10 Beam Shelf/Sheer Clamp

A suitable beam shelf and/or sheer clamp shall be fitted, and the minimum section area shown in table M.22 shall be maintained.

The shear clamp siding shall be sufficient to maintain faying surfaces equal to 2 times the deck planking thickness.

K.10.11 Fitting of Longitudinal Members

Beyond 0.6L amidships the scantlings of stringers, chines, sheer clamps and beam shelves may be reduced by a uniform taper of both moulding and siding by up to 20% of the cross-sectional area shown in the Tables.

Scarphs used in stringers, sheer clamps, beam shelf etc. shall be no closer than the web frame spacing, measured between the closet extremities of the scarphs considered. Scarphs shall not be located in the way of bulkheads, web frames or in line with keel scarphs. The scarph in a sheer clamp shall be at least one web frame spacing away from the butt in a sheer strake.

Breasthooks of grown timber or chocks of straight grain or brackets shall be fitted at the forward end of the hull between the stern and:

- Sheer clamp
- Chines in vessels of 12.5 metres in length and over

Growth knees, solid chocks or brackets shall be fitted between the transom and:

- Sheer clamp
- Chines 12.5 metres in length and over
- Every second stringer in vessels of 12.5 metres in length and over

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K.10.12 Hull Planking

The hull planking thickness shall be determined in accordance with table M.23 and associated notes.

Plywood planking of a single layer shall be provided with butt straps and fastenings in accordance with table M.24 and associated notes.

Where multiple layers of plywood are used, the minimum overlap shall have the same width as the butt straps as obtained from table M.24.

Where planking layers are laid parallel to each other in double planked fully glued diagonal construction, there shall be a minimum overlap of the alternate layers of 44 times the plank thickness and not greater than half the plank width.

K.10.13 Deck Planking

Deck planking thickness shall be determined in accordance with Table M.13 and associated notes.

In general, the planking for single planked decks have sidings no greater than twice the table thickness. Butts shall be no closer than 1500 mm to each other unless a passing plank is located between them, a distance of 1200mm may then be allowed. There shall be no butts in the same transverse plane unless there are three passing planks between.

Deck longitudinal scantlings in associations with the plywood decks shall be obtained from table M.27 and associated notes.

K.10.14 Deck Beams

Deck beam scantlings shall be determined in accordance with table M.12.

K.10.15 Watertight Bulkheads

Watertight bulkheads shall be constructed in accordance with 'watertight bulkheads' clause 6 and timber bulkhead scantlings shall be as shown in table M.25.

K.10.16 Pillars

The scantlings of pillars shall be determined in accordance with table M.14.

K.10.17 Engine Seatings

The installation of engine seatings shall be in accordance with table M.20.

K.10.18 Deckhouse

Plywood deckhouses shall have scantlings determined from table M.15 and associated notes.

Deckhouse framing shall be substantially fastened to the deck framing by through boulting to carlings, coamings or deck beams.

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K.11 Scantlings for Hard Chine Plywood Hulls Constructed on a System of Longitudinal Frames Supported by Web Frames

K.11.1 Symbols and units

B maximum beam (metres)

D depth moulded (metres)

h height to deck edge from:

- Mid span of the stiffener or frame, for calculation of stiffener or frame scantlings
- The middle of the panel between effective stiffeners, for panel thickness
- The centre of the longitudinal, for calculation of longitudinal scantlings (millimetres)

L waterline length (metres)

e length of span of frame stiffeners or beams (millimetres)

p bottom pressure, determined from part 2 displacement hull or part 3 planning hulls, of design loadings sub-section, as appropriate (kilopascals)

S spacing of stiffeners, frames, beams or floors, measured from centre to centre (millimetres)

t thickness of panels (millimetres)

V maximum speed (knots)

Z modulus of section (millimetres^3)

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K.11.2 Basis for scantlings

	Plywood (MPa)	Timber (MPa)
Bending Working Stress	14.0	14.0
Tensile Working Stress	11.0	11.0
Modulus of elasticity	12500	12500

Where the plywood or timber has a greater strength than that given in sub-clause above, the thickness shall be obtained from the following equation:

$$t_2 = t_c \sqrt{\frac{14}{permissible\ working\ stress}}$$

Where:

t_c thickness calculated in accordance with this part

t_2 required thickness

and the modulus of section (Z) of frames and stingers from the formula:

$$Z_2 = Z_c \frac{14}{permissible\ working\ strength}$$

where:

Z_c modulus calculated in accordance with this part

Z_2 required modulus

The permissible working stress is to be taken from the Australian Standards 1720-1975. Rules for use of timber in structures (SAA Timber Engineering Code).

K.12 Hull Thickness

K.12.1 Bottom pressure

Bottom pressure shall be determined from part 2 for displacement hulls, or part 3 for planning hulls of the design loadings sub-section, as appropriate.

Bottom pressure in any case should not be less than 3(L+6) kPa.

Special consideration shall be granted for the bottom pressure when the rise of floor is less than 12°.

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K.12.2 Bottom Ply

The plywood thickness from hog to chine shall not to be less than the greater of:

$$t = 0.018f(125 + P)\frac{S}{100}$$

$$t = 0.021(160 + 50L - 6V)$$

Where f = f_1 f_2 and f_1 and f_2 are defined in the following paragraphs respectively.

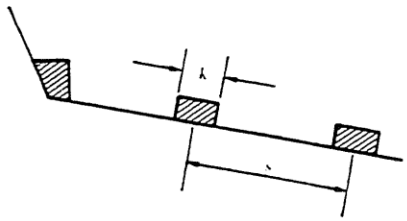
Correction for aspect ratio, where the aspect ratio of an unstiffened panel a/b (where a= length of longer side and b= length of shorter side) is less than 2, shall be by multiplying he calculated thickness by the factor f_1, where:

$$f_1 = 0.6 + 0.2\frac{a}{b}$$

Correction of breadth of frame, where the frame has a breadth K as shown below, is greater than $K = 0.05S$, shall be by multiplying the calculated thickness by the factor f_2, where:

$$f_2 = 1.1 - 2\frac{K}{S}$$

In no case should f_2 be taken as less than 0.7.



K.12.3 Side Ply

The thickness of the side plywood shall be determined using the loading P, as illustrated below where P is the bottom pressure determined by the 'bottom thickness' sub-clause prior where appropriate.

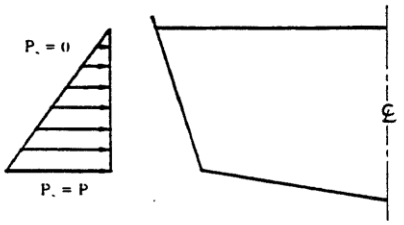
The pressure to be used is that applicable at the middle off the panel being considered.

The plywood thickness from chine to deck at side shall be no less than the greater of:

$$t = 0.013f(100 + P_s)\frac{S}{100}\ mm$$

$$t = 0.21(160 + 50L)\ mm$$

Where f = f_1f_2 and in no case shall the thickness be less than 6mm.



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K.12.4 Transom

Transoms for carrying outboard engine or stern drive installation

The plywood thickness shall be dependent on the engine power and shall be obtained as follows:

- The transom thickness located outside the area of attachment of the outboard or stern drive installation, shall be no less than that obtained from the following equation:

$$t = 0.41(160 + 50L)$$

- The transom thickness located in the area of attachment of the outboard or stern drive installation, shall be no less than that obtained from the following equation:

$$t = 0.41(160 + 50L) + a$$

Where 'a' shall be obtained from the following table:

Total installed engine power (kW)	a
< 30	20
$30 \leq kW < 60$	25
$60 \leq kW < 100$	30
$100 \leq kW < 135$	35
$135 \leq kW < 165$	45
$65 \leq kW$	to be specially considered

substantial knee shall be fitted:

- In the case of an outboard installation, between the transom and the hog
- In the case of a stern drive installation, between the transom and the engine seating

The plywood thickness of a transom that is not supporting an outboard or stern drive installation, shall be no less than that obtained from the following equations:

$$t = 0.013f(100 + P_s)\frac{S}{100}\ mm$$

$$t = 0.21(160 + 50L)\ mm$$

Where f = f_1f_2 and in no case shall the thickness be less than 6mm.

The deck shall be supported by transvers beams, longitudinal stringers or battens on association with deep transverse beams. Deep transverse beams shall be aligned with the side web frames and shall be arranged at the end of deck openings which are in the way of masts, posts and under heavy deck fittings. The deck thickness shall be increased by doubling pads around stressed corners of deck openings and under masts, posts and heavy deck fittings and heavy loads.

The plywood deck thickness for vessels 15metres or less shall be no less than: $t = 0.036S$.

After applying corrections f_1 and f_2 where appropriate, the plywood deck thickness for vessels greater than 15 metres shall in no case be less than: $t = 2.1(0.2L + 3)$.

Subject to the previous paragraph, the plywood deck thickness of a vessel greater than 15 metres shall be no less than:

- Where the deck is supported by transverse beams, $t = 0.001\left(\frac{L}{33}\right)S$
- Where the deck is supported by longitudinals, $t = 0.001\left(\frac{L}{18}\right)S$

Compensation for openings is to be provided in the side and bottom plywood having a diameter greater than 150mm.

K.12.5 Local reinforcement

Means shall be provided for protecting the side against abrasion and impact from operating, gallows, windlasses, hawse pipes, winches and derricks.

Where the rise of floor of the bottom of the vessel is less than 30°, there shall require addition stiffening. The frame spacing should be decreased or the bottom plywood thickness increases by the following percentages:

Rise of Floor (degrees)	Percentage Increase
30	0
25	10
20	20
15 or less	30

Intermediate values shall be determined by interpolation.

Adequate reinforcement shall be provided in way of the attachments of shaft brackets.

K.12.6 Hull Stiffening

Section modulus

Section modulus (Z) in relation to a frame or stiffener is provided by the member and the panel of plywood to which it is glued and fastened having an effective width of one frame spacing.

Section modulus (Z) in relation to a web frame, beam or girder which is supporting stiffeners shall be provided by the member and an effective width of plywood equal to either half the sum of the spacing on either side of the member or 33% of the unsupported span of the member, whichever is the less. For a member located alongside an opening, the effective plywood width shall be equal to either half the spacing or 16.5%% of the unsupported span, whichever is less.

The section modulus of a member that is not glued and fastened to the plywood, shall be the member only.

K.12.7 Stern, keel and hog

Stern, keel and hog scantlings shall be given in table M.2 and M.17 with associated notes, with the exception of note (b)(i) of table M.17, where on either side of the keel there shall be 3 times the plywood thickness provided and in note (b)(ii) of table M.17, the moulding should be sufficient to provide 3 times the plywood thickness.

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The stern, keel and hog may be laminated or solid timber construction.

A solid keel or hog in vessels 10 metres or less in length shall be of one length and in vessels over 10 metres in length where the keel or hog is not in one length it shall be efficiently scarphed.

Where the keel or hog shall be of laminated construction, full details of the glue and method of lamination shall be submitted to ASUCLASS to be approved.

The keel or hog may be scarphed at one third their respective lengths with at least 10 times the keel moulding given in table M.17 between the adjacent scarph in the keel and the scarph in the hog.

Keel or hog scarphs should be avoided one engine length forward or aft of the main engine.

Keel and hog scarphs shall not be less in length than 6 times the respective tabular moulding. The scarphs shall have nibs of the following depth:

- 0.25 times the depth of the scarph for a moulding not greater than 200mm.
- 0.125 times the depth of the scarph plus 25mm for a moulding greater than 200mm.

Stop waters shall be fitted at all centre line construction joints where that intercept the rabbet line.

The scarph of the stem to the keel should be no less in length than 2.5 times the tabular moulding.

K.12.8 Sheer Clamp

A suitable sheer clamp shall be fitted with a minimum section as shown in table M.22.

The siding and moulding of the sheer clamp shall be sufficient to maintain faying surfaces equal to twice the planking thickness for deck and hull respectively.

K.12.9 Chines

The cross-sectional area of the chine in millimetres over 0.6L amidships shall be no less than:

$$\text{area} = 12.5\ t_b{}^2$$

Where:

t_b = thickness of bottom plywood

In general, the ratio of siding to moulding of chines should not be greater than 1:2. The siding shall be in all cases sufficient to provide a fraying surface which is 2.5 times the thickness of the bottom plywood.

Where practicable, chines shall be in one length and if not shall be effectively scarphed.

Where chines are scarphed the length of the scarph shall be no less than 6 times the moulding.

Feather edge scarphs may only be used in vessels less than 15 meters in length. The length of the scarph shall be no less than 6 times the moulding and shall be glued and fastened.

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K.12.10 Beam Shelf

Where a beam shelf is fitted, the section modulus (Z) about the horizontal axis shall be no less than:

$$Z = 0.045\, S^2\, B_1$$

Where:

B_1 span of beam supported

K.12.11 Stringers

The section modulus (Z) of each bottom stringer in association with the attached plywood shall be no less than that obtained from the following equation:

$$Z = 0.022P * s * \left(\frac{e}{100}\right)^2$$

The section modulus (Z) of each side stringer is association with the attached plywood shall be no less than that obtained from the following equation:

$$Z = 1.1S\left(\frac{h}{1000} + 0.25\right)\left(\frac{e}{100}\right)^2$$

Where practicable stringers should be in one length. If not in one length, the stringers shall be scarphed or joined by a butt strap.

Where stringers are scarphed the length of scarphed shall be no less than 6 times the siding.

Butt straps where used shall extend the complete length adjacent to web frames and shall have a thickness no less than that of the bottom or side plywood, as appropriate.

Feather edge scarphs all only be used in vessel less than 15 metres in length. The scarph length shall be not less than 6 times the siding. The scarphs are to be glued and fastened.

K.12.12 Fitting of Longitudinal Members

Beyond 0.6L amidships the scantlings of the chine and sheer clamp may be reduced by a uniform taper of both moulding and siding up to 20% of the cross-sectional area.

Adjacent joints in stringers, chines, sheer clamps and beam shelves, shall be no closer than the web frame spacing. The distance between the joints is to be measured between the end of one scarph and the commencement of the next.

Longitudinal members shall not have joints in way of bulkheads, web frames or in line with keel scarphs.

A scarph in a sheer clamp shall not be closer than one web frame spacing to a butt in the side plywood.

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K.12.13 Web Frames

Web frames shall be efficiently connected to floors and shall be aligned with strong full deck beams.

The section modulus (Z) of each web frame in association with the attached plywood shall be no less than that obtained from the following equation:

- In the case of a bottom web: $Z = 0.026 * P * S * \left(\frac{e}{100}\right)^2$
- In the case of a side web: $Z = 1.1 * S * \left(\frac{h}{100} + 0.25\right) * \left(\frac{e}{100}\right)^2$

In no case shall the siding and moulding of the side web frames be less than 60% of the siding moulding of the bottom frame.

K.12.14 Floors

Floors shall be provided at each web frame and between web frames at not more than 450 mm centres.

At the centreline the floor depth shall be 625mm and have a section modulus $(\mathrm{Z}) = 35 * \mathrm{S} * \mathrm{D} * \mathrm{B}^2$.

Intermediate floors between web frames shall extend and be fastened to a stringer.

K.12.15 Transom Stiffeners

Where horizontal stiffeners are fitted, they are to be aligned and fixed to the side shell stringers. Where the horizontal stiffeners exceed 2 metres in length, vertical transom stiffeners shall be fitted. Vertical stiffeners shall be in align with and connected to the hog, engine beds or bottom stringers or efficiently bracketed to the bottom plywood and carried through to the first web frame.

The section modulus (Z) of horizontal stiffeners in association with the attached plywood shall be no less then:

$$Z = 1.1S\left(\frac{h}{100} + 0.25\right)\left(\frac{e}{100}\right)^2$$

The section modulus (Z) of vertical stiffeners in association with the plywood to which they are attached, shall be no less than that obtained from the following equation:

$$Z = 1.1S\left(\frac{h}{100} + 0.25\right)\left(\frac{e}{100}\right)^2$$

K.12.16 Transverse and Longitudinal Deck Beams

Where the deck is supported as illustrated below, the modulus of section (Z) of each deck longitudinal in association with the plywood to which it is attached, shall be no less than that obtained from the following equation:

$$Z = 25 * S * \left(\frac{e}{1000} + 1\right)^2$$

And the modulus section (Z) of the transverse deck beam shall be no less than:

$$Z = 25 * S * \left(\frac{e}{1000} + 1\right)^2$$

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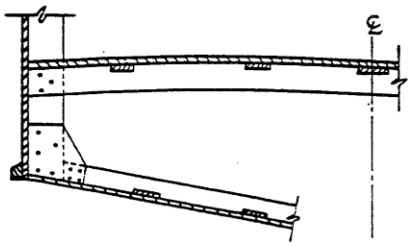

The modulus of section (Z) of the beam in association with the deck plywood, when the deck is directly attached to the transverse deck without longitudinals, shall be no less than that obtained from the following equation:

$$Z = 25 * s * \left(\frac{e}{1000} + 1\right)^2$$

Heavier beams or supporting pillars shall be fitted under areas of concentrated loads such as masts, winches, fish tanks, windlasses.

The end of transverse beams shall be aligned with and securely connected to side web frames. Intermediate beams shall be supported by a beam shelf and/or sheer clamp, the beams also be securely connected to the side web frames.

K.12.17 Pillars

Pillars shall be fitted below masts, winches, windlasses, bollards and other heavy and vibrating loads, here no other support options are provided.

The loads on a pillar is to be obtained from the following equation:

$$\mathrm{W} = 0.715 * \mathrm{b} * \mathrm{h} * \mathrm{s} \ \text{tonnes}$$

Where:

W load in tonnes

B mean breadth in metres of area supported

s spacing of pillars in metres

h height in metres above the deck supported as defined below:

- h for a pillar below an exposed deck on which cargo is carried is the distance from the deck supported to a point 3.65 metres above the exposed deck. Where it is intended to carry deck cargoes in excess of 2640 kg/m^2, h proportion to the added loads which will be imposed on the structure.
- Where tween deck cargo is carried and its mass is other than 2640 kg/m^2, h shall be suitably adjusted.
- h for a pillar below the freeboard deck shall be measured to a point not less than 0.02L+0.75 metres above the freeboard deck.
- h for a pillar below the superstructure deck shall be measured to a point not less than 0.2L+0.5 metres above the superstructure deck.

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The permissible load a pillar can carry is to be equal to or greater than the pillar load as determined above. The permissible load may be obtained from the equation:

$$wa = \frac{A}{1000}\left(l - 17\left(\frac{l}{a}\right)\right)$$

Where:

wa permissible load on the pillar in tonnes

l unsupported length of pillar in metres

a diameter of a circular pillar or shorter ide of a rectangular pillar in millimetres

A area of cross section in square millimetres

Table M.14 provides pillar loadings for a representative selection of round and rectangular pillars.

The scantlings of pillars and stanchions or material other than timber shall be determined from the appropriate sub-section, special consideration shall be given by AUSCLASS if scantlings are unable to determined.

Pillars and stanchions may be located directly under beams, deck openings, corners or deck longitudinals. Pillars which are fitted under longitudinals, shall be spaced between bulkheads and shall not be greater than 5 time the beams spacing = 500mm in the fore or aft direction, they shall also not be placed more than 25% of the vessels beam from the centreline.

Supports under pillars or stanchions are to be able to distribute the loads effectively and be of sufficient strength.

K.12.18 Engine Seatings

The engine seatings shall have dimensions which are proportionate with the power of the machinery fitted. They should:

- Be of a length not less than twice the distance between the extreme engine holding down bolts
- Distribute the load over as many transverses as possible
- Terminate on a substantial transverse member
- Be checked over and securely fastened through all transverse floors and the hull planking

Where the maximum timber engine seating height above the required floors is in excess of 3 times the siding of the seating, the seating shall be stiffened and support by side brackets located on every second floor. Side brackets shall be used as support between the seatings.

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K.12.19 Plywood Bulkheads

The thickness of the bulkhead shall be no less than that obtained from the following equation:

$$t = 0.0042\left(\frac{h}{1000} + \frac{7L}{15}\right)$$

Where:

h height of bulkhead at the centreline

collision bulkheads shall have a thickness 45% greater than that obtained in the above equation.

The bulkhead shall be fastened to a transverse web frame effectively.

The minimum section modulus (Z) of stiffeners located on watertight bulkheads in association with the attached plywood shall be no less than that obtained from the following equation:

$$Z = 1.06\left(\frac{e}{100}\right)^2 * \frac{Sh}{1000}$$

Where:

h height from midpoint of span to top of bulkhead measured at the centreline

The modulus of section (Z) of stiffeners located on collision bulkheads shall be at a minimum 1.25 times that given by the above equation.

K.12.20 Deckhouses

In the construction of the deckhouse or casing, the plywood thickness shall be at minimum that obtained from the following equation:

- In the case of a deckhouse front: $t = 0.0028 * S * (B + K)$
- In the case of a deckhouse side or after bulkhead or deckhead: $t = 0.0022 * s * (B + K)$

Where K is derived from:

L	K
$\mathrm{L} < 5$ metres	3
$5 \leq \mathrm{L} < 7.5$ metres	4
$7.5 \leq \mathrm{L} < 10$ metres	5
$10 \leq \mathrm{L} < 15$ metres	6
$\mathrm{L} \geq 15$ meters	7

The stiffener spacing shall be reduced by 20% or the plywood thickness increased by 20% when the front of the deckhouse is within 0.25L of the forward perpendicular.

The section modulus(Z) of the stiffener and beams in association with the deck plywood to which they are attached shall be no less than that obtained from the following equation:

- In the deckhouse front: $Z = 33B * S * \left(\frac{e}{1000}\right)^2$
- In the case of a deckhouse side or after bulkhead: $Z = 19.8 * B * S * \left(\frac{e}{1000}\right)^2$
- In the case of a deckhand: $Z = 16.7 * S * \left(\frac{e}{1000} + 1\right)^2$

Deckhouse beams shall be affixed to the stiffeners at the side whenever practicable.

K.13 Scantlings for Vessels of Sawn Frame Construction

Vessels of sawn frame construction shall have special consideration by the governing authority.

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Table M.1

KEEL AND HOG OR KEELSON (SINGLE PLANKED HULLS)

Measured length	*Keel*			*Hog*			*Keelson*		
	Section area	*Siding*	*Moulding*	*Section area*	*Siding*	*Moulding*	*Section area*	*Siding*	*Moulding*
m	mm²	mm	mm	mm²	mm	mm	mm²	mm	mm
5	7 500	75	100	7 500	150	50	3 850	70	55
6	7 500	75	100	8 750	175	50	5 200	80	65
7	9 375	75	125	11 000	200	55	6 750	90	75
8	12 500	100	125	13 500	225	60	8 500	100	85
9	15 000	100	150	14 625	225	65	10 450	110	95
10	18 750	125	150	17 500	250	70	12 600	120	105
11	26 250	150	175	20 625	275	75	14 950	130	115
12	35 000	175	200	24 000	300	80	17 500	140	125
13	39 375	175	225	25 500	300	85	20 250	150	135
14	45 000	200	225	29 250	325	90	24 000	160	150
15	50 000	200	250	33 250	350	95	27 200	170	160
16	56 250	225	250	37 500	375	100	30 600	180	170
17	68 750	250	275	39 375	375	105	35 100	195	180
18	75 000	250	300	44 000	400	110	38 950	205	190
19	81 250	250	325	48 875	425	115	43 000	215	200
20	89 375	275	325	54 000	450	120	47 250	225	210
21	96 250	275	350	56 250	450	125	51 700	235	220
22	105 000	300	350	61 750	475	130	56 350	245	230
23	112 500	300	375	67 500	500	135	62 475	255	245
24	121 875	325	375	73 500	525	140	67 575	265	255
25	130 000	325	400	79 750	550	145	72 875	275	265
26	140 000	350	400	86 250	575	150	79 750	290	275
27	148 750	350	425	93 000	600	155	85 500	300	285
28	159 375	375	425	96 000	600	160	91 450	310	295
29	168 750	375	450	106 250	625	170	97 600	320	305
30	180 000	400	450	113 750	650	175	100 650	330	315
31	190 000	400	475	121 500	675	180	112 200	340	330
32	212 500	425	500	129 500	700	185	119 000	350	340
33	223 125	425	525	133 000	700	190	126 000	360	350
34	236 250	450	525	141 375	725	195	135 000	375	360
35	247 500	450	550	150 000	750	200	142 450	385	370

—*Notes*:

(a) Keel siding and moulding may be varied provided Section Area is maintained, and the ratio of siding to moulding is not greater than 1 to 1.5.

(b) Hog siding and moulding may be varied provided Section Area is maintained, and:

(i) Siding is sufficient for garboard plank landings of at least 1.75 times plank thickness on each side of keel; and

(ii) Moulding is sufficient to provide 2.5 times plank thickness.

(c) Keelson siding and moulding may be varied provided Section Area is maintained, and the ratio of siding to moulding is not greater than 1 to 1.2.

Table M.2

STEM & FORWARD DEADWOOD

Measured length	*Stem (heel)*		*Stem (head)*		*Forward deadwood*
	1	*2*	*3*	*4*	
	Siding	*Moulding*	*Siding*	*Moulding*	**Siding*
m	mm	mm	mm	mm	mm
5	75	100	60	80	150
6	75	100	60	80	175
7	75	125	60	100	175
8	100	125	80	100	200
9	100	150	80	120	225
10	125	150	100	120	250
11	150	175	120	140	275
12	175	200	140	160	300
13	175	225	140	180	300
14	200	225	160	180	325
15	200	250	160	200	350
16	225	250	180	200	375
17	250	275	200	220	375
18	250	300	200	240	400
19	250	325	200	260	425
20	275	325	220	260	450
21	275	350	220	280	450
22	300	350	240	280	475
23	300	375	240	300	500
24	325	375	260	300	525
25	325	400	260	320	550
26	350	400	280	320	575
27	350	425	280	340	575
28	375	425	300	340	600
29	375	450	300	360	625
30	400	450	320	360	650
31	400	475	320	380	675
32	425	500	340	400	675
33	425	525	340	420	700
34	450	525	360	420	725
35	450	550	360	440	750

* Forward Deadwood does not include Apron.

Notes:

(a) Stem siding and moulding may be varied provided sectional area is maintained and the ratio of siding to moulding is not greater than 1 to 1.5.

(b) The stem may be uniformly tapered from heel to the dimensions shown in columns 3 and 4. Where stem siding and moulding are varied in accordance with Note (a) the taper shall be not greater than one fifth of the heel scantlings.

(c) The face of the stem may be reduced in siding below the deckline.

(d) Laminated stems shall be subject to special consideration.

(e) Grown knees forming forward deadwoods shall have a moulding of not less than 1.5 times the siding.

Table M.3

STERNPOST AND AFT DEADWOOD

Measured length	*Sternpost*		*Aft deadwood*
	**Siding*	*Moulding*	**Siding*
m	mm	mm	mm
5	75	100	75
6	75	100	75
7	75	125	75
8	100	125	100
9	100	150	100
10	125	150	125
11	150	175	150
12	175	200	175
13	175	225	175
14	200	225	200
15	200	250	200
16	225	250	225
17	250	275	250
18	250	300	250
19	250	325	250
20	275	325	275
21	275	350	275
22	300	350	300
23	300	375	300
24	325	375	325
25	325	400	325
26	350	400	350
27	350	425	350
28	375	425	375
29	375	450	375
30	400	450	400
31	400	475	400
32	425	500	425
33	425	525	425
34	450	525	450
35	450	550	450

* Thickness of timber on each side of the shaft tube is to be not less than 0.25 times the keel siding.

Notes:

(a) The sternpost is to be connected to the keel by a mortice and tenon joint and also by a dovetail plate or other equivalent connection on both sides in addition to the fastenings.

(b) The inner posts, deadwood and/or shaft logs shall be substantially moulded to permit a double row of fastenings in the hood ends coupled with a minimum faying surface of 3 times the planking thickness.

(c) Where the keel siding has been modified in accordance with Note (a) Table M.1, the sidings of sternposts and aft deadwoods may be uniformly tapered from below the shaft line to the keel.

Table M.3

STERNPOST AND AFT DEADWOOD

Measured length	*Sternpost*		*Aft deadwood*
	**Siding*	*Moulding*	**Siding*
m	mm	mm	mm
5	75	100	75
6	75	100	75
7	75	125	75
8	100	125	100
9	100	150	100
10	125	150	125
11	150	175	150
12	175	200	175
13	175	225	175
14	200	225	200
15	200	250	200
16	225	250	225
17	250	275	250
18	250	300	250
19	250	325	250
20	275	325	275
21	275	350	275
22	300	350	300
23	300	375	300
24	325	375	325
25	325	400	325
26	350	400	350
27	350	425	350
28	375	425	375
29	375	450	375
30	400	450	400
31	400	475	400
32	425	500	425
33	425	525	425
34	450	525	450
35	450	550	450

* Thickness of timber on each side of the shaft tube is to be not less than 0.25 times the keel siding.

Notes:

(a) The sternpost is to be connected to the keel by a mortice and tenon joint and also by a dovetail plate or other equivalent connection on both sides in addition to the fastenings.

(b) The inner posts, deadwood and/or shaft logs shall be substantially moulded to permit a double row of fastenings in the hood ends coupled with a minimum faying surface of 3 times the planking thickness.

(c) Where the keel siding has been modified in accordance with Note (a) Table M.1, the sidings of sternposts and aft deadwoods may be uniformly tapered from below the shaft line to the keel.

DRAFT

Table M.5
TRANSOM

Measured length	*Thick-ness*	**Stiffeners*		*Margin*	
		Siding	*Mould-ing*	*Siding*	*Mould-ing*
m	mm	mm	mm	mm	mm
5	28	50	25	75	35
6	30	55	25	80	40
7	32	60	25	85	45
8	34	60	30	90	45
9	36	65	30	95	50
10	38	70	30	100	50
11	40	70	35	105	50
12	42	75	40	110	55
13	44	80	40	120	60
14	46	85	45	125	60
15	48	90	45	130	65
16	50	95	45	140	65
17	52	95	50	145	70
18	54	100	50	150	75
19	56	105	50	160	75
20	58	110	55	165	80
21	60	115	55	170	80
22	62	115	60	180	85
23	64	120	60	185	90
24	66	125	65	190	90
25	68	130	65	200	95
26	70	130	70	205	95
27	72	135	70	210	100
28	74	140	75	220	100
29	76	145	75	225	105
30	78	150	80	230	110
31	80	155	85	235	110
32	82	155	90	245	115
33	84	160	90	250	120
34	86	165	95	255	120
35	88	170	100	260	125

* Stiffeners spaced at 450 mm centre to centre.

Notes:

(a) Table thickness is for single thickness planked construction. Where diagonal or multiple skin construction is adopted, the thickness may be reduced to 0.75 of that in the table.

(b) Where stiffener spacing is less than the standard spacing or 450 mm used in the table, stiffener scantlings may be adjusted by maintaining the section modulus of stiffener per millimetre of stiffener spacing. For example:

Vessel 20 m length—propose to use spacing of 300 mm with siding of 100 mm;
Modulus per millimetre at table scantlings and spacing = 123

$$\text{Required moulding} = \sqrt{\frac{123 \times 300 \times 6}{100}} = 47 \text{ mm}$$

(c) Where the stiffener spacing is less than the basic 450 mm the transom thickness may be decreased for every decrease in the resulting space between the stiffeners at the rate of 3 mm per 30 mm decrease.

Table M.6
BENT FRAMES

Measured length	*Bent frames*		
	**Spacing*	*Siding*	*Moulding*
m	mm	mm	mm
5	100	30	25
6	110	35	25
7	120	40	25
8	130	45	25
9	140	45	25
10	150	50	25
11	160	55	30
12	170	60	30
13	180	65	35
14	190	70	35
15	200	75	40
16	210	80	45
17	220	85	50
18	230	85	55
19	240	90	55
20	250	95	60
21	260	100	60
22	270	105	65
23	280	105	70
24	290	110	70
25	300	115	75
26	310	120	80
27	320	125	85
28	330	125	90
29	340	130	95
30	350	135	95
31	360	140	100
32	370	145	100
33	380	150	105
34	390	155	105
35	400	160	110

* Spacing is measured from centre to centre of frames.

Notes:

(a) Bent frames may be in unglued laminations, each not less than 12 mm in thickness and fastened with copper nails clenched or rivetted on roves or bolts with nuts and washers. See Table M.26.

(b) If the frame spacing shown is not used then frame scantlings are to be adjusted by maintaining the section modulus of frame per millimetre of frame spacing. For example—

Vessel 20 m length—wish to use spacing of 300 mm with siding of 100 mm:

Modulus per millimetre at table scantlings and spacing = 228

$$\text{Required moulding} = \sqrt{\frac{228 \times 300 \times 6}{100}} = 64 \text{ mm}$$

N.B. Plank thickness will also require increase of 3 mm per 25 mm increase in frame spacing—refer note (a) Table M.11

Table M.6
BENT FRAMES

Measured length	*Bent frames*		
	**Spacing*	*Siding*	*Moulding*
m	mm	mm	mm
5	100	30	25
6	110	35	25
7	120	40	25
8	130	45	25
9	140	45	25
10	150	50	25
11	160	55	30
12	170	60	30
13	180	65	35
14	190	70	35
15	200	75	40
16	210	80	45
17	220	85	50
18	230	85	55
19	240	90	55
20	250	95	60
21	260	100	60
22	270	105	65
23	280	105	70
24	290	110	70
25	300	115	75
26	310	120	80
27	320	125	85
28	330	125	90
29	340	130	95
30	350	135	95
31	360	140	100
32	370	145	100
33	380	150	105
34	390	155	105
35	400	160	110

* Spacing is measured from centre to centre of frames.

Notes:

(a) Bent frames may be in unglued laminations, each not less than 12 mm in thickness and fastened with copper nails clenched or rivetted on roves or bolts with nuts and washers. See Table M.26.

(b) If the frame spacing shown is not used then frame scantlings are to be adjusted by maintaining the section modulus of frame per millimetre of frame spacing. For example—

Vessel 20 m length—wish to use spacing of 300 mm with siding of 100 mm:

Modulus per millimetre at table scantlings and spacing = 228

$$\text{Required moulding} = \sqrt{\frac{228 \times 300 \times 6}{100}} = 64 \text{ mm}$$

N.B. Plank thickness will also require increase of 3 mm per 25 mm increase in frame spacing—refer note (a) Table M.11

Table M.7
TRANSVERSE WEB FRAMES

Measured length	*Spacing	*Web frames*	
		Siding	*Moulding*
m	mm	mm	mm
5.	500	20	60
6.	550	25	65
7.	600	25	75
8.	650	30	80
9.	700	30	90
10.	750	35	95
11.	800	35	105
12.	850	40	110
13.	900	45	120
14.	950	45	125
15.	1 000	50	135
16.	1 050	50	140
17.	1 100	55	150
18.	1 150	60	155
19.	1 200	60	165
20.	1 250	65	170
21.	1 300	65	180
22.	1 350	70	185
23.	1 400	75	195
24.	1 450	75	200
25.	1 500	80	210
26.	1 550	80	215
27.	1 600	85	225
28.	1 650	90	230
29.	1 700	90	240
30.	1 750	95	250
31.	1 800	95	255
32.	1 850	100	265
33.	1 900	105	270
34.	1 950	105	280
35.	2 000	110	285

* Spacing is measured from frame centre to frame centre.

Notes:

(a) Where the basic spacing shown in the table is not adopted, frame scantlings are to be adjusted by maintaining the section modulus of the frame per millimetre of frame spacing (Refer to Note (b) Table M.6).

(b) Frames of the above siding and moulding may be notched to a depth of not more than 12.5 per cent of the moulding to house longitudinal stringers.

Table M.8

FLOORS (SINGLE PLANKED HULLS)

Measured length	*Floors*	
	Siding	*Moulding*
m	mm	mm
5.	40	100
6.	45	125
7.	45	150
8.	50	150
9.	55	175
10.	60	200
11.	65	225
12.	65	250
13.	70	250
14.	75	275
15.	80	300
16.	85	325
17.	90	325
18.	90	350
19.	95	375
20.	100	400
21.	105	425
22.	110	425
23.	110	450
24.	115	475
25.	120	500
26.	125	525
27.	125	550
28.	130	550
29.	135	575
30.	140	600
31.	145	625
32.	145	650
33.	150	650
34.	155	675
35.	160	700

Notes:

(a) Both flitch and grown floors are to be sided generally 2 times the planking thickness shown for single planked hulls in Table M.11. Sidings are for single planked hulls, and floors shall be fitted at not more than 3 times the bent frame spacing outside the engine room in round bilge hulls.

(b) Floors in machinery spaces shall be increased in siding by 30 per cent or alternatively may be fitted at 2 times the bent frame spacing.

(c) Where practicable floors should be of sufficient depth to connect with and be through fastened to the lower bilge stringers.

(d) For floors in way of web frames refer to M.14.

Table M.9

CHINES AND STRINGERS (SINGLE PLANKED HULLS)

Measured length	*Chines*			*Stringers*		
	Section area	*Siding*	*Moulding*	*Section area per side*	*Siding*	*Moulding*
m	mm^2	mm	mm	mm^2	mm	mm
5.	1 950	30	65	5 400	60	30
6.	2 450	35	70	5 850	65	30
7.	3 000	40	75	7 350	70	35
8.	3 600	45	80	8 400	80	35
9.	4 250	50	85	9 600	80	40
10.	4 950	55	90	11 400	95	40
11.	6 000	60	100	14 175	105	45
12.	7 150	65	110	14 850	110	45
13.	8 050	70	115	18 000	120	50
14.	9 375	75	125	18 750	125	50
15.	10 800	80	135	22 275	135	55
16.	12 325	85	145	23 100	140	55
17.	13 950	90	155	27 000	150	60
18.	15 675	95	165	31 200	160	65
19.	17 000	100	170	32 175	165	65
20.	18 375	105	175	36 750	175	70
21.	19 800	110	180	37 800	180	70
22.	21 275	115	185	42 750	190	75
23.	22 800	120	190	45 000	200	75
24.	24 375	125	195	49 200	205	80
25.	26 000	130	200	51 600	215	80
26.	27 675	135	205	56 100	220	85
27.	29 400	140	210	62 100	230	90
28.	31 175	145	215	63 450	235	90
29.	33 000	150	220	69 825	245	95
30.	34 875	155	225	72 675	255	95
31.	36 800	160	230	78 000	260	100
32.	38 775	165	235	81 000	270	100
33.	40 800	170	240	88 200	280	105
34.	42 875	175	245	94 050	285	105
35.	45 000	180	250	97 350	295	110

Notes:

— (a) At least 3 stringers shall be fitted on each side of a round bilge hull and in the bottom of chine hulls. Where more than 3 stringers are fitted their scantlings shall be subject to special consideration by the Authority.

(b) Stringers may be laminated. Each lamination should be not less than 12mm in thickness (Refer M.15.1 (b)).

(c) Scantlings of chines and stringers may be reduced from those shown in the table by a uniform taper of both siding and moulding by up to 20 per cent of the cross sectional area beyond 0.6L amidships.

Table M.10

SHEER CLAMP AND BEAM SHELF (SINGLE PLANKED HULLS)

Measured length	*Sheer clamp*		*Beam shelf*	
	Siding	*moulding*	*Siding*	*Moulding*
m	mm	mm	mm	mm
5	20	115	25	20
6	20	125	30	20
7	25	130	35	25
8	30	135	40	25
9	35	140	50	30
10	40	150	55	35
11	45	155	60	40
12	45	165	65	40
13	50	170	75	45
14	55	175	80	50
15	60	180	85	50
16	65	190	95	55
17	70	195	100	60
18	75	205	105	60
19	75	210	110	65
20	80	215	120	70
21	85	225	125	75
22	90	230	130	75
23	95	235	135	80
24	100	245	145	85
25	105	250	150	90
26	110	255	155	95
27	110	260	160	95
28	115	270	170	100
29	120	275	175	105
30	125	280	180	110
31	130	290	190	110
32	135	295	195	115
33	140	300	200	120
34	145	310	205	120
35	150	315	210	125

Notes:

(a) Scantlings of sheer clamp and beam shelf may be reduced by a uniform taper of both moulding and siding by up to 20 per cent of the sectional area beyond 0.6L amidships.

(b) Sheer clamps and beam shelves in way of raised decks. etc.. shall have scantlings as shown in the Table.

Table M.11
HULL PLANKING THICKNESS

Measured length	*Single planked*	*Multiple skins (total)*			*Marine plywood*
		2 Layers	*3 Layers*	*4 Layers*	
m	mm	mm	mm	mm	mm
5	18	15	15	15	9
6	20	17	17	17	11
7	22	19	19	18	12
8	24	21	20	19	14
9	26	23	22	21	15
10	28	25	24	23	16
11	30	26	25	24	18
12	32	28	27	25	20
13	34	30	29	27	21
14	36	32	30	28	22
15	38	34	32	30	24
16	40	36	34	32	25
17	42	38	36	33	27
18	44	40	37	34	28
19	46	42	39	36	30
20	48	44	41	38	31
21	50	45	42	39	33
22	52	47	44	41	34
23	54	49	46	42	36
24	56	51	47	43	37
25	58	53	49	45	39
26	60	55	51	46	40
27	62	57	53	48	42
28	64	59	54	49	43
29	66	60	56	51	45
30	68	62	58	53	46
31	70	64	59	54	48
32	72	66	61	56	50
33	74	68	63	57	51
34	76	70	65	59	52
35	78	72	66	60	54

Notes:

(a) Where frame spacing differs from the basic frame spacings shown in Table M.6, planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between frames as follows:

(i) Bent frames—3 mm per 25 mm difference

(ii) Other frame types—3 mm per 30 mm difference

(b) Plywood may be in multiple thicknesses to obtain the total thickness shown in the right hand column of the Table.

(c) Table thicknesses for multiple skins are applicable only to hulls where planking layers are glued together.

(d) Where multiple skins are not glued together the total thickness shall be as for single planking, however, where the multiple skins are laid diagonally and not glued together the total thickness shall be 90 per cent of the Table thickness for single planking.

(e) The Table scantlings are for hardwood of 960kg/m3 density and marine grade plywood to Australian Standard AS 2272-1979, Plywood For Marine Craft.

Table M.12
DECK BEAMS

*	*Deck beams*			
Length of beam	*Spacing*	*Siding*	*Moulding (mid-span)*	*Moulding (ends)*
m	mm	mm	mm	mm
1.	250	25	35	25
1.5	275	35	45	35
2.0	300	40	60	40
2.5	325	50	75	50
3.0	350	50	90	50
3.5	375	65	110	65
4.0	400	70	130	70
4.5	425	80	155	80
5.0	450	90	175	90
5.5	475	100	200	100
6.0	500	110	225	110
6.5	525	120	250	125
7.0	550	130	275	140
7.5	575	140	300	150
8.0	600	150	325	160

* See notes (b) and (c) for determination of length of beam.

Notes:

(a) Basic spacing is from beam centre to beam centre.

(b) Length of beam shall be the breadth of the vessel at the position of the beam.

(c) Length of beam when pillars and girders are fitted is to be determined from sub-clause M.17.1 (f).

(d) If basic spacing is increased or decreased then the section modulus at mid-span of the beam shall be increased or may be decreased respectively in the same proportion.

(e) If the table dimensions for siding and moulding are varied then the section modulus is to be maintained.

M not to exceed 3 x s

Note: section modulus $Z = S \times M^2/6$

where S = siding in mm

M = moulding in mm

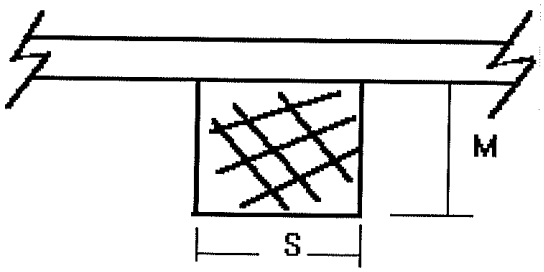


Table M.13

DECK PLANKING

Measured Length	*Deck planking*	
	Single planked	*Plywood*
m	mm	mm
5.	25	10
6.	25	10
7.	26	12
8.	28	14
9.	30	16
10.	32	18
11.	34	20
12.	36	22
13.	38	24
14.	42	26
15.	44	28
16.	46	30
17.	48	32
18.	50	34
19.	52	36
20.	54	38
21.	56	40
22.	58	42
23.	60	44
24.	64	46
25.	66	48
26.	68	50
27.	70	52
28.	72	54
29.	74	56
30.	76	58
31.	78	60
32.	80	62
33.	84	64
34.	86	66
35.	88	68

Notes:

(a) Where beam spacing differs from the basic beam spacings shown in Table M.12. planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between beams as follows:

(i) Single planked—3 mm per 25 mm difference.

(ii) Plywood—3 mm per 50 mm difference

(b) Plywood may be in multiple thicknesses to obtain the total thickness shown in the right hand column of the table.

(c) The table scantlings are for softwood of 640 kgs/m³ density and marine grade plywood to Australian Standard AS 2272-1979. Plywood For Marine Craft.

Table M.14

PERMISSIBLE LOAD ON TIMBER PILLARS

(Tonnes)

a (mm)	*Unsupported length of pillar (m)*							
	Rectangular section				*Round section*			
	1	*2*	*3*	*4*	*1*	*2*	*3*	*4*
50	1.7	0.8	..	..	1.3	0.6	..	..
60	2.6	1.6	0.5	..	2.0	1.2	0.4	..
70	3.7	2.5	1.3	..	2.9	2.0	1.0	..
80	5.0	3.7	2.3	1.0	4.0	2.9	1.8	0.8
90	6.6	5.0	3.5	2.0	5.2	4.0	2.8	1.6
100	8.3	6.6	4.9	3.2	6.5	5.2	3.8	2.5
110	10.2	8.4	6.5	4.6	8.0	6.6	5.1	3.6
120	12.4	10.3	8.3	6.2	9.7	8.1	6.5	4.9
130	14.7	12.5	10.3	8.1	11.5	9.8	8.1	6.3
140	17.2	14.8	12.5	10.1	13.5	11.7	9.8	7.9
150	20.0	17.4	14.9	12.3	15.7	13.7	11.7	9.7
160	22.9	20.2	17.4	14.7	18.0	15.8	13.7	11.6
170	26.0	23.1	20.2	17.3	20.4	18.2	15.9	13.6
180	29.3	26.3	23.2	20.2	23.0	20.6	18.2	15.8
190	32.9	29.6	26.4	23.2	25.8	23.3	20.7	18.2
200	36.6	33.2	29.8	26.4	28.7	26.1	23.4	20.7

Note: In the above table a is the shorter side of a rectangular pillar or, the diameter of a circular pillar in millimetres.

Table M.15
DECK HOUSES

Deck house sides and front			*Deck house framing*			
Measured length	*Plywood*					
	Sides	*Front*	*Planking*	*Spacing*	*Siding*	*Moulding*
m	mm	mm	mm	mm	mm	mm
5	6	6	16	380	38	50
6	6	6	16	380	38	50
7	6	9	16	380	38	50
8	9	9	16	400	38	50
9	9	9	16	400	50	80
10	9	12	17	400	50	80
11	9	12	17	400	50	80
12	9	12	18	400	50	80
13	9	12	19	400	50	80
14	9	12	20	400	50	80
15	9	12	21	400	50	80
16	12	16	22	420	50	80
17	12	16	23	420	50	80
18	12	16	24	420	50	100
19	12	16	25	420	50	100
20	12	16	26	420	50	100
21	12	16	27	420	50	100
22	12	16	28	420	50	100
23	12	16	29	440	50	100
24	16	18	30	440	50	100
25	16	18	31	440	50	100
26	16	18	32	440	60	120
27	16	18	33	440	60	120
28	16	18	34	440	60	120
29	16	18	35	440	60	120
30	16	22	36	460	60	120
31	16	22	37	460	60	120
32	16	22	38	460	60	120
33	18	22	38	460	60	120
34	18	22	38	460	60	120
35	18	22	38	460	60	120

Notes:

(a) Where the basic spacing shown in the table is not adopted, frame scantlings are to be adjusted by maintaining the section modulus of the frame per millimetre of frame spacing (Refer to Note (b) Table M.6).

(b) Where frame spacing differs from the basic frame spacings shown in Table M.6, planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between frames as follows:

(i) Bent frames—3 mm per 25 mm difference

(ii) Other frame types—3 mm per 30 mm difference.

Table M.16

DECK HOUSE BEAMS AND DECK HOUSE TOP (NON WORKING DECK)

	Deck house beams			*Deck house top*	
Length of beam	*Spacing*	*Siding*	*Moulding*	*Plywood*	*Planking*
m	mm	mm	mm	mm	mm
1.5	350	30	54	9	12
2	350	35	70	9	13
3	350	45	100	9	15
4	400	60	140	12	17
5	400	75	180	12	19
6	400	90	200	12	21
7	450	100	220	16	23
8	450	100	240	16	25

Notes:

(a) Basic spacing is from beam centre to beam centre.

(b) Length of beam shall be the breadth of the deck house at the position of the beam.

(c) Length of beam when pillars and girders are fitted is to be determined from M.17.1(f).

(d) If basic spacing is increased or decreased then the section modulus at mid-span of the beam shall be increased or may be decreased respectively in the same proportion.

(e) If the table dimensions for siding and moulding are varied then the section modulus is to be maintained

$$\left(\text{Section modulus } Z = \frac{S \times M^2}{6} \right)$$

(f) Where it is intended that the deck house top be used as a working deck then scantlings shall be taken from Tables M.12 and M.13 and associated Notes.

(g) Where beam spacing differs from the basic beam spacings shown in the Table planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between beams as follows:

(i) Single planked—3 mm per 25 mm difference

(ii) Plywood—3 mm per 50 mm difference.

Table M.17

HARD CHINE VESSELS—KEEL AND HOG

Measured length	*Keel*			*Hog*		
	Section area	*Siding*	*Moulding*	*Section area*	*Siding*	*Moulding*
m	mm^2	mm	mm	mm^2	mm	mm
5	7 350	70	105	4 200	120	35
6	8 625	75	115	5 400	135	40
7	10 625	85	125	6 750	150	45
8	12 150	90	135	8 250	165	50
9	14 250	95	150	9 900	180	55
10	16 800	105	160	10 725	195	55
11	18 700	110	170	12 600	210	60
12	21 600	120	180	14 625	225	65
13	23 750	125	190	16 800	240	70
14	27 000	135	200	19 125	255	75
15	29 400	140	210	20 250	270	75
16	33 750	150	225	22 800	285	80
17	36 425	155	235	25 500	300	85
18	40 425	165	245	28 800	320	90
19	44 200	170	260	31 825	335	95
20	48 600	180	270	35 000	350	100
21	51 800	185	280	36 500	365	100
22	56 550	195	290	39 900	380	105
23	60 000	200	300	43 450	395	110
24	65 100	210	310	47 150	410	115
25	68 800	215	320	50 400	420	120

Notes:

(a) Keel siding and moulding may be varied provided section area is maintained and siding is sufficient to provide 0.25 times the table siding on each side of the shaft tube.

(b) Hog siding and moulding may be varied provided section area is maintained, and

(i) Siding is sufficient for garboard plank landings of at least 1.75 times plank thickness on either side of keel; and

(ii) Moulding is sufficient to provide 2.5 times plank thickness.

(c) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.18

HARD CHINE VESSELS—TRANSOM

Measured length	*Thickness plywood*	**Stiffeners*		*Margin*	
			Mould-ing	*Siding*	*Mould-ing*
m	mm	mm	mm	mm	mm
5	12	50	25	75	35
6	12	55	25	80	40
7	12	60	25	85	45
8	12	60	30	90	45
9	16	65	30	95	50
10	16	70	30	100	50
11	19	70	35	105	50
12	19	75	40	110	55
13	19	80	40	120	60
14	24	85	45	125	60
15	24	90	45	130	65
16	24	95	45	140	65
17	24	95	50	145	70
18	24	100	50	150	75
19	24	105	50	160	75
20	24	110	55	165	80
21	30	115	55	170	80
22	30	115	60	180	85
23	30	120	60	185	90
24	30	125	65	190	90
25	30	130	65	200	95

* Stiffeners spaced at 450mm centre to centre..

Notes:

(a) Where planking is used table thickness is to be increased by 25 per cent.

(b) Where stiffener spacing varies from the standard spacing of 450mm used in the table, stiffener scantlings are to be adjusted by maintaining the section modulus of the stiffener per millimetre of stiffener spacing (Refer to Note (b) Table M.6).

(c) Transom thickness may be decreased if the stiffener spacing is less than the basic 450mm as follows:

(i) Plywood—3mm per 50mm

(ii) Planking—3mm per 30mm.

(d) Plywood may be in multiple thicknesses to obtain the total thickness shown in the table.

(e) The table scantlings are for hardwood of 960 kg/m3 density and marine grade water-proof plywood to Australian Standard AS 2272-1979, Plywood for Marine Craft.

(f) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.19

HARD CHINE VESSELS—FLOORS

Measured length	**Floors*	
	Siding	*Moulding at centre line*
m	mm	mm
5	35	90
6	35	100
7	40	110
8	40	120
9	45	130
10	50	140
11	50	150
12	55	160
13	60	180
14	60	190
15	65	200
16	70	210
17	70	220
18	75	230
19	80	250
20	80	260
21	85	270
22	90	280
23	90	290
24	95	300
25	100	310

* Floors spaced at 450mm centres.

Notes:

(a) Where floor spacing is less than 450mm, floor scantlings may be adjusted by maintaining the section modulus of the floor at the vessel's centre line per millimetre of floor spacing (Refer to Note (b) Table M.6).

(b) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.20
HARD CHINE VESSELS—BOTTOM STRINGERS

Measured Length	*Bottom stringers*			
	Spacing	*Total section area per side*	*Moulding*	*Siding*
m	mm	mm²	mm	mm
5.	215	2 760	20	46
6.	245	4 032	24	56
7.	270	5 544	28	66
8.	295	7 056	28	84
9.	260	8 448	32	66
10.	280	9 728	32	76
11.	300	11 248	38	74
12.	320	12 464	38	82
13.	280	14 060	38	74
14.	300	15 580	38	82
15.	325	17 200	40	86
16.	345	18 400	40	92
17.	310	20 160	40	84
18.	330	21 600	40	90
19.	340	22 680	42	90
20.	355	24 192	42	96
21.	325	25 872	42	88
22.	340	27 048	42	92
23.	355	28 336	44	92
24.	370	30 184	44	98
25.	385	31 416	44	102

Notes:

(a) Where stringer spacing varies from the table. stringer scantlings are to be adjusted by maintaining the section modulus of stringer per millimetre of stringer spacing (Refer Note (b) Table M.6).

(b) Where the spacing of web frames supporting bottom or side stringers varies from the table spacing in Table M.7. the scantlings of stringers shall be increased or may be decreased for any increase or decrease respectively in web frame spacing by increasing or decreasing the section modulus in accordance with the formula:

$$Z_1 = Z\left(\frac{S_1}{S}\right)$$

Where Z = section modulus of table stringer as adjusted for stringer spacing. if applicable.

Z_1 = required section modulus at new spacing

S = table spacing for web frames

S_1 = new spacing for web frames

(c) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.21

HARD CHINE VESSELS—CHINES

Measured length	*Sectional area*	*Siding*	*Moulding*
m	mm^2	mm	mm
5	1 458	27	54
6	1 800	30	60
7	2 312	34	68
8	2 628	36	73
9	3 200	40	80
10	3 872	44	88
11	4 560	48	95
12	5 354	52	104
13	6 272	56	112
14	6 844	58	118
15	7 688	62	124
16	8 712	66	132
17	9 248	68	136
18	10 366	72	144
19	10 952	74	148
20	12 168	78	156
21	12 800	80	160
22	13 440	82	164
23	14 450	85	170
24	15 480	88	176
25	16 200	90	180
26	17 200		
27	18 200		
28	19 200		
29	20 200		
30	21 200		To the satisfaction of the Authority concerned
31	22 200		
32	23 200		
33	24 200		
34	25 200		
35	26 200		

Table M.22

HARD CHINE VESSELS—BEAM SHELF/SHEER CLAMP

Measured length	*Section area*
m	mm^2
5	2 300
6	2 500
7	3 250
8	4 050
9	4 900
10	6 000
11	6 970
12	7 420
13	8 500
14	9 620
15	10 800
16	12 350
17	13 650
18	15 370
19	15 750
20	17 200
21	19 120
22	20 700
23	22 320
24	24 500
25	26 250

Note:

(a) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.23

HARD CHINE VESSELS—HULL PLANKING THICKNESS

Measured length	*Bottom*		*Topside*	
	Plywood	*Double diagonal*	*Plywood*	*Double diagonal*
m	mm	mm	mm	mm
5	9	15	9	15
6	11	17	9	15
7	12	19	9	15
8	14	21	11	16
9	15	23	11	18
10	16	25	12	19
11	18	26	14	20
12	20	28	15	21
13	21	30	16	23
14	22	32	17	24
15	24	34	18	26
16	25	36	19	27
17	27	38	20	29
18	28	40	21	30
19	30	42	22	32
20	31	44	23	33
21	33	45	25	34
22	34	47	26	36
23	36	49	27	37
24	37	51	28	39
25	39	53	29	40

Notes:

(a) Where stringer spacing differs from the basic stringer spacings shown in Table M.20, planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between stringers as follows:

(i) Plywood—3 mm per 50 mm difference

(ii) Diagonal planking—3 mm per 30 mm difference.

(b) Plywood may be in multiple thicknesses to obtain the total thickness shown in the table.

(c) the table scantlings are for hardwood of 960 kg/m³ density and marine grade water-proof plywood to Australian Standard AS 2272-1979 Plywood for Marine Craft.

(d) Table thicknesses for double diagonal planking are applicable only to hulls where planking layers are glued together.

(e) Vessels over 25 metres measured length will be specially considered by the Authority.

Table M.24

HARD CHINE VESSELS—PLYWOOD PLANKING BUTT STRAPS

Plywood planking thickness	*Breadth of butt strap*	*Fastings*	
		Method of fastening	*Copper boat nails*
mm	mm		S.W.G.
6	175		12
9	225	Double	12
12	250	fastened	12
16	300		10
19	325	Treble	10
24	375	fastened	8

Notes:

(a) Where multiple layers of plywood are used butt straps are not required to be fitted, however overlaps having a minimum width equal to the table width for butt straps shall be provided.

(b) Butt straps should not be fitted in the bottom or side plywood planking in any of the machinery space.

Table M.25

TIMBER BULKHEADS

Height of bulkhead	*Planking*		*Stiffener*		
	Double planked	*Ply-wood*	*Stiff-ener spacing*	*Mould-ing*	*Siding*
m	mm	mm	mm	mm	mm
1.0	20	10	400	70	35
1.5	30	15	400	85	45
2.0	40	20	400	100	55
2.5	50	25	450	115	65
3.0	60	30	450	135	75
3.5	70	35	450	150	85
4.0	80	40	450	165	95

Notes:

(a) The height of the bulkhead is to be measured from the top of the keel to the underside of the deck beam at the centre line of the vessel.

(b) Where stiffener spacing differs from the basic stiffener spacings shown in the Table planking thickness shall be increased and may be decreased for every increase or decrease respectively in the resulting span between stiffeners as follows:

(i) Planking—3 mm per 30 mm difference

(ii) Plywood—3 mm per 50 mm difference.

(c) If the stiffener spacing shown in the table is not used then the stiffener scantlings are to be adjusted by maintaining the section modulus of stiffener per millimetre of stiffener spacing (Refer Note (b) Table M.6).

(d) In the case of a collision bulkhead the table planking thickness is to be increased by 25 per cent and the section modulus of the stiffener is to be not less than 1.25 times the table modulus.

(e) Where collision bulkhead stiffeners are glued and fastened to the bulkhead, the required increase, based on the section modulus will be specially considered.

Table M.26

FASTENINGS

Thickness of member being fastened	Copper nails	Screws	Bolts	
	Gauge	Gauge	Total thickness of members being joined	Diameter
mm	BG	No.	mm	mm
18-22	12	4-6	150-200	9
22-26	11	6-8	200-300	12
26-30	10	8-10	300-380	16
30-34	9	10-12	380-600	19
34-38	8	12-14	600 and over	22
38-42	7	14-16		
42-46	6	16-18		
46-50	5	16-18		
50-54	4	16-18		
54-58	3			
58-70	2			
70-80	1			

Note:

Minimum plank fastenings at frames shall be as follows:

less than 150mm width of plank double fastened

150mm and over width of plank treble fastened.

The bolt sizes are based on the use of copper having an ultimate strength of 210 MPa.

For bolts of materials other than copper the diameter may be determined from the formula:

$$\text{diameter} = d_c \times \sqrt[3]{\frac{210}{U}}$$

where d_c = diameter of copper bolt

U = ultimate strength of other material

Table M.27

PLYWOOD DECK PLANKING AND ASSOCIATED DECK LONGITUDINALS

Plywood thickness	Deck longitudinals		
	Spacing	Siding	Moulding
6	140	30	45
8	180	30	50
10	230	40	50
12	270	40	54
14	310	40	58
16	350	40	62
18	395	45	62
20	435	45	64
22	465	45	68
24	510	50	68
26	550	50	70
28	595	55	70
30	635	55	72

Notes:

(a) Deck longitudinal spacing is measured centre to centre.

(b) Section Modulus of deck longitudinals in the Table is for longitudinals associated with web beams spaced 1000mm apart. Where spacing of web beams varies from 1000mm then the scantlings of longitudinals shall be increased or may be decreased for any increase or decrease respectively in web beam spacing by increasing or decreasing the section modulas in accordance with the formula

$$Z_1 = Z \left(\frac{S}{1000} \right)^2$$

where Z = section modulus of Table longitudinals as adjusted for longitudinal spacing, if applicable

Z_1 = required section modulus (refer note (e) Table M.12)

(c) Where longitudinal spacings varies from the table, longitudinal scantlings are to be adjusted by maintaining the section modulus of the longitudinal per millimetre of longitudinal spacing (Refer Note (b) Table M.6)

(d) Deck thickness shall be increased and may be decreased for every increase or decrease respectively in the table spacing by an amount of 3mm for each 50mm difference.

K.15 Sketches

CONTENTS

DRAFT

PROFILE

Fig. M.1.

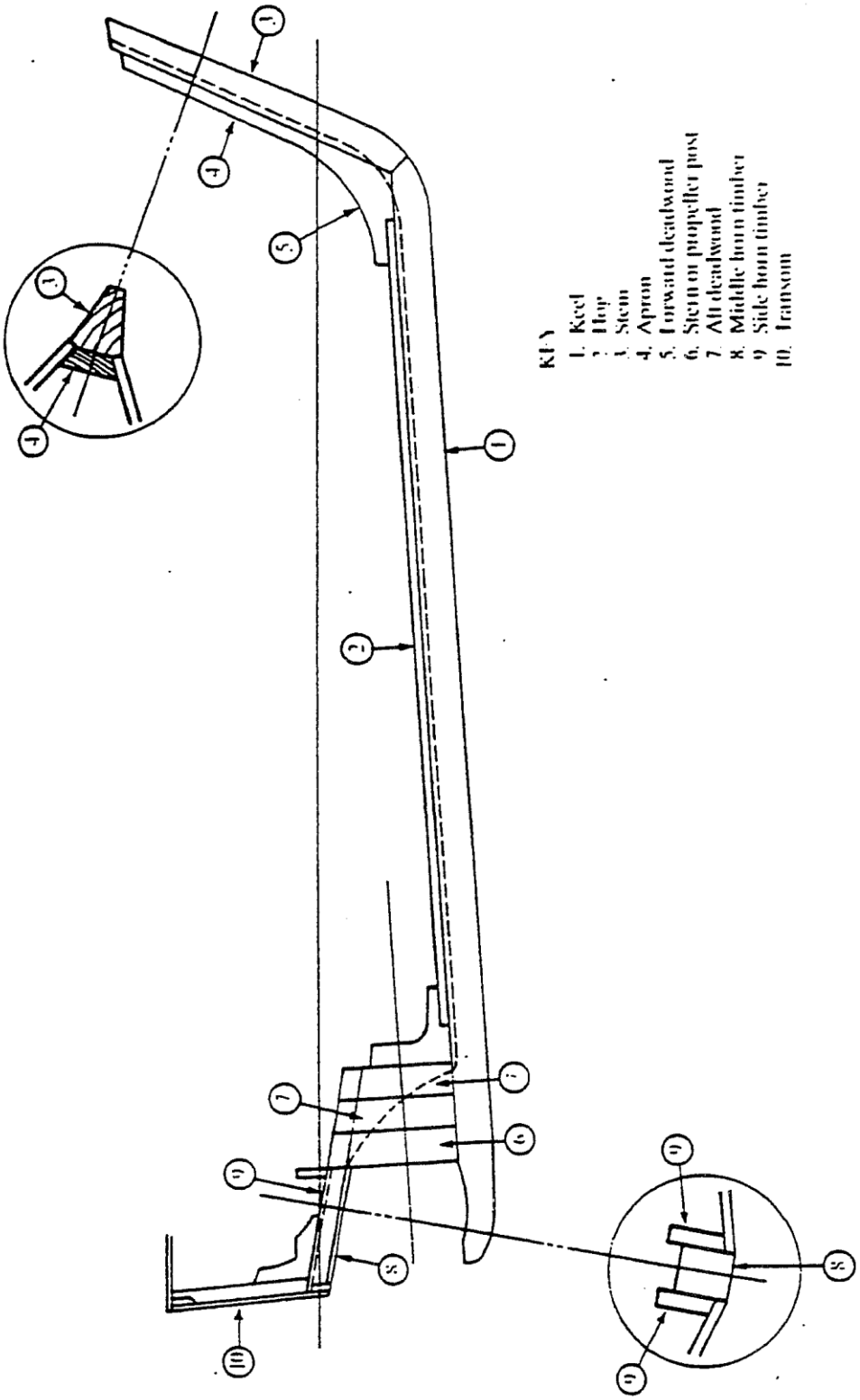


Figure M.1 **PROFILE**

Fig. M.2.

TYPICAL SECTION CHINE HULL

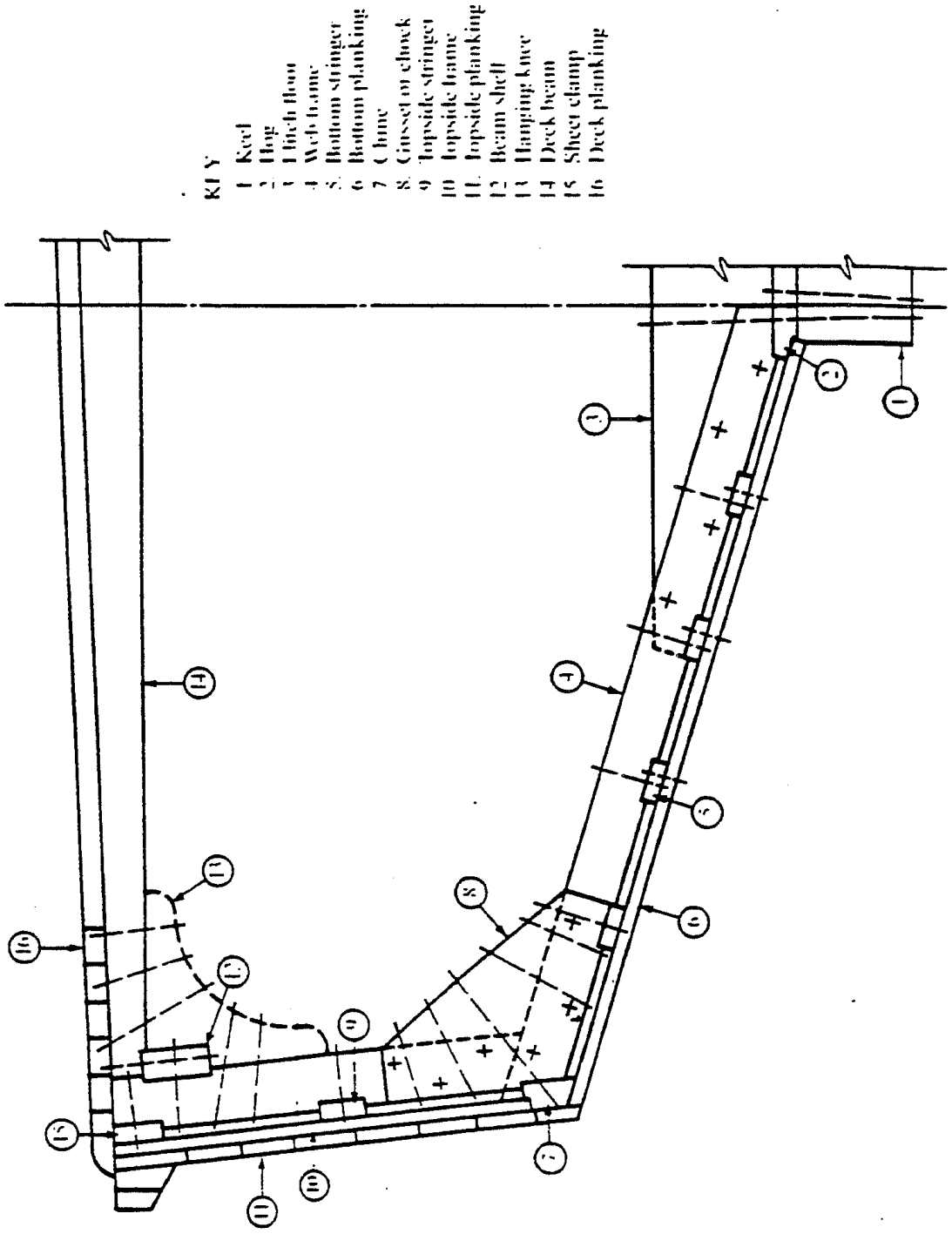


Figure M.2 TYPICAL SECTION CHINE HULL

ISOMETRIC VIEW

Fig. M.3.

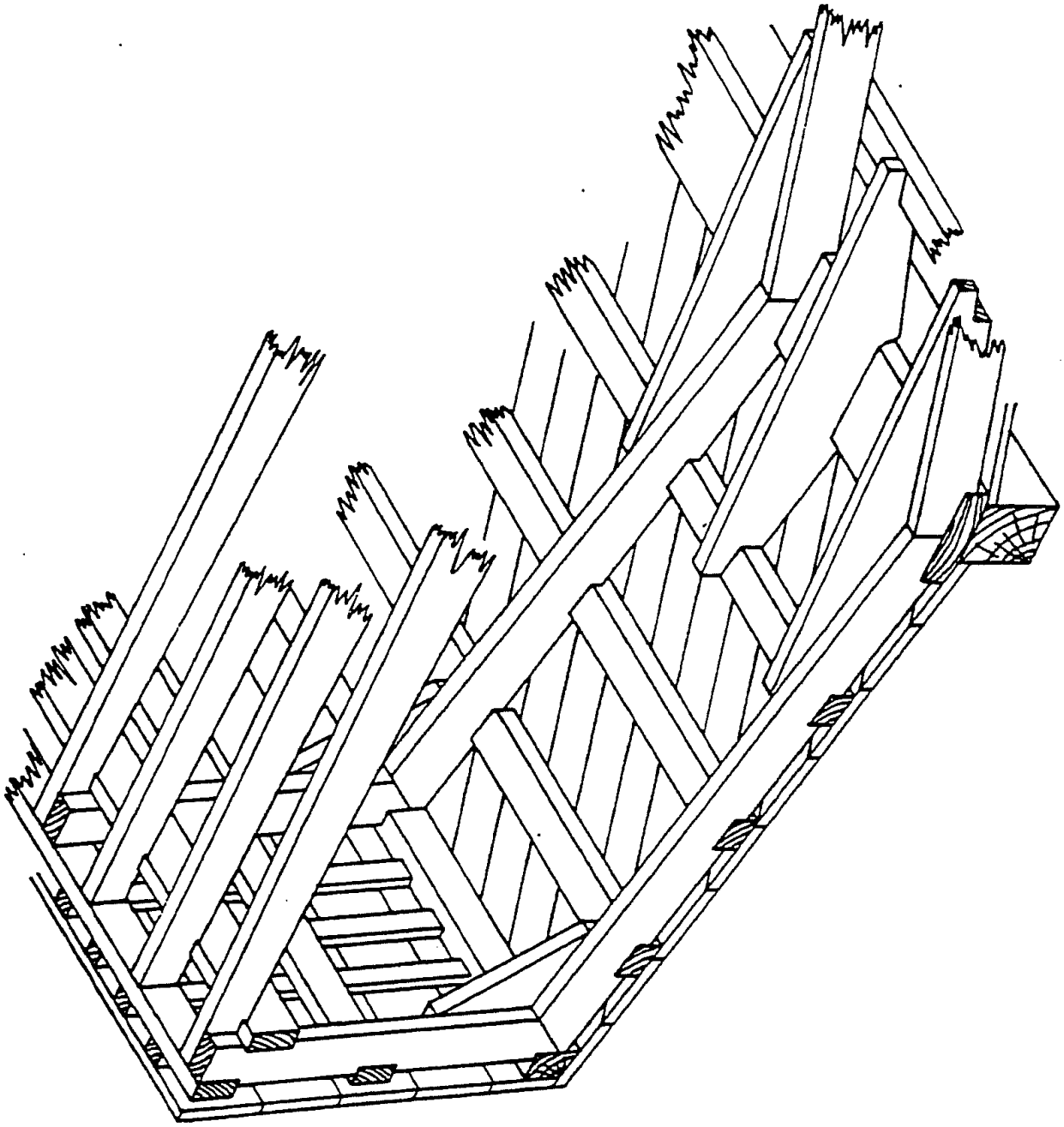


Figure M.3 ISOMETRIC VIEW

TYPICAL WEB FRAME CONSTRUCTION

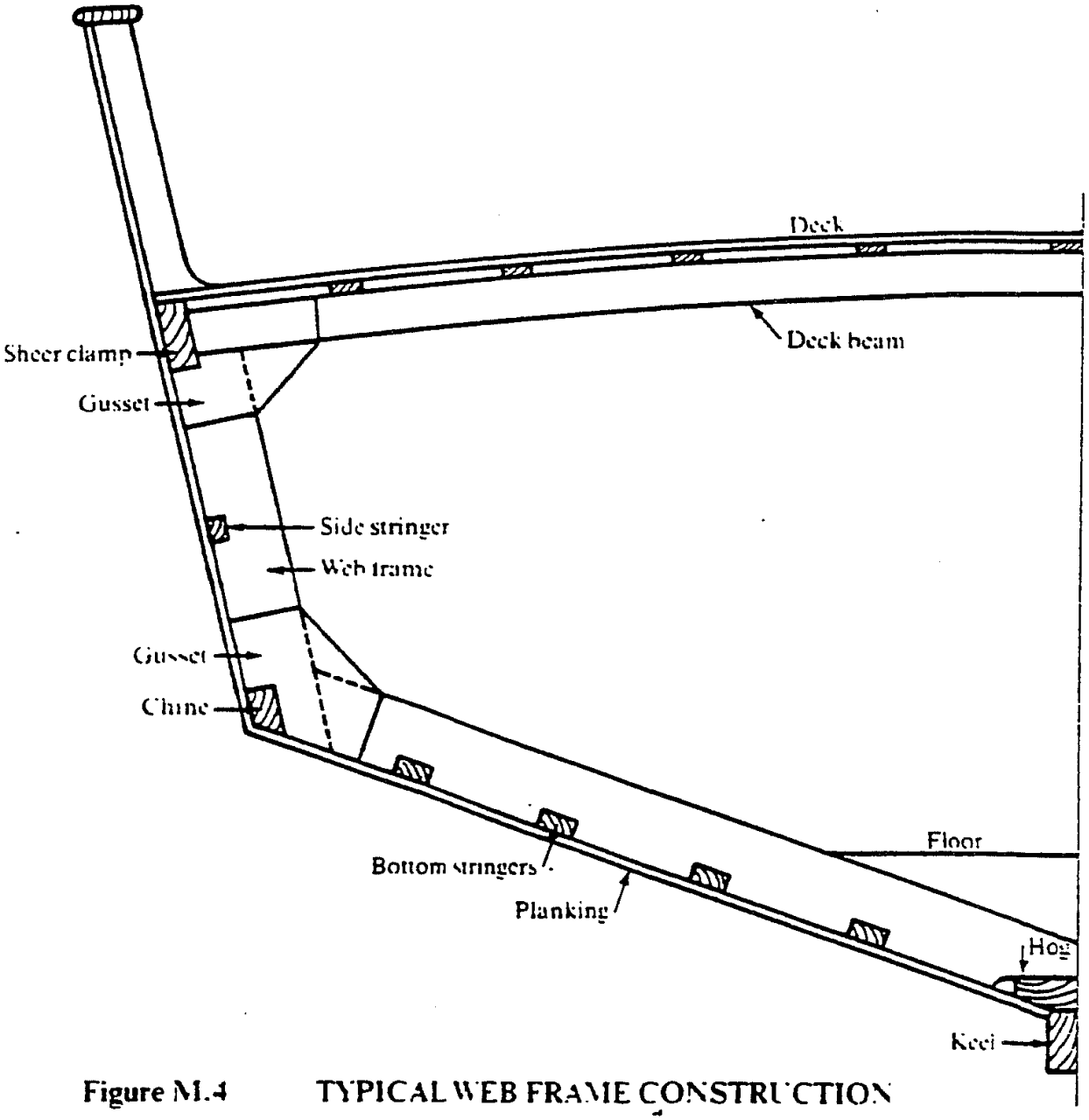
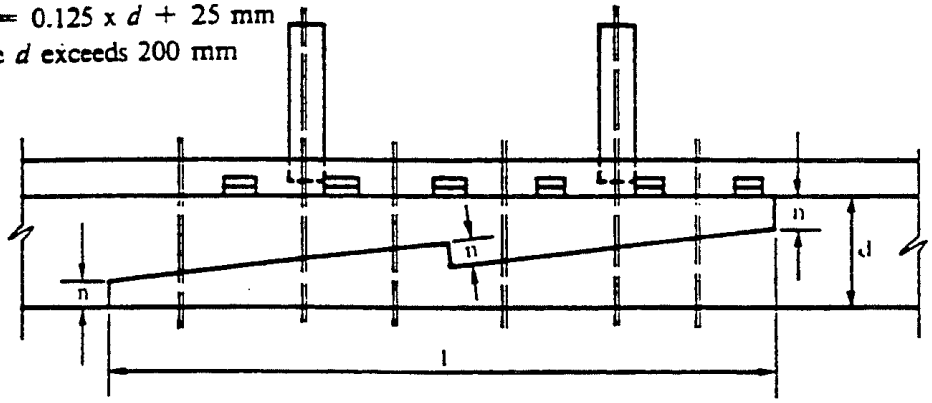
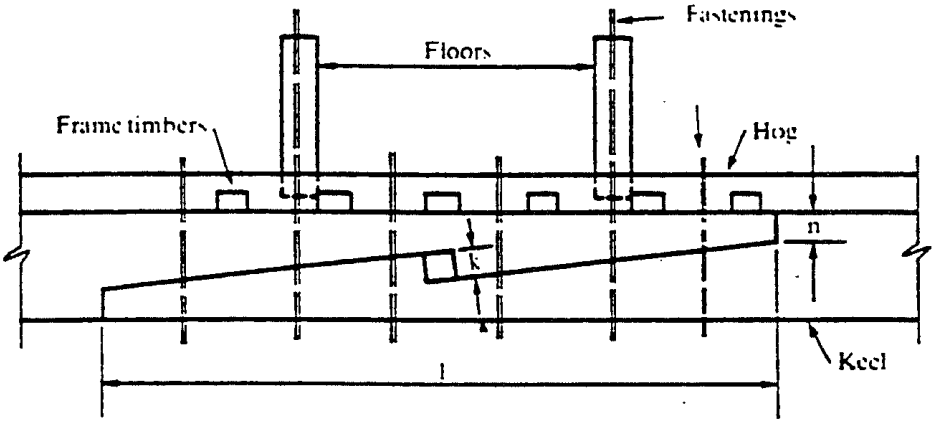


Figure M.4 TYPICAL WEB FRAME CONSTRUCTION

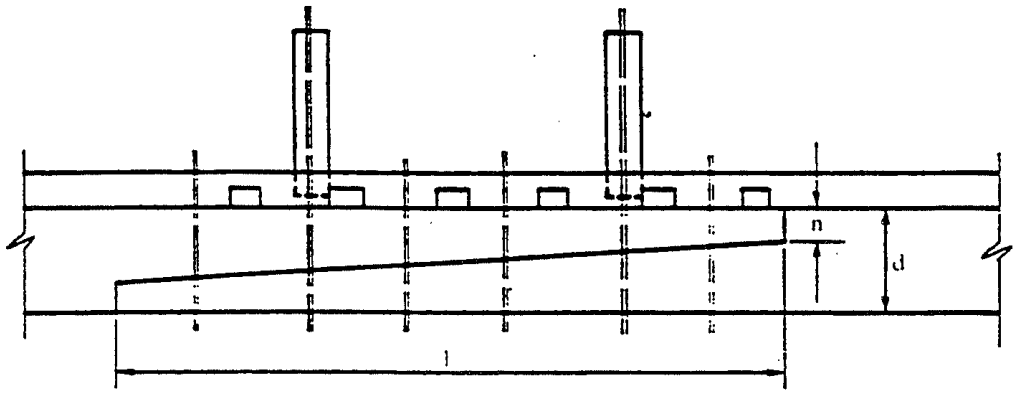
$l = 6 \times d$
$k = n$
d = Depth of Keel
$n = 0.25 \times d$
or $n = 0.125 \times d + 25$ mm
where d exceeds 200 mm



HOOKED SCARPH



KEYED HOOKED SCARPH



PLAIN SCARPH

Figure M.5 COMMON FORMS OF SCARPHS

TYPICAL STEM ASSEMBLY
Fig. M.6.

KEY
1. Stem
2. Riser chock
3. Keel
4. Floor
5. Hog
6. Grown or straight grain chock

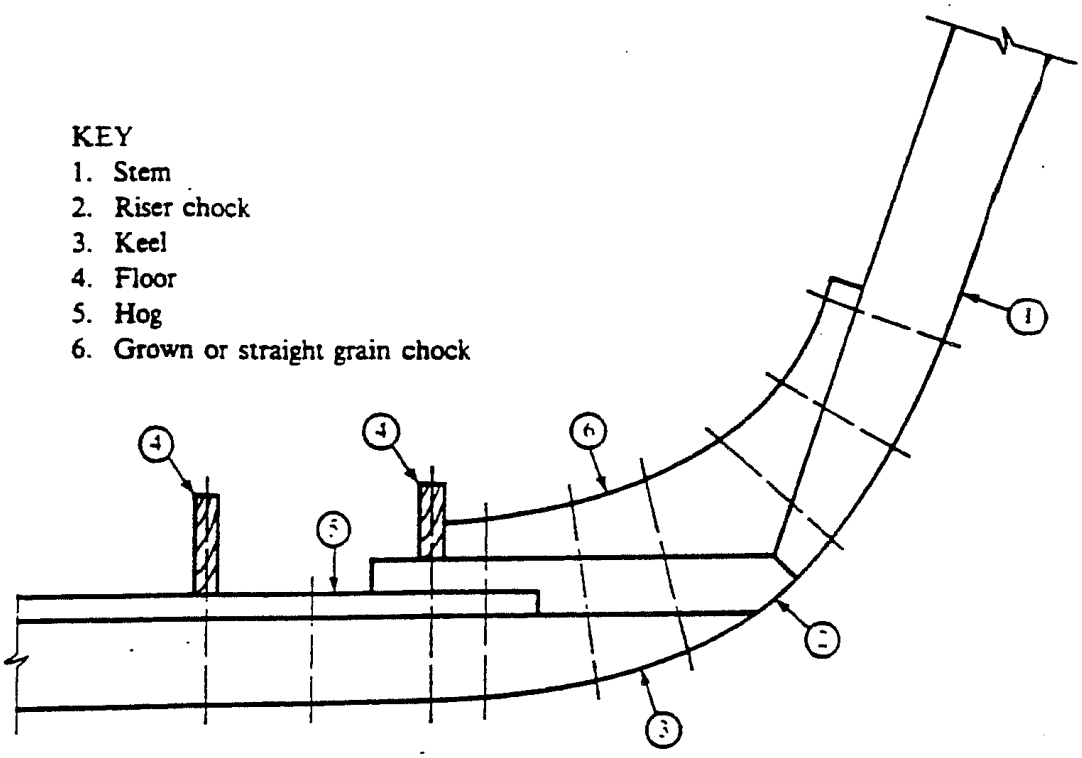


Figure M.6 TYPICAL STEM ASSEMBLY

DRAFT

KEY

1. Stem
2. Keel
3. Floor
4. Hog
5. Grown or straight grain chock
6. Apron

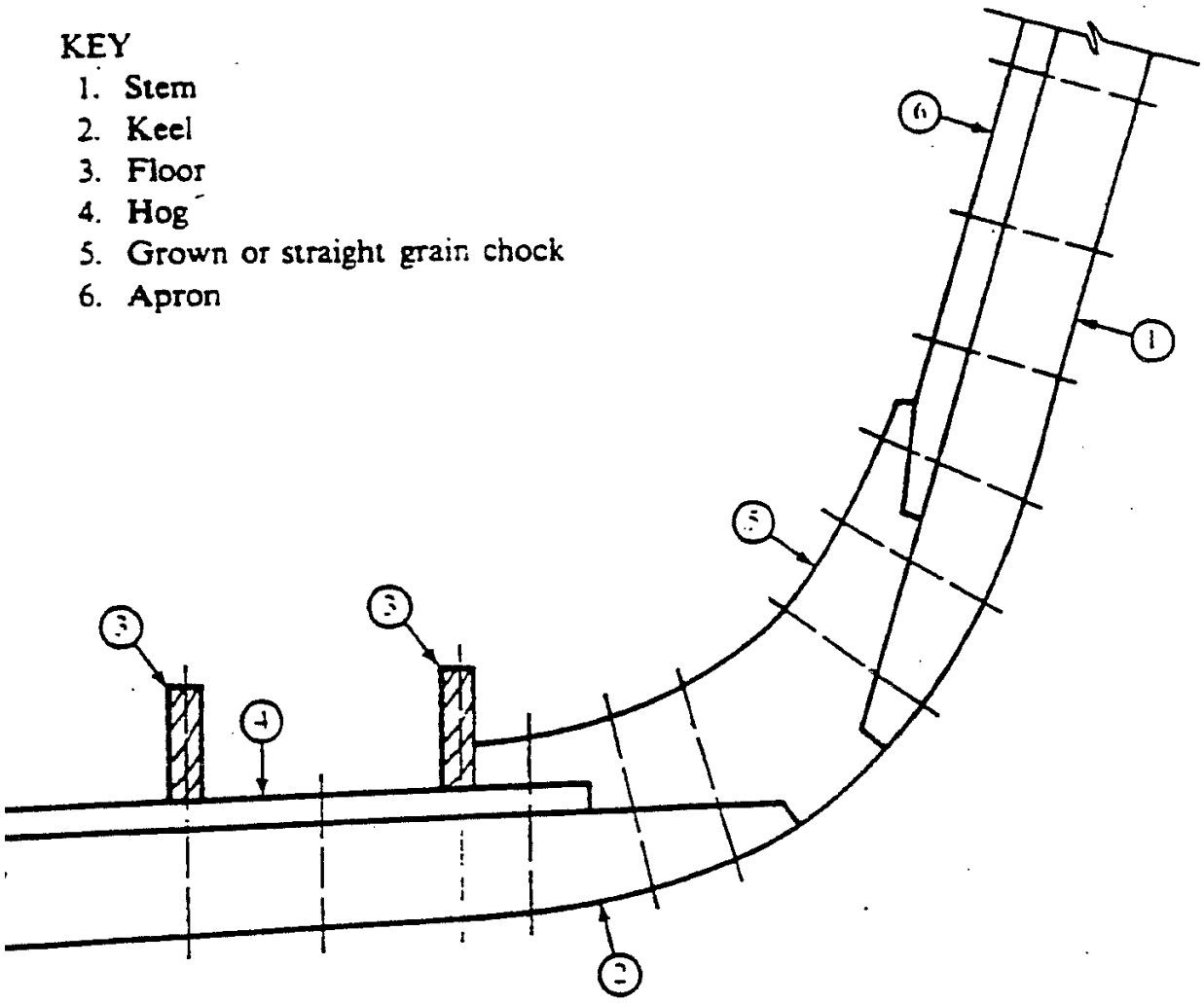
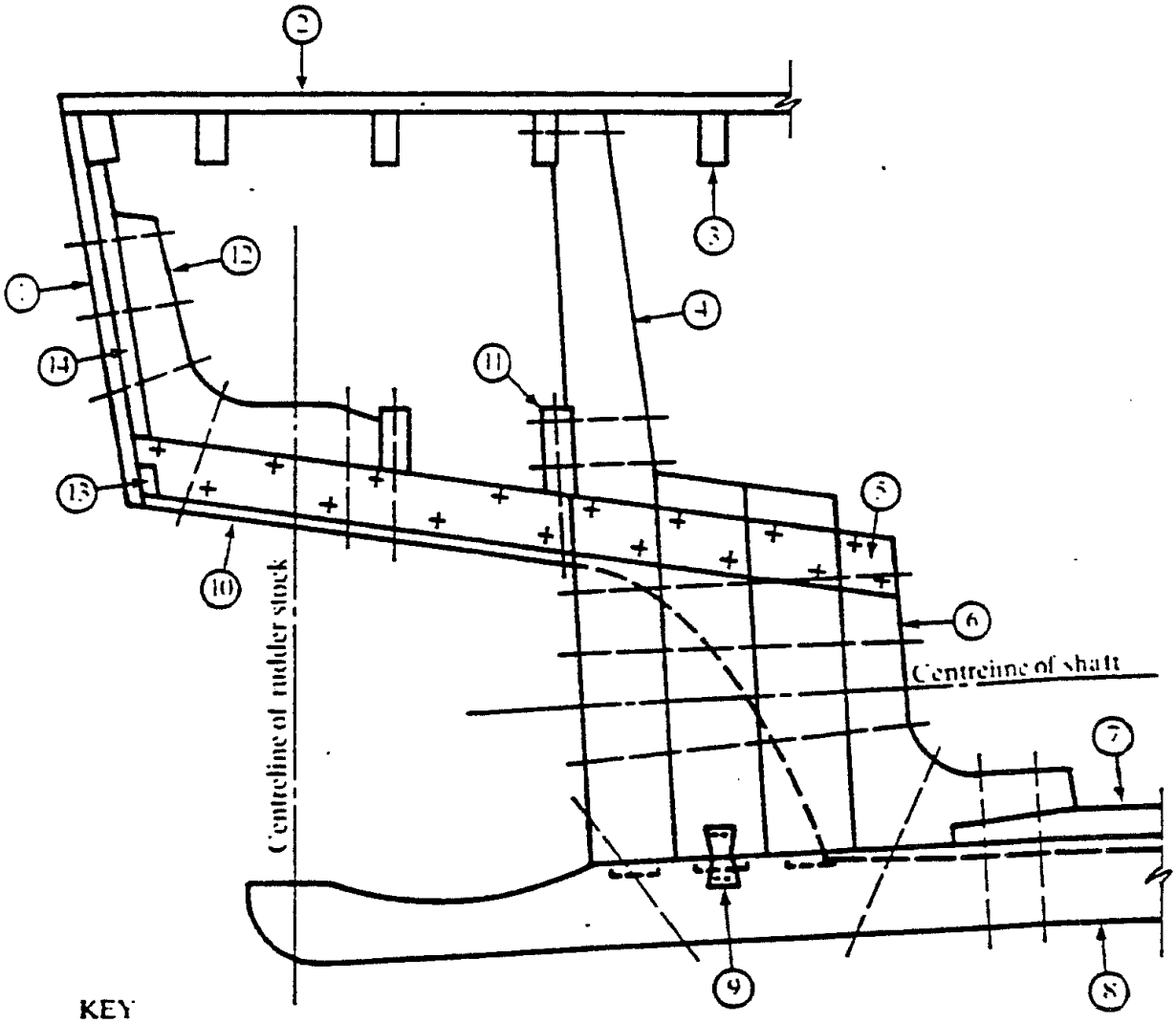


Figure M.7 ALTERNATIVE TYPICAL STEM ASSEMBLY

TYPICAL DEADWOOD AFT

Fig. M.8.



KEY

1. Planking
2. Deck planking
3. Deck beams
4. Stern or propeller post
5. Side horn timbers bolted to deadwood
6. Deadwood knee
7. Hog piece
8. Keel
9. Dovetail plate
10. Outside rabbet line
11. 'Transom Floor'
12. Transom knee
13. Transom margin
14. Transom stiffener

Figure M.8 TYPICAL DEADWOOD AFT

TYPICAL DEADWOOD AFT

Fig. M.9.

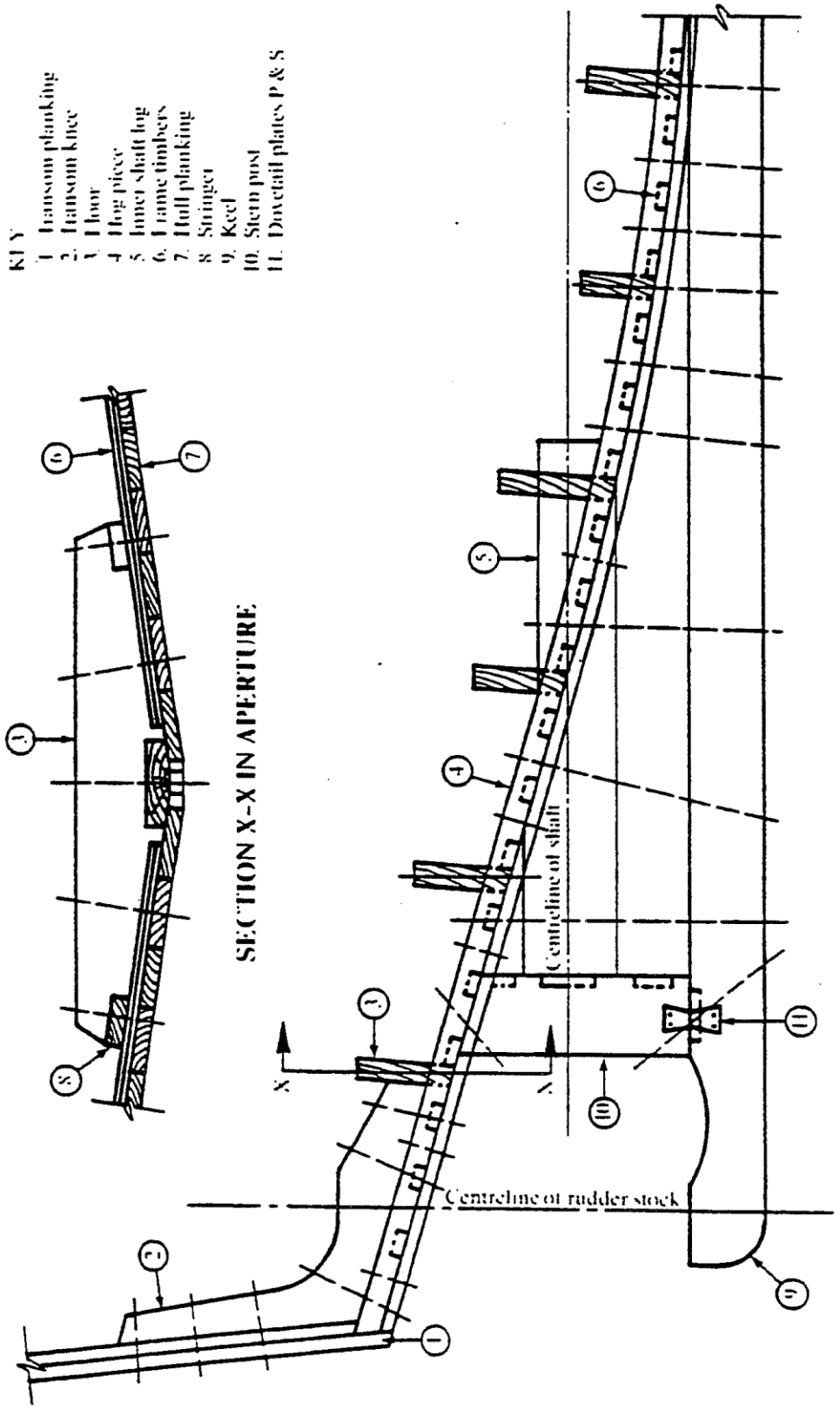


Figure M.9 TYPICAL DEADWOOD AFT

TYPICAL DEADWOOD AFT

Fig. M.10.

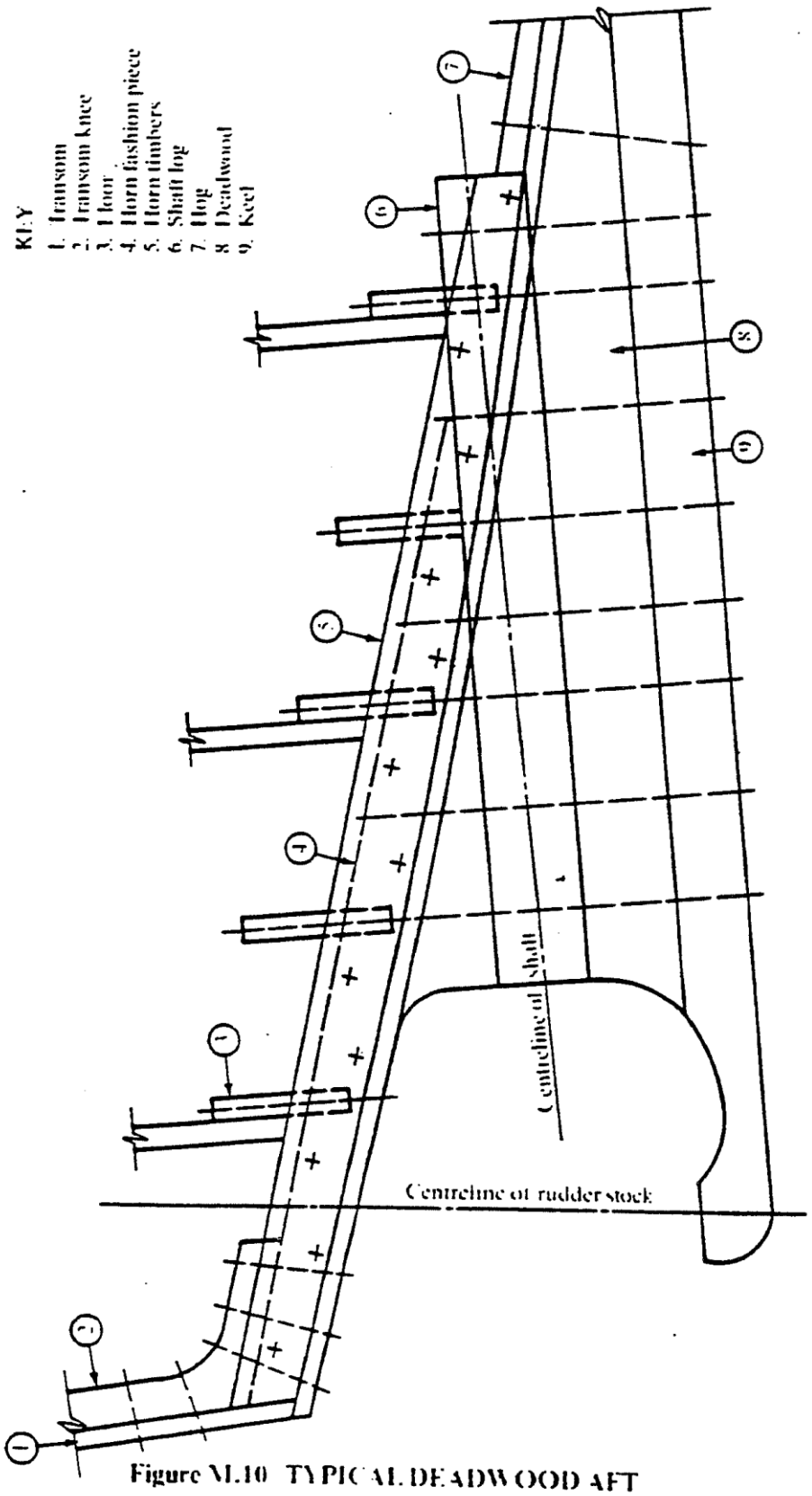


Figure M.10 TYPICAL DEADWOOD AFT

TYPICAL MIDSHIP SECTION
BILGE TYPE HULL

Fig. M.11.

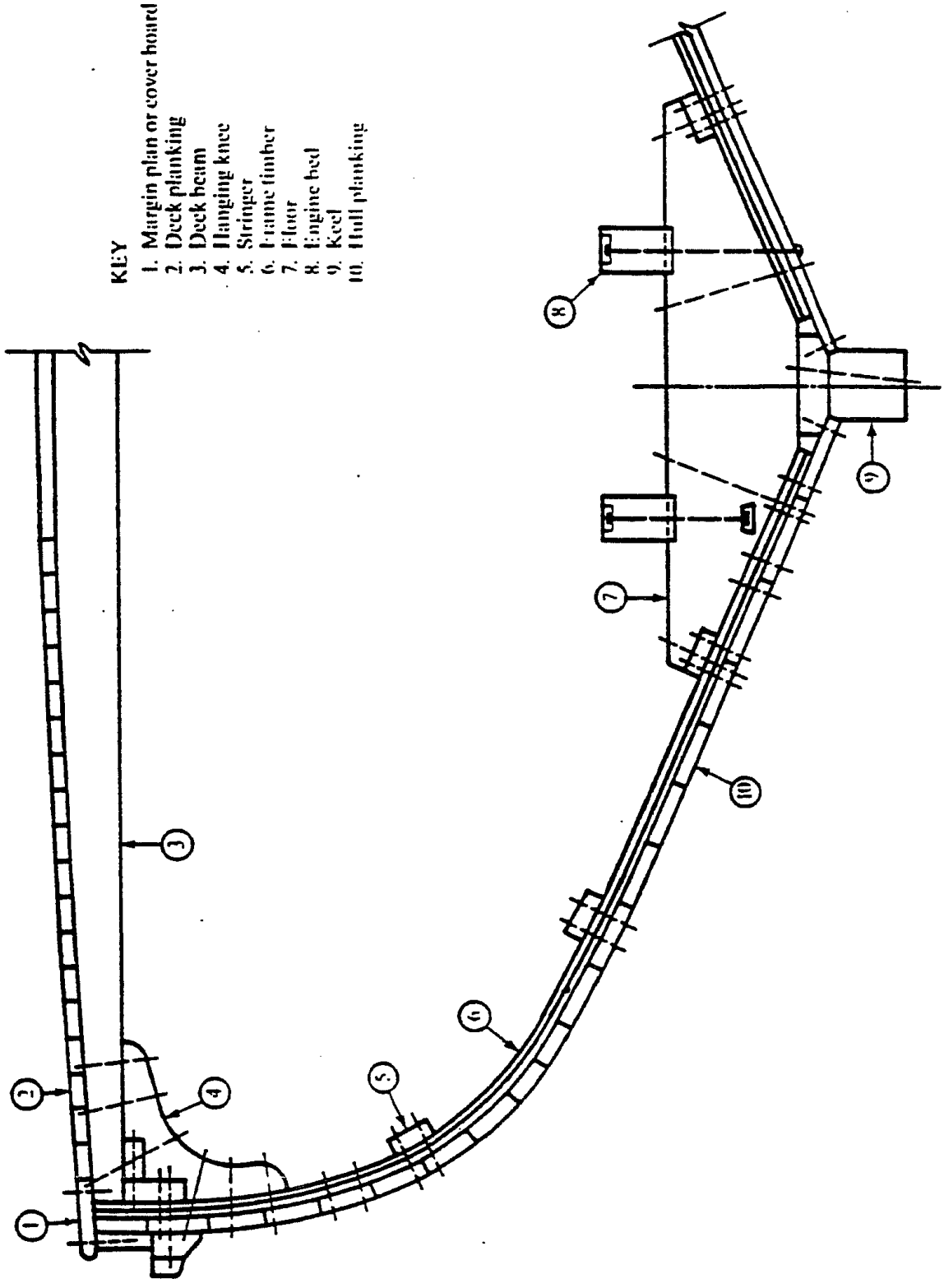
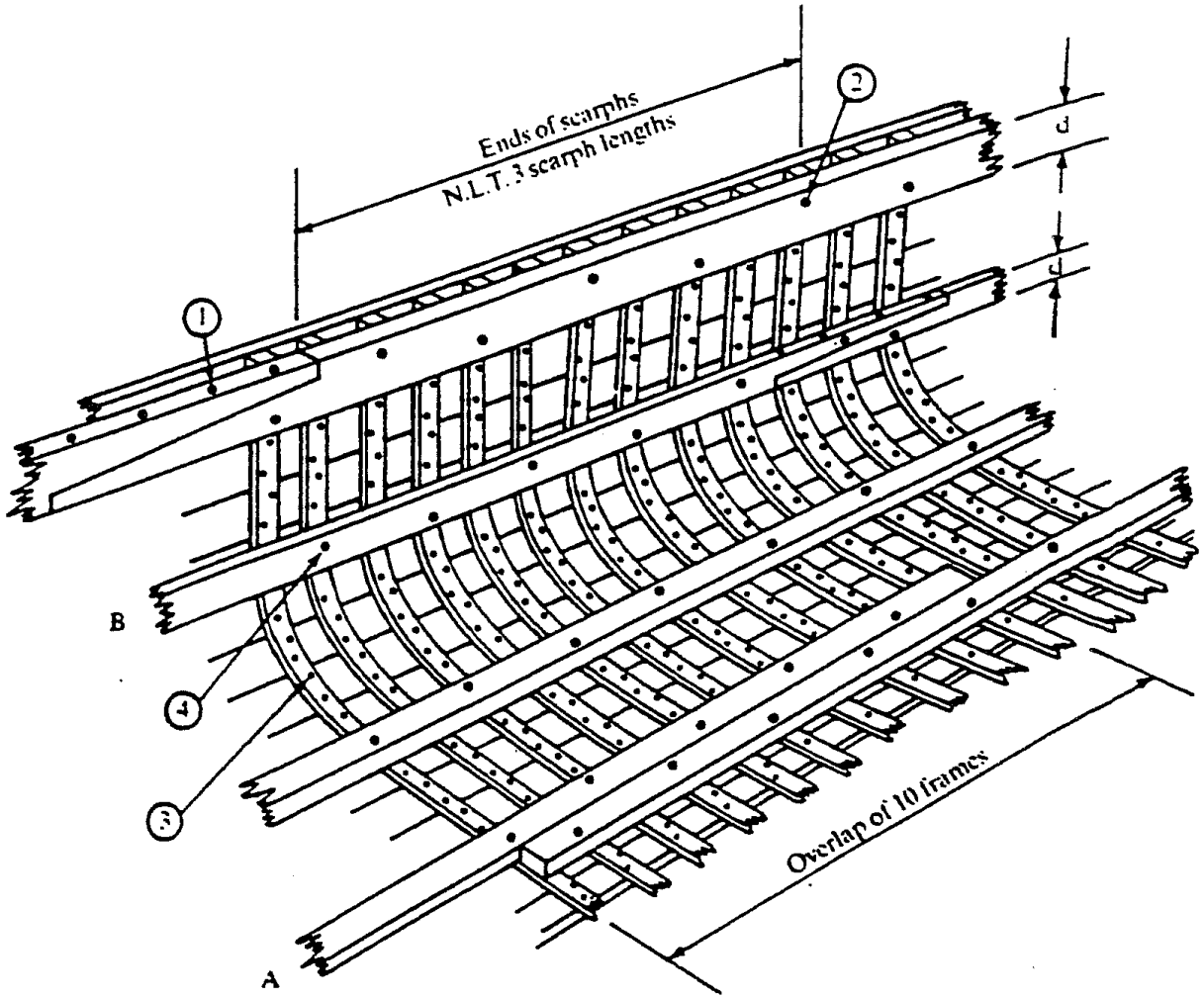


Figure M.11 TYPICAL MIDSHIP SECTION BILGE TYPE HULL

SCARPHING AND LAPPING OF LONGITUDINALS

Fig. M.12

VIEW INSIDE HULL



Note:
Beam shelf. keel assembly. floors etc.. are not shown.

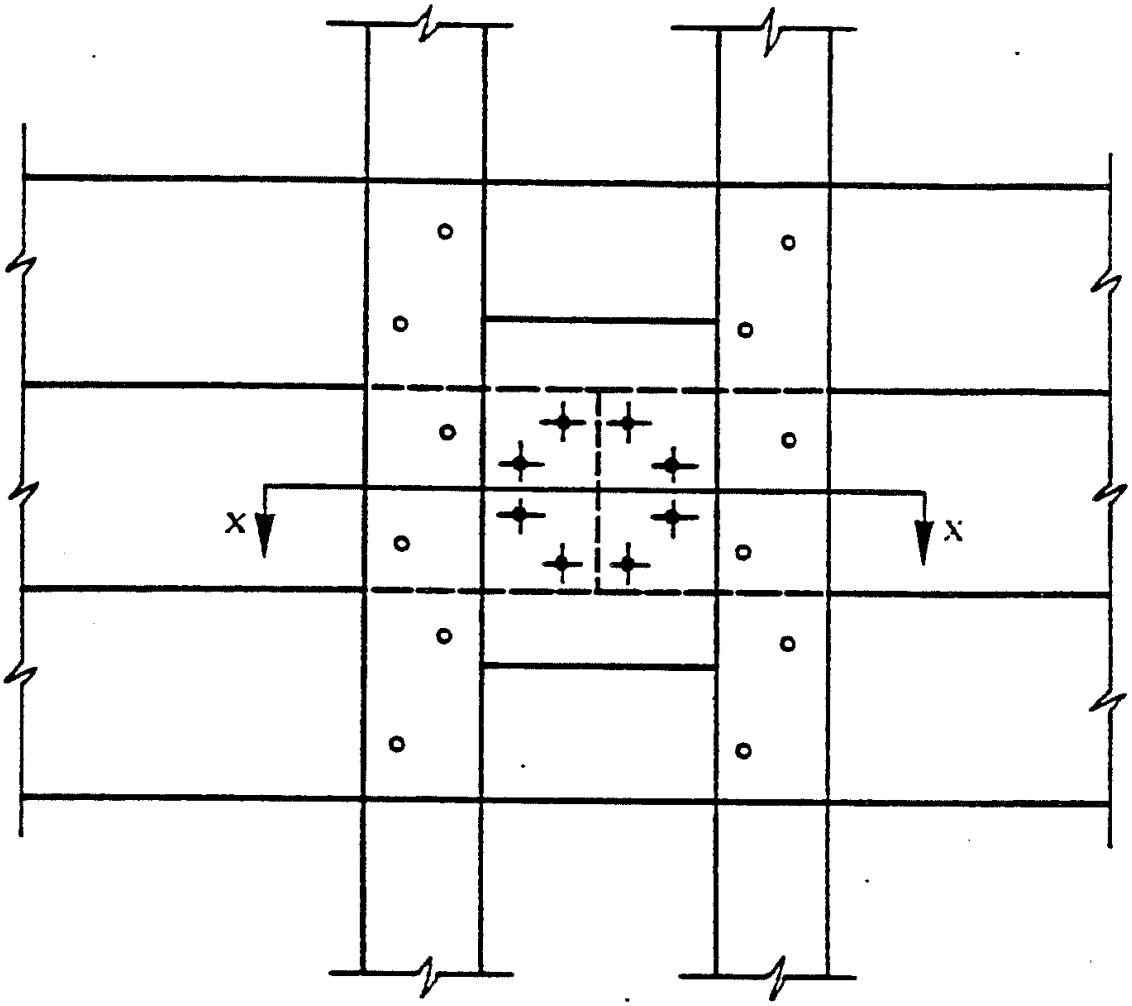
A: Laps in stringers not less than 10 frames.
B: Scarphs not less than 6 × 'd' in length.

1. Scarphs — min. of 4 edge bolt fastenings.
2. 'Reel' or stagger-fastenings.
3. Nail fastenings in frames keeled.
4. Fasten stringers and clamps thro' alternate frames.

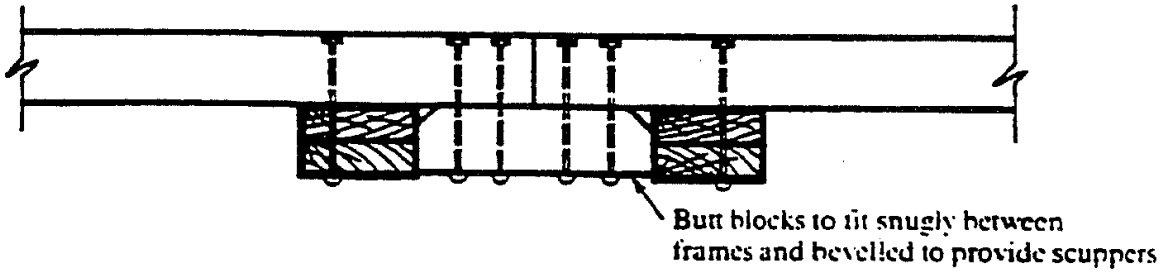
Figure M.12 SCARPHING AND LAPPING OF LONGITUDINALS

TYPICAL BUTT BLOCK IN HULL PLANK

Fig. M.13.



VIEW INSIDE HULL



SECTION X-X

Figure M.13 TYPICAL BUTT BLOCK IN HULL PLANK