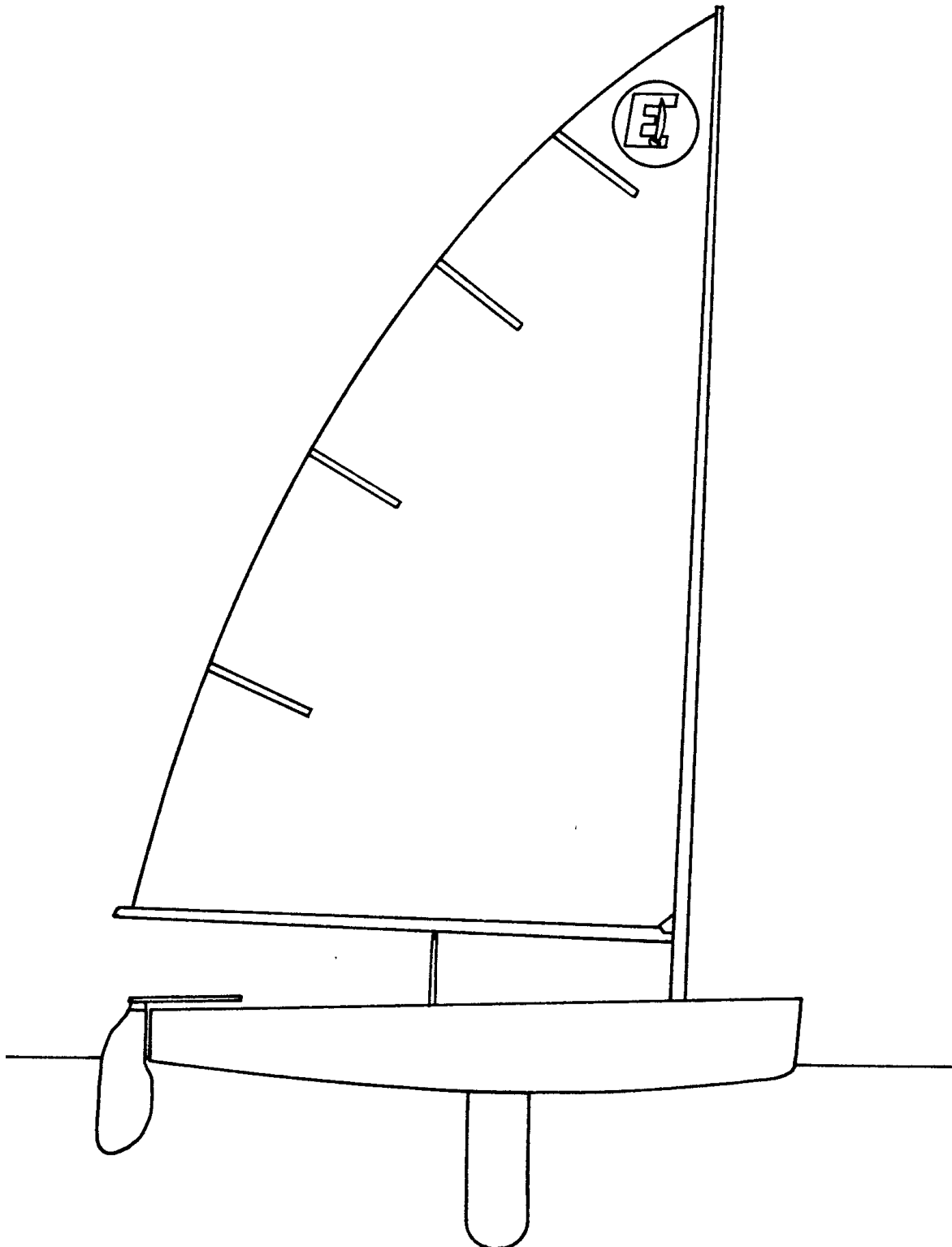


2000



# INTERNATIONAL EUROPE CLASS RULES

Authority\*: International Sailing Federation  
Ariadne House, Town Quay, Southampton SO14 2AQ



\* The International Sailing Federation (ISAF) is not a National Authority (NA).

## **1. GENERAL**

- 1.1 The Europe is a one design class. The intention of these rules is to ensure that the boats are as alike as possible in all respects affecting performance. Everything that is not actually stated as permitted or optional shall be prohibited.
- 1.2 The official plans, measurement diagrams and measurement form shall be considered an integral part of these rules. In the event of any discrepancy between them the matter shall be referred to the ISAF.
- 1.3 Any interpretation of these rules shall be made by the ISAF which may consult the International Europe Class Union (IECU).
- 1.4 Boats shall be built to comply with these Class Rules, the official plans, measurement diagrams and measurement form.
- 1.5 Neither the ISAF nor the IECU accept any legal responsibility in respect of these rules, the plans, the measurement diagrams and/or the measurement form or any claim arising from them.
- 1.6 Except where Part 4 Class rules specify that variations may be declared in sailing instructions Class Rules shall not be amended by any race organisation without the specific approval of the ISAF and concurrence of the IECU in writing on each occasion.

## **2. ADMINISTRATION**

### **2.1 LANGUAGE**

The official language of the class is English. In the event of dispute over interpretation the English text shall prevail.

### **2.2 BUILDERS**

2.2.1 Professional builders shall be licensed by the ISAF. A professional builder is anyone who builds or has built boats of any type for sale.

2.2.2 A non-licensed builder shall be permitted to build not more than one boat a year.

#### **2.2.3 Building licence**

- (i) Applications for a building licence shall be made in writing on the appropriate form to the ISAF, who shall consult the IECU and the appropriate National Authority (NA).
- (ii) The issue of a licence shall not authorise the production of boats for sale until the licence has been ratified by ISAF approval of a prototype hull. Any subsequent proposed change to the production tooling, hull characteristics or layout, method of construction, materials or specification shall require ISAF approval. The procedures for approval of the prototype hull and subsequent changes, which shall include consultation with the IECU, shall be detailed in the licence agreement.

#### **2.2.4 International Class Fee**

- (i) The International Class Fee (ICF) shall be paid to IECU. The ICF shall be apportioned to the ISAF, the IECU and Europe Class National Associations. The amounts due to each shall be decided by the ISAF in consultation with the IECU.
- (ii) The amount of the ICF shall be reviewed by the ISAF annually in consultation with the IECU.

- (iii) The ICF shall be paid by the builder on every hull or kit produced whether or not it is subsequently completed, measured and registered. Payment shall be made to IECU. The IECU will inform Sailing International Limited which will issue a sticker, an ICF receipt and a current measurement form and invoice the IECU for their due portion.

## 2.3 REGISTRATION AND MEASUREMENT CERTIFICATE

2.3.1 No boat is permitted to race in the class unless it has a valid measurement certificate.

2.3.2 The certificate is obtained as follows:

- (i) The builder, or owner shall apply to the National Authority (NA) for a sail number enclosing the ICF receipt. Personal sail numbers may be allowed. A same number shall never exist twice. The NA shall issue a sail number only on production of the ICF receipt.
- (ii) The boat shall be measured by an official measurer. See Rule 2.4. The completed measurement form shall be returned to the owner.
- (iii) On completion of measurement the owner shall send the completed measurement form to his/her NA together with any registration fee that may be required. If satisfied, from the evidence presented on the form, that the boat complies with the rules in all respects the NA may then issue a measurement certificate to the owner. See Rule 2.4.4. A certified copy of the measurement form shall be provided with the certificate and shall form part of the certification documents.
- (iv) The certificate shall include the following information. ISAF ICF plaque or sticker serial number, National letter(s) and sail number, Owner's name, address and club, Builder and date built, Name(s) of measurer(s) and date measurement completed, Hull weight, number and weight of correctors, mass moment of Inertia, position of hull centre of gravity, date of issue and issuing authority.

2.3.3 Change of ownership invalidates the certificate but shall not necessitate remeasurement. The new owner shall apply to his/her NA for a new certificate, returning the old certificate together with any re-registration fee that may be required and stating the changed particulars. A certificate may then be issued to the new owner. If there is a change of NA, a new sail number in that nation's sequential series shall be issued. The new owner and NA shall be provided with a certified copy of the original measurement form.

2.3.4 (i) Subject to prior ISAF approval the NA may delegate the administrative task of issuing sail numbers and measurement certificates to the class national association. The NA shall not delegate their overall responsibility to the ISAF for control of measurement standards.

- (ii) The administration of issuing certificates shall be independent of the administration of measurement.

## 2.4 MEASUREMENT

2.4.1 An official Measurer is a measurer approved and authorised by a NA and/or IECU to measure International Europe Dinghies and equipment. Only an official measurer or measurers, shall measure a boat, spars, sail, foils and equipment.

2.4.2 Boats shall be measured using templates authorised by the ISAF. All sets of ISAF approved templates shall be registered with the ISAF. A registration number shall be allocated to each set of approved templates and shall be stamped on each template of the set.

2.4.3 A measurer shall not measure a boat, spars, sails, foils or equipment owned, built or supplied by him/her self, or in which he/she is an interested party or has a vested interest. A measurer shall not compete in a boat or with equipment which he/she has measured.

- 2.4.4 The measurer shall enter all measurements found in the 'actual' column of the measurement form. Any other form of entry is not acceptable.
- 2.4.5 The measurer shall report on the measurement form anything which he/she considers to be a departure from the intended nature and/or design of the boat, or to be against the general interest of the class. Any feature not clearly permitted by these rules, the plans, the measurement diagrams or measurement form must be assumed to be illegal and shall be reported by the measurer on the measurement form.
- 2.4.6 Notwithstanding anything in these rules, on the evidence of a measurer's report and/or other information, even if the specific requirements of the rules are satisfied, the ISAF and/or NA shall have the power to refuse to grant a certificate to, or to withdraw a certificate from, any boat.
- 2.4.7 New, repaired or recut sails shall be measured, or remeasured by an official measurer who shall stamp, sign and date the sail across the IECU sail label. On first measurement the dimensions found shall be entered on the measurement form.
- 2.4.8 Boats and equipment shall be liable to remeasurement at the discretion of the ISAF, a NA or a race committee.
- 2.4.9 It is the owner's responsibility to ensure that his/her boat, including foils, spars, sails and equipment, complies with the class rules at all times and that alterations or repairs do not invalidate the certificate.

## 2.5 MEASUREMENT INSTRUCTIONS

- 2.5.1 Except where otherwise specified in these rules, the measurement diagrams, the plans and/or the measurement form, the ISAF Equipment Rules of Sailing shall apply.

## 2.6 IDENTIFICATION MARKS

- 2.6.1 Each boat shall have:
- (i) permanently fixed on the starboard side of the main bulkhead and clearly visible the official ISAF ICF plaque or sticker.
  - (ii) the builder's company name clearly shown on the hull on the inside face of the transom on the starboard side.
  - (iii) its National letter(s) and sail number engraved on the IYRU plaque or, for boats with IYRU/ISAF stickers, permanently marked on a plate or sticker below the IYRU/ISAF sticker.
- 2.6.2 Each sail shall have an IECU sail label sewn on to the starboard side of the sail not more than 400mm from the tack.
- 2.6.3 Each NA shall issue sail numbers consecutively starting with 1.
- 2.6.4 Each mast (at the gooseneck), boom (at mast end), centreboard (near the top), rudder blade (near the top) and rudder stock (near the top) shall have a unique identifying code impressed on the starboard side by the manufacturer.

### **3. CONSTRUCTION AND MEASUREMENT RULES**

#### **3.1 GENERAL**

- 3.1.1 Except where otherwise permitted under these rules the boat, spars, foils and sails shall be constructed generally in accordance with and shall comply with the measurements and tolerances specified in the plans, these rules, the measurement diagrams and the measurement form.
- 3.1.2 Tolerances on design dimensions are to accommodate small errors in construction and subsequent distortion during the life of the boat.
- 3.1.3 Protective coatings of any type of paint and/or varnish are permitted on the hull, spars and foils.
- 3.1.4 Backing plates, or locating plates of metal or wood are permitted either behind or moulded into the hull and spars for local strengthening where permitted fixed fittings are to be fastened.

#### **3.2 HULL**

##### **3.2.1 Materials**

(i) Permitted materials:

The hull, including deck, side tanks, bulkheads, centreboard case and all structural components shall be made of wood, plywood, glass reinforced plastic (GRP) or any combination of these materials. Sandwich construction, whose total thickness is not more than 12mm is permitted. The type of material used as a sandwich core or filler is optional except as prohibited by rule 3.2.1(ii). Any type of resin may be used.

(ii) Prohibited materials:

Fibres of carbon, boron, aromatic polyamides (such as Kevlar) or other high tensile materials, including any listed in the ISAF catalogue of materials classified as exotic, are prohibited.

##### **3.2.2 Construction and measurement datum**

- (i) The 'aft measurement point' (AMPt) shall be the intersection of the underside of the hull on the centreline with the transom, both extended if necessary.
- (ii) The 'aft measurement plane' (AMPn) shall be a transverse plane through the AMPt perpendicular to the base line. It is vertical.
- (iii) The 'base line' shall be as shown on the measurement diagram. It is horizontal.
- (iv) For the purpose of rule 3.2.2(i) the transom is an imaginary surface enclosed by the aft end of the underside of the hull shell and a line joining the port and starboard sheerlines at the aft end of the hull shell.
- (v) The centreline plane is a vertical plane through the baseline. For measurement purposes the hull should be arranged so that this plane goes through the AMPt and the top of the underside of the hull at station 3. For hulls first measured before 1st March 1997 and subsequently re-measured, the first and second sentences of Rule 3.2.2(v) are not mandatory.

### 3.2.3 Hull shell

The outside surface of the hull shall be a fair curve as defined by the lines:

- (i) Aft of station 4 the curve shall be convex or flat except that concavities of not more than 1.0mm measured below a fore and aft straight edge of any length are permitted.
- (ii) Forward of station 4 the curve shall be convex, flat or concave except that concavities, measured below a straight edge in the horizontal plane shall be not more than 2.5mm and in any other plane shall be not more than 18mm.
- (iii) The radius of the stem, measured in the horizontal plane, is optional.
- (iv) The width and position of the centreboard slot shall be as shown on the measurement diagram. A recess is permitted extending not more than 30mm from each side of and not more than 50mm from each end of the centreboard case slot to accommodate the slot gasket. The depth of the recess is optional.
- (v) Rubbing strakes shall be not wider than:
  - (a) 20mm at the stem.
  - (b) 40mm at transom, including inwale and transom, but shall not extend more than 20mm aft of the AMPn.
  - (c) 40mm elsewhere.
- (vi) The depth of the rubbing strake shall be not more than 25mm, except that the underside may be faired to the hull shell by a fillet or fairing of radius not more than 25mm provided that, when hull measurement templates are correctly positioned, any such fillet or fairing is entirely within the minimum rubbing strake cutout area of the templates.
- (vii) Holes in the transom are permitted but shall be not more than 0.02m<sup>2</sup> in total area. These holes may be covered by hinged flaps or fixed windows of any material.
- (viii) Stiffening webs or stringers of any material permitted for hull construction may be fitted to the inner surface of the hull forward of the main bulkhead and inside the side tanks.
- (ix) No part of the outer face of the transom shall be more than 20mm from the AMPn.

### 3.2.4 Cockpit and deck

The external surface of the deck, sidetanks, main bulkhead and centreboard case shall have a fair profile as shown on the drawings except where varied by these rules.

- (i) Main bulkhead
  - (a) There shall be a main bulkhead at 2000mm  $\pm$  20mm from the AMPn.
  - (b) The bulkhead shall have not more than 2 hatches with watertight covers. A hatch whose opening has an area more than a circle of 150mm diameter shall be for maintenance access only. It shall be bolted, screwed or securely clipped into place at other times.
  - (c) The bulkhead may have not more than two drainholes with watertight plugs or non-return valves which allow water to flow out of but not into the compartment forward of the bulkhead.
  - (d) The bulkhead may have not more than eight lead holes for control lines provided they are not in a part of the bulkhead which forms a boundary of the forward buoyancy unit or tank required by rule 3.2.6. Each hole shall be not more than 7mm in diameter and shall be within an area enclosed by lines 100mm from the floor of the hull, the side tanks and the line of the foredeck. Any such holes not occupied by control lines shall be plugged.

(ii) Sidetanks:

The sidetanks shall extend from the main bulkhead to the transom. The shape shall be as defined by the lines:

- (a) the distance between the vertical faces of each side tank shall be 660mm  $\pm$  20mm at the inner face of the transom and 740mm  $\pm$  20mm at the main bulkhead.
- (b) The radius of curvature between the top and sides shall be 130mm  $\pm$  20mm.
- (c) Each side tank shall have at least one drain hole, with watertight plug, and/or hatch with watertight cover.

(iii) Centreboard Case:

- (a) The centreboard case shall have sides of single skin or sandwich not more than 12mm thick. It shall be rigidly fixed to the bulkhead at its forward end over not less than 25mm of its depth measured from the top of the case.
- (b) The centreboard case capping shall be not more than 65mm wide each side, measured from the slot, and not more than 65mm deep.
- (c) A step to accommodate mainsheet blocks may be added to the centreboard case which shall be not more than 200mm from the slot, and not more than 100mm deep and wide.
- (d) The upper, aft end of the slot shall be not less than 1510mm from the AMPn.
- (e) The width of the slot shall be 20mm  $\pm$  2mm.
- (f) The distance, measured along the keel from the AMPt, to the aft end of the slot at the keel line shall be not less than 1465mm and to the forward end shall be not more than 2005mm.
- (g) At station 7 the distance from top of the case to the height of the sheerline shall be 184mm  $\pm$  10mm.
- (h) The top of the centreboard case shall be parallel to the base line within a tolerance of 10mm.
- (i) Pads of any resilient material may be fitted inside the top and bottom of each end of the slot to protect the edges of the centreboard.
- (j) Strips of any material may be fitted inside the top and/or bottom of the case to reduce friction and/or to match the slot width to the centreboard thickness provided the permitted dimensions of the case are not infringed.

(iv) Thwart

- (a) A thwart of width 105mm  $\pm$  45mm and depth 25mm  $\pm$  10mm shall connect any part of the vertical face of each side tank, abreast the aft end of the centreboard case, with the upper part of the centreboard case at the after end.  
In wooden construction the thickness shall be not less than 15mm; in GRP construction the thickness shall be not less than 3mm.
- (b) The thwart may be integral with the centreboard case capping.
- (c) Support struts and stiffening webs are optional.
- (d) As an alternative to (iv)(c), in GRP construction only, the forward and aft vertical faces of the thwart moulding may extend down the vertical face of the side tanks as stiffening webs not more than 45mm wide and with a radius of not more than 100mm between the web and the underside of the thwart.

(v) Foredeck

The foredeck shall have a fair profile as shown on the drawings except that on each side of the centreline not more than one step in the profile, of not more than 5mm in height, is permitted within the overall profile limits set by the tolerances for the sheer height and the deck camber at the main bulkhead. The deck camber at the main bulkhead shall be 52mm  $\pm$  10mm and at station 3 shall be not more than 30mm.

- (vi) Shaped pads, which may be an integral part of the moulding in GRP boats, are permitted on curved surfaces of the deck, side tanks and cockpit floor to accommodate flat based, permitted, fixed fittings. No part of a pad shall be more than 20mm from the line of the curved surface on which it provides a flat base. One vacant pad may be provided on each side of the boat as an alternative position for overdeck or underdeck control line cleats.
- (vii) Stiffening webs, stringers or beams of any material permitted for hull construction may be fitted to the inner surface of the foredeck and sidetanks.
- (viii) Centreline and other battens or pads for stiffening or support of hiking straps are optional. They shall be not more than 30mm deep.
- (ix) Except where otherwise specified the radius of any fairing, flange or fillet between hull components (e.g. main bulkhead, sidetanks, centreboard case, transom, thwart, foredeck) shall be not more than 25mm. The width of flanges used to secure hull components to each other is optional provided the 12mm sandwich thickness limitation is not infringed.
- (x) Spare number
- (xi) A centreline knee or strut of any material may be fitted between the inside face of the transom and the floor of the cockpit. No part of it shall extend more than 200mm from the transom nor more than 50mm from the centreline of the hull. In GRP hulls it may be moulded integrally with a centreline stiffening batten permitted by rule (viii) above.
- (xii) A stiffening beam (inwale) not more than 25mm deep may be fitted to the top of the inside of the transom. The overall width of inwale, transom and rubbing strake shall be not more than 40mm.

### 3.2.5 Fitting and equipment

- (i) Permitted fixed fittings are:
  - (a) Hatches, hatch covers, drains, drain plugs and non return valves as permitted or required elsewhere in these rules;
  - (b) 2 gudgeons on the stern to connect the rudder stock so that every rudder stock fits every hull. See Class Rule 3.4.5 (iv) and Rudder Blade Measurement Diagram for details of fittings and grandfather clause.
  - (c) A rudder stock retaining device;
  - (d) Not more than 3 hiking straps, which may be padded, and an adjustment system for each comprising not more than 2 single sheave blocks and 1 cleat;
  - (e) A mainsheet block which may be a ratchet type;
  - (f) A mainsheet traveller system comprising track, carriage, mainsheet block, 4 single sheave control line blocks and 2 cleats;
  - (g) Control systems for cunningham, clew outhaul, tack inhaul and boom kicker (vang) each comprising not more than 6 single sheave blocks and 2 cleats;
  - (h) Not more than 8 lead eyes or sheaves and sheave boxes fitted in main bulkhead for control lines;
  - (i) A painter/towing line fairlead fitting at the stem head, which is mandatory;
  - (j) A mast heel fitting, which may incorporate an adjustment system for the fore and aft position of the heel of the mast provided no part of the adjustment system can extend aft of a plane 500mm forward of the main bulkhead and the fore and aft movement of the heel of the mast in any setting of the adjustment system is not more than 5mm;
  - (k) A deck bearing ring for the mast which shall be fixed and shall have no moving parts;
  - (l) Not more than 4 automatic (self) bailers;
  - (m) Not more than 2 retaining devices for water bottles;
  - (n) Fastenings, including shackles where appropriate, for fittings listed.



- (ii) Fitting types and material are optional except that the use of fittings which are oversized, relative to their specific function, to add or concentrate weight is prohibited.
- (iii) Fittings and equipments not defined as fixed in Rule 3.2.5(i) are optional except that any electronic or electrically powered fitting or equipment other than a timing device is prohibited. They shall be removed for weighing and weight distribution tests.
- (iv) Rigging. Any form of standing rigging is prohibited. Except where otherwise specified in these rules the type, material, size and length of line, rope or wire used for running rigging is optional.

### 3.2.6 Buoyancy

- (i) There shall not be less than three separate buoyancy units which shall comprise the two side tanks and a forward buoyancy unit.
- (ii) The forward buoyancy unit may be provided by any one or combination of the following: watertight compartment(s); closed cell foam block(s); air bag(s). Not less than 30 litres of the unit's total volume shall be forward of the mast. The forward buoyancy unit, if it is a compartment or compartments, shall be:
  - (a) isolated from the mast position by a watertight bulkhead or bulkheads.
  - (b) fitted with not less than one inspection hatch with watertight cover and/or drainhole with watertight plug.
- (iii) Buoyancy tanks shall be watertight. On first measurement the measurer shall carry out tests on each tank as follows:

Super or sub-atmospheric air pressure shall be applied to the tank sufficient to produce a differential reading of 130mm on a water gauge. The pressure differential shall not reduce from 130mm to less than 50mm in less than 30 seconds.
- (iv) After satisfying the buoyancy test detailed in 3.2.6.(iii) a pressure equalising hole, made with a nominal 2mm drill, may be provided in not more than one hatch cover or drainhole plug in each buoyancy unit. Sailing Instructions may require that any such hole be sealed.

### 3.2.7 Weight

- (i) The hull in dry and clean condition, with permitted fixed fittings, as defined in rule 3.2.5(i) shall weigh not less than 45kg. Mainsheet and control lines, except those forming part of the hiking strap or traveller control systems, shall be removed for weighing.
- (ii) If the hull is found to weigh less than 45kg, but not less than 40kg, a lead corrector weight, or weights, shall be securely fastened to the forward or aft face of the main bulkhead not lower than 200mm from the bottom of the hull. The weight (kg:g) and ISAF plaque number of the boat shall be stamped or engraved on each corrector weight.
- (iii) The hull weight, without correctors, and the weight and number of corrector weights shall be recorded on the certificate.
- (iv) Corrector weights shall not be removed or changed except after reweighing of the hull by an official measurer. The measurer shall record any change on the measurement certificate and send details to the certifying authority.

### 3.2.8 Weight Distribution

- (i) Any attempt to concentrate the weight of the hull is prohibited.

- (ii) The weight distribution, as defined by the fore and aft mass moment of inertia (I) and the location of the centre of gravity (CG) relative to the aft measurement plane, ie horizontal CG (CGH) and the underside of the hull on the centreline vertically below the CG, ie vertical CG (CGV), shall be determined, for the hull in the same condition as for weighing. 'I' shall be calculated from a radius of gyration (RG) measured using the method detailed on measurement diagram, sheet (vii) and the hull weight.
- (iii) If 'I' is less than 35.5kg/m<sup>2</sup> (which is the 'I' given by a radius of gyration of 888mm and a hull weight of 45kg) lead corrector weights, marked as in Rule 3.2.7, shall be securely fitted on the centreline, 50% forward of station 3 and 50% aft of station 10.
- (iv) The CGH shall be not less than 1500mm from the aft measurement plane.
- (v) The CGV shall be not less than 200mm above the underside of the hull on the centreline.
- (vi) If CGH and/or CGV is outside the limits specified lead corrector weights, marked and positioned as in Rule 3.2.7, shall be fitted.
- (vii) Corrector weights required to bring weight, weight distribution and centre of gravity within permitted limits shall be applied in that order. Weights required to correct weight distribution and centre of gravity shall be additional to those required to correct for weight.

### 3.3 CENTREBOARD

#### 3.3.1 Materials

The centreboard shall be made of wood, which may be laminated, of plywood or GRP with or without a plastic foam core, or of any combination of these materials. If of hollow construction there shall be an expansion/drain hole, which shall not be covered, at not more than 80mm from an upper corner.

3.3.2 The profile, cross section and dimensions shall comply with those specified on the centreboard measurement diagram and/or the measurement form.

3.3.3 The weight of the centreboard shall be not less than 2kg.

### 3.4 RUDDER AND TILLER

#### 3.4.1 Materials

The rudder blade shall be made of wood, which may be laminated, of plywood or GRP with or without a plastic foam core, or of any combination of these materials. If of hollow construction there shall be a drain/expansion hole, which shall not be covered, at not more than 80mm below the top of the blade.

3.4.2 The profile, cross section and dimensions shall comply with those specified on the rudder blade measurement diagram and/or the measurement form.

3.4.3 The rudder blade, fitted to the rudder stock, hung on the pintles, in the fully down position and aligned fore and aft, shall have its lower edge not more than 600mm below a horizontal plane through the AMPt and its trailing edge not more than 280mm from the AMPn.

3.4.4 The weight of the rudder blade shall be not less than 0.9 kg.

#### 3.4.5 Rudder Stock and Tiller

The materials, type and shape of rudder stock, tiller and tiller extension and associated fittings are optional except that:

- (i) the rudder blade shall be able to pivot about its axis in the rudder stock so that it may be lifted during launching and recovery of the boat. A fixed rudder blade is prohibited.
- (ii) A lanyard, locking pin and/or clamping screw and nut shall be fitted to secure the rudder blade in the fully down position.
- (iii) The profiles, cross sections and dimensions of the fittings shall comply with those specified on the rudder blade measurement diagram and the measurement form.
- (iv) The fittings to connect the rudder stock to the hull shall be made so that every rudder stock fits every hull. This shall apply for new rudder stocks and boats first measured after 1 March 1998 and all rudder stocks and all boats after 1 March 2000.
- (v) The weight of the complete rudder stock, tiller and tiller extension assembly, but excluding rudder blade, shall be not less than 1.25kg.

### 3.5 MAST

#### 3.5.1 General

- (i) The intention of these rules is that masts should be of reasonable cost, reliable, and as uniform as possible, whilst allowing sufficient variation in stiffness to suit a wide range of helm body weights. The rules are framed to discourage the use of expensive materials and production methods, and to prevent developments in the aerodynamic shape.
- (ii) Concentration of weight of the mast by the use of Fittings, Materials or Laminates, even if otherwise permitted within these rules, is prohibited.
- (iii) In case of doubt the ISAF and the IECU may prescribe any tests and investigations, (including, but not limited to, destructive tests) to check rule compliance of the mast at manufacturer's expense.

#### 3.5.2 Mast Builders

- (i) Masts may be built only by manufacturers who have been authorised by the IECU with the approval of ISAF. Authorised Manufacturer status will be granted to applicants based on their technical ability to produce good quality masts in accordance with these rules. Each Authorised Manufacturer will be issued with a unique Authorised Manufacturer Code (AMC) which must be shown on each mast made in accordance with rule 3.5.4 (ix).
- (ii) Prototype measurement is obligatory for all manufacturers to ensure that any prototype mast measures correctly before series production commences. Prototypes shall only be measured by measurer specifically authorised by ISAF and IECU.
- (iii) The ISAF and or IECU will require specification and samples of laminates to check compliance with class rules. A manufacturer shall permit a measurer or class representative, authorised by IECU, to inspect work at any time during production of masts or fittings.

#### 3.5.3 Permitted Mast Material

- (i) The basic mast section (including sail track but without fittings) shall be made of FRP (Fibre Reinforced Plastic)

Permitted mouldable fibres	Shall be Carbon fibres, Glass-fibres, Aramid-fibres or any combination thereof. The fibre volume fraction of the laminate shall be > 50%
Resin	Shall be either: Polyester, Vinylester, Epoxy or Polyurethane. Shall only be used as a matrix to enclose the fibres.
Coating	A coating of any paint may only be used at the outer skin of the mast.

No other materials as prescribed above shall be used to construct the basic mast section.

- (ii) The mast Fittings and Fasteners shall only be made of : stainless steel, brass, copper, aluminium alloys, plastic, FRP or any combination thereof.
- (iii) Metal or plastic washers and backing plates to fasten fittings shall be of max. thickness 2mm, and of max diameter: 3x nominal diameter of it's fastener. Below station 4500 a metal plate of alloy max dimension 4 x 30 x 400mm is allowed for fasten corresponding fittings at the aft face of the mast.
- (iv) An inflatable plastic tube weighing not more than 70 g/m<sup>2</sup> is permitted to remain inside the mast section.

#### 3.5.4 Construction and Measurement

- (i) The mast shall comply with the dimensions and requirements specified on the mast design specifications and measurement diagrams and/or the measurement form.
- (ii) The tolerances on the design shape are as stated in the mast design specifications and measurement diagrams.
- (v) The mast heel fitting and deck ring shall be mounted concentric to the mast section within  $\pm 1$ mm.
- (iv) The mast shall be hollow throughout its whole length. In order to facilitate inspection of the internal mast section, the heel fitting shall be open or removable without damage.
- (v) To provide class statistics and information for sailors, 10 mast bend measurements (5 transverse and 5 fore-&-aft) shall be obtained as prescribed on the mast measurement diagram.
- (vi) The mast shall pivot on its heel. It shall be supported only at the heel and the deck ring.
- (vii) The mast shall be secured in position in the boat when sailing so that the heel cannot be lifted out of the mast step in any mast position.
- (viii) A manufacturer shall issue with each mast a measurement form issued by IECU. This form shall have three sections, i.e.:
  - a) An Authorised Manufacturers Declaration (AMD) duly signed and filled out by the manufacturer, stating that the mast complies with the relevant class rules.
  - b) A manufacturer's measurement section duly signed and filled out by the authorised manufacturer.
  - c) An official measurers section duly signed and filled out by an official measurer stating:
    - that the mast complies with the relevant class rules.
    - the measurers confirmation that the measurements in section b) are correct.

- (ix) Each mast (near the gooseneck), shall have:
- a) permanently fixed a unique identifying numbered Authorised Manufacturer Sticker (AMS) issued by ISAF and distributed by IECU. Procedure for AMS fee and fee apportioning shall be similar as stated in Class Rules 2.2.4 (i & ii) for ICF.
  - b) an Authorised Manufacturer Code (AMC), allocated by IECU following approval of each prototype by ISAF, clearly legible and indelibly marked next to the AMS in figures not less than 6mm high. This code may be invalidated if it is established that masts have deviated from the class rules after prototype approval.

### 3.5.5 Weight

The weight of the mast shall be not less than 5.5kg and the centre of gravity shall be not more than 3500mm below the lower edge of the upper measurement band. If the mast weighs less than 5.5kg but not less than 5.0kg and/or the centre of gravity is more than 3500mm below the lower edge of the upper measurement band, both measured with the halyard removed, lead corrector weight(s), of maximum length 250mm, shall be permanently attached to the outer face of the mast. The weight and the AMS number (see 3.5.4 ix a) shall be permanently marked on the corrector weight(s).

### 3.5.6 Grandfathering

Masts shall comply with these rules after:

- |                               |              |
|-------------------------------|--------------|
| - at fundamental measurements | 1 March 2000 |
| - at the Olympic Games        | 1 March 2000 |
| - at all other events         | 1 March 2006 |

Event Authorities may give further allowance.

## 3.6 BOOM

### 3.6.1 Boom Builders

- (i) Booms may be built only by manufacturers who have been authorized by the IECU with the approval of ISAF. Authorized Manufacturer status will be granted to applicants based on their technical ability to produce good quality booms in accordance with these rules. Each Authorized Manufacturer will be issued with a unique Authorized Manufacturer Code (AMC) which must be shown on each boom made in accordance with rule 3.6.3 (vii).
- (ii) Prototype measurement is obligatory for all manufacturers to ensure that any prototype boom measures correctly before series production commences. Prototypes shall only be measured by a measurer specifically authorised by ISAF and IECU.
- (iii) The ISAF and or IECU will require specification and samples of materials to check compliance with class rules. A manufacturer shall permit a measurer or class representative, authorised by IECU, to inspect work at any time during production of booms or fittings.

### 3.6.2 Permitted Boom Materials

- (i) The basic boom section shall be made of wood, laminated wood or aluminium alloy, or any combination of these materials.  
No other materials as prescribed above shall be used to construct the basic boom section.
- (ii) The boom fittings and Fasteners shall only be made of stainless steel, brass, copper, aluminium alloys, plastic, FRP or any combination thereof.  
This shall apply for booms fundamental measured after 1 March 1998 and all booms after 1 March 2000.

After 1 March 2000 National Class Unions may give a limited permission to use old carbon booms for national events only. Provided these carbon booms have passed fundamental measurement before 1 March 1998.

### 3.6.3 Construction and Measurement

- (i) The boom shall comply with the dimensions and requirements specified on the mast and boom measurement diagrams and/or the measurement form.
- (ii) A stop shall be fitted to the boom to prevent the sail being hauled out beyond the inner edge of the measurement band.
- (iii) The boom shall be straight but a permanent set due to distortion of 20mm shall be permitted.
- (iv) The boom shall be fitted to the mast so that they rotate together.
- (v) There shall be a track or groove on the upper side of the boom for the foot bolt rope of the sail.
- (vi) A manufacturer shall issue with each boom a measurement form issued by IECU. This form shall have three sections, i.e.
  - a) An Authorised Manufacturers Declaration (AMD) duly signed and filled out by the manufacturer, stating that the boom complies with the relevant class rules.
  - b) A manufacturers measurement section duly signed and filled out by the authorised manufacturer.
  - c) An official measurers section duly signed and filled out by an official measurer stating:
    - that the boom complies with the relevant class rules.
    - the measurers confirmation that the measurements in section b) are correct.
- (vii) Each Boom (near the gooseneck), shall have:
  - a) permanently fixed a unique identifying numbered Authorised Manufacturer Sticker (AMS) issued by ISAF and distributed by IECU. Procedure for AMS fee and fee apportioning shall be similar as stated in Class Rules 2.2.4 (i & ii) for ICF.
  - b) an Authorised Manufacturer Code (AMC), allocated by IECU following approval of each prototype by ISAF, clearly legible and indelibly marked next to the AMS in figures not less than 6mm high. This code may be invalidated if it is established that booms have deviated from the class rules after prototype approval.

### 3.6.4 Weight

If the weight of the boom, without sheet blocks and shackles, but with securing eyes, kicker (vang) system and its running rigging in their racing position (loose and movable ends fixed vertically), is less than 3.30kg but not less than 3.00kg and/or the centre of gravity is less than 1250mm from the gooseneck end, lead corrector weights shall be fitted to the outside of the profile.

### 3.7 SAIL

- 3.7.1 The sail shall be made and measured in accordance with the ISAF Equipment Rules of Sailing except where differences are defined on the sail measurement diagram and/or measurement form.
- 3.7.2 The sail shall comply with the dimensions, tolerances and other requirements specified on the sail measurement diagram and the measurement form.

- 3.7.3 The Class Insignia, national letter(s) and sail number(s) shall comply with the dimensions given on the measurement diagram and the measurement form.
- 3.7.4 The sail shall have luff and foot bolt ropes of not less than 80% of their respective lengths and which may be elastic, running in a track or groove on the after side of the mast and the upper side of the boom.
- 3.7.5 The sail shall be hoisted on an external halyard. The arrangement shall permit hoisting and lowering the sail at sea from the cockpit.

### 3.8 ALL UP WEIGHT

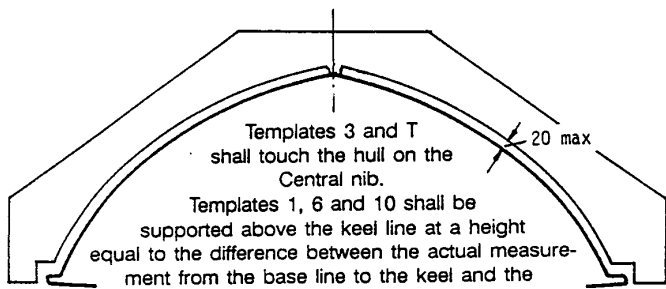
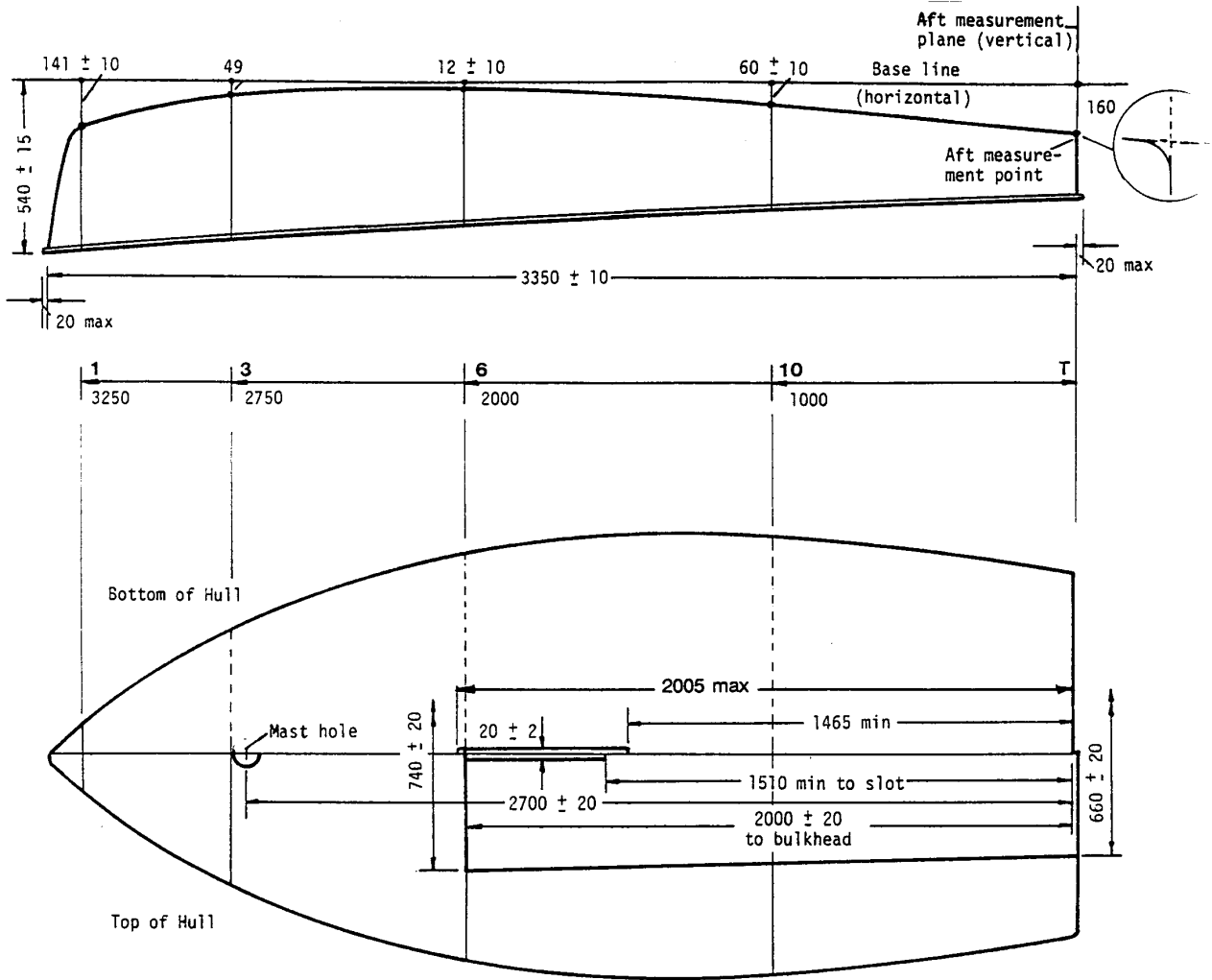
The all up weight is not controlled.

## 4. ADDITIONAL RULES WHICH APPLY WHEN RACING

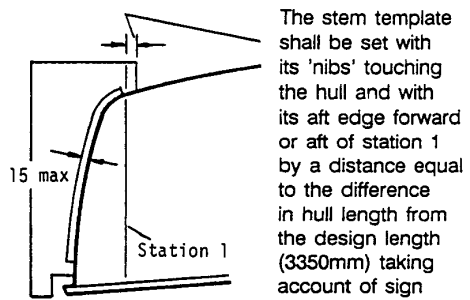
### 4.1 AT ALL TIMES WHEN RACING

- (i) All covers to hatches and plugs to drainage holes shall be in place.
- (ii) The mast heel adjuster setting shall not be altered.
- (iii) The rudder blade shall be secured in the fully down position. However, the sailing instructions may prescribe an exception to this rule for racing in shallow water.
- (iv) The following equipment shall be on board:
  - (a) A lifejacket or buoyancy aid. Unless otherwise prescribed in the Sailing Instructions the buoyancy aid or life jacket shall be worn. Sailing instruction may prescribe standards of approval required.
  - (b) A hand bailer, if the boat has no self-bailer fitted.
  - (c) A painter, of diameter not less than 6mm and length not less than 14m unless otherwise prescribed in the sailing instructions. The painter shall be of buoyant line having a nominal breaking strain of not less than 450kg.
- (v) Weight of clothing and equipment.
  - (a) Clothing worn by a competitor shall be solely to provide protection from the environment and not to increase weight. Water absorbent garments worn for example, on top of a dry suit or spray top shall be considered as a deliberate attempt to infringe this rule.
  - (b) A competitor's clothing and equipment shall not weigh more than 10 kilograms excluding clothing (and footwear) worn only below the knee.
  - (c) spare number
- (vi) Hiking pads, cushions or similar which are attached to the boat are prohibited.
- (vii) spare number

# HULL MEASUREMENT DIAGRAM



Example for station 10:  
 Actual base line to Keel 58mm  
 Minimum permitted 50mm  
 Height of template 8mm



The stem template shall be set with its 'nibs' touching the hull and with its aft edge forward or aft of station 1 by a distance equal to the difference in hull length from the design length (3350mm) taking account of sign (i.e. + or -)  
 Examples:

(1) actual length 3348  
 design length -3350  
- 2

Aft edge 2mm aft of station 1

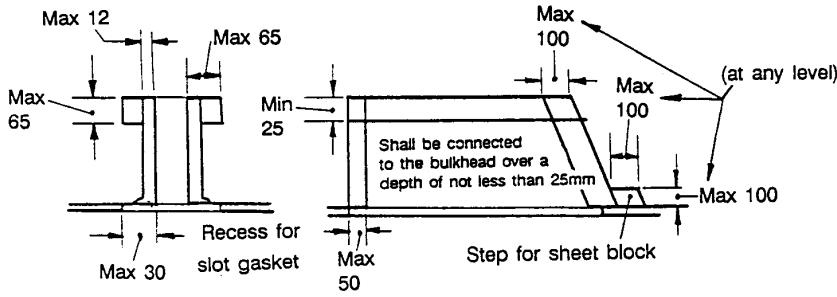
(2) actual length 3356  
 design length 3350  
+ 6

Aft edge 6mm forward of station 1

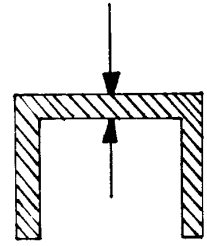


# HULL DETAIL MEASUREMENT DIAGRAM

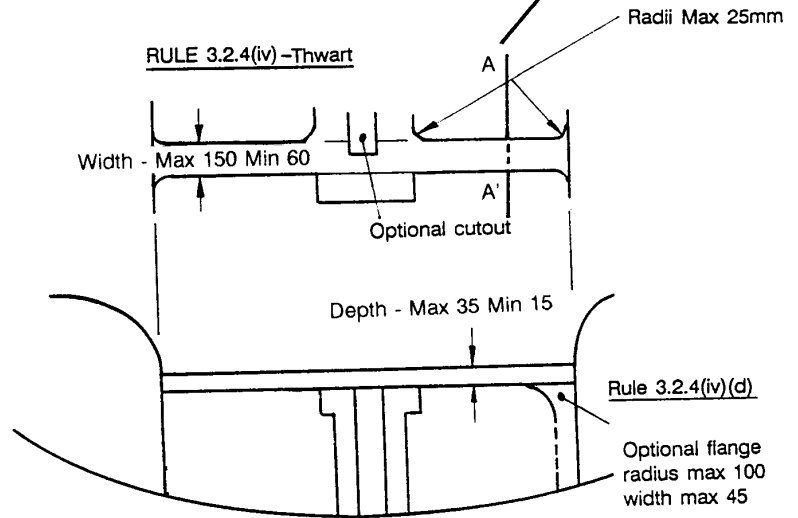
## RULE 3.2.4(iii) — CENTREBOARD CASE



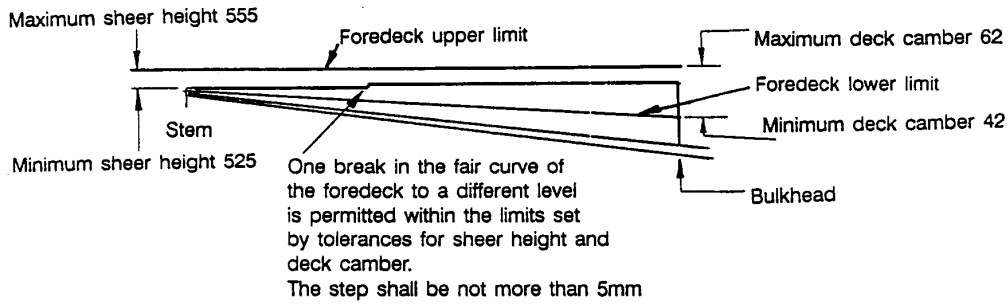
Thickness:  
Wood min 15mm  
GRP min 3mm



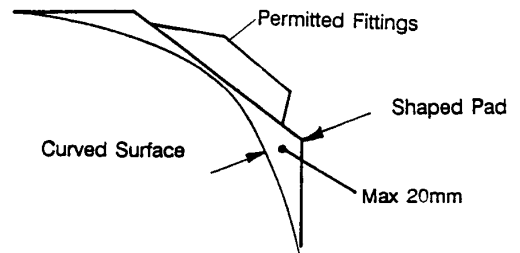
## RULE 3.2.4(iv) -Thwart



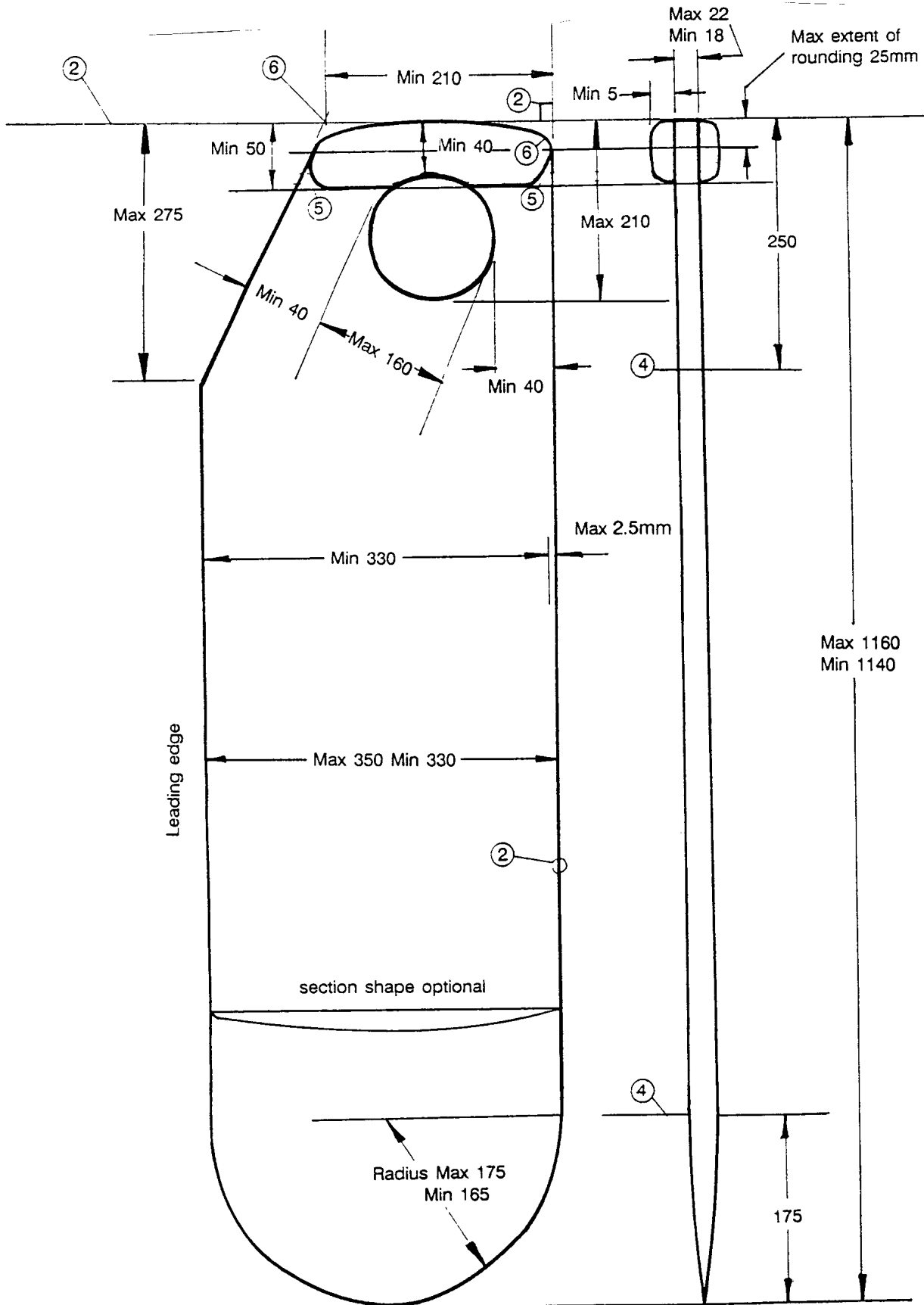
## RULE 3.2.4(v) - FOREDECK



## RULE 3.2.4 (vi) - SHAPED PADS



# CENTREBOARD MEASUREMENT DIAGRAM



## **CENTREBOARD MEASUREMENT DIAGRAM**

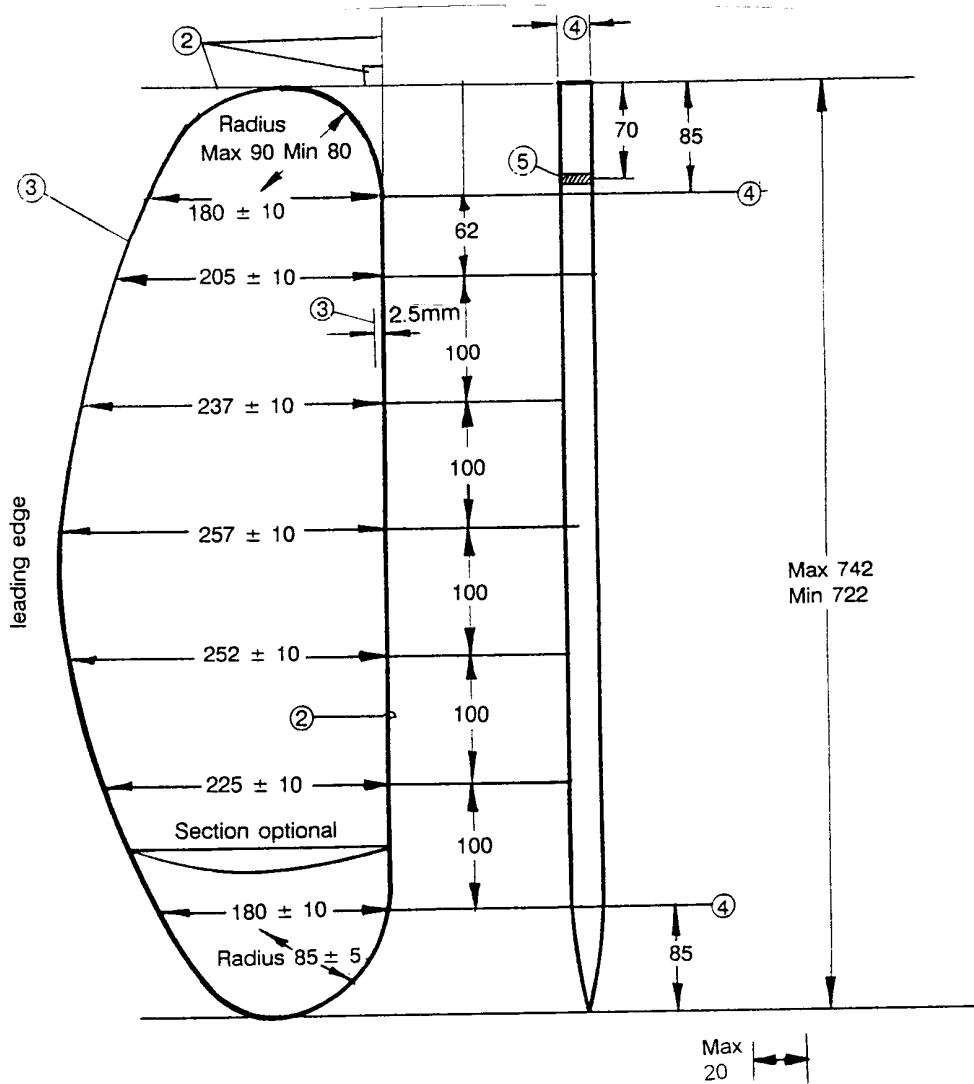
1. The profile of the centreboard shall comply with the diagram. When positioned over a template of the maximum and minimum permitted profiles it shall concurrently be not greater than the maximum nor smaller than the minimum.
2. Except where otherwise shown the datum lines for profile measurement are:
  - (i) for width, a straight edge placed against the trailing edge of the board.
  - (ii) for length, a straight edge placed against the highest point of the board and at right angles to the width datum line.
3. The trailing and leading edges of the blade between the limits of the top corner or radius and the bottom radius, as shown on the diagram, shall be straight except that concavities of not more than 2.5mm, which in aggregate are not more than 150mm, are permitted. For measurement of width any such concavities in the profile shall be bridged. The overall profile shall be a fair curve.
4. The shape of the cross section is optional except that:
  - (i) below 175mm from the bottom edge the thickness shall be not more than 22mm.
  - (ii) above a line 250mm below the top of the centreboard the thickness shall be 20mm  $\pm$  2mm. It shall not vary by more than 1mm except that within 20mm of each edge the board may be shaped to a thickness of less than 18mm.
  - (iii) between the limits in (i) and (ii) the thickest part of the board in any section shall be 20mm  $\pm$  2mm.

If of hollow construction the thickness limits shall not be exceeded if sub or super atmospheric pressure is applied at the drain hole by blowing or sucking.
5. A batten of wood or GRP, or stops of wood, rubber or plastic, not less than 5mm thick shall be fitted to each side of the top of the board. They shall be positioned so that even if compressed no part of the board less than 50mm from the top, except at less than 20mm from each edge, can enter the centreboard case slot.
6. The upper edge of the board may be rounded. Any such rounding shall not extend more than 25mm below the length datum line (see Note 2(ii)).
7. A handgrip hole is permitted. It shall be not more than 160mm across in any direction. No part of the hole shall be more than 210mm from the top of the board nor less than 40mm from the top or either edge.

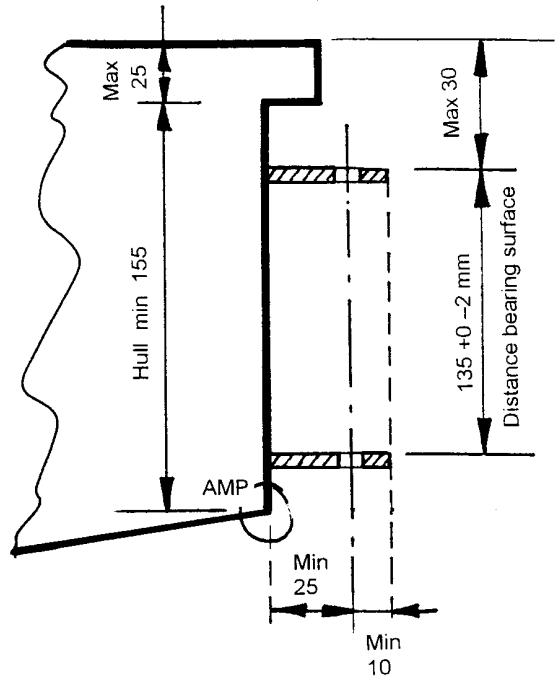
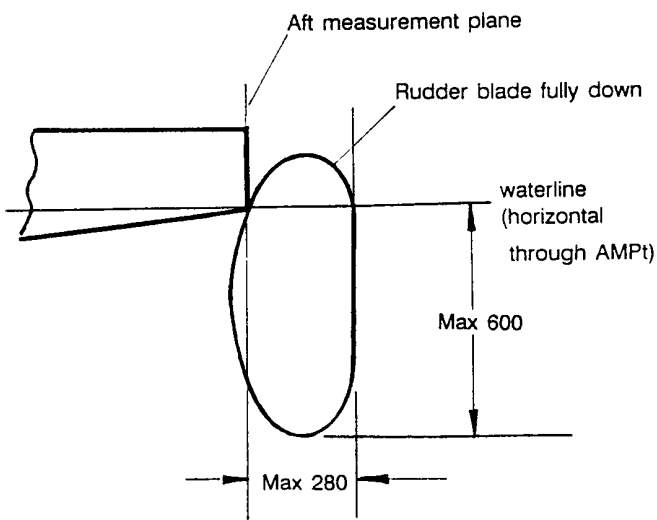
## **RUDDER BLADE MEASUREMENT DIAGRAM**

1. The profile of the rudder blade shall comply with the diagram. It shall be a fair curve. When positioned over a template of the maximum and minimum permitted profiles it shall concurrently be not greater than the maximum nor smaller than the minimum.
2. The datum lines for profile measurement are:
  - (i) for width; a straight edge placed against the trailing edge.
  - (ii) for length; a straight edge placed against the highest point of the blade and at right angles to the width datum line.
3. The trailing edge of the blade between the lower and upper limits of the top and bottom radii respectively, as shown on the diagram, shall be straight except that concavities of not more than 2.5mm, which in aggregate are not more than 100mm, are permitted. For measurement of width any such concavities in the profile shall be bridged. The overall profile shall be a fair curve.
4. The shape of the cross section is optional except that:
  - (i) below 85mm from the bottom edge the thickness shall be not more than 22mm.
  - (ii) above a line 85mm below the top of the centreboard the thickness shall be 20mm  $\pm$  2mm. It shall not vary by more than 1mm except that within 20mm of each edge the board may be shaped to a thickness of less than 18mm.
  - (iii) between the limits in (i) and (ii) the thickest part of the board in any section shall be 20mm  $\pm$  2mm.

If of hollow construction the thickness limits shall not be exceeded if sub or super atmospheric pressure is applied at the drain hole by blowing or sucking.
5. The centre of the pivot hole shall be not less than 70mm from the top of the blade.



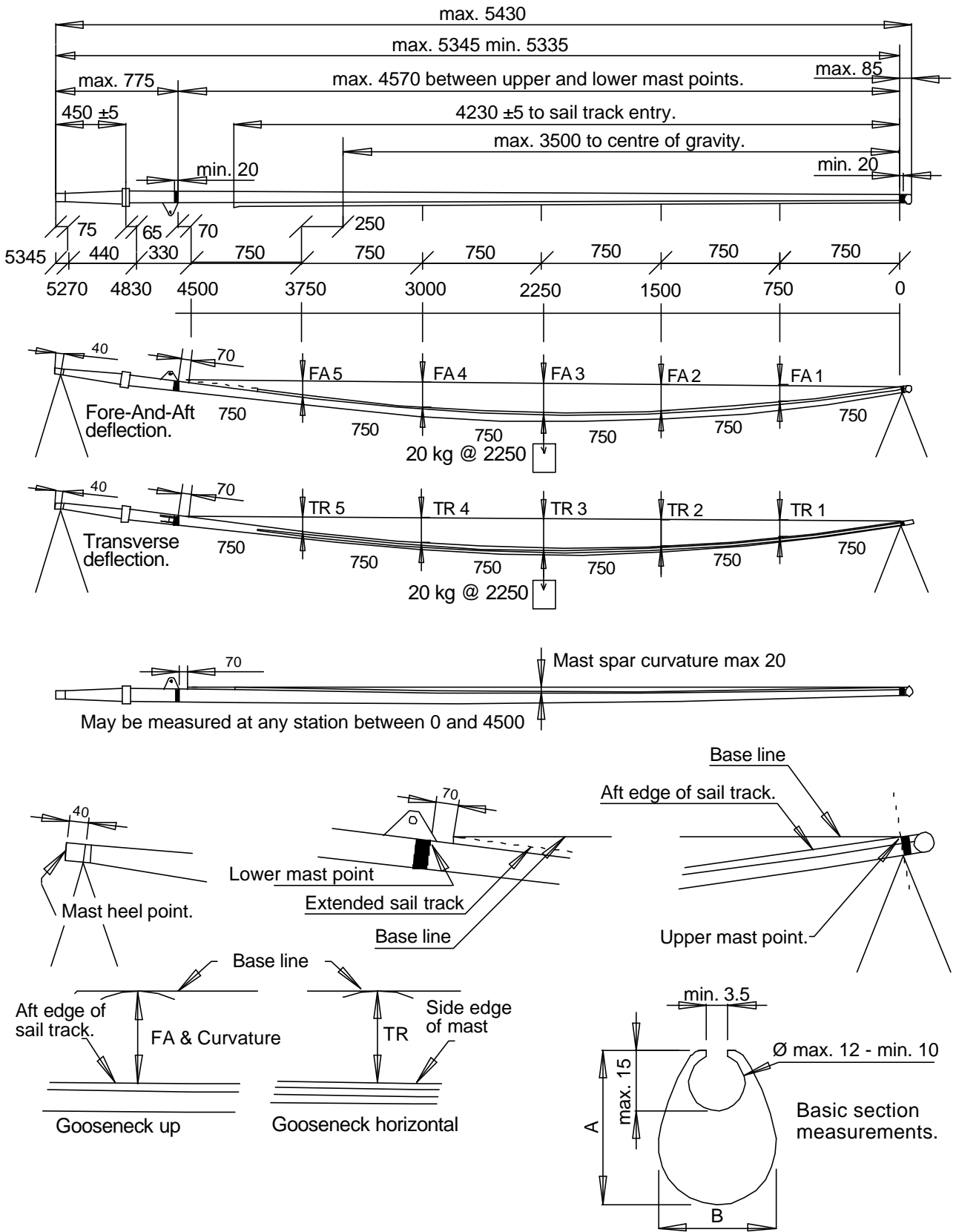
**Rule 3.4.3 - Rudder Fully Down**



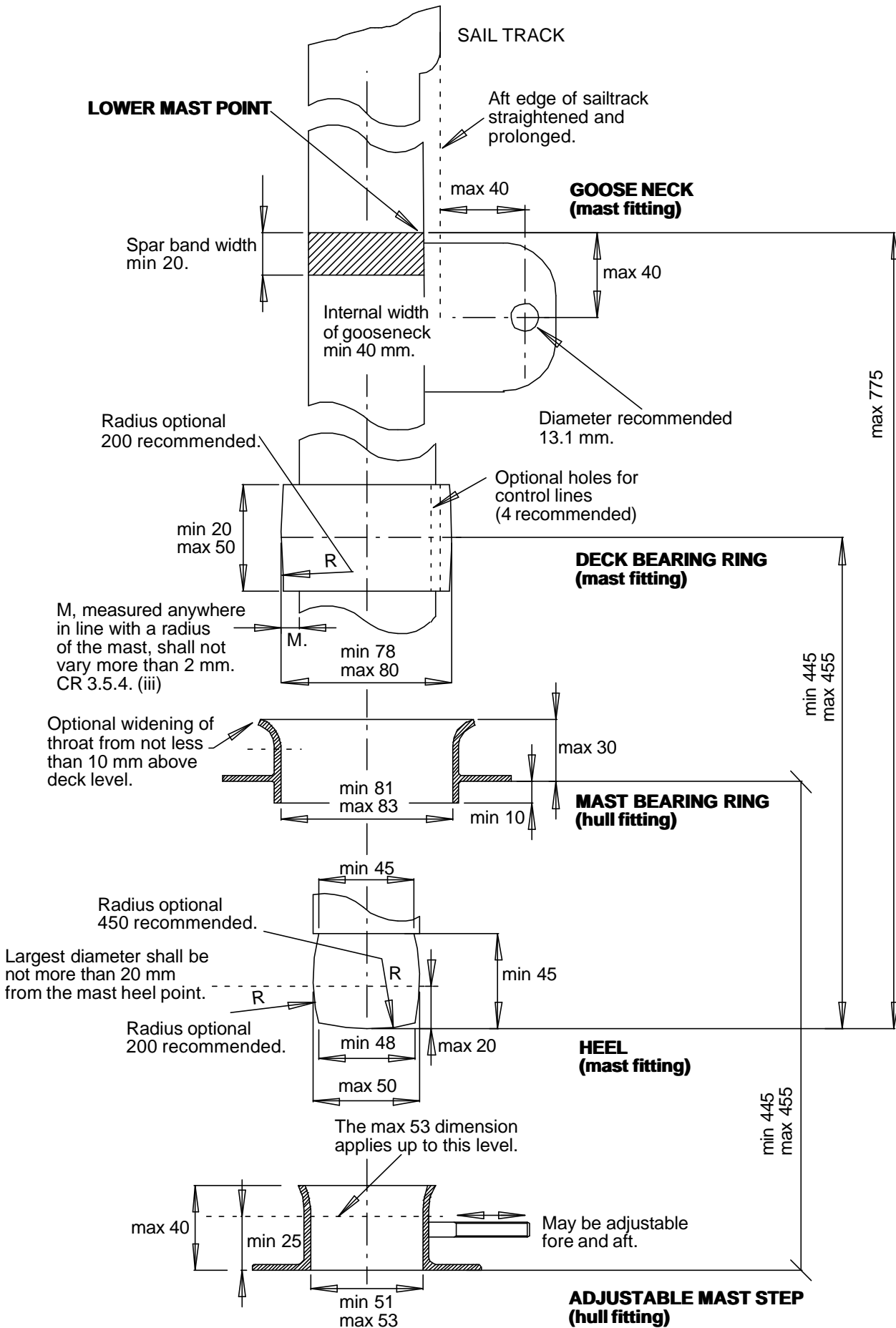
Diameter of holes in the bearing  
Surfaces min 8.0mm

Diameter of pintles at the rudder stock max 8.0mm

# MAST MEASUREMENT DIAGRAM SHEET 1 OF 2.



# MAST MEASUREMENT DIAGRAM SHEET 2 OF 2.



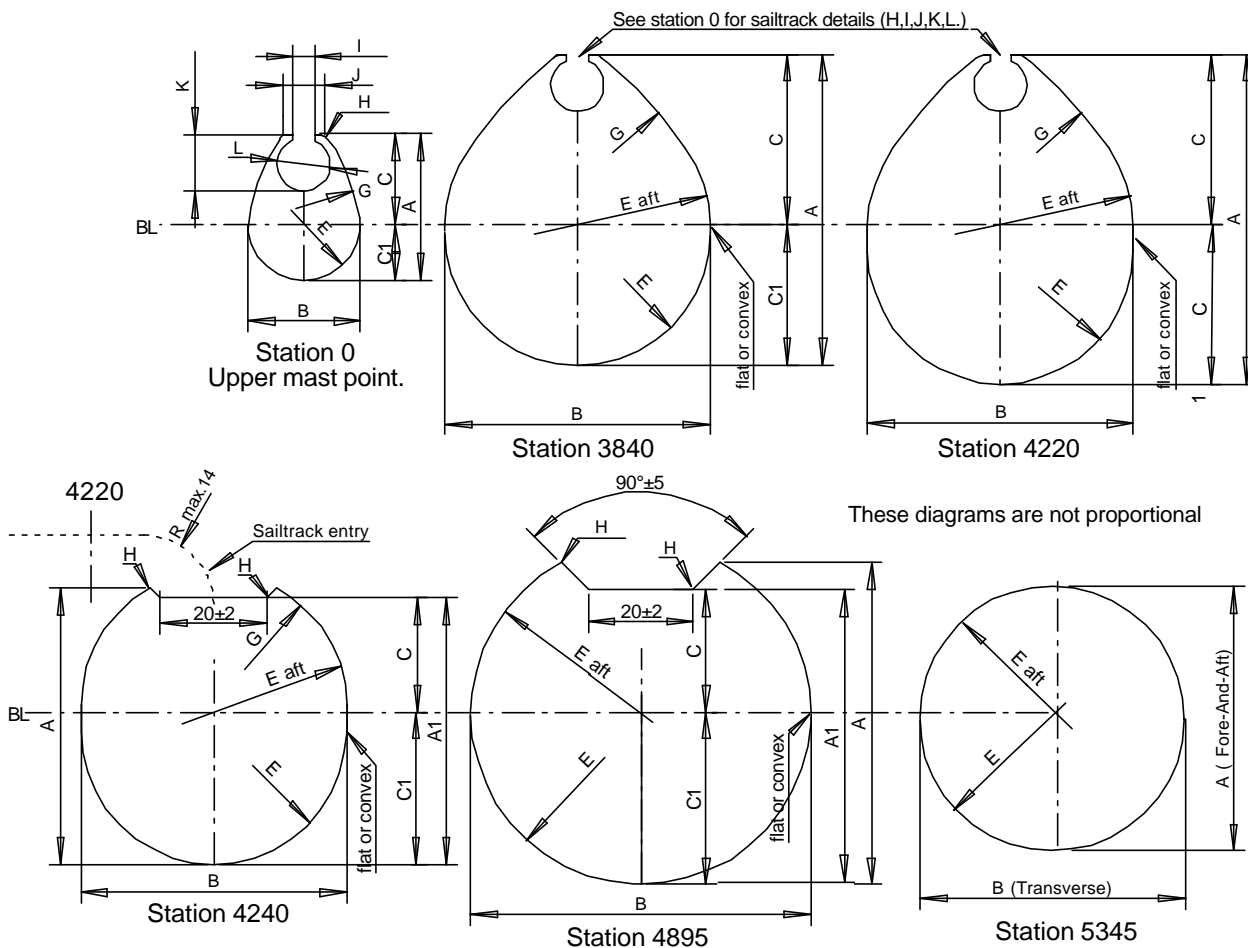
# MAST DESIGN SPECIFICATIONS,

basic FRP profile incl. sailtrack. (without fittings), see CR 3.5.4. (i)

Table of offsets:

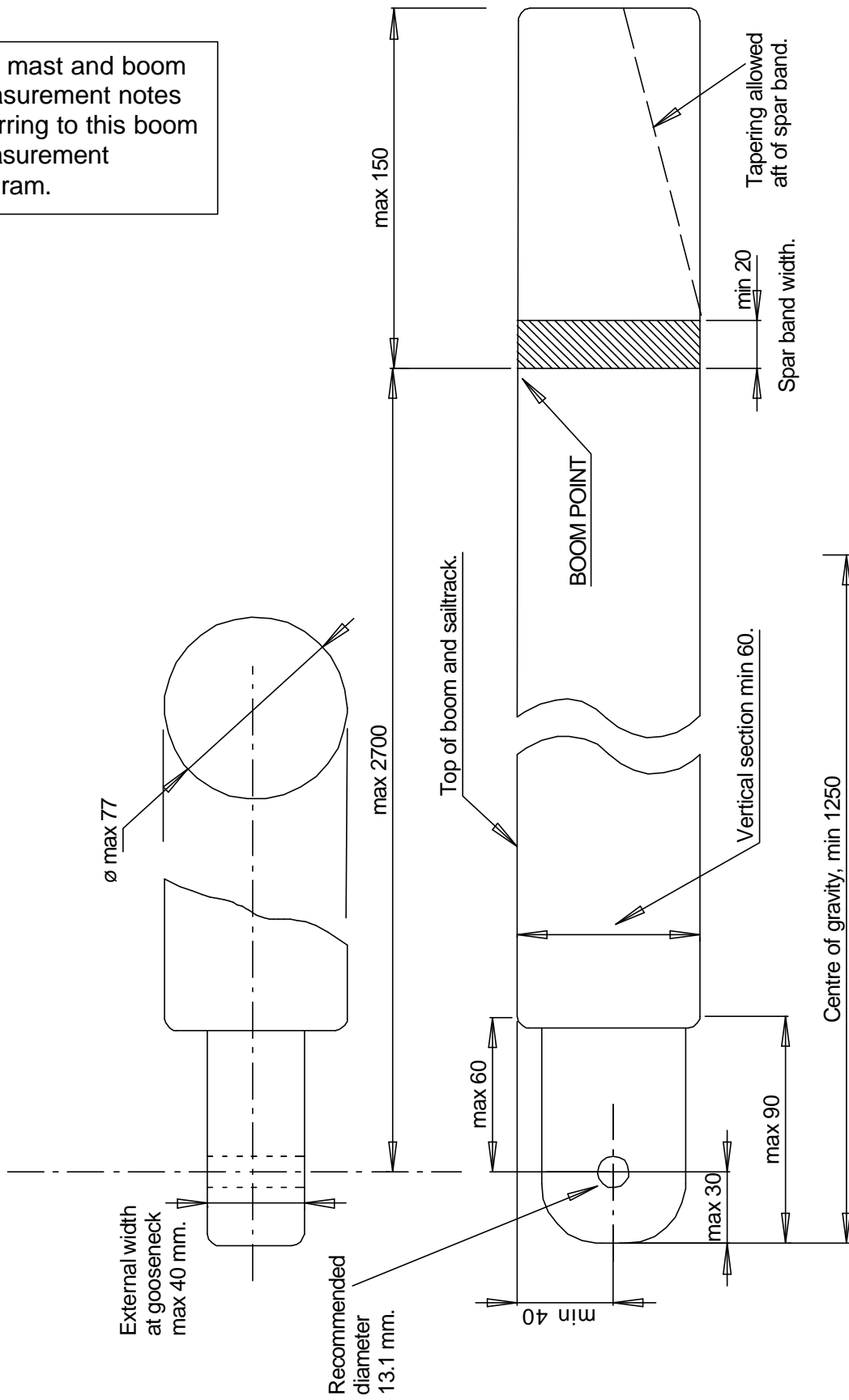
Position	Station	A	B	A1	C	C1	E	G	H	I	J	K	L
Measurement tolerance.	±1	±2	±1	±2		±2	r+2	r+5	r max	min	max	max	Ø±1
Upper end of top or top fitting	<b>-85</b>	-	-	-	-	-	-	-	-	-	-	-	-
Top of design shape.	<b>-20</b>	28.1	22.2	-	17.04	11.08	11.08	38.8	3	3.5	9	15	11
Upper mast point.	<b>0</b>	28,3	22,3	-	17.10	11.18	11.15	39.0	3	3.5	9	15	11
Section.	<b>750</b>	34,3	28,5	-	19.75	14.52	14.25	48.0	3	3.5	9	15	11
Section.	<b>1500</b>	40,3	34,7	-	22.40	17.87	17.35	57.0	3	3.5	9	15	11
Section.	<b>2250</b>	46,3	40,9	-	25.04	21.21	20.45	66.0	3	3.5	9	15	11
Section.	<b>3000</b>	52,3	45,9	-	27.69	24.56	22.95	74.9	3	3.5	9	15	11
Section.	<b>3750</b>	58,2	49,8	-	30.34	27.90	24.90	83.9	3	3.5	9	15	11
Section.	<b>3840</b>	59,0	50,0	-	30.66	28.31	25.00	85.0	3	3.5	9	15	11
Sail track entry high.	<b>4220</b>	62,0	50,5	-	32.00	30.00	25.25	85.0	3	3.5	9	15	11
Sail track entry low.	<b>4240</b>	52,2	50,5	50,1	20.40	29.70	25.25	83.4	3	-	-	-	-
70 above lower mast point.	<b>4500</b>	55,5	55,9	52,2	21.48	30.76	27.95	63.0	3	-	-	-	-
260 below lower mast point.	<b>4830</b>	59,7	62,9	55,0	22.86	32.11	31.45	37.1	3	-	-	-	-
Centre of bearing ring.	<b>4895</b>	60,5	64,0	55,5	23.13	32.37	32.00	-	3	-	-	-	-
75 above heel point.	<b>5270</b>	51,8	51,9	50,9	24.75	25.98	25.95	-	-	-	-	-	-
Bottom of design shape, heel.	<b>5345</b>	50,0	50,0	50,0	25.00	25.00	25.00	-	-	-	-	-	-

Shapes shall vary gradually between stations without any sudden changes, parameters for any other station can be obtained by interpolation. Fore and aft and sailtrack measurements between stations 4220 and 4240 may deviate to suit sailtrack-entry fittings. Shape above -20 shall be extrapolated design shape or may deviate to suit top fitting. Shape between 5270 and 5345 may deviate to suit heel fitting. Joints between arcs shall be at their mutual tangent. When a straight line (flat) connects arcs it shall be at their mutual tangent. 'E aft' shall be centred at the baseline. Value for 'E aft' see E.



# BOOM MEASUREMENT DIAGRAM

See mast and boom measurement notes referring to this boom measurement diagram.

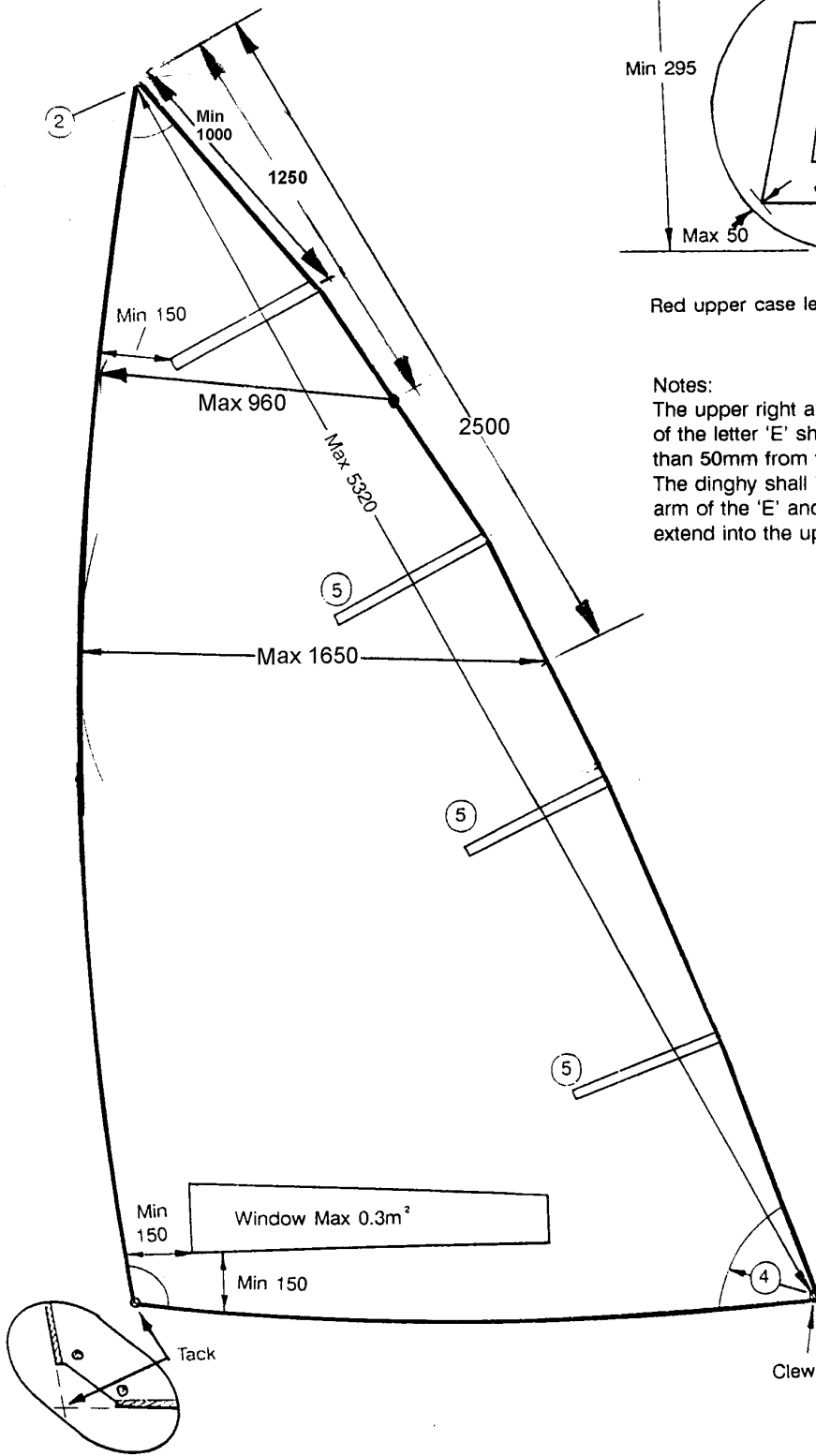




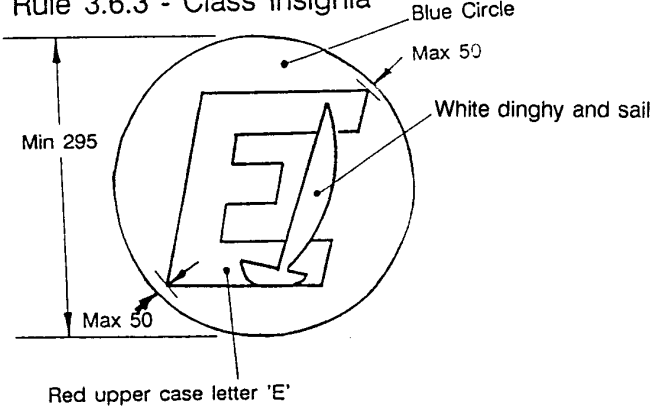
## MAST AND BOOM MEASUREMENT NOTES

1. A number inscribed in a circle is a reference to the note of that number.
2. The type of permitted fittings used on mast and boom are optional. Permitted are: gooseneck; mast deck bearing ring, which shall have no moving parts; mast heel fitting, which shall have no moving parts; halyard sheave and housing, halyard lock, halyard tail cleat or other securing arrangement, not more than 3 halyard tail locating clips on the foreside of the mast burgee and/or wind direction indicator, control line sheaves, housings and/or blocks, sheet blocks and securing eyes, boom kicker (vang) system, mast retaining system.
3. No fittings should be positioned so that measurement at the stations shown in the measurement form may be obstructed.
4. The gooseneck fittings of the mast and boom shall be made so that every boom fits every mast and both can be measured separately. The profiles, cross sections and dimensions of the fittings shall comply with those specified on the mast and boom measurement diagram and the measurement form.
5. The position of the inner edge of the mast and boom measurement bands shall be permanently marked with a scribed line or not less than two indentation marks. If correctly positioned, of sufficient width and of a contrasting colour, the gooseneck and halyard sheave case on the mast and/or the end fitting/outhaul sheave case on the boom shall be used in lieu of any other form of measurement band. If so used scribed lines or indentations are not required.
6. The surface of the basic mast section without heel, top, gooseneck and other fittings shall be as shown in the Table Of Offsets (MAST DESIGN SPECIFICATION), within the tolerances stated. (For the intended prototype measurement the tolerances are half the figures given in the Tables Of Offsets).
7. The mast shall be straight. A permanent set of not more than 20mm, measured to a taut line touching the surface of the profile at the lower edge of the upper measurement band and at station 4500 at the height of the extended aft face of the sailtrack, is permitted.
8. The horizontal movement of the mast at the bearing surfaces on the boat shall be not more than 5mm at the deck and not more than 5mm at the heel including movement of the mast heel position adjustment system.
9. The mast bend measurements shall be obtained as given in the mast measurement diagram - sheet 1 of 2.
10. Measurement marks. Masts and booms shall have indented marks at those stations shown in the measurement form, where figures or controls have to be taken.
11. The boom, without fittings, shall be capable of passing through a 77mm diameter circle. The cross section shall be constant, with a tolerance of 2mm, from 90mm from the foremost point of the boom part of the gooseneck to the outer edge of the measurement band.

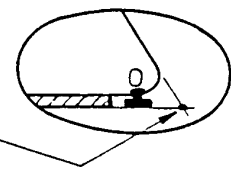
**SAIL MEASUREMENT DIAGRAM - SHEET 1 OF 2**



**Rule 3.6.3 - Class Insignia**



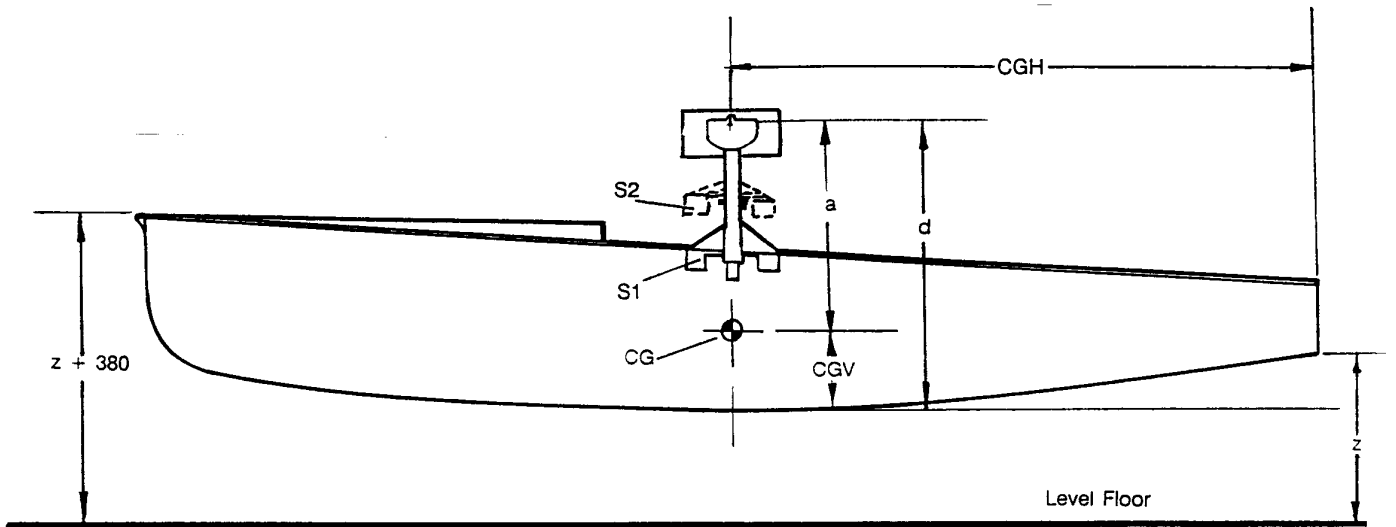
**Notes:**  
 The upper right and lower left corners of the letter 'E' shall be not more than 50mm from the edge of the circle.  
 The dinghy shall be within the lower arm of the 'E' and its sail shall extend into the upper arm of the 'E'.



## SAIL MEASUREMENT DIAGRAM SHEET 2 OF 2

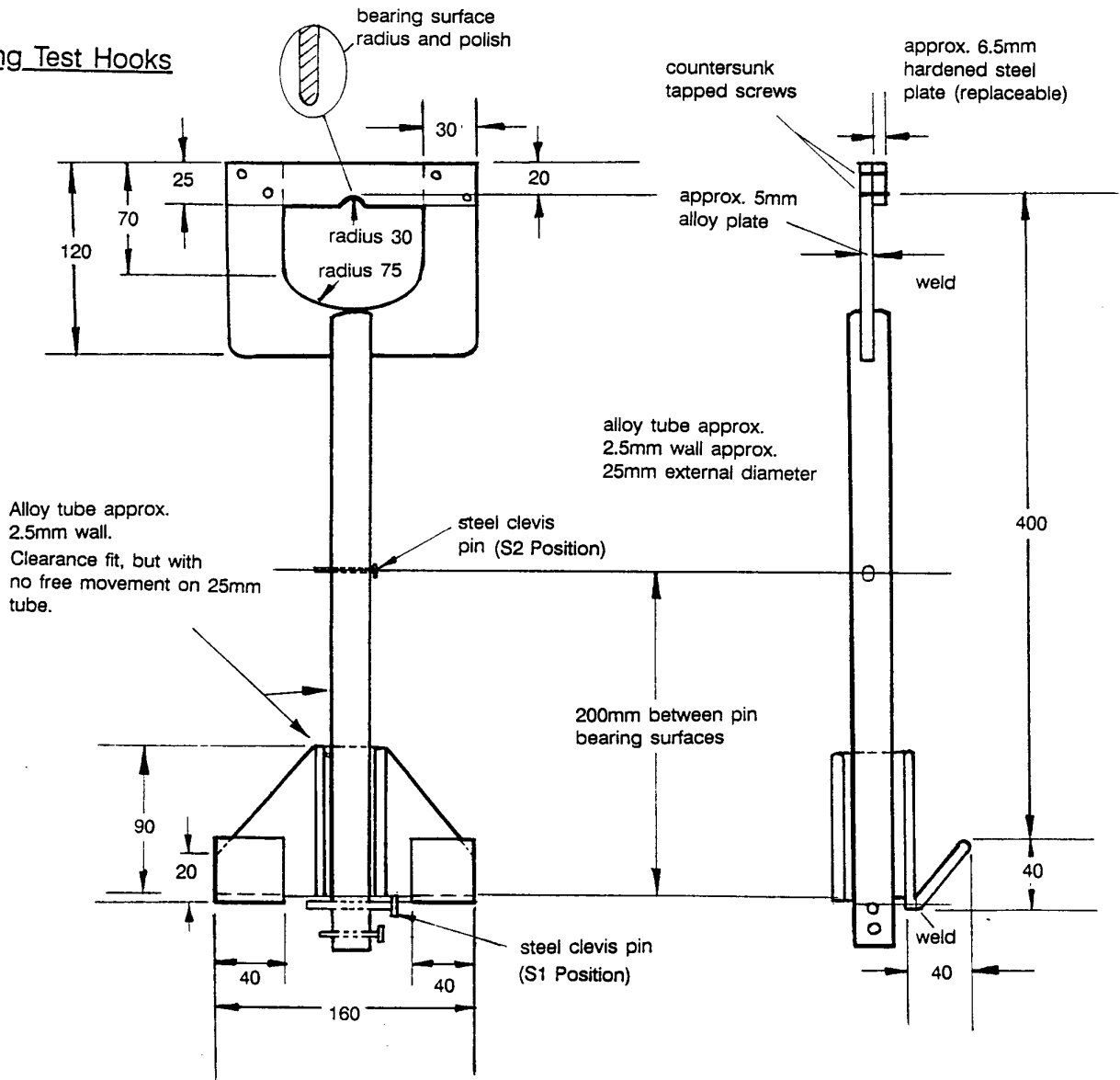
1. The sail shall be woven, soft, single-ply construction. The body of the sail and secondary reinforcements shall be of the same material throughout. Primary reinforcement, batten pocket patches, flutter patches and sail shape indicator stripes may be of different woven material.
2. The measurement points at head, clew and tack are as defined by the ISAF Equipment Rules of Sailing.
3. Window. There shall be a window or windows of total transparent area not more than 0.3m<sup>3</sup>. No part of a window shall be less than 150mm from any edge of the sail.
4. Reinforcement. Primary reinforcement shall be not more than 295mm from the tack, clew, head and cunningham positions. Secondary reinforcement is optional. One reefing eye is permitted within the area of the clew primary reinforcement but shall not provide a new datum for adding to the area of clew reinforcement.
5. Battens and Batten Pockets. There shall be 4 batten pockets and 4 battens.
  - (i) The total inside length of all batten pockets shall be not more than 2400mm.
  - (ii) Except at local widening for inserting battens the inside width of battens pocket shall not be more than 50mm.
  - (iii) No part of any batten pocket shall be less than 150mm from the luff.
  - (iv) The intersection of the centreline of the top batten pocket with the aft edge of the sail shall be not less than 1000mm from the headpoint. This is mandatory for all sails measured after 1<sup>st</sup> March 1999.
  - (v) The batten pockets shall be constructed so that battens can be removed for sail measurement without cutting stitching.
6. Leech. The length of the leech measured from clew to head shall be not more than 5320mm. Adjustable leechlines are not allowed.
7. For sails first measured after 1<sup>st</sup> March 1998, the top girth, measured at the leech 1250mm from the headpoint shall be not more than 960mm. The centre girth, measured at the leech 2500mm from the headpoint shall be not more than 1650mm. Any hollows in the leech shall be bridged. All sails shall comply after 1<sup>st</sup> March 1999.
8. Headboard. A headboard shall be fitted.
  - (i) The height of the headboard, measured parallel to the *luff*, shall be not less than 95mm and not more than 158mm.
  - (ii) No part of the headboard shall be more than 130mm from the *luff*.
  - (iii) The *Top Width* shall be not more than 130mm.
  - (iv) No part of the *leech* shall be more than 5mm outside a straight line joining the *Aft Head Point* and the upper aft corner of the top batten pocket.
9. National letter(s) and sail number(s). The dimensions shall be:
  - (i) Height. Not less than 295mm.
  - (ii) Width. (Except for I and 1) Not less than 200mm.
  - (iii) Thickness. Not less than 40mm.
  - (iv) Spacing between characters on the same and opposite sides and between a character, the class ensignia and the edge of the sail. Not less than 60mm.
10. Class insignia. The class insignia shall be not less than 295mm in diameter. The colours shall be: Circle, blue; letter E, red; dinghy white. The insignia may be placed back to back provided no part of the insignia is translucent.
11. The class insignia shall be positioned above the line of the top (number 1) batten pocket extended to the luff. If not back to back the starboard side shall be uppermost. The national letters shall be placed, starboard side uppermost, below the line of the top batten pocket, extended to the luff and above the line of number 2 batten pocket extended to the luff. The sail number(s) shall be placed, starboard side uppermost, below the line of number 2 batten pocket extended to the luff, and above the line of number 3 batten pocket extended to the luff.  
Note 11 shall apply retrospectively to all sails from 31 December 1994.

**WEIGHT DISTRIBUTION MEASUREMENT DIAGRAM - SHEET 1 OF 2**



A 90 degree knife edge for the support beam pivot axis is recommended

**Swing Test Hooks**



## WEIGHT DISTRIBUTION (SWING TEST) MEASUREMENT DIAGRAM - SHEET 2 OF 2

1. The procedure for the swing test is based on the 'Lamboley Test' used by the International Finn Class. The hull is suspended from brackets hanging from a transverse beam which forms the swing axis. The brackets locate on the hull below the rubbing strake. The bracket design allows the hull to be supported at 2 different heights relative to the swing axis. The swing period is measured at each height.
  2. The swing period may be measured using either:
    - (i) A stop watch with 1/100 second readout.
    - (ii) An electro-optical device, such as a photo-electric cell linked to an electronic timer or micro-computer. These notes assume the manual, stopwatch method is used.
  3. If the weight of the hull is not known, weigh the hull in conditions as defined in rule 3.2.7. Record as 'M' kg.
  4. Suspend the hull, supported on the brackets in position S1 as shown in the diagram, so that it is level fore and aft in condition as for weighing. When level the height of the sheerline at the stem will be 380mm more than the height of the Aft Measurement Point (AMPt) above a level floor. Assuming a level floor the error in fore and aft level will be not more than 15mm in 3350mm, ie less than 0.5%. If the true sheer height at the stem is known, from either the measurement form or when the swing test is conducted as part of hull measurement, apply a correction to the 380mm height as follows:  
 Subtract 540 from the sheer height. Add result to 380.  
 e.g. sheer height = 530: 530 - 540 = - 10: 380 + (-10) = 370  
 sheer height = 555: 555 - 540 = + 15: 380 + (+15) = 395  
 Ensure that the suspension axis is at right angles to the fore and aft line of the hull. When it is, the distance from the aft end of each bracket to the transom will be the same. Mark the bracket position on the hull.
  5. Measure:
    - (i) the horizontal distance from the vertical plane through the pivot point of the transverse beam and the transom. Record as 'CGH'.
    - (ii) the height of the support axis above the underside of the hull. Record as 'd'.
  6. Set up a support post for a reference pointer close to the bow. Ensure it is just clear of the hull when the hull is swung.
  7. Mark a level datum on the reference post aligned to a clearly defined mark or feature on the hull, eg the underside of the rubbing strake. Mark a swing start point on the post 50mm below the level datum.
  8. Depress the bow to the start position and release. Allow at least 1 complete cycle for the system to settle.
  9. Start the stopwatch as the bow passes the level reference. Count and time not less than 10 complete cycles. Record as 'TTI'.
  10. Calculate the mean period for the number of cycles completed, eg record mean period as 'T1'.
  11. Repeat steps 6 to 9 with the hull suspended on the brackets in position S2. It is important that the brackets are set at the same fore and aft position on the hull as for S1, using the marks made in the procedure of paragraph 4. Record mean period as 'T2'.
  12. Calculations:
    - (i) Calculate the height of the swing axis (a) above the centre of gravity [CG] and radius of gyration [RG] by either:
      - (a) solving the following equations:
 
$$a = \frac{0.2 \times b \times T2^2 + 0.04}{b \times (T2^2 - T1^2) + 0.4} \quad RG = \sqrt{(b \times T1^2 \times a) - a^2} \quad \text{where } g = 9.815$$

$$PI = 3.142$$

$$b = g / (4 \times PI^2)$$

$$= 0.2486$$
- (constant)
- or
- (b) entering T1 and T2 in the tables in the Europe Measurement Manual.

Calculator and computer programs for calculating 'a' and 'RG' from 'T1' and 'T2' are given in the IYRU Measurement Manual.

- (ii) Calculate the Mass Moment of Inertia (I) as follows:

$$I = M \times RG^2 \quad \text{where: } M \text{ is the mass of the hull}$$

- (iii) Calculate the height of CG above the underside of the hull (CGV) as follows:

$$CGV = (d - a) \times 1000\text{mm}$$

13. Record data on the measurement form.

OFFICIAL PLANS:

Table Of Offsets	(September 1976)
Lines Plan	(September 1976)
Full Size Hull Section	(September 1976)