

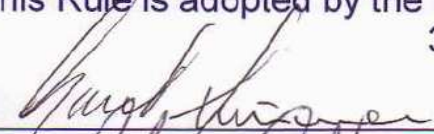



AMERICA'S CUP© 90 CLASS RULE

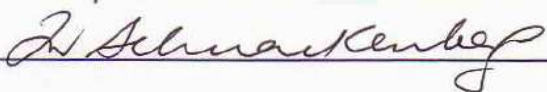
Version 1.0 (2009)

31 October 2007

This Rule is adopted by the Challenger of Record and the Defender for the 33rd America's Cup


_____ on behalf of the Defender


_____ on behalf of the Challenger of Record


_____ on behalf of ACM

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INTENT

The America's Cup 90 Rule ("**AC90 Rule**") is intended to be the premier development rule in the sport of sailing, producing a fleet of high performance racing yachts which utilise commercially available materials and technology.

The **AC90 Rule** is intended to provide for match and fleet racing which is visually exciting while being physically and technically challenging for the crew, who handle and trim sails using manual power only.

The yachts are intended to be raced on windward leeward courses with support craft present within defined wind and sea limits which are not extreme.

The **AC90 Rule** is intended to survive several editions of the America's Cup commencing with the 33rd Americas Cup (2009). It is anticipated that the **AC90 Rule** will be revised for each subsequent edition of the America's Cup to promote the evolution of rule compliant yachts and continued use of the existing fleet.

OTHER FACTORS

The yachts must be eligible for competition under the terms of the **Deed of Gift**.

The yachts must be capable as much as practicable of using the existing Base and Port America's Cup infrastructure in Valencia.

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SECTION A - GENERAL

1. STATUS

- 1.1 Amendments may be made to the **AC90 Rule** by **ACM** pursuant to Articles 1.1(a), 5.4 (c) and (d) of the Protocol.
- 1.2 After 1 Jan 2008, any such amendments shall however require the unanimous approval of all the **Competitors**.
- 1.3 The words "America's Cup" and the Symbol of the America's Cup as shown in **AC90 Rule** Appendix E are the trademark property of America's Cup Properties Inc. No person or entity may use such trade marks in any manner without authority of and written licence from America's Cup Properties Inc.
- 1.4 Copyright in these **AC90 Rules** is owned by **ACM**. All rights are reserved.

2. LANGUAGE & DEFINITIONS

- 2.1 The official language of the America's Cup **AC90 Rule** is English. If this **AC90 Rule** is translated into another language, this English text shall prevail. Except for words specifically defined, the meaning of any word shall be determined by reference to the Oxford English Dictionary second edition (1989) – CD Rom Version 3.0 (Oxford University Press 2002) or any later published version.
- 2.2 The word "shall" is mandatory; and the words "may" and "can" are permissive.
- 2.3 The metric system shall be used for all measurements unless otherwise prescribed.
- 2.4 Interpretation: Words, phrases and interpretation principles defined in the Protocol, Event Regulations and Competition Regulations shall have the same meaning and application in this **AC90 Rule**. The following additional terms are used in this **AC90 Rule**.
- 2.5 System of Axes. The three major orthogonal axes of the yacht: vertical, longitudinal, and transverse, shall be related to **MWP** and to the hull centreplane, being the plane about which the hull shall be symmetrical.
- 2.6 When a defined term is used in its defined sense, it is printed in **bold** type.
 - (a) "**AC90 Rule**" means the America's Cup class rule issued by ACM pursuant to Article 14.1 of the Protocol for AC90 Yachts, as amended from time to time and as interpreted by the Measurement Committee pursuant to AC90 Rule 3 hereunder.
 - (b) "**Appendage**" means any element outside the **hull** up to the **sheerline** but excludes bowsprits. **Appendage** may also include an integral element of an **appendage** which extends from outside the **hull** into the yacht (eg. fin head or rudder stock).
 - (c) "**Ballast**" means material used to provide stability and/or measurement compliance and has a density greater than 9000 kg/m³ and less than 11,350 kg/m³. **Ballast** may contain naturally occurring trace elements which have a density greater than 11,350 kg/m³, however these trace elements shall not exceed 1 part per million.
 - (d) "**Bowsprit**" means a spar(s) extending beyond the **stem** for the tacking of a spinnaker, but not including a lightweight fitting attached thereto to catch a spinnaker **sheet**.

- (e) “**Cockpit**” means a surface aft of the aft side of the mast, inboard of and extending below the adjacent **sheerline**.
- (f) “**Cure**” means the irreversible change of properties of a thermosetting resin by the chemical reaction of ring closure (polymerisation) via linking agents.
- (g) “**Deck**” means the upper surface of the yacht above the **hull** and inside the **sheerline**, and any transom, but excluding **cockpits**, recesses and troughs.
- (h) “**Draft**” means the furthest distance of any part of the hull or **appendages** below **MWP**
- (i) “**Fibre modulus**” means the batch-nominal elastic modulus of the fibres in an FRP laminate as determined by one of the measurement methods listed below with the modulus measured with **impregnated** tows, by extensometers, in the strain range between 1000 and 6000 microstrains. The testing method may be either SACMA-SRM16, ASTM D 4018, or JIS R 7601
- (j) “**FRP**” means commercially available fibre reinforced polymer matrix composites, of which the fibres would include carbon, glass, aramid and polymer.
- (k) “**Headsail**” means a three-sided sail which is tacked forward of the mast while set.
- (l) “**Hull**” means the fair body of the yacht up to the **sheerline** and does not include the **deck**, or the **appendages**, or the **bowsprit**.
- (m) “**Interpretation**” means an **Interpretation** issued in writing by the **Measurement committee** in accordance with **AC90 Rule 3** after the latest version of the **AC90 Rule** has been issued;
- (n) “**Mainsheet**” means a line attached to the mainsail clew and/or the boom for the purpose of trimming the mainsail;
- (o) “**Measurement condition**” means the condition of the yacht as specified in **AC90 Rule 37.1**;
- (p) “**Measurement weight**” means the weight of the yacht in **measurement condition**;
- (q) “**Measurer**” means a person appointed by the **Technical Director** to provide measurement or compliance services; a **measurer** may or may not be a member of the Measurement Committee;
- (r) “**MWP**” is the flotation plane in **measurement condition**, corrected as necessary when the specific gravity of the water is different from 1.025;
- (s) “**MWPx**” is a plane parallel to and 250mm above **MWP**;
- (t) “**Owner**” means the owner (or charterer) or the designated representative of a **Competitor**;
- (u) “**Running Rigging**” means rigging which is used to hoist, trim, or control sails or spars and includes running backstays, checkstays, halyards, **sheets**, **mainsheet**, tack line and forestay strop, but does not include **standing rigging**;
- (v) “**Sheerline**” means the intersection of the **hull** and the **deck**;
- (w) “**Sheet**” means a line attached to the clew of a sail for the purpose of trimming;
- (x) “**Standing Rigging**” means rigging which supports the mast and **bowsprit** and maintains essentially the same position and orientation relative to the mast and

bowsprit whilst sailing and includes bobstay, forestay, sidestays, diagonal stays, diamond stays, jumper stays, whether swinging or not but does not include **running rigging**;

- (y) "**Stem**" means the vertical transverse plane at the foremost part of the **hull**.
- (z) "**Stern**" means the vertical transverse plane at the aft most part of the hull.

3. INTERPRETATIONS

- 3.1 After 31 Dec 2007, **Interpretations** shall be issued by the **Measurement Committee** sequentially and when issued after the last version of the **AC90 Rule** shall form part of this **AC90 Rule**. All **interpretations** will be issued on behalf of **ACM** and shall be available to the public.
- 3.2 **Interpretations** may be sought by a **Competitor** at any time by request in writing to the **Technical Director**. An **Interpretation** may be initiated by the **Measurement Committee** itself. **Interpretations** shall be issued by the **Measurement Committee** within 30 days of the request being received by the **Technical Director** unless an extension of the time has been requested by the Measurement committee and agreed with the requesting **Competitor**.
- 3.3 In the preparation of an **Interpretation**, the **Measurement Committee** may consult other parties at its discretion.
- 3.4 A **Competitor** shall place no reliance on any advice or opinion from a **measurer** or any member of the **Measurement Committee** unless it is set out in an **Interpretation**. The **Measurement committee** shall not be bound by any advice or opinion given in any form, other than in an **Interpretation**.

4. ABBREVIATIONS

The following abbreviations are used:

ABREV.	DESCRIPTION
BAS	height of top of boom above sheerline
CO	mainsail clew offset
D	Draft
E1, E2, E3, E4, & E5	mainsail girths
FTA	mainsail foot triangle area
I	Height of foretriangle
J	Base of foretriangle
MSA	mainsail area
P	mainsail luff length
ISP	spinnaker hoist height
MWP	Flotation waterplane in measurement condition
MWPx	A plane 250mm above MWP

SECTION B - LIMITATIONS

5. LENGTH

The longitudinal distance between the **stem** and the **stern** shall be not more than 27.400 m including **hull, appendages** and fittings, but not including the **bowsprit** and its rigging or any equipment supplied by **ACM**.

6. RIG & SAILS

6.1 The yacht shall be sloop rigged with one mast only.

6.2 J shall be not be more than 10.700 m

6.3 I shall be not more than 32.000 m

6.4 P shall not be more than 35.500 m

6.5 BAS shall not be less than 2.300 m nor more than 2.400 m

6.6 MSA shall not be more than 300.00 sq m.

6.7 ISP shall not be more than P + BAS.

6.8 The foremost part of the bowsprit shall not extend more than 15.500 m from the forward side of the mast.

7. FREEBOARD

7.1 In **measurement condition** the yacht shall have the following minimum freeboards measured from **MWP** to the **sheerline**:

(a) at 0.500m aft of the **stem**: 1.800m

(b) at 0.500m forward of the **stern**: 1.300m

(c) midway between these locations: 1.500m

8. DRAFT

8.1 In **measurement condition** the maximum **draft** shall be 6.500m from **MWP**.

8.2 **Appendages** shall be able to be lifted to reduce **draft** to 4.7m or less, but shall be fixed in their **measurement condition** while racing. The lifting mechanism (all mechanical components required to move the **appendage**) shall be dedicated to lifting the **appendage** and must stay on the yacht while racing. The lifting mechanism shall be powered from a hydraulic pressure source of less than 34 MPa, external to the yacht. During periods of measurement control, **Competitors** shall be required to demonstrate this capability to the **measurers** at a time before or after racing, on a regular basis in a smooth water test. The required movement of the **appendage** shall take no longer than 5 minutes.

9. WEIGHT

The **measurement weight** of the yacht shall not be less than 22900 kg nor more than 23000 kg.

10. BEAM

Maximum overall beam including fittings and any part of the yacht's **standing rigging**, mast or mast support devices shall be 5.300 m. The beam of the yacht shall be measured between verticals at each side of the yacht set up in a transverse plane perpendicular to the yacht's centreplane.

11. SHEERLINE

11.1 For measurement purposes, each point on the **sheerline** is defined in a vertical transverse plane, as the lowest point on the **hull** where a tangent at 45 degrees to the vertical and transverse axes can be rested on the **hull and deck**.

11.2 The designers shall provide to the **Measurement Committee** a dimensioned drawing of the yacht which identifies the **sheerline** as defined in **AC90 Rule 11.1** and which the **measurers** may use for reference in determining compliance with the **AC90 Rule** for **sheerline** shape and minimum freeboards.

11.3 The **sheerline** in elevation between the point 500mm aft of the **stem** and the point 20mm forward of the **stern** shall be a fair continuous concave curve whose minimum radius of curvature shall be 30 m.

11.4 The **sheerline** in plan view between the point 500 mm aft of the **stem** and the point 20mm forward of the **stern** shall be a fair continuous convex curve whose minimum radius of curvature shall be 30 m.

11.5 **Measurers** will determine compliance with these **AC90 Rules 11.3 and 11.4** by using the drawing specified in **AC90 Rule 11.2** and verifying by inspection that the yacht is built to the drawing with allowances made as required for building errors.

11.6 Less than 500mm aft of the **stem** and more than 500mm above **MWP**, the **hull and deck** may be any shape.

12. HOLLOWS

12.1 In a vertical transverse plane hollows in the **hull** shall not be allowed unless they are in a region within 500 mm from a section of a fixed **appendage** which is 100mm from the **hull** surface

12.2 In any transverse section, no part of the **hull** below **MWP** shall be wider than it is at **MWP**.

12.3 Hollows associated with legitimate fittings such as self-bailers or bobstays are permitted.

SECTION C - CONSTRUCTION

13. HULL, DECK & INTERNAL STRUCTURE

13.1 The structural integrity of the yacht is the responsibility of the **Competitor**. Compliance with the following requirements does not relieve the **Competitor** from ensuring the yacht is of adequate strength.

13.2 The **owner**, designers and builders of the **hull, deck** and internal structure shall provide to the **Measurement Committee** a signed declaration as set out in **AC90 Rule Appendix C** confirming the **hull, deck** and internal structure have been constructed from materials and using methods permitted by **AC90 Rule 13**.

- 13.3 For the purposes of **AC90 Rule** 13 only, **deck** includes the transom, recesses, troughs, and **cockpits**.
- 13.4 The **hull** and/or **deck** shall not be loaded or deformed by any device or with any force that may create deflections that may improve the performance of the yacht other than normal loads and deflections imposed by the sea or by normal rigging arrangements.
- 13.5 Except as provided elsewhere in this **AC90 Rule**, the **hull, deck**, but excluding internal structure, shall be made from **FRP** laminates complying with the following:
- (a) The minimum panel weights specified below shall not include filling, fairing, and paint. For the purposes of determining compliance with this **AC90 Rule**, the removal of any filling, fairing and paint shall be carried out by the **measurer**. The panel weight in kg per square metre, rounded to two decimal places, shall be determined from samples of approximately 50 mm in diameter.

Position	Minimum Panel Weight
Hull below MWPx and aft of 17m aft of the stem	7.40 kg/m ²
Hull below MWPx , and forward of 17m aft of the stem	8.00 kg/m ²
Hull above MWPx	6.40 kg/m ²
Deck	4.70 kg/m ²

- (b) Core materials shall comply with the following:

Area	Min Thickness	Max Thickness	Min Density
Hull below MWPx Fwd of 17 m aft of the stem	39 mm	46 mm	72 kg/m ³
Remainder of Hull	39 mm	46 mm	57 kg/m ³
Deck	19 mm	26 mm	48kg/m ³
Hull within 50mm of sheerline	19mm	46mm	57kg/m ³
Deck within 50mm of sheerline	19mm	46mm	48 kg/m ³

Any component materials used in the manufacture of core shall have a modulus in any direction not exceeding 140 GPa. Metallic core materials are prohibited in the construction of **decks**.

- (c) If the core thickness is less than the minimums specified (i.e., in single skin areas and the surrounding core taper area), the panel weight per square metre shall exceed the following:

Area	Minimum Panel Weight when core is below minimum thickness
Hull below MWPx Fwd of 17 m aft of the stem	11 kg/m ²
Remainder of Hull	9 kg/m ²
Deck	7 kg/m ²

- (d) The inherent shape of the **hull** fairbody may be created using filling, fairing or other materials applied over a "rule-legal" laminate provided that any fibre used shall not have a fibre modulus greater than 245 GPa and that the thickness of such filling and fairing shall not exceed 200mm at any location.

- (e) Should the sampling of the **hull** or **deck** demonstrate non-compliance with the minimum weights per unit area or thicknesses in (a), (b) or (c), correction of any shortfall over the non-compliant area shall be made up by additional **FRP** laminate to the satisfaction of the **measurer**.
- 13.6 The internal structure shall be constructed of wood, polymer, aluminium alloys, **FRP**, titanium, or steel and steel alloys, or a combination thereof, and shall comply with the following:
- (a) Aluminium alloys - 2000, 5000, 6000 and 7000 series alloys with a density greater than 2650 kg/m³;
- (b) **FRP** - with **fibre modulus** less than 245 GPa.
- 13.7 Materials and building methods used in the construction of the **hull**, **deck** and internal structure shall comply with the following:
- (a) fibres used shall have **fibre modulus** less than 245 GPa;
- (b) the temperature of the component shall not exceed 105 degrees Celsius at any time during the building process;
- (c) the use of electric current or electron beam through the laminate during **cure** is prohibited;
- (d) pressure applied at any time during construction shall not exceed 1 atmosphere, but this limitation shall not prohibit building methods including the use of clamps or mechanical fastenings, wrapping, and winding etc;
- (e) a material manufacturer's certificate of compliance, and, if required by the **Measurement Committee**, samples, shall be supplied to the **Measurement Committee**;
- (f) a material-usage schedule as shown in **AC90 Rule** Appendix D shall be supplied to the **Measurement Committee**, that shall include the quantity supplied, relevant batch numbers, and a description to assist identification; however, documentation is not required for wet-laminate **FRP** materials used in the construction of the **hull**, **deck** and internal structure, provided that the total quantity of wet-laminate **FRP** is less than 5% by weight of the total **FRP** materials used in the construction of the **hull**, **deck** and internal structure. Nonetheless, wet-laminate **FRP** mechanical properties shall comply with **AC90 Rule** 13.7 and shall be covered by a declaration referencing this clause as set out **AC90 Rule** Appendix C;
- (g) except that a maximum of 100 kg of cured **FRP** components from commercially available ex-stock material (eg. tube, plate, etc.) may be used in the construction of the **hull**, **deck** and internal structure, provided that no single component exceeds 10kg. These components are not limited by the building methods set out in **AC90 Rule** 13.7. These materials shall be covered by a declaration referencing this clause as set out in **AC90 Rule** Appendix C;
- 13.8 The requirements of **AC90 Rule** 13.7 apply to the processes used by the boat builder to construct the **hull**, **deck** and internal structure, but not to the manufactured constituent materials such as carbon fibre, resin systems and core materials.
- 13.9 Any fastening (bolt, screw, rivet, nail, etc.) that carries only tension or shear and that is used to attach, fix or secure one element of the yacht to another element may be of any material provided the density of the fastening is not greater than 9,000 kg/m³.

14. APPENDAGES

14.1 **Appendages** shall be constructed from **FRP** and/or metals.

14.2 Metal used in the construction of **appendages** shall have:

- (a) a tensile modulus less than 215 GPa;
- (b) a specific tensile modulus not greater than 2.7×10^6 metres;
- (c) a density not greater than 11350 kg/m³; and
- (d) a manufacturer's test certificate or similar which specifies the material designation; the **Technical Director** may also require a manufacturer's certificate stating the tensile modulus and density of the material supplied.

14.3 **FRP** and building methods used in the construction of **appendages** shall comply with the following:

- (a) have a **fibre modulus** that shall not exceed:
 - (i) 310 GPa for an **appendage** that supports a second **appendage** which contains **ballast**; and
 - (ii) 395 GPa for any other **appendage**.
- (b) the temperature of the **appendage** shall not exceed 135 degrees Celsius at any time during the building process but this limitation shall not prohibit hand building methods including the use of a hand-held heat gun;
- (c) the pressure applied to the **appendage** at any time during construction shall not exceed 7 atmospheres, but this limitation shall not prohibit building methods including the use of clamps or mechanical fastenings, wrapping, and winding etc;
- (d) a material manufacturer's certificate of compliance, and, if required by the **Measurement Committee**, samples, shall be submitted to the **Measurement Committee**;
- (e) a material-usage schedule as shown in **AC90 Rule** Appendix D shall be submitted to the **Measurement Committee** that shall include the quantity supplied, relevant batch numbers, and a description to assist identification; however, documentation is not required for wet-laminate **FRP** materials used in the construction of the individual **appendage**, provided that wet-laminate **FRP** is less than 5% by weight of the **FRP** component of that **appendage**; nonetheless, wet-laminate **FRP** mechanical properties shall comply with **AC90 Rule** 14.3 and shall be covered by a declaration referencing this clause as set out **AC90 Rule** Appendix C.

14.4 The requirements of **AC90 Rule** 14.3 apply to the processes used by the **appendage** builder to construct the **appendages**, but not to the manufactured constituent materials such as carbon fibre, resin systems and core materials.

14.5 Sandwich construction techniques may be used. Sandwich cores may be of any material provided the materials used in the manufacture of the core comply with the **AC90 Rules** 14.2 and 14.3.

14.6 For each **appendage**, the **owner**, **appendage** designers and **appendage** builders shall provide to the **Measurement Committee** a signed declaration as set out in **AC90 Rule** Appendix C confirming each **appendage** has been constructed from materials and using methods permitted by **AC90 Rule** 14.

- 14.7 An **appendage** may extend into the **hull**; however, the **Measurement Committee** shall be satisfied that it is designed solely to attach the **appendage** to the **hull** and not to significantly contribute to the strength or stiffness of the **hull**. The **appendage** shall be able to be removed without damaging the structural integrity of the **hull**.
- 14.8 When the yacht is in **measurement condition**, no part of an **appendage** in any position shall be outside the transverse extent of the **hull** vertically above that **appendage**.
- 14.9 A moveable **appendage** is limited as follows:
- (a) movement is limited to rotation only, about a single axis; and
 - (b) the axis of rotation shall not exceed an angle of 25 degrees to the vertical in **measurement condition**.
- 14.10 There shall be a maximum of two moveable **appendages**, except that a yacht may have three moveable **appendages** providing two of these are more than 25m aft of the **stem**.
- 14.11 All fixed **appendages** attached to the **hull** shall be attached on the centreplane.
- 14.12 No fixed **appendage** may extend more than 0.650m from the yacht's centreplane, and no moveable **appendage** shall extend more than 0.650m from its axis of rotation.
- 14.13 A movable device whose sole purpose is the removal of weed or debris or water from the **hull** or **appendages**, and which in no other way enhances the performance of the yacht, shall not constitute a movable **appendage**. Such a device may be retracted.
- 14.14 Self-bailers are not moveable **appendages**. The size, quantity and positioning of self-bailers shall be consistent with the purpose of removing water from the yacht.
- 14.15 For the purposes of **AC90 Rule 14**, the longitudinal location of a moveable **appendage** shall be the location of its axis of rotation at the **hull** surface, projected if necessary.
- 14.16 **Appendages** which contain **ballast** or with a weight greater than 300kg shall not rotate.
- 14.17 **Appendages** shall not deform more than 5% of their span, measured from the fair body attachment of the **appendage**, when subjected to a pressure of 6.4 kPa applied normal to a plane defined by the chordwise and spanwise axes of the **appendage**.
- 14.18 Fairing strips between a fixed and moveable **appendage** are permitted provided:
- (a) they are constructed from a material with an elastic modulus less than 245 GPa;
 - (b) their deflection away from their position when the moveable **appendage** is centred is caused only by contact with the surface of the moveable **appendage**;
 - (c) they are attached, connected, or constrained along one edge only to the fixed **appendage**;
 - (d) their chord length, measured from the aftermost point of attachment perpendicular to the axis of rotation, is less than 100 mm.
- 14.19 Cross-flow closing devices which are flexible, sprung or hinged between a fixed and moveable **appendage**, or between the **hull** and a moveable **appendage**, are permitted. These devices shall not exceed 25 mm in the spanwise direction of the moveable **appendage**. A flexible or hinged rotating closing plate that closes a **hull** recess around a movable **appendage** is permitted provided it does not extend more than 250mm from the **appendage** centreplane.

15. DECK

- 15.1 Forward of the aft face of the mast, the entire **hull** shall be decked, except for hatches and small openings as specifically permitted in the **AC90 Rule**. Aft of the aft face of the mast, the upper surface can be **deck** or **cockpit**.
- 15.2 The upper surface of the **deck** shall not fall below, nor rise more than 250mm above, a straight line from the **sheerline** on one side of the yacht to the **sheerline** on the transversely opposite side of the yacht. Small transverse hollows are permitted provided they are solely the result of irregularities in the building process and do not exceed 3 mm in 1 m or 10 mm in any length.
- 15.3 Recesses in the **deck** are permitted, provided they:
- (a) accommodate fittings and winches and are no larger than necessary to service and operate the fitting or winch;
 - (b) are watertight;
 - (c) are built in accordance with the **deck** construction requirements of **AC90 Rule 13**.

This **AC90 Rule 15.3** does not permit recesses in **cockpits**.

16. COCKPITS

- 16.1 **Cockpits** shall be watertight except that:
- (a) they shall self-drain overboard in **measurement condition**;
 - (b) hatches are permitted in accordance with **AC90 Rule 17**;
 - (c) small openings are permitted in accordance with **AC90 Rule 18**; and
 - (d) small ports for hand access are permitted, provided each does not exceed 0.1 sq metres in area and is closed by a hinged or screwed watertight cover.
- 16.2 **Cockpits** shall have a depth of not more than 800 mm. Cockpit depth shall be measured below the adjacent **sheerline**.
- 16.3 In the absence of a **deck**, the inside surface of the **hull** may be considered as part of the **cockpit**, but shall be considered as part of the **hull** for the purposes of **AC90 Rule 13**.
- 16.4 Any covering over part or all of a **cockpit** shall comply with the **deck** construction requirements.

17. HATCHES

- 17.1 Hatches in the **deck** and **cockpit** are permitted provided:
- (a) The minimum horizontal distance from a hatch opening to the adjacent **sheerline** shall be 600 mm;
 - (b) Each hatch shall be closed by a cover permanently attached to the **deck** or **cockpit** sole by hinges, slides or similar arrangement and shall be reasonably watertight when closed;
 - (c) There shall be a maximum of two hatches forward of the mast; the area of each shall not exceed 3.0 square metres;

- (d) More than 17m aft of the **stem**, there shall be a rectangular safety hatch opening to the interior of the yacht, at least 600mm by 600mm in size;
 - (e) The combined area of all hatch openings aft of the mast shall not exceed 4.0 square metres;
 - (f) Hatches fitted in **cockpit** soles shall be watertight. Watertight in this context means a closed hatch shall prevent the ingress of water from a hose applied in any direction;
 - (g) The weight of hatch covers without hinges or slides attached shall be equal to or greater than the rule minimum weight of **deck** or **cockpit** area they replace.
- 17.2 A compartment, freely draining to the bilge, with a watertight hatch cover, may be required in the **cockpit** sole or the **deck** located more than 22m aft of the **stem**. The hatch cover shall be constructed to **deck** laminate requirements. The sole purpose of this compartment would be to house the regatta supplied media equipment. The size would be advised in a Notice to **Competitors** issued by the **Technical Director**.

18. SMALL OPENINGS

- 18.1 Small openings in **cockpits** and the **deck** for passing rigging or similar lines and attachments are permitted provided:
- (a) they are no larger than required for their specific task;
 - (b) they are at least 300 mm above the **cockpit** sole; and
 - (c) if the area exceeds 2500 square millimetres a rubber gaiter boot or other means of closing the opening shall be fitted.
- 18.2 Lightening holes in **decks** and **cockpits** are prohibited.

19. WINCH PLACEMENT

- 19.1 Winches and their **pedestals** shall be located such that they can only be operated, including tailing, from the **deck** or **cockpit**.
- 19.2 **Headsail sheet** winches shall be located such that crew members are not required to operate or tail such winches within the area bounded by the winch, the turning block, the **deck** edge and the chainplate.

20. SURFACE FINISHES & BOUNDARY LAYER INTERFERENCE

- 20.1 Only paint systems using two-component linear polyester saturated aliphatic polyurethane or two component acrylic urethane shall be applied. No materials other than specified manufacturer-supplied retardants, accelerants, thinners and pigments shall be added. Similarly, the specific gravity of the paint shall not be altered with any material other than those specified above.
- 20.2 Only paint systems, as generically specified above, and manufactured by International, Awlgrip, Akzo Nobel or Resene Santano, shall be applied as the outermost surface finish of the **hull** and **appendages**. The **Technical Director** may authorize the use of paint products manufactured by another manufacturer upon that manufacturer meeting the requirements for product standardization, compliance, and testing.

Each **Competitor** shall supply to the **Measurement Committee** a declaration similar to that

shown in **AC90 Rule** Appendix C of the **AC90 Rule** stating that only paint systems as specified above have been applied to the outermost surfaces of the **hull** and the **appendage(s)**.

The **Measurement Committee** reserves the right to take samples of the paint from the **hull** and/or **appendages** for analysis by the manufacturer to ensure that only the specified paint systems have been used.

Coatings of paint in compliance with this **AC90 Rule** 20.1 must be used for all repairs or modifications to the outermost **hull** and **appendage** surfaces.

- 20.3 This **AC90 Rule** does not prohibit the application of vinyl-film over the painted surface of the **hull**, provided:
- (a) its sole purpose is branding or advertising;
 - (b) it shall not be textured in any way;
 - (c) the area of the vinyl shall be no larger than required to portray the branding or advertising; and
 - (d) it shall not be applied below **MWP** unless subsequently covered by a paint system complying with **AC90 Rule** 20.1 above.
- 20.4 The outermost surfaces of the **hull** or **appendages** may be sanded and/or cleaned with normal concentrations and quantities of detergents or similar materials. However, while afloat on a scheduled race day, no substances shall be present on the outermost surfaces of the **hull** and **appendages** other than those permitted in **AC90 Rules** 20.1 and 20.2.
- 20.5 Devices in, on or near the surface of the **hull** or **appendages**, the purpose or effect of which is or could be to bleed off or alter the water flow of the boundary layer, are prohibited. Such devices include but are not limited to holes in surfaces, textured surfaces, riblets, Large Eddy Break-Up Devices (LEBUs), and compliant surface structures. This shall not prohibit **appendage** fairing strips and cross-flow closing devices, as defined in **AC90 Rules** 14.12, 14.13 and 14.14 and normal through-hull fittings (such as self-bailers, drains, boatspeed transducers, weed-removal devices,) approved by the **Measurement Committee**.
- 20.6 Electric, magnetic, sonic, thermal and other methods, the purpose or effect of which is to modify the flow characteristics of the water in the boundary layer of the **hull** and **appendages**, are prohibited.

SECTION D - SPARS

21. SPAR CONSTRUCTION

- 21.1 Spars, including masts, booms, **bowsprits** and associated struts, shall be constructed principally from **FRP**. **FRP** and building methods used in the construction of spars shall comply with the following:
- (a) the **fibre modulus** shall not exceed 395 GPa;
 - (b) the temperature of the spar shall not exceed 135 degrees Celsius at any time during the building process;
 - (c) the pressure applied at any time during construction shall not exceed 7 atmospheres, but this limitation shall not prohibit building methods including the use of clamps or mechanical fastenings, wrapping, and winding etc;

- (d) a material manufacturer's certificate of compliance, and, if required by the **Measurement Committee**, samples, shall be submitted to the **Measurement Committee**; and
 - (e) a material-usage schedule as shown in **AC90 Rule** Appendix D shall be submitted to the **Measurement Committee** that shall include the quantity supplied, relevant batch numbers, and a description to assist identification; however, documentation is not required for wet-laminate **FRP** materials used in the construction of the individual spar, provided that wet-laminate **FRP** is less than 5% by weight of the **FRP** component of that spar; nonetheless, wet-laminate **FRP** mechanical properties shall comply with **AC90 Rule** 21.1 and shall be covered by a declaration referencing this clause as set out in **AC90 Rule** Appendix C.
- 21.2 The requirements of **AC90 Rule** 21.1 apply to the processes used by the spar builder to construct the spars, but not to the manufactured constituent materials such as carbon fibre, resin systems and core materials.
- 21.3 Sandwich construction techniques may be used. Any component materials used in the manufacture of core shall have a modulus in any direction not exceeding 140 GPa.
- 21.4 For each spar, the **owner**, spar designer and spar builder shall provide to the **Measurement Committee** a signed declaration as set out in **AC90 Rule** Appendix C confirming the spar has been constructed from materials and using methods permitted by **AC90 Rule** 21.1.
22. **MAST**
- 22.1 The minimum weight of the mast in mast-measurement condition as specified in **AC90 Rule** 22.2 shall be 875.0 kg, having its centre of gravity no less than 16.000 m. above the location of the **sheerline**.
- 22.2 Mast-measurement condition shall be the condition of the mast when the mast is removed from the yacht and shall:
- (a) include all **standing rigging**, spreaders, jumpers and jumper systems, diamonds, all backstays and runner fly blocks (but excluding runner tails); check stays, instrument displays, instrument sensors, cameras, cables, and hydraulic rams;
 - (b) include all mast fittings required to sail the yacht, headboard car, halyard locks, spreader fittings, vang brackets, gooseneck bracket and gooseneck toggle;
 - (c) exclude all **halyards** and control lines (each of which may be replaced with light weight mouse lines not exceeding 4 mm diameter), and any vang rams, associated pipe-work, mast jacks, forestay strops and forestay rams.
 - (d) have equipment positioned as follows:
 - (i) all **standing rigging** in place and pulled tight down the **mast**;
 - (ii) headboard car placed at the upper black band;
 - (iii) all moveable fittings except headboard car set in their lowest sailing position; and
 - (iv) inter-changeable fittings and rigging configured to achieve the minimum weight and the lowest centre of gravity, and with hydraulic cylinders and tubing containing a sensible minimum amount of oil.
- 22.3 The mast tube:

- (a) shall be symmetrical about a centreplane and shall be a continuous single-surface tube except in way of laminated or mechanically-fastened joints;
- (b) shall have a silhouette in the fore and aft and the transverse directions which is a fair convex curve between the upper measurement band and the **sheerline**;
- (c) may be locally reinforced either internally or externally in way of fittings; provided that the minimum dimensions in **AC90 Rule** 22.4 and the fair convex curve of the mast tube shall be maintained under any local reinforcement; and
- (d) may deviate from a fair convex curve by no more than 1 mm in 1.0 m or 3 mm in any length, provided that the mast tube does not fall within a straight line defined by the minimum dimensions at the measurement points stated in **AC90 Rule** 22.4.

22.4 The mast tube at any point shall not exceed 500mm in the fore and aft dimension, and shall comply with the following dimensional limitations and measured in accordance with guidelines in Figure 2 of **AC90 Rule** Appendix F:

Position	Maximum Fore and Aft	Minimum Fore and Aft	Minimum Athwartships
At sheerline	500 mm		190mm
At I point	500 mm		170mm
At top band	250mm	200mm	150mm

- 22.5 Any mainsail luff track shall be fixed and on the fore and aft centreplane of the mast tube.
- 22.6 A mainsail luff track which is not part of the single-surface mast tube may be Aluminium Alloy (2000, 5000, 6000 and 7000 series alloys with a density greater than 2650 kg/m³) or steel, titanium or **FRP**. If **FRP** it shall comply with **AC90 Rule** 21.1.
- 22.7 A mainsail luff track which is not part of the single-surface mast tube shall not be measured in the fore and aft dimension of the mast provided that:
- (a) the bolt rope recess and the bolt rope on the mainsail, or the luff track, shall be no larger than necessary and certainly no larger than 30mm for the recess; and
 - (b) if the track is a bolt rope track, the distance from the forward side of the bolt rope recess shall not be more than 6 mm aft of the aft face of the mast tube.
- 22.8 The mast shall have two clearly discernible measurement bands not less than 30mm wide as follows:
- (a) a lower band, with the upper edge defining BAS, at the forward face of the mast when the mast is vertical; and
 - (b) an upper band, with the lower edge not more than P above the top of the lower band.
- 22.9 A mast is prohibited if it:
- (a) is hinged in any way;
 - (b) has a permanent set exceeding 200 mm between the upper and lower measurement bands on the aft edge;
 - (c) has holes or joints whose function is to reduce the torsional stiffness of the mast, even if filled or covered with rule legal materials;

- (d) has spreader attachments that allow fore and aft movement of the **standing rigging** at the spreader tip relative to the mast tube except if the spreader centreline at the root is within 200mm of or above the I point;
 - (e) has a device to move the athwartships or rotational position of the mast at its heel or at the **deck**;
 - (f) has a device to move the mast to windward of its normal sailing position. However, this shall not prevent the normal use of running backstays or asymmetrically-adjusted jumpers, diamonds or spreaders, provided that at the root, the centreline of the jumper, diamond or spreader strut is within 200mm of, or above, the I point; or
 - (g) has slots, slats or similar devices, or other contrivances, whose primary function is to enhance the aerodynamic performance, except the following which are permitted:
 - (i) fittings to attach sails and rigging, etc;
 - (ii) slots and holes for specific purposes such as halyard exits or fittings etc. are permitted however they shall be no larger than required to fulfil their intended purpose;
 - (iii) local covers or normal fairings over fittings.
- 22.10 All **standing rigging** and backstays shall be attached to the mast such that their line of action passes within 20 mm of the fair surface of the mast tube as shown in Figure 3 of **AC90 Rule** Appendix F.
- 22.11 The mast shall be restrained such that at the level of the local deck, it cannot rotate more than 0.5 degrees about a vertical axis.
- 22.12 The mast shall not be able to move fore and aft more than 20 mm at the local deck level.
- 22.13 At its lower end, the projection of the **standing rigging** centreline on to the deck shall be inside the sheerline.
- 22.14 The heel of the mast shall be stepped at or below **MWPx**. The heel of the mast is the underside of the lowest compressive load-bearing component of the mast which remains part of the mast when the mast is removed normally from the yacht.
- 22.15 Masts may be fitted with internal bulkheads provided that they do not carry a significant proportion of vertical compression loads and bending moments. Materials used for internal bulkheads shall comply with **AC90 Rule** 21.1.
- 22.16 Fairings between the mast and mainsail are prohibited, including fairings over headboards and headboard cars, batten cars or batten car tracks.
23. **BOOM**
- 23.1 The boom, including any sail groove or sail track but excluding other fittings and associated local reinforcements, shall not exceed 750 mm in depth. No part of the boom shall exceed 450 mm in width. Struts and outriggers outside these maximum dimensions are prohibited.
- 23.2 The top longitudinal surface or edge of the boom shall be straight within a tolerance of 20 mm between the extreme ends of the top of the boom, except that a recess for an outhaul track is permitted.
- 23.3 When the boom is horizontal and at its lowest position on the mast, the line of the top of the boom (including an external sail track) when extended shall be at or above BAS.

23.4 The clew point of the mainsail shall be no more than 150 mm above the top longitudinal surface or edge of the boom.

24. BOWSPRIT

24.1 The **bowsprit** shall be removable from the **hull** without damaging the structural or watertight integrity of the **hull**.

24.2 The **bowsprit** shall be fastened to the **hull** by mechanical means only. This requirement shall not preclude the use of small quantities of non-structural sealing compound at the point(s) of attachment to the **hull**. Damage to a **bowsprit** shall not be grounds for redress beyond the day of such damage.

24.3 The **bowsprit** shall not be retractable; nor shall it pivot; nor shall it be removed during racing.

24.4 No part of the bowsprit forward of the **stem** shall extend below a plane 250mm below the freeboard at 500mm aft of the **stem**. However, a bobstay is permitted.

SECTION E - SAILS

25. MEASURED SAIL AREA (see also AC90 Rule 6)

25.1 Mainsail

- (a) The intention of this **AC90 Rule** is to find the actual area of the mainsails using the formula below. If, in the opinion of the **measurer**, the area is not being accurately measured using the following formula, he may use another method after reference to the **Measurement Committee**:

$$\text{MSA} = (P - 0.6) \times (E1 + 4E2 + 2E3 + 4E4 + E5) / 12 + \text{FTA},$$

where $E5 > E4 > E3 > E2 > E1$, and

where P is the distance between the lower edge of the upper measurement band and the upper edge of the lower measurement band on the mast.

- (b) $\text{FTA} = E5 \times \text{CO} / 2$,

where CO equals the perpendicular distance from the E5 girth line to the clew point. If the clew point is below the E5 girth line, CO is positive. If the clew point is above the E5 girth line, CO is negative. FTA may be a negative component in calculating MSA. In the case where the actual length of the mainsail luff exceeds P, CO equals the perpendicular distance from the perpendicular ordinate at the base of P to the clew point.

- (c) The sail area above E1 and below a line joining the tack point to the clew point shall not be measured.
- (d) The foot round offset below a line joining the tack point and clew point shall not exceed 750 mm.

25.2 Foretriangle

- (a) "I" is measured from the **sheerline**, and the upper point of I shall be the highest of:

- (i) the intersection of the line of the forward side of the jib luff support device into which the luff of a jib or staysail is fitted, with the forward side of the mast tube disregarding any local reinforcement;
- (ii) the intersection of a line parallel to the forestay with the forward side of the mast through any contrivance which supports a jib or staysail halyard forward of the face of the mast.

A halyard which has its bearing surface above the "I" point defined in **AC90 Rule 25.2(a)** may be used to raise a sail in the foretriangle provided the halyard is restrained by a contrivance as defined in **AC90 Rule 25.2(a)(ii)** which is at or below the "I" point. This contrivance may be open to allow the halyard to be used for another purpose. However, when it is being used to raise a jib or staysail the halyard shall be restrained by the contrivance.

- (b) "J" is the shortest horizontal distance from the forward side of the mast to the intersection of the line of the forward side of the jib luff support device with a transverse line joining points on the local **sheerline** port and starboard. The mast shall be upright and in its aftmost position at the **deck** when taking this measurement.
- (c) Neither I nor J may be extended by the attachment of any device.

25.3 Spinnaker

- (a) A spinnaker is defined as a **headsail** with a foot length greater than $J + 3m$
- (b) No dimension of a spinnaker shall be greater than 50m.
- (c) ISP is measured from the **sheerline** to a height defined in **AC90 Rule 25.3(d)**.
- (d) The upper point of ISP shall be the highest of:
 - (i) the bearing surface of the spinnaker halyard sheave in the mast above which the sail cannot be hoisted; or
 - (ii) the intersection of a line parallel to an imaginary stay extending from the forward end of J through any contrivance which supports a spinnaker halyard forward of the face of the mast.

Vertical rollers which are offset from the centreplane and are parallel to the centreplane of the mast and each side of the spinnaker halyard sheave do not constitute a contrivance which supports the halyard forward of the mast provided they are of a size and offset forward of the mast commensurate with their function of only providing a fair lead for the halyard onto the halyard sheave.

26. SAILS - GENERAL

- 26.1 Sails shall be measured in accordance with **AC90 Rule Appendix G**.
- 26.2 Non-woven and multi-ply sails are permitted.
- 26.3
 - (a) Within 800 mm of the head point, clew point, or tack point, reinforcement may be of any number of layers of fabric, webbing, or similar materials. Any rigid materials used in these areas shall comply with the sail hardware dimensional constraints of **AC90 Rule 26.4**;
 - (b) Beyond 800 mm from the head point, clew point, or tack point, a sail shall be flexible and capable of being folded without damaging the sail or reinforcement;

- (c) Spreader patches and similar chafing areas may have a single protective ply of fabric of any size of up to 300 grams/m² placed on each side of the sail. Any additional plies of fabric or padding in the spreader impact zone beyond two layers of 300 grams/m² material shall be limited in area to 1.5 sq metres on each side of the sail. This reinforcement shall be flexible and capable of being folded without being damaged or damaging the sail.

For the purposes of this **AC90 Rule 26.3**, damage is defined as either clearly visible structural failure, or failure of the sail to return to near flat after being folded.

- 26.4 The dimension of any sail hardware, in any direction, shall not exceed 300 mm.
- 26.5 Specifically prohibited are:
- (a) artificially thickened sails, eg. foamed sails or rigid sails, except for padding at spreaders as defined in **AC90 Rule 26.3(c)**; and
- (b) multiple-surface sails, whether inflated by the action of the wind or otherwise, except battens and batten pockets as provided in **AC90 Rule 30**.
- 26.7 Other than for sail hardware, intentional openings in a sail are prohibited.

27. **MAINSAIL**

- 27.1 Luff zippers are not permitted.
- 27.2 No device shall be used to control the mainsail except:
- (a) a **mainsheet**;
- (b) a vang;
- (c) a halyard attached in close proximity to the head of the mainsail; and a halyard lock device which when attached at the head of the mainsail allows the halyard to be slack while sailing;
- (d) a cunningham system attached in close proximity to the tack;
- (e) an outhaul system;
- (f) one leech line which follows the entire length of the leech from head to clew, except that it may be seized off at any point, and at the clew and reef points, the line may exit the sail to permit adjustment while racing;
- (g) a footline;
- (h) a preventer opposing the inboard or aft pull of the **mainsheet**;
- (i) normal reefing systems;
- (j) the mast; and
- (k) a traveller
- 27.3 Mainsails shall be hoisted using a dedicated mainsail halyard and the same halyard shall remain attached to the head of the mainsail while racing.

- 27.4 The mainsail luff, over its complete length, shall be attached directly to the mast by a bolt rope or by slides with spacing no greater than 2.0 m; at the head and tack, the luff may be free from the mast for a distance not exceeding 2.0 m.
- 27.5 The head point of the mainsail shall not be hoisted above the lower edge of the upper measurement band.
- 27.6 Mainsails shall be able to be lowered to the **deck** without the necessity of a crew member going aloft.

28. JIBS & STAYSAILS

- 28.1 A jib is a **headsail** with a foot length less than or equal to $J * 1.03$
- 28.2 A staysail is a **headsail** set aft of and in addition to a spinnaker.
- 28.3 The maximum foot length of any staysail shall be $J + 3m$
- 28.4 No device shall be used to control a jib or staysail except:
- (a) a halyard on the head, and if installed, a halyard lock;
 - (b) a tack system on the tack;
 - (c) a cunningham system near the tack;
 - (d) a luff furling system;
 - (e) leech and foot lines;
 - (f) **sheets** on the clew;
 - (g) a tacking line near the middle of the foot, the purpose of which is to bring the clew of the sail forward during a tack or gybe, provided it is not used to sheet the jib in any way;
 - (h) a luff support device on the forestay;
 - (i) systems to control the lead of the **sheets**.
- 28.5 Further to **AC90 Rule** 28.4(f), except when a spinnaker is set, jibs shall be attached to such a luff support device over their entire luff length except within 2 metres of the tack point and 1 metre of the head point.
- 28.6 When in use, a jib or staysail shall be tacked aft of the forward end of J such that the clew cannot extend beyond 3m aft of the forward side of the mast.
- 28.7 The tack of a jib shall be constrained such that, at the forward end of J, the tack point or projection of its luff shall be no more than 30 mm from the centreplane.
- 28.8 The maximum cross-sectional dimension of a luff support device on the headstay shall not exceed 75 mm. A set of hanks spaced no wider than 1m would qualify as a luff support device provided also that the distance from the bearing point of the hank on the forestay to the luff of the **headsail** is no more than 75 mm.
- 28.9 The girths of any jib shall be subject to the following limits and measured as defined in **AC90 Rule** Appendix G:

	Maximum girths
	As % of J
3/4-girth	30%
mid-girth	53%

28.10 The girths of any jib shall increase from head to foot, as detailed in **AC90 Rule** Appendix G

29. SPINNAKERS

29.1 No device shall be used to control a spinnaker except any of the following:

- (a) a halyard attached to the head and if fitted, a halyard lock;
- (b) a tack line(s) attached to the tack and which can only be constrained in the centreplane of the yacht;
- (c) a cunningham attached near the tack of the sail and which can only be constrained in the centreplane of the yacht;
- (d) **sheets** attached to the clew;
- (e) retrieval lines which shall only be tensioned when retrieving the spinnaker;
- (f) luff, leech, and foot-line systems; and
- (g) systems to control the lead of the **sheets**, tack or retrieval lines.

29.2 The head of any spinnaker, when normally set, shall be in close proximity to the mast.

29.3 Spinnakers shall be sheeted inboard of the sheerline

30. BATTENS

30.1 The maximum numbers of battens are as follows:

Mainsail	12
Jib	6
Staysail	5
Spinnaker	0

30.2 A batten:

- (a) shall be able to pass through a 100 mm diameter circle;
- (b) is prohibited below a line joining the tack and clew of any sail (foot);
- (c) shall be constructed of materials with a modulus less than 395 GPa fibre. There are no limitations on the method of fabricating battens;
- (d) may consist of multiple elements that need not necessarily be attached to one another, provided they shall be in close proximity over their entire length, and the multiple-element array complies with (a) above;

- (e) shall be approximately straight within a tolerance of 100 mm either side of a straight line;
- (f) shall have one end of the batten positioned on the leech;
- (g) shall not be adjusted when a sail is set;
- (h) in a mainsail shall not be closer than 600 mm from the head point. This measurement shall be taken from the head point to the closest point on the batten;
- (i) may be inflatable. However, when a sail is set, the inflation of the batten shall not be adjusted. If inflatable, the provisions of this **AC90 Rule 30.2** shall apply to the batten (including all elements of the batten) inflated to the maximum pressure used when racing;
- (j) shall not be oriented at an angle of less than 30 degrees to the local luff;
- (k) may be inside a pocket not exceeding 300 mm in width measured normal to the batten.

30.3 In jibs and staysails:

- (a) No part of a batten shall be closer than 3.5 metres from the head point. This measurement shall be taken from the head point to the closest point on the batten.
- (b) Within the surface of the sail the longitudinal axis of a batten, projected if necessary, shall not join or intersect another batten.
- (c) The longitudinal axis of a batten, projected if necessary, shall intersect the luff.

31. NATIONAL LETTERS & SAIL NUMBERS

31.1 National letters and sail numbers shall be carried on the mainsail only.

31.2 The sail numbers may be placed on the same line following the national letters.

31.3 The following are the minimum sizes for national letters and sail numbers.

Height	1200 mm
Width	800 mm*
Thickness	180 mm
Space between adjoining letters/numbers	240 mm

* except the number "1" and the letter "l".

SECTION F - OTHER RULES

32. RIGGING, FITTINGS & OTHER EQUIPMENT

32.1 **Standing rigging and running rigging** shall be made of one or any combination of steel, lead, carbon, aramid, polymer, and polymer fibres of **fibre modulus** less than 310 GPa.

32.2 The **owner** shall provide to the **Measurement Committee** a signed declaration similar to that shown in **AC90 Rule Appendix C** stating the materials used for the **standing** and **running rigging** comply with **AC90 Rule 32**.

- 32.3 **Standing** and **running rigging** or any fairing on rigging apart from a luff support device shall be of a circular cross section within a tolerance of 5% on diameter. This rule does not apply within 200mm of the rigging intersections. It is permitted to wrap a line of less than 2mm diameter in a spiral around a piece of **running rigging**.
- 32.4 Multiple-element **standing rigging** stays are prohibited and if two or more **standing rigging** stays are near parallel to each other then they shall have a clear space between the two stays of at least 50 mm along their length. This rule does not exclude the use of tightly bundled rigging in which the bundle complies with **AC90 Rule 32.3**.
- 32.5 Fittings shall not be constructed of boron or beryllium. Any other material with a density of less than 9,000 kg/m³ may be used.:
- 32.6 Compartments or containers that hold liquid in a manner that may increase performance are prohibited. Any compartment or space which could hold water shall be drained with limber holes of size consistent with the rapid draining of that compartment. A keel tower, well, or case which facilitates the support and/or the lifting of an **appendage** may contain water provided the water can drain or slosh freely from side to side of the tower, case, or well, with respect to the centreplane.
- 32.7 Yachts shall be fitted with a lifting eye(s) which enable weighing by lifting from a single point, and placed such that when lifted, the yacht shall be approximately horizontal.
- 32.8 **Running rigging, standing rigging** and **appendages** shall only be adjusted manually, and the use of stored energy is not permitted, except:
- (a) for springs, shockcord, and similar devices;
 - (b) low pressure hydraulic or gas accumulators of less than 6 bar which provide back pressure to a hydraulic system to prevent cavitation, but do no significant work themselves;
 - (c) batteries to power electric bilge pumps provided their total capacity is no greater than 200 l/min; and
 - (d) batteries to power any permitted electronics.

SECTION G - INSPECTION & MEASUREMENT

33. MEASUREMENT - GENERAL

- 33.1 Unless otherwise prescribed, all measurements shall be taken without crew on board.
- 33.2 At the time of measurement ashore and afloat, backstays, runners and forestays shall be slack.
- 33.3 Calculations shall be rounded to the nearest millimetre, or the third place of decimals for measurements of area. The weight of the yacht shall be rounded to the nearest 20 kg.
- 33.4 A yacht may be re-measured at the discretion of the **Measurement Committee**.

34. MEASUREMENT COMMITTEE & MEASURERS

A **measurer** who becomes aware that a **Competitor** may have failed to comply with any **AC90 Rule** shall advise the **Measurement Committee**.

Any matters relating to the measurement of a yacht, the interpretation of this **AC90 Rule** or the determination as to whether a yacht complies with this **AC90 Rule**, shall be determined by the **Measurement Committee** pursuant to Article 20 of the Protocol.

Unless otherwise prescribed, decisions of the **Measurement Committee** shall be subject to appeal to the **Sailing Jury** pursuant to Article 20 of the Protocol.

35. **COMPLIANCE & ASSISTANCE**

35.1 **Competitors** shall permit and assist all inspections and measurements by a **measurer** and the **Measurement Committee** and shall afford all reasonable facility to carry out such measurements and inspections.

35.2 **Competitors** shall ensure that the yacht, its spars, sails and equipment comply with the **AC90 Rules** at all times while racing and that any alterations, replacements and repairs do not invalidate the measurement certificate.

36. **PROCEDURES, DECLARATIONS & POST-CONSTRUCTION INSPECTIONS**

36.1 A new sail number shall be allotted by the **Technical Director**:

(a) when construction of the yacht is commenced. Construction is deemed to commence upon lamination of the first skin of the **hull**. The first skin shall be the inner skin of a **hull** constructed on a male mould or alternatively the outer skin on a female mould. Where the **hull** is built in sections it shall be the first skin on any **hull** component exceeding 25% of the **hull** by area; or

(b) when otherwise required by the **Protocol**.

36.2 The allotted sail number shall be issued to the yacht by the **Technical Director** when a measurement certificate is issued.

36.3 Sail numbers shall be allotted sequentially, irrespective of nationality. When a yacht's ownership is transferred from one country to another, it shall retain the same sail number with only the national letters being changed.

36.4 Upon completion of the **hull** and **deck** and prior to the issue of the measurement certificate, **Competitors** shall submit declarations to the **Measurement Committee** that the **hull** and **deck** have been constructed in accordance with the **AC90 Rule**. The declaration(s) shall be signed by the yacht's designer(s), builder(s), and **owner**. The form of this declaration shall be as shown in **AC90 Rule** Appendix C.

36.5 The **Measurement Committee** may inspect a Competitor's yacht at any time during construction and carry out whatever measurement checks it requires.

36.6 A minimum of eight laminate samples (at least 5 from the **hull** and 3 from the **deck**) of approximately 50 mm diameter shall be taken from the yacht. These samples shall be taken in the presence of the **measurer**, and at positions selected by the **Technical Director** or, at the discretion of the **Technical Director**, by the **measurer**. All samples shall be indelibly marked with the sail number of the yacht and the position from which the sample came. The samples shall be sent to the **Technical Director** upon his request.

36.7 Additional laminate samples may be taken at the discretion of the **measurer**.

36.8 The **measurer** shall submit to the **Measurement Committee** a diagram indicating the approximate positions on the **hull** and **deck** from which the samples have been taken.

- 36.9 If a **Competitor** disputes the **measurer's** selection of the number, method or position of sampling or testing, the matter shall be referred to the **Technical Director** whose decision shall be final.
- 36.10 Upon completion of the spars and **appendages**, a **Competitor** shall submit to the **Measurement Committee** a declaration for each item that the construction materials and methods used are in accordance with the **AC90 Rule**. The form of the declarations shall be as shown in **AC90 Rule** Appendix C.
- 36.11 Upon completion of the yacht but prior to the issue of a certificate, a **Competitor** shall submit to the **Measurement Committee** a declaration that the rigging, paint finish and wet laminates comply with the relevant **AC90 Rules**. The form of the declarations shall be as shown in **AC90 Rule** Appendix C.

37. MEASUREMENT AFLOAT

- 37.1 For the measurement afloat, the yacht shall be in **measurement condition**. **Measurement condition** shall be with:
- (a) a measured mast, boom and **bowsprit**. The mast shall be vertical;
 - (b) all **appendages** fitted and including the **appendage** lifting mechanisms required by **AC90 Rule** 8.2;
 - (c) fore and aft **running** and **standing rigging** slack (with running backstays at any position between their aft rigged position and the mast);
 - (d) mast compression greater than 15 tonnes;
 - (e) no sails, sail bags, sail furling equipment, or battens;
 - (f) no crew, crew clothing, food, drinking fluids, or safety equipment;

Other equipment may be removed or remain on board the yacht during its measurement afloat, however, attention is drawn to the provisions of **AC90 Rule** 38.1.

- 37.2 With the yacht afloat, the **measurer** shall measure the **draft**, and shall also measure the freeboards at the stations specified in **AC90 Rule** 7.1. The freeboards measured shall be recorded on the yacht's certificate.
- 37.3 The specific gravity of the sea water shall be measured and recorded at the time of measurement afloat.
- 37.4 When specific gravity of the sea water varies from 1.025, the **measurer** shall allow 0.27 mm sinkage or bodily rise for each 0.001 variation in specific gravity.
- 37.5 Immediately prior to measurement afloat and with the yacht in **measurement condition** as defined in **ACC Rule** 37.1, the **measurer** shall weigh the yacht. Upon a successful flotation, this shall be the **measurement weight** recorded for the yacht.

38. COMPLIANCE WHILST RACING

- 38.1 Whilst racing:
- (a) the weight of the yacht without:
 - (i) the crew;

- (ii) crew clothing including any equipment that crew members normally carry on their person when racing;
- (iii) food and drinking fluids;
- (iv) any equipment prescribed or supplied by the **Event Authority**; and
- (v) the sails, sail bags, sail furling equipment and battens.

shall not be less than nor more than 150 kg greater than its **measurement weight**;

- (b) the total weight of sails, sail bags, sail furling equipment and battens carried on board shall not exceed 900 kg;
- (c) the total weight of consumable stores and their containers carried shall not exceed 70 kg;
- (d) sails, equipment and other stuff shall not be moved for the purpose of changing trim or stability;
- (e) sails not in use shall be stowed forward of a line 12m aft of the aft face of the mast;
- (f) the number of crew shall be 20 (unless the number is reduced while racing due to accident or injury);
- (g) a crew member who is aft of the mast shall not position his torso or legs outside a line projected vertically above the heeled **sheerline** for the purpose of increasing stability;
- (h) running backstays, checkstays and topmast backstays shall remain permanently attached at each end while racing. There shall be only one flying block on each side; the tail may be eased enough to drape over the boom aft of the main, but no further;
- (i) **standing rigging** or spreaders shall not be adjusted, except for:
 - (i) rake adjustments in the centreplane of the yacht made by changing the length of the forestay strop, and
 - (ii) adjustments as specifically permitted in **AC90 Rule 22.9 (f)**.
- (j) internal **ballast** shall be fixed in the position recorded in the yacht's certificate.
- (k) the mast jack shall not be on board.

38.2 When carrying out post-race measurement checks to ensure compliance with **AC90 Rule 38.1 (a) and (b)**, the **measurer** shall allow a reasonable time to drain water from the yacht and equipment and allow the substitution of wet **running rigging** with equivalent dry **running rigging**.

39. MEASUREMENT CERTIFICATE

39.1 When the **Measurement Committee** is satisfied that the yacht has been inspected and measured correctly, it shall issue to the **Competitor** a measurement certificate in the form appearing in **AC90 Rule Appendix A** and shall retain a copy for its own records. The **Measurement Committee** shall provide a copy of the front page of that measurement certificate to the **Regatta Director** for public dissemination.

39.2 The measurement certificate ceases to be valid if there is any change:

- (a) to the yacht's **appendages** except for repair of damage;
 - (b) to the yacht that would alter any information recorded on the yacht's measurement certificate except that boom and **bowsprits** may be substituted, provided the **Competitor** notifies the **Measurement Committee** and the yacht, whilst racing, complies with **AC90 Rule** 38.1. A yacht shall always be able to return to its weight recorded on its measurement certificate.
- 39.3 A damaged **appendage** may be replaced or repaired, with the written approval of the **Measurement Committee**, provided:
- (a) if an **appendage** is replaced the **Measurement Committee** is satisfied that the damaged **appendage** cannot be repaired in a reasonable regatta-constrained time;
 - (b) the **Measurement Committee** is satisfied that after all the necessary changes associated with repairing or replacing the damaged **appendage**, the yacht complies with **AC90 Rule** 38.1.
- 39.4 A measurement certificate may be withdrawn by the **Measurement Committee** at any time if the **Measurement Committee** believes, on reasonable grounds, that the yacht is no longer in compliance with this **AC90 Rule** or an **Interpretation**.
- 39.5 When a certificate is invalidated, a new measurement certificate will be issued following a partial or complete re-measurement, as appropriate.
- 39.6 A yacht shall have only one valid measurement certificate at any one time.
- 39.7 The **Technical Director**, **measurers** and the **Measurement Committee** shall hold certificates in confidence until after America's Cup 34.

APPENDIX A

	<p>AMERICA'S CUP AC90 CLASS</p> <p>Measurement Certificate No.</p>	<p>Office Use Only</p> <p>Original to Owner () Copy to TD File () Other Copies ()</p>
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Yacht's Name

National Letters
and Sail Number

Designer(s)

Builder(s)

Owners(s)

VALIDATION

This yacht has been measured by **measurer**(s) approved in accordance with the America's Cup AC90 Rule and has been found to be in compliance with the Rule.

This certificate is dated

Supersedes Certificate No. and Date

America's Cup Technical Director

APPENDIX A

LIMITATIONS**Yacht****Sail Number**

Length (max. 27.400m)

Freeboard

At 0.500m aft of the stem (min. 1.800m)

At 0.500m forward of the stern (min. 1.300m)

Midway between these locations (min. 1.500m)

Draft from MWP (max. 6.500m)

Draft with appendage lifted (max. 4.700m)

Weight (min. 22900kg, max. 23000kg)

Beam (max. 5.300m)

RIG & SAILS

J (max. 10.700m)

I (max. 32.000m)

P (max. 35.500m)

BAS (min. 2.300m, max. 2.400m)

MSA (max. 300 sq. m.)

ISP (max. P + BAS)

Bowsprit from mast (max. 15.500m)

Certificate No.
MeasurerDate
Signature

APPENDIX A

FLOTATION

Yacht

Sail Number

Actual Specific Gravity of Water

Description and location of internal ballast

Designated equipment at flotation

- Mast
- Boom
- Bowsprit
- Fin Strut
- Bulb
- Wings
- Trim Tab
- Rudder

Certificate No.
Measurer

Date
Signature

APPENDIX C

HULL CONSTRUCTION DECLARATION**DESIGNER'S DECLARATION**

I, the designer of the yacht _____ declare that the hull has been designed and to the best of my knowledge, built, only from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Designer (Block Letters) _____

Signature _____ Date _____

BUILDER'S DECLARATION

I, the builder of the yacht _____ declare that the hull has been built only from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Builder (Block Letters) _____

Signature _____ Date _____

OWNER'S DECLARATION

I, the owner of the yacht _____ declare that the hull has been built only from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Owner (Block Letters) _____

Signature _____ Date _____

This declaration is to be preceded by a completed material usage schedule as set out in **AC90 Rule** Appendix D.

COMPONENT DECLARATION

YACHT _____

COMPONENT _____ **DATE** _____

DESIGNER'S DECLARATION

I declare that the component named and referenced above has been designed, and to the best of my knowledge, is constructed only from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Designer (Block Letters) _____

Signature _____ Date _____

BUILDER'S DECLARATION

I declare that the component named and referenced above, is constructed only from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Builder (Block Letters) _____

Signature _____ Date _____

OWNER'S DECLARATION

I declare that the component named and referenced above, is constructed from materials, and using building methods, as permitted in the America's Cup 90 Class Rule.

Owner (Block Letters) _____

Signature _____ Date _____

This declaration is to be preceded by a completed material usage schedule as set out in **AC90 Rule** Appendix D.

APPENDIX D

America's Cup 90 Class Hull Construction Material Usage Schedule							
Date:		Yacht Name:					
Area:		Sail Number:					
	Material Description	Supplier Batch Number	Quantity Supplied	Supplier C of C Number	Material Type	Manufacturer Batch Number	Manufacturer of C
Hull	Inner Skin						
	Core						
	Outer Skin						
Deck	Inner Skin						
	Core						
	Outer Skin						

APPENDIX E

AC90 Class Insignia



APPENDIX F

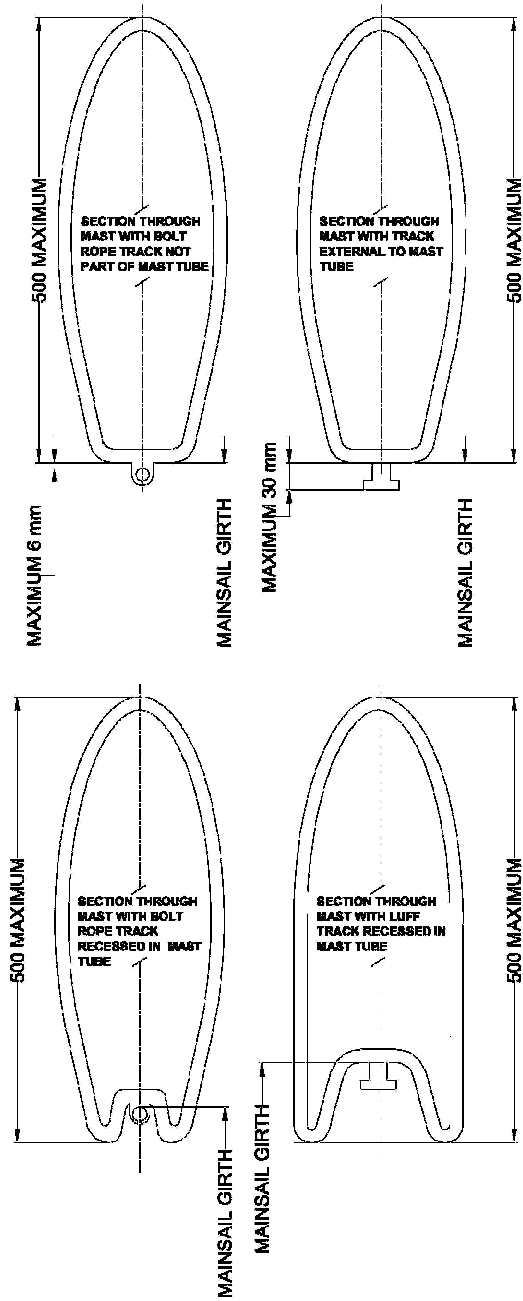


FIGURE 2 OF APPENDIX F
AC90 RULE 22.4 & 22.7b

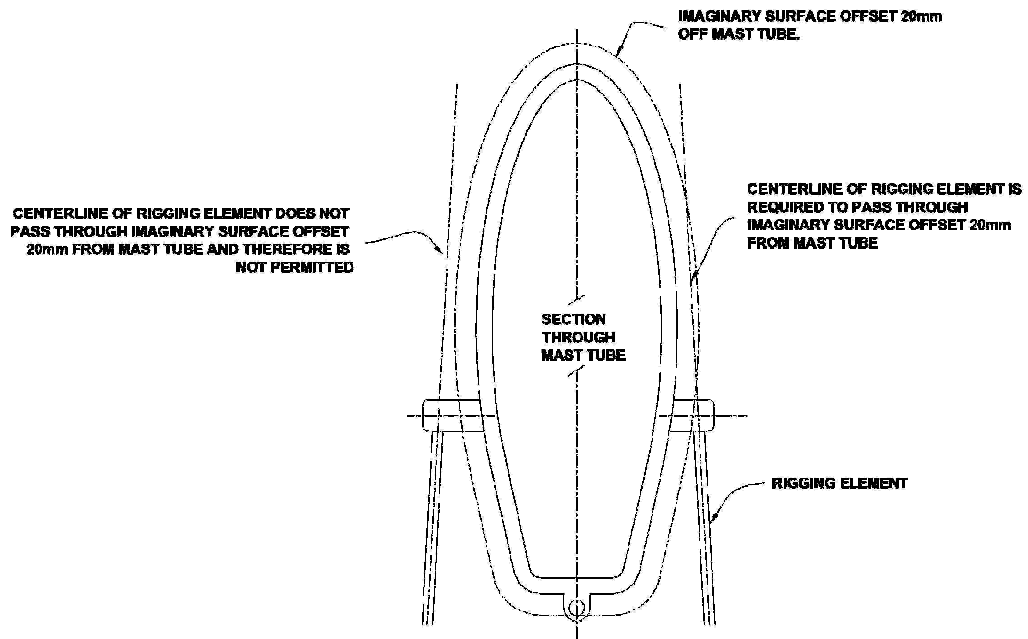


FIGURE 3 OF APPENDIX F
AC90 RULE 22.10

APPENDIX G

AC90 Sail Measurement Definitions

The **Forward, Aft, Bottom, and Top** edges of a sail are measured in the same co-ordinate system as the yacht:

- a) **Forward** means closer to the bow.
- b) **Aft** means closer to the stern.
- c) **Bottom and Top** refer to the height above the waterline.

Foot

The **Bottom** edge of the sail in its normal configuration when in use.

Head

The **Top** edge or point of the sail in its normal configuration when in use.

Luff

The **Forward** edge of the sail.

Leech

The **Aft** edge of the sail.

Tack

The area on the sail where the **luff** and **foot** meet.

Clew

The area on the sail where the **leech** and **foot** meet.

Mainsail Head Ordinate Line

The line through the highest point on the mainsail, at 90 degrees to the vertical grid line, projected as necessary, and not including protruding hardware or webbing.

Headsail Head Ordinate Line

The line through the highest point on the sail, at 90 degrees to the **luff**, projected as necessary.

Head point

- a) Mainsail: The intersection of the **luff** and the **Mainsail Head Ordinate Line**, projected as necessary.
- b) Jib or Staysail: The intersection of the **luff** and the **Headsail Head Ordinate Line**, projected as necessary.

Clew point

The intersection of the **leech** and **foot**, projected as necessary.

Tack point

The intersection of the **luff** and **foot**, projected as necessary.

Foot shelf

A sail fabric assembly on the foot of the mainsail, subject to **AC90 Rule 29.1(g)** and **AC90 Rule 30**, which is below the straight line joining the **tack point** and the **clew point**.

Jib girth measurement

The **mid-luff point** shall be located on the luff by folding the **head point** to the **tack point**.
The **mid-leech point** shall be located on the leech by folding the **head point** to the **clew point**.

The $\frac{3}{4}$ -**luff point** shall be located on the luff by folding the **head point** to the **mid-luff point**.
The $\frac{3}{4}$ -**leech point** shall be located on the leech by folding the **head point** to the **mid-leech point**.

Jib foot length

The distance between the **tack point** and the **clew point**, measured as the shortest path on the surface of the sail.

Jib mid-girth

The distance between the **mid-luff point** and the **mid-leech point**, measured as the shortest path on the surface of the sail, except that hollows between battens shall be bridged for measurement purposes.

Jib $\frac{3}{4}$ -girth

The distance between the $\frac{3}{4}$ -**luff point** and the $\frac{3}{4}$ -**leech point**, measured as the shortest path on the surface of the sail, except that hollows between battens shall be bridged for measurement purposes.

Jib **y-girth** (**AC90 Rule 28.10**)

In an analogous manner to the definition of jib **mid-girth**, we define a jib **y-girth** as follows:

For any variable "y" which has values between 0 and 1, a **y-luff point** is a point on the luff whose distance from the **head point**, measured as the shortest path on the surface of the sail, is $y * \text{luff length}$, where the **luff length** is the shortest distance on the surface of the sail between the **head point** and the **tack point**.

The **y-leech point** is the point on the leech whose distance from the **head point**, measured as the shortest distance on the surface of the sail, is $y * \text{leech length}$, where the **leech length** is the shortest distance on the surface of the sail from the **head point** to the **clew point**.

The jib **y-girth** is the shortest distance on the surface of the sail from the **y-luff point** to the **y-leech point**, except that hollows between battens shall be bridged for measurement purposes.

For the purpose of satisfying **AC90 Rule 28.10**, for any two variables y_1 and y_2 , where y_1 is greater than y_2 and both y_1 and y_2 are between 0 and 1, the jib **y_1 -girth** shall not be less than the jib **y_2 -girth**.

Mainsail girth measurement

For the purposes of measurement a grid shall be used. (See figure below)

The grid shall be laid out such that the vertical grid line is defined as the line joining a point on the luff 600mm below the head point, (E1 luff point) and a point on the luff, or the projection of the luff at a distance of P below the headpoint (E5 luff point)

The luff shall be deemed to lie at the aft face of the mast, the front face of any luff track, or at the actual luff of the sail, whichever gives the greatest girths. (See figure)

The **measurer** shall determine the location of the luff relative to the physical sail by inspection of the luff support system.

E1 shall be the girth from luff to leech, measured perpendicular to the vertical grid line, from the E1 luff point to the leech.

E5 shall be the girth measured perpendicular to the vertical grid line, from the E5 luff point to the leech (or projected leech).

E2, E3 and E4 are girths equally spaced (between E1 and E5), measured perpendicular to the vertical grid line. These girths shall be measured from luff to leech.

Any leech hollows shall be bridged for measurement purposes.

OTHER DEFINITIONS

Batten

A device that is attached to the sail to perform one or more of the following functions:

- a) provide support for the leech roach;
- b) assist in the control of the sail shape;
- c) provide local stiffening in the body of the sail.

Sail hardware

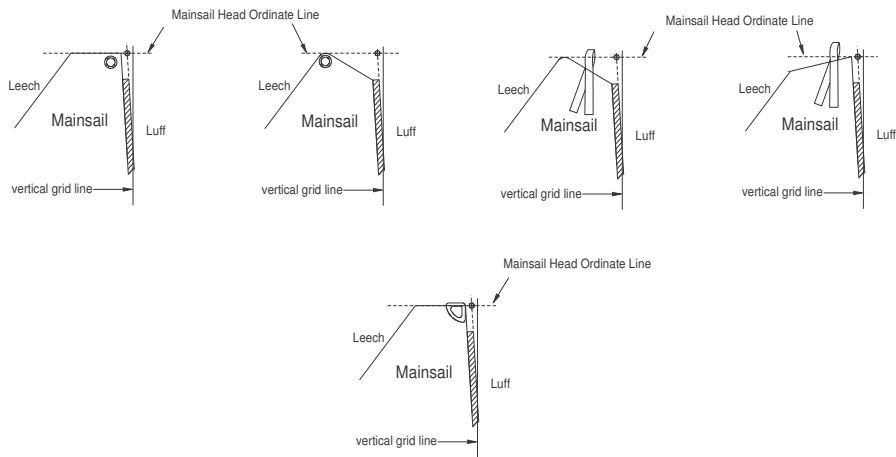
A component of the sail, not including battens, constructed of metal, plastic, or FRP, that is attached to the sail to perform one or more of the following functions:

- a) provide a means of attachment for sail controls;
- b) provide a means of attachment for a batten;
- c) provide local stiffening near a corner;
- d) act as part of a control system on the sail.

Such components include but are not limited to corner rings, headboards, batten fittings, cord system cleats, cord system blocks.

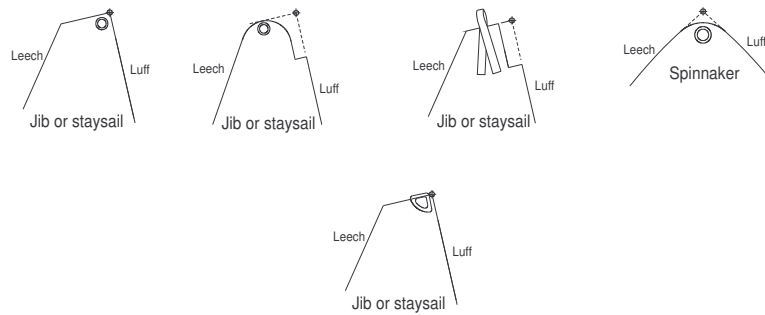
Mainsail head point

◆ denotes head point

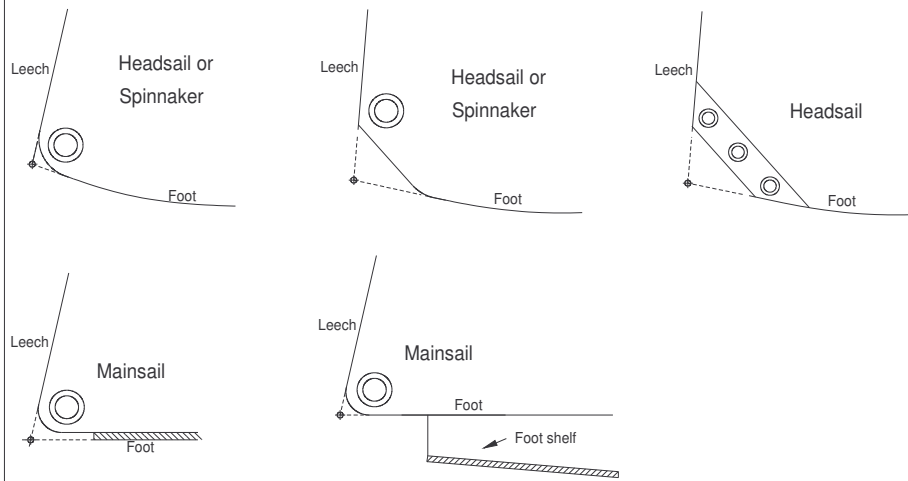


Headsail head point

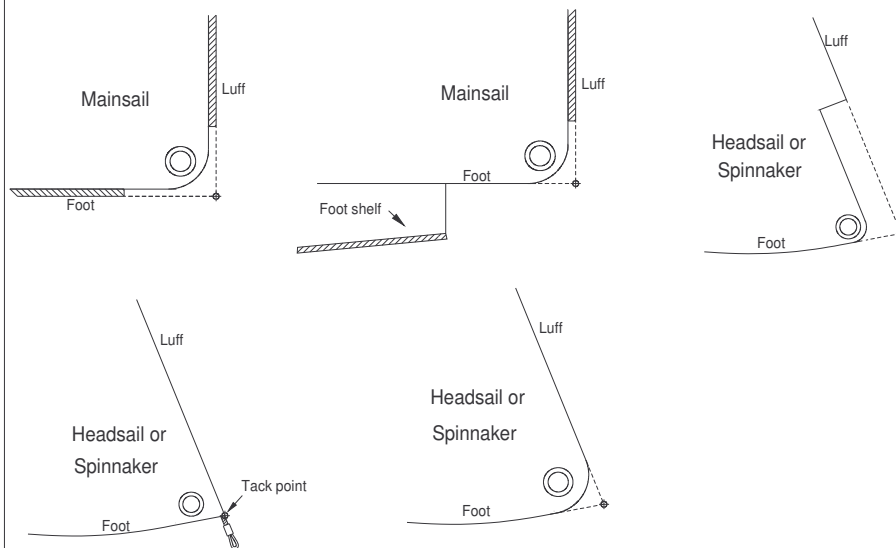
◆ denotes head point



Clew point



Tack point



APPENDIX H

SCHEDULE OF REQUIRED DECLARATIONS & CERTIFICATES OF CONFORMITY

CLAUSE	SUBJECT	SUPPLIED
13.2	Component Declaration for Materials and Methods - Hull, Deck & Internal Structure	
13.7	Component Declaration for Commercially Available FRP Ex-stock Material - Hull, Deck, & Internal Structure	
13.7(f)	Material Usage Schedule and Manufacturer's Certificates of Conformity for FRP - Hull, Deck, & Internal Structure	
13.7(g)	Component Declaration for Wet-Laminate FRP Mechanical Properties - Hull, Deck, & Internal Structure	
14.3 (d)	Material Usage Schedule and Manufacturer's Certificates of Conformity for FRP - Appendages (One for Each Appendage)	
14.3 (e)	Component Declaration for Wet-Laminate FRP Mechanical Properties - Appendages (One for Each Appendage)	
14.6	Component Declaration for Materials and Methods - Appendages (Owner, Designer, & Builder) (One for Each Appendage)	
20.2	Component Declaration for Materials and Methods -Surface Finishes & Boundary Layer Interface	
21.1 (d)	Material Usage Schedule and Manufacturer's Certificates of Conformity for FRP - Spars (One for Each Spar)	
21.1 (e)	Component Declaration for Wet-Laminate FRP Mechanical Properties - Spars (One for Each Spar)	
21.4	Component Declaration for Materials and Methods - Spars (Owner, Designer, & Builder) (One for Each Spar)	
32.2	Component Declaration for Materials - Standing and Running Rigging	