# NEW UNIVERSAL RULE OF MEASUREMENT

A PROPOSED REVISION TO THE MEASUREMENT RULE


## CLASS Q

Version 2.0.0 Preliminary

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June 2015

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Version 2.0.0

### INTRODUCTION TO VERSION 2.0.0

This proposed new version of the Universal Rule of Measurement for Class Q takes into account development work done over a number of years, incorporating what has been learned about this kind of boat from that work, and also from considerations of desired handling characteristics. This proposed version of the measurement rule is far more restrictive than the original, and is intended to produce modernized hulls of the same general type and character as the original class, though keels and rigs are less restricted.

This version of the Measurement Rule was developed directly from version 8.5.1 of the rule for Class M, modified as appropriate to account for inherent differences in the boats of each class, most especially the general size of the boat, and more particularly the greater beam / length ratio of the Q-Class, and other proportion differences which will exist between Class M and Class Q. However, it should never be assumed that this rule is merely a scaled-down version of the M-Class rule. There will be other differences as well, and while it will be the philosophy of the New Universal Rule of Measurement's Measurement Committees to keep the rules as much in the same “family” as practical, this is a general ideal only, and each rule will definitely be allowed to follow its own path as far as particulars go so that a good boat is produced by each rule.

### CHANGES FROM VERSION

- First public version of the Q Class rule.

## INQUIRIES ABOUT THE RULE

Inquiries about this rule should be addressed to info@universalrule.com.

## TERMINOLOGY INDICATING MANDATORY OR ALLOWABLE

Throughout this measurement rule, the term “shall” is taken to mean mandatory, while the term “may” is taken to mean allowable but not mandatory.

## MULTIPLE MEASUREMENT CERTIFICATES

A boat measured under this measurement rule shall have only one valid measurement certificate at a given time. That is, if any change in ballast, flotation, sail plan, hull form, keel form, rudder configuration or any other factor requiring re-measurement is made to the boat, then the re-measurement must be physically performed and a new measurement certificate covering the new configuration(s) must be issued. Issuing of that new certificate automatically voids the old certificate, such that the boat, if returned at some point to the earlier configuration, must then be re-measured and yet another new certificate must be issued for the configuration to which the boat was returned..

It is never legal to change back and forth between configurations requiring remeasurement without actually performing the re-measurement.

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## GUIDING PRINCIPLE IN DETERMINATION OF LEGALITY OF DESIGNS

The guiding principle in making a determination about the suitability, and especially the legality, of some particular hull design or proposed hull design under this rule, is whether or not the concept in question will continue the kind of boat, appearance of the boat, and performance of the boat in the tradition of the class. Changes which simply carry forward the kind of design progress which has been seen in previous boats is encouraged, while totally new and different shapes are discouraged unless allowed by some provision of this rule or its appendixes.

This rule contains the lines of a “demonstration” Q-boat, identified as “Hull 116F5”. This boat illustrates in a general way what we expect a modern Q-boat to be like. Any feature incorporated in the demonstration boat, or any feature which is simply an extension of any such included feature, is deemed to be legal and suitable, regardless of historical foundation. However, in case of apparent conflict, the wording of the “Limitations” sections of this rule take priority over the Hull 116F5 drawing and over historical consideration.

A similar situation exists with appendages, except that in the case of appendages, the date range is any date prior to September 1983. See APPENDIX 1 for a more thorough discussion.

## CLASS RATING FOR UNIVERSAL RULE CLASS Q

The class rating for Universal Rule Class Q shall be 25.00 feet.

## BASIC RATING FORMULAS

The basic rating formula for the Universal Rule of Measurement is:

$$R = 0.18 \frac{L\sqrt{S}}{\sqrt[3]{D}}$$

Where:

- R = Class Rating in Feet;
- L = Rated Length in Feet;
- S = Rated Sail Area in Square Feet;
- D = Rated Displacement in Cubic Feet.

## LENGTH FORMULAS

The formulas for determining Rated Length are:

$$L = LWL + P_{qbl} + P_{fwd} + P_{aft} + P_{disp} + P_{beam} + P_{draft} + P_{fbd} \quad (2)$$

Where:

- L = Rated Length In Feet;
- LWL = Water Line Length in Feet, in Measurement Trim
- $P_{qbl}$ = Quarter Beam Penalty in Feet;
- $P_{fwd}$ = Excessive Breadth of Section Penalty at Forward End of LWL in Feet;
- $P_{aft}$ = Excessive Breadth of Section Penalty at Aft End of LWL in Feet;
- $P_{disp}$ = Insufficient Actual Displacement Penalty in Feet;
- $P_{beam}$ = Excessive or Insufficient Breadth Penalty at Maximum Beam Station in Feet;
- $P_{draft}$ = Excessive Draft Penalty at the Maximum Draft Station in Feet;
- $P_{fbd}$ = Insufficient freeboard Penalty in Feet.

## MAXIMUM & MINIMUM LWL AND MEASUREMENT OF B

The LWL shall be the length, at the line of flotation with the boat in measurement trim, from the forward most point of immersion to the after most point of immersion. See FIGURE 1.

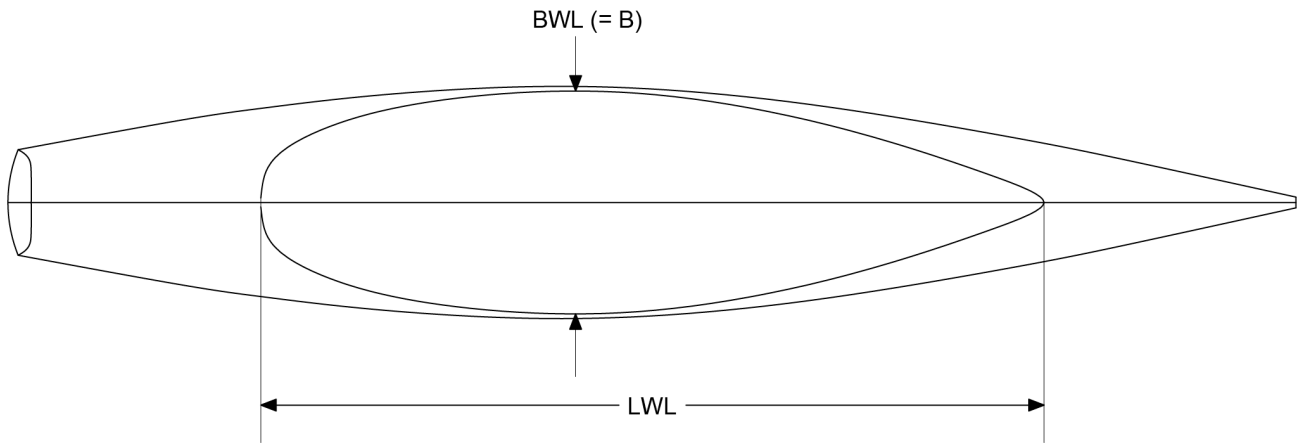


**FIGURE 1. MEASUREMENT OF B & LWL**

The Maximum LWL in Measurement Trim shall be:

$$LWL_{max} = (1.08 * \text{Class Rating}) + 5.0 \text{ ft.} \quad (3)$$

The Minimum LWL in Measurement Trim shall be:

$$LWL_{min} = (1.08 * \text{Class Rating}) + 3.0 \text{ ft.} \quad (4)$$

If any point on the hull, below the LWL, lies further forward than the forward end of the LWL, then a vertical projection of that point up to the surface of the water shall be taken as the forward end of LWL for all purposes under this rule. Nothing in this section shall be taken to imply any exception to the limitations on hull profile in the Limitation on Hull Forms section below.

If any point on the hull, below the LWL, lies further aft than the aft end of the LWL, then a vertical projection of that point up to the surface of the water shall be taken as the aft end of LWL for all purposes under this rule. Note that the rudder is not considered to be a point on the hull for purposes of this section of the measurement rule.

The Beam, B, shall be the maximum breadth of the water line plane when the boat is in measurement trim.

## PENALTIES ADDED TO LENGTH L

### *Quarter Beam Length*

The quarter beam length, QBL, shall be the length of the boat measured in the water plane parallel to the LWL in measurement trim, and measured parallel to the centerline of the boat, at a height B/10 above the LWL, and at a breadth B/4 from fore / aft the centerline of the boat.

The maximum quarter beam length without penalty shall be:

$$\text{QBL}_{max} = \frac{100-\sqrt{LWL}}{100} * LWL + 2.10 \quad (5)$$

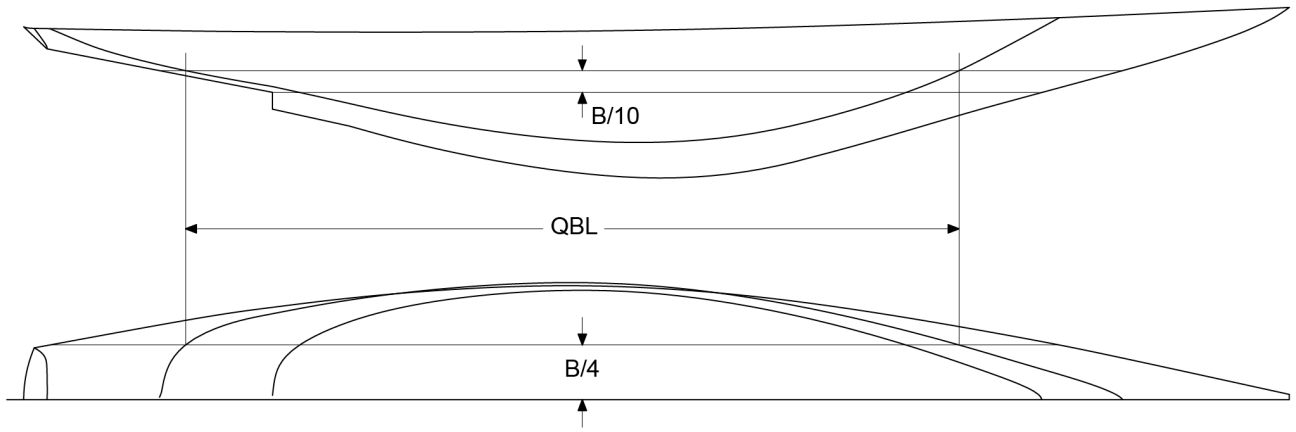


**FIGURE 2. QUARTER BEAM LENGTH**

If the quarter beam length is greater than the maximum permitted without penalty in (5), the quarter beam penalty shall be given by:

$$\text{Pqbl} = 0.5\ [QBL - (\frac{100-\sqrt{LWL}}{100}) * LWL] - 1.05 \quad (6)$$

The forward end of QBL shall not be taken as further aft than 0.11 * LWL aft of the forward end of LWL.

***Forward Breadth***

The forward breadth, FWD, shall the breadth of the boat measured in the transverse plane at the forward ending of LWL, taken at a height of 0.230 ft (70 mm) above LWL.

The maximum forward breadth without penalty shall be:

$$\text{FWD}_{max} = 0.04 * \text{LWL} \quad (7)$$

If the forward breadth as defined above is greater than the maximum allowed without penalty in (7), the penalty shall be given by:

$$P_{fwd} = 2 * (\text{actual forward breadth} - (0.04 * \text{LWL})) \quad (8)$$

***Aft Breadth***

The aft breadth, AFT, shall be the breadth of the boat measured in the transverse plane at the aft ending of LWL, taken at a height of 0.400 ft (122 mm) above LWL.

The maximum aft breadth without penalty shall be:

$$\text{AFT}_{max} = 0.14 * \text{LWL} \quad (9)$$

If the aft breadth as defined above is greater than the maximum allowed without penalty in (9), the penalty shall be given by:

$$P_{aft} = \text{actual aft breadth} - (0.14 * LWL) \quad (10)$$

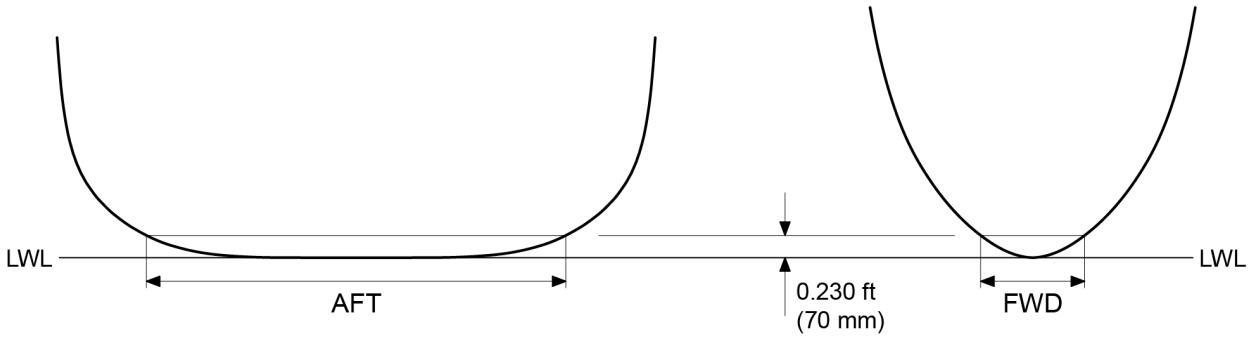


**FIGURE 3. FORE & AFT MEASUREMENT**

***Displacement***

The minimum displacement (in cubic feet) without penalty shall be

$$\text{Disp}_{min} = (0.2 * LWL + 0.5)^3 \quad (11)$$

If the actual displacement (in cubic feet) is less than the minimum given by (11), then the displacement penalty shall be

$$P_{disp} = LWL - \frac{\sqrt[3]{(actual\ displacement)} - 0.5}{0.2} \quad (12)$$

Rated displacement, D in the rating formula, shall be the actual displacement of the boat as determined by weighing. D shall not be taken as greater than the rule minimum displacement as defined in (11) above. Therefore

$$\sqrt[3]{D} \le (0.2\,LWL + 0.5) \quad (13)$$

***Beam***

The Beam, B, as defined above under Quarter Beam Length, shall be not less than

$$B_{min} = 0.277 * LWL \quad (14)$$

If B is less than the minimum defined in (14), the penalty shall be

$$P_{beam} = 0.277 * LWL - \text{actual LWL beam} \quad (15)$$

The Beam, B, as defined above under Quarter Beam Length, shall be not greater than

$$B_{max} = 0.300 * LWL \quad (16)$$

If B is greater than the maximum defined in (16), the penalty shall be

$$P_{beam} = \text{actual LWL beam} - (0.300 * LWL) \quad (17)$$

***Draft***

Draft, H, shall be the maximum vertical depth that can be found, perpendicular to the water line plane with the boat upright in measurement trim, from the water line plane to the lowest point on the boat or any extension thereof or on any appendage attached thereto. Note that the maximum depth might not lie on the transverse centerline of the boat.

The maximum draft as defined just above shall be

$$H_{max} = 0.16 * LWL + 2.56 \text{ ft} \quad (18)$$

If the draft exceeds the maximum defined just above, the penalty shall be

$$P_{draft} = 3 * (\text{actual draft} – (0.16 * LWL + 2.56)) \quad (19)$$

***Freeboard***

The sheer line shall be a fair, continuous concave curve, from stem head to transom. The Freeboard, F, shall be the vertical height from the line of flotation to the top of the deck at the appropriate fore / aft location.

The freeboard taken in measurement trim at the midship (50% LWL) station shall be not less than

$$F_{min} = 0.062 * LWL + 0.6 \text{ ft} \quad (20)$$

The freeboard at the forward end of LWL, in measurement trim, shall be not less than

$$F_{min\ fwd} = F_{min} * 1.179 \quad (21)$$

and the freeboard at the aft end of LWL, in measurement trim, shall be not less than

$$F_{min\ aft} = F_{min} * 0.979 \quad (22)$$

If any of the above 3 freeboard measurements is less than the minimum required, the penalty shall be

$$P_{fbd} = 2 * (F_{rqd} – F_{act}) \quad (23)$$

where:

$F_{rqd}$ = Freeboard required at that station from (20), (21), or (22) above;

$F_{act}$ = Actual freeboard at that station.

If more than one of the measured freeboards is less than the required minimum, the penalty shall be based on the largest deficiency, not the sum of the deficiencies.

Decks shall not have “negative camber”, that is the deck shall not get lower when one moves from the edge of the deck toward the centerline. However, if the sides of the boat extend upwards to form a rail, or if a bulwark is fitted, then the deck will be lower than the sides due to the rail or bulwark, and that situation is permitted without penalty. The maximum deck camber shall be 6 inches (152 mm).

There shall be no winches below deck, nor shall anyone stand in a hatch to operate a winch or tail a line from the winch.

## SAIL AREA

### *Sail Area Formula*

Rated sail area, S, in the rating formula shall be the triangular area of the mainsail plus 85% of the area of the fore triangle, that is

$$S = \frac{P * E}{2} + 0.85 \frac{I * J}{2} \quad (24)$$

Where:

P = Mainsail luff length in feet;

E = Mainsail foot length in feet;

I = Fore triangle height in feet, taken from the sheer line abreast the mast;

J = Base of fore triangle in feet.

## LIMITATIONS ON HULL FORM

### *General Description*

Boats designed to this measurement shall be of a narrow, deep, form with long, relatively low, overhanging ends. The following stipulations are specifically included:

### *Multiple Hulls & Outriggers*

Configurations with multiple hulls of any kind are prohibited. The basic test of this shall be that the longest length measurement, on the centerline plane, shall be on the transverse centerline itself, and shall be taken to points on the actual hull, not on extensions or interpolations of same. In similar manner, the maximum depth of the hull at any transverse section shall be on the transverse centerline, and shall also be to a point on the physical hull, not to extensions or interpolations thereof. Thus, catamarans are illegal. Where a cross section is flat or nearly flat, near the centerline of the boat, a tolerance of 1/8 in. (3 mm) is permitted such that an unintended depth of hull off the centerline not more than 1/8 in (3 mm) in depth is not considered to contravene this rule.

There shall be no outriggers of any kind attached to the hull, or suspended above or alongside or below it. For this purpose an outrigger is a device which supports a pontoon or other object(s) which may, at some angle of heel or other orientation of the boat, touch or become immersed in the water. Thus, trimarans are illegal.

There shall be no device for positioning the crew outboard of the edge of the deck of the boat, or outboard of a vertical extension of the deck of the boat, with the boat upright. A small cap strip on top of a bulwark is not an outrigger for purpose of this paragraph, provided that it extends no further than 0.75 in. (19 mm) outboard of the outer surface of the bulwark. Likewise, a tapered chafing sleeve for mooring lines may extend outside the hull through a drain hole in the rail, but it also shall not extend further than 0.75 in.
(19 mm) beyond the edge of the hull.

Bowsprits, and similar devices at the stern of the boat, are prohibited.

### *External "Hulls"*

There shall be only one hull. No appendage shall be configured such that it simulates a hull, and – except for one rudder which is mounted at the aft end of LWL – no appendage shall increase the waterline length or the sailing length of the boat. There is no legal configuration in which there is a hull, or part of a hull, inside of another hull or part of a hull.

### *Flexible Hulls*

The hull of the boat shall be essentially rigid, and fixed in shape. No flexible skin, fluid-filled skin, or other methodology shall be used to make it possible to alter the shape of the hull, other than by standard rebuilding methods during a major alteration of the boat.

### *Surface Roughness*

No material shall be added to the hull for the purpose, or with the effect, of adding roughness to the surface of the hull or keel, except that a strip 0.35 ft (107 mm) long, measured parallel to the line of flotation, and beginning at the leading edge of the stem of the boat and / or the leading edge of the keel, may be made rough by means of adding ground shells or other material to the bottom paint.

This section shall not be construed so as to prevent flat plates or pegs or similar devices from being used as turbulence generators along portions of the keel or other appendages.

Turbulence generators, other than the additions to paint described in the previous paragraphs, shall not be used on the hull.

For purposes of surface roughness as addressed in this section, the deck is not part of the hull.

### *Overhang & Length Requirements*

The minimum forward overhang of the boat, when in measurement trim, shall be 10.00 ft (3.048 m), measured in the horizontal plane, from the forward most ending of LWL, in measurement trim, to the stem head, neglecting any fitting or attachment on or over the stem head. The minimum overall length of the boat, measured in the horizontal plane from the stem head as defined herein, to the farthest aft point on the transom or stern overhang, shall be 52.00 ft (15.850 m).

Unless it is double-ended, the boat shall have a transom, the centerline profile of which may slope aft or forward as freeboard increases. If a transom slopes forward as freeboard increases, the transom, measured at the transverse centerline, shall make an angle with the vertical not greater than 45 degrees. A transom is always part of the hull, not part of the deck.

### *Hull / Deck Radius*

Where the sides are not carried up above the sheerline to form a railing along the edge of the boat, and where there is no bulwark added above the sheer line, the maximum radius of the side of the boat to the deck shall be 0.625 in (16 mm).

### *Free Flooding Tanks, Water Ballast, etc.*

There shall be no free flooding tanks. Water or other fluids shall not be carried on board for the purpose of acting as ballast, and if carried, shall not be shifted by any manner other than by the natural force of gravity while the boat is underway, except that the fluid in such a tank may be used for its intended purpose(s), for instance water in a water tank may be consumed or used for cooking, washing, etc.

### *Tumble Home*

The maximum tumble home, if any, on each side of the boat, shall be not greater than 0.32 ft (97.5 mm). Any excess shall be added to the rating, R.

***Hollows in Hull Profile***

There shall be no hollows in the deck planform (ie. top view profile).

There shall be no hollows in the profile of the hull between the sheer line and the LWL in measurement trim. Below the LWL, and forward of a transverse station 10% of LWL abaft the forward end of LWL, there shall be no double inflections in profile shape, that is, the stem profile between the forward end of LWL and the 10% LWL station aft of the forward end of LWL, may be straight, convex or concave, but shall not be a combination of convex and concave.

Drawing A at right shows a straight stem below LWL.

Drawing B at right shows a boat with a stem which is hollow (concave) below the LWL.

Drawing C at right shows a stem which is convex below the LWL.

All of the above are legal configurations.

Drawing D at right shows a stem with a bulge in it, that is, it is hollow (concave), then reverses the curvature to be convex, both below LWL but forward of a Station 10% of LWL aft of the forward ending of LWL. The form in Drawing D is illegal.

To allow for transitions from convex above the LWL to concave below the LWL, a tolerance of ¼ in (6.35 mm) is permitted on the double-inflection portion of this rule. That is, if a double-inflection has no convex portion or concave portion greater than ¼ in (6.35 mm) in the area in question, then it is allowed.

See FIGURE 4.

See also the section which follows.

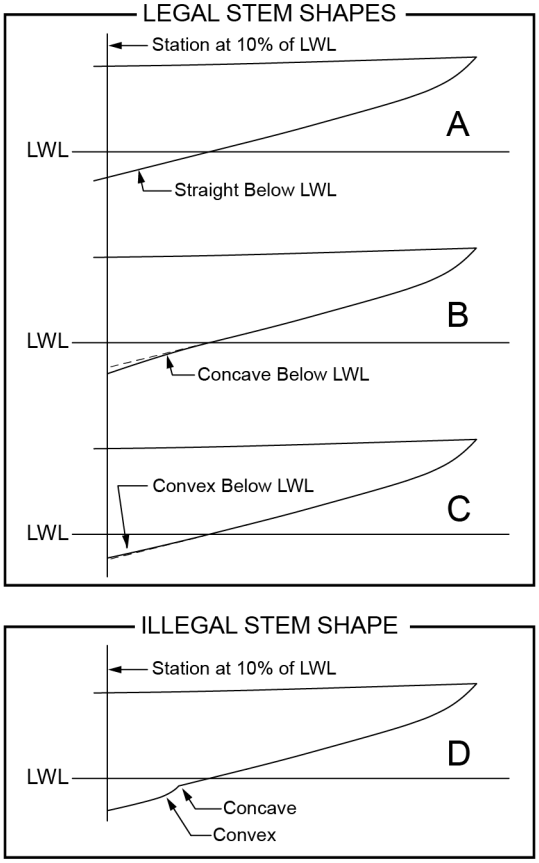


**FIGURE 4.**
**LEGAL & ILLEGAL STEM SHAPES**

A straight-edge shall be placed on the stem from a point located on the stem at a horizontal distance of 3.5% of LWL forward of the forward end of LWL, and extending along the stem to a point on the stem a horizontal distance of 3.5% of LWL aft of the forward end of LWL. Any hollow lying within that portion of the stem shall be bridged as described, and a new value of LWL established from the aft end of the original LWL to the point where the water plane established by the original LWL intersects the bridge. The bridged value of LWL shall be used for calculating the measured Length and for calculating the minimum displacement. All other functions of LWL shall be calculated using the non-bridged value of LWL.

Except at the aft end of the LWL, if any hollow in the surface of the hull occurs at or near a measurement point [i.e. within 0.75 ft (229 mm) above and 0.75 ft (229 mm) below the measurement point, and 2.12 ft (646 mm) forward and 2.12 ft (646 mm) aft of the measurement point], that hollow shall be bridged with an 4.25 foot (1.295 m) straight edge, whose center is at the measurement point within the hollow area, and which is rotated to whatever position will give the largest dimension when the measurement is taken to a point determined by the bridge.

The same 4.25 foot bridge methodology applies at the aft end of the LWL, except that the bridging forward of the aft end of the LWL is not to be done below the + 10” (+ 254 mm) waterline.

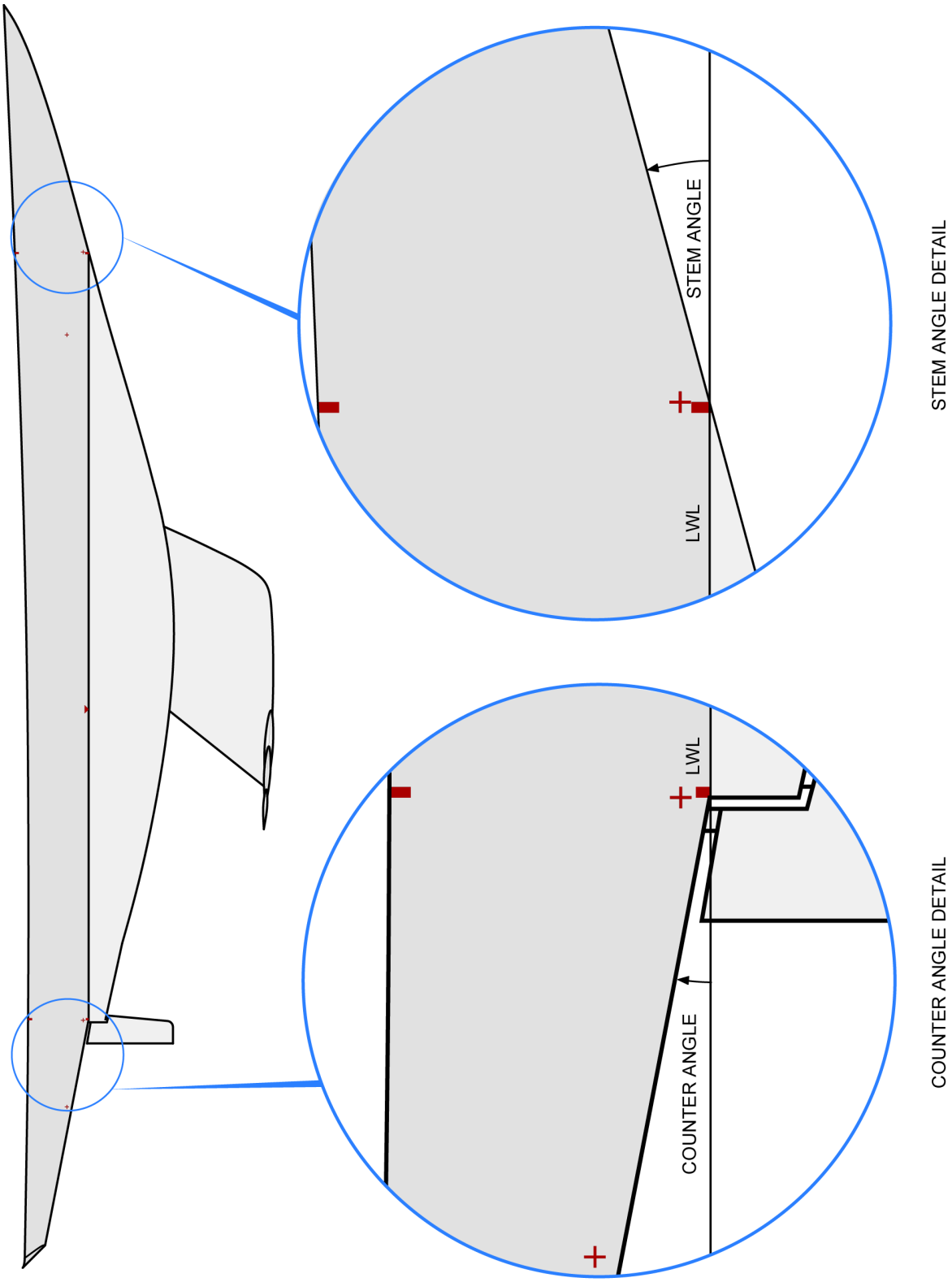


**FIGURE 5. STEM AND COUNTER ANGLE MEASUREMENT**

### *Angles of Stem and Counter*

At or above LWL, the minimum angle between the stem and the LWL, when the boat is in measurement trim, shall be 12.90 degrees. The minimum angle between the counter and the LWL shall be 9.50 degrees. Any deficiency is to be added to the rating R, 0.1 ft. for each 0.1 degree etc., interpolated to find the penalty for deficiencies which are not exactly tenths of a degree.

## LIMITATIONS ON SAIL CONSTRUCTION & SAIL PLAN

### *Sail Construction*

Sails shall be made of a form of "cloth", that is, they shall not be rigid wings or foils. Sails shall be constructed of a material such that the sail may be folded loosely into segments not greater than 3 ft (0.914 m) in width. Provided that the sail can be folded in this manner, it may be constructed of any material, including kevlar, mylar, carbon fiber, Dacron, or any combination of these. The purpose of the term "loosely" in this section is to require that the sail be of a cloth-like material rather than a rigid wing configuration, not to require that the sail be creased which would potentially damage the threads or other flexible materials from which it is constructed.

Double-luffed sails or sails which in any way wrap around any spar(s) are prohibited.

### *Maximum Height of Sail Plan*

The maximum height of the sail plan above the sheer line, measured along the aft edge of the mast (not necessarily vertical), shall be given by

$$\text{Rig Height}_{max} = 1.85\sqrt{S} + 5.0 \quad (25)$$

### *Minimum Height of Boom Above Sheer*

The minimum vertical height of the lower measurement point of mainsail luff P above the sheer line of the boat, abreast the aft edge of the mast, shall be 5.00 ft (1.524 m).

### *Maximum Girth of Mainsail*

The maximum dimension of the mainsail, measured perpendicular to the luff at a height 65% of P above the base of P, shall be

$$\text{Girth}_{max} = 0.56 * E \quad (26)$$

The leech of the mainsail shall lie on a fair continuous convex curve drawn through the headboard, the boom black band, and the outboard end of each batten. Small flat spots or hollows between battens, used solely to make the leech of sail stand properly, do not violate this rule, but the girth maximum shall be taken to a fair curve through the battens, even if that curve lies off of the sail.

### *Maximum Size of Mainsail Headboard*

The maximum horizontal length of the top of the mainsail headboard abaft the aft end of the mast shall be 0.67 ft (204 mm). No part of the headboard shall be longer than a fair interpolation of the top length and the girth and foot of the mainsail.

### *Maximum Height of Fore Triangle*

The maximum height of the fore triangle above the sheer line, measured along the leading edge of the mast (not necessarily vertical) shall be 47.12 ft (14.362 m).

A jib is taken to be any sail which is set within the fore triangle of the boat, except that a jib may extend aft of the mast. Jibs may be of any planform shape, but may not have battens and may not have headboards.

Exception: jibs which do not at any point overlap or extend aft of the mast may use up to 5 battens in the leech, provided the battens are not longer than 3 ft. (0.914 m) in length, and are not more than 3 in (76.2 mm) in width.

### *Maximum Height and Shape of Spinnaker*

The maximum height of the spinnaker halyard above the upper measurement point of I shall be not greater than 0.50 ft (152.4 mm). Spinnakers may be of asymmetrical or symmetrical shape.

### *Length and Construction of Spinnaker Pole*

The maximum length of spinnaker pole shall be not greater than 1.08 * J. Spinnaker pole(s) may be constructed of aluminum, steel, wood, fiberglass, titanium, carbon fiber, kevlar, or any combination thereof.

### *Minimum Weight and Construction of Mast*

The mast shall have a minimum weight of 200 lbs (90.7 kg), including all spreaders and fittings, but excluding running and standing rigging. The vertical center of gravity of the mast, when in measurement condition, shall be not lower than 37.5% of the maximum height of sail plan above the sheer line. The minimum weight is to ensure good racing, and does not guarantee the safety of the mast or rigging. It remains the responsibility of the designer, builder, and spar maker to ensure that the mast and rig are adequate for the purpose.

The mast may be made of aluminum, steel, wood, fiberglass, carbon fiber, kevlar, titanium, or any combination thereof. All other materials are prohibited.

The mast shall be stepped either on or just above the keel / stem centerline structure of the boat, and shall be fixed athwartship such that the base of the mast may not move from side to side. The deck partners shall have only the opening width required to properly pass the mast through, in no case more than 0.5 in (12.7 mm) on each side of the mast, such that the mast is effectively prevented from moving from side to side at the deck. The mast may be free to move forward / aft at the deck, but the base of the mast shall be fixed in the forward / aft direction. The maximum motion of the mast forward / aft at the deck shall be 0.250 ft (76 mm). Hydraulic rams and other mechanical devices may be used to move the mast forward / aft at the deck, or to constrain the mast from moving forward / aft at the deck. Where the mast is permitted / caused to move at the deck, the “J” dimension shall be taken with the mast in it's aft-most deck position.

Masts which tilt from side to side, other than that which occurs naturally due to stretch in rigging, etc., and masts which consist of a structure other than a single spar supported by rigging with spreaders, are prohibited. Rotating and permanently bent masts are prohibited. A small permanent bend of less than 0.5 ft (152 mm), which is incidental and not deliberately built into the mast, is acceptable.

Spreaders may be made of aluminum, steel, wood, fiberglass, titanium, carbon fiber, kevlar, or any combination thereof. All other materials are prohibited.

### *Transverse Rigging & Head Stay*

Transverse rigging, that is shrouds, and the head stay, shall not be adjusted during a race, except if an emergency situation arises which requires making such an adjustment. If that occurs, the boat shall report the situation and the action taken to the Race Committee and / or Rules Committee for their decision whether the action taken was in fact warranted.

### *Dimensions and Construction of Boom*

The boom shall have a maximum width of 1.50 ft (457 mm), measured in the transverse plane and horizontal. The maximum vertical depth of the boom shall be not greater than 0.8 ft (244 mm).

The boom may be constructed of aluminum, steel, wood, fiberglass, titanium, kevlar, carbon fiber, or any combination thereof. All other materials are prohibited.

### *Luff Groove Devices*

Luff groove devices for jibs are prohibited. All jibs must be attached to the head stay or a fore stay by means of pull-pin hanks, twist hanks, Velcro wrap-around straps, or other similar methods. All mainsails must be attached to the mast by means of slides running along a track, or by means of slugs running inside a tunnel. The mast cross-sectional shape may be such that the track is essentially internal.

### *Loose-Footed Mainsails*

Loose-footed mainsails are prohibited. Traditional "Park Avenue" booms and mechanically bent booms are permitted.

## LIMITATIONS ON APPENDAGES

### *Characterization of Appendages*

Appendages are items which protrude from the hull or from another appendage, and which carry out at least one of their functions by means of aerodynamic lift, drag, etc.

Appendages may be broken down into different groups, whose limitations will be set as a function of which group they fall into:

**Rudders**: the main function of a rudder is to steer the boat. Typically a rudder rotates about some post which is vertical in the transverse plane, thus creating a difference in lift on each side of the rudder which has the effect of turning the boat. A rudder may also generate lift which resists the side force generated by the sail plan of the boat; this is not the main function of the rudder, but does not disqualify the rudder from being deemed a rudder.

A rudder may be attached to a skeg or keel. A rudder must be mounted on the transverse centerline of the boat. A rudder may be mounted above the LWL if and only if the rudder post is entirely aft of the aft end of the LWL, and only if it is on the transverse centerline and is vertical in the transverse plane. A rudder mounted in this manner may not have its leading edge, or the leading edge of the post about which it rotates – whichever is further aft – further aft than 0.10 ft (30.5 mm) aft of the after end of LWL. Where any portion of the rudder is above the LWL with the boat upright in measurement trim, the longest horizontal length of the rudder above the LWL shall be 1.25 ft (366 mm), and the trailing edge of the rudder must not slope aft so as to increase the length of the rudder below the LWL.

A rudder shall not be deeper (below the LWL) than 0.425 times the rule maximum draft of the boat, that is the rudder shall have a maximum depth below the LWL of

$$\text{Rudder Depth}_{max} = 0.425 * H_{max} \quad (27)$$

Where:

$H_{max}$ = maximum draft without penalty per (18) above.

*Exception*: if a rudder is the only movable appendage except for a centerboard or daggerboard, and if the rudder is attached to the trailing edge of the keel, then the rudder may be any depth provided that the rule draft (equation 18 above) is not exceeded.

Rudders may be made of aluminum, steel, wood, or fiberglass, or any combination thereof. If made of fiberglass, the mechanical characteristics of the laminate may not exceed that of S-Glass.

**Keels:** a keel is an airfoil which is attached to the centerline structure of a hull, and serves at least the two primary purposes of:

Holding ballast which keeps the boat upright or more nearly upright than it would be without the ballast; and

Providing lateral resistance, usually developed by means of aerodynamic lift, which acts to counteract the side forces generated by the rig and sail plan.

A Keel must be vertical in the transverse plane when the boat is upright in measurement trim. A keel may have one or more of the following attached to it:

One rudder;

One set of winglets (one winglet per side);

One trim tab (if there is no rudder attached to the keel);

Below a plane parallel to the line of flotation, 4.5 in (114 mm) below the lowest exposed point of the hull, a keel shall have no hollows. This means that the perimeter profile of the keel may not have hollows, nor may any transverse section through the keel. Where necessary, compliance with this provision shall be confirmed by testing with a straight edge. Areas immediately involved in the attachment of a trim tab, or the attachment of winglets, are excepted from this hollows requirement, provided that any such excepted surface is within 4.5 in (114 mm) of the nearest part of the tab or winglet.

The leading edge of the keel shall sweep aft as the draft of the vessel increases, by at least 25 degrees to vertical (See Figure 6). In the event that the profile of the keel is curved along the leading edge, the leading edge sweep-back angle shall be measured to a point on the leading edge of the keel which is 1/2 of the depth of the keel from the lowest point of intersection with the hull to the lowest point on the keel.

Canting and rotating keels are prohibited.

Keels may not be heavier than cast lead (708 lbs / $ft^3$, or 11,341 kg / $m^3$).

**Skegs:** the main function of a skeg is to direct fluid flow along the after underbody of the boat toward the rudder. A skeg may be classed as a skeg if and only if there is a rudder operating in its immediate wake.

**Centerboards and Daggerboards:** a centerboard is a device which protrudes from the bottom of a keel, and which is raised and lowered by means of rotation about some point, usually at or near the leading edge of the centerboard. A daggerboard is a device which protrudes from the bottom of a keel, and which is raised and lowered by means of lifting up on it causing it to slide up and down. Hence is centerboard rotates about some point, while a daggerboard translates vertically.

Centerboards and daggerboards are not permitted in Class Q.

**Trim Tabs:** trim tabs are secondary rudders, mounted on the trailing edge of a keel, which have as a primary purpose to influence the lift generated by the keel by aerodynamic means, and have as a secondary purpose to aid in steering the boat. The difference between a trim tab and a rudder is that a trim can exist only if there is another rudder, and then it has steering as its secondary, not primary, purpose. A rudder always has steering as its primary purpose. Trim tabs may not comprise more than 20% of the total keel chord dimension along any given keel chord.

Trim tabs may be attached to the keel at the bottom extremity of their position, but the mounting must be in the form of support for the trim tab, and must not have a second purpose of altering the shape of the tab or the keel to effectively create a bulb at the tip of the keel or trim tab. The mounting may not increase the depth of the keel or of the trim tab, and the trim tab is at all points restricted to a chord length no greater than 20% of the corresponding keel chord (including the tab).

Trim tabs may not be heavier than cast lead (708 lbs / $ft^3$, or 11,341 kg / $m^3$).

**Winglets:** winglets are airfoil surfaces mounted to the keel near the bottom of the keel, and projecting outward very approximately perpendicular to the surface of the keel. Winglets must be fixed in orientation; that is they may not rotate, translate, pivot (as to alter sweep angle), etc., in any plane or in any axis.

The maximum span, from winglet tip on one side of the boat, to winglet tip on the other side of the boat, must be not greater than B as defined above in Figure 1. Winglets may have dihedral angles which place the winglet tip lower than the winglet root, but the static draft given by equation 18 above must not be exceeded when the boat is upright in measurement trim. Winglets may not have a thickness coefficient greater than 15%, that is the thickness as a percentage of the chord length must be less than or equal to 0.15.

The ratio of winglet tip chord length to winglet root chord length must be at least 0.25.

Winglets may not be heavier than manganese bronze (518.2 lbs / $ft^3$, or 8300 kg / $m^3$).

### *Legal Appendage Configurations*

A Q-boat shall have one keel and one rudder (which may or may not be connected to each other). Optional appendages are limited to:

One Trim Tab;

One set of two keel-mounted Winglets (one winglet per side of the keel);

One skeg (which, in order to be legal, must have a rudder operating directly in its wake).

There is no legal configuration in which a series of high aspect ratio foils are used along the fore/aft axis of the boat rather than using one larger keel. There is no legal configuration which uses a bulb at the bottom of a foil or a keel. Canards are illegal. See FIGURE 6.

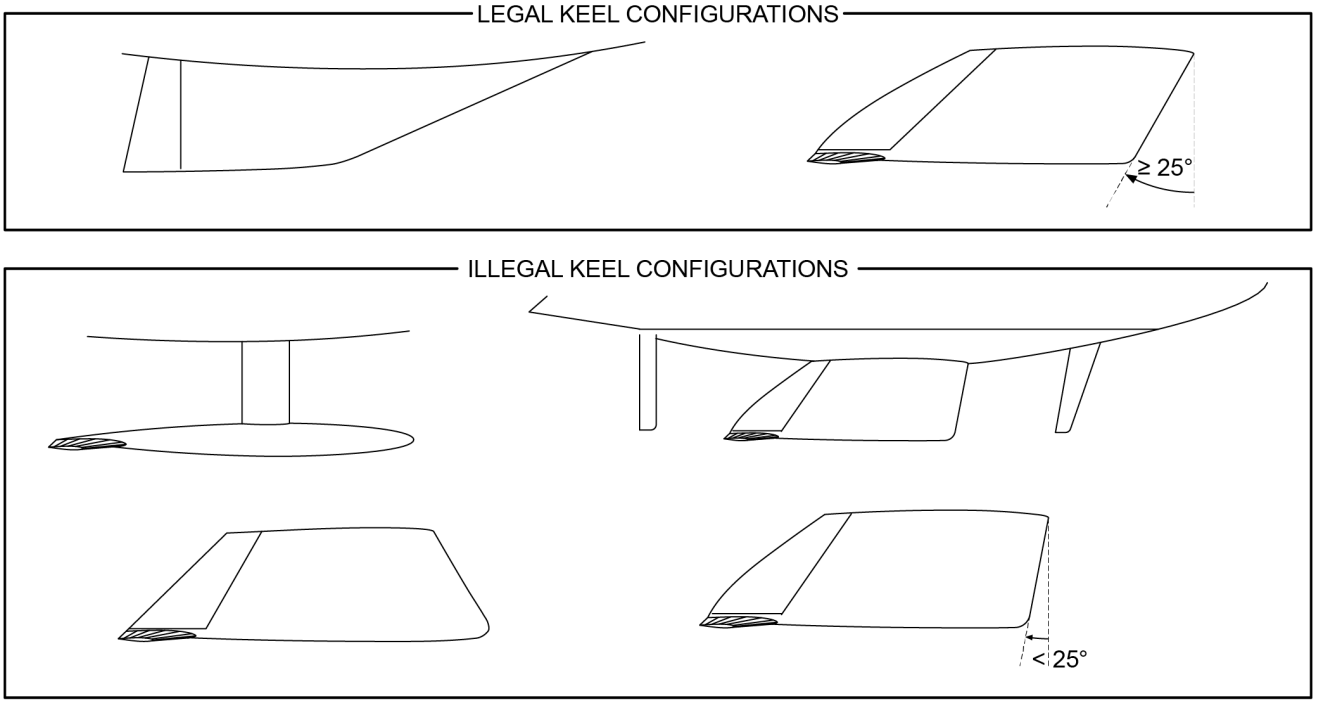


**FIGURE 6. LEGAL AND ILLEGAL KEEL CONFIGURATIONS**

### *Appendage Construction Requirements*

#### Basic Keel Construction

Except where the upper portion of a keel must be made of multiple materials, the keel shall be all of one material, normally lead. There shall be no voids in the keel casting, and only those holes or other openings shall be permitted which are there for attachment of winglets or a trim tab, or for attachment of the rudder in a configuration where the rudder is hung from the keel.

#### Hybrid Keel Construction

It may happen that the upper portion of the keel must be made of a different material than lead, if for instance, the amount of lead available for the keel is less than is required to make up the size of the keel. In this case the keel shall be built in two stages, where the lower portion is the lead casting complying with all of the above provisions, and the upper portion is another casting, say of aluminum, which also complies with all the previously-stated requirements, the only difference being the material from which this upper casting is made.

Where the hybrid keel construction is utilized, a weldment may be used instead of a separate casting. That is, where the upper portion is an aluminum casting, it would acceptable to use an aluminum weldment instead of a casting, provided that full allowance is made for the actual welded strength of aluminum which is considerably less than that of a solid (unwelded) aluminum. On a wood hull, a stainless steel casting could also be used if adequate provision could be made to prevent corrosion.

In this hybrid keel case, the keel portions must each comply with all the requirements for attaching the keel to the hull, that is:

> Each portion of the hybrid keel is connected to the portion physically above it (keel or hull) by means of keel bolts meeting all the requirements for size, number, and strength of keel bolts. Hence, there are two sets of keel bolts, one holding the lead casting to the casting (or weldment), and the second holding the now bolted-together lead and casting (or weldment) keel to the hull;
>
> it is not acceptable to use one long set of bolts to connect the lead to the hull, with the casting or weldment being sandwiched in between, as there is too much possibility of the pieces moving on each other and working the structure loose.
>
> *Exception*: where, for purposes of making a hard surface for the keel to bear against when the boat is heeled over, a spacer of a harder material than lead is used between the top of the lead keel and the bottom of an aluminum hull, then one set of bolts may pass through that spacer and into the hull without requirement for a second set of bolts. In this case, the spacer must be solid, not a casting or a weldment, and must be not greater than 2 in (50.8 mm) thick.
>
> Note that, where the nature of the structure is such that the width is very different for one attachment, say hull to aluminum, from the other, aluminum keel to lead keel, the requirements for the keel bolts will also differ greatly, and each connection is to be made with bolts appropriate for that connection.

#### Fairing Rudder Connections to Keel or Skeg

Where the rudder is attached to the trailing edge of the keel, or the trailing edge of the skeg, it will be necessary to fair the rudder to the keel or skeg (this also applies to the trim tab hung from the trailing edge of the keel). In this case a shallow relief is allowed to be cut into the keel or skeg so that a flexible plastic strip can be set flush into the keel or skeg, then overlapping the rudder or trim tab post to provide a fair transition. Note though that there is a limit to how far aft of the skeg that the rudder post can be located.

### Keel Attachment to Hull to Comply with International or Other Standard

Because each case will be different, no single norm for size or strength of keel attachment bolts, etc., is given here. The method chosen, and the dimensions, etc., utilized, shall comply with one of the International standards such as ISO, Lloyds, or American Bureau of Shipping, or with the new scantlings published by Dave Gerr, *The Elements of Boat Strength. (Note:* As they cover both English and Metric units, the standards published by American Bureau of Shipping and in *The Elements of Boat Strength* are particularly convenient to use).

### Fairing the Keel into the Hull

Where the keel joins the hull itself, there may be some small areas of unfairness, which may be corrected simply by the use of micro-balloon putty, a small amount of fiberglass cloth or mat, or some similar method. These alterations are acceptable if they are confined to covering up the metal hull or the metal keel for no more that 6 in (152 mm) above and/or below the bottom of the hull. Where an anti-corrosion mat has been placed between the keel and the hull, the thickness of that mat may be added to the 6 inch allowance.

Note that the purpose of this fairing is to permit a smooth transition from hull to keel; these methods may not be used to build a shape which is otherwise prohibited in these rules, particularly regarding hollows in the keel. If, in the process of fairing the keel into the hull as described in this section, it happens that a small hollow is created by the fairing, which stops at the 6 in (152 mm) height defined in the preceding paragraph, that hollow is allowed, provided that it is clearly incidental to the fairing, and is not part of an attempt to circumvent the hollow transverse section provision stated above Also note that this 6 in (152 mm) band is the same band defined in the section on keels above.

## PATENTED, COPYRIGHTED, & OTHERWISE PROTECTED DESIGNS & DESIGN CONCEPTS

No patented, copyrighted or otherwise legally protected design or design concept may be used in the design of a boat built to this measurement rule unless that design or design concept is available to all boats built to this measurement rule without charge.

# MINIMUM CONSTRUCTION REQUIREMENTS

### *Scope & Proper Interpretation of these Scantlings*

The construction minimum scantlings which follow are not intended to be a complete listing of all the components of construction of the boat, **nor does compliance with them ensure a strong or well-built boat**. Many critical items, such as rudder post, chain plates, and keel bolts, are not covered at all. These scantlings are meant to be a listing of a sufficient number of large or heavy structural items so that boats which comply with these scantlings will have, relative to their exact size and shape, weights, centers of gravity, and gyradii which are consistent from boat to boat. In other words, the goal of these scantlings is not to state all the requirements for a properly built Q-Boat, but rather to define minimums for a sufficient number of structural components that it can be reasonably assumed that construction weights and weight locations will not substantially favor one boat over another with regard to racing performance.

**In all cases, it remains the responsibility of the Designer and the Builder to ensure that the boat is a properly built and seaworthy boat.**

Any item not specified in the following construction scantlings should be built in accord to best practices, as defined (for instance) in the Royal Institution of Naval Architects (RINA) Rules for Yachts, in the American Bureau of Shipping's Rules for Offshore Yachts (ABS Rules), or with the methods and scantlings laid down in *The Elements of Boat Strength* by Dave Gerr.

### *Types of Materials and Methods of Construction*

These minimum scantlings presume an wood boat, of strip plank and diagonal veneer construction, except that some deck and cabin areas may be of strictly diagonal veneer construction if indicated in these scantlings. Where no construction method is specifically indicated, the construction is to be in accord with industry standard for that particular location and application. Throughout the hull and deck construction, it is assumed that the Wood Epoxy Saturation Technique (WEST) kind of construction is utilized.

While specific woods are mentioned in these scantlings, they are minimums allowed for race performance purposes rather than for structural strength purposes, and therefore other suitable woods may be substituted, provided, however, that the weight and weight distribution obtained from the use of those materials does not in part, or in total, provide any weight or weight distribution advantage over the materials indicated in these scantlings. As a general statement, where a lighter material is used, **and where satisfactory strength, reliability and structure life longevity can be obtained thereby,** the scantling may be increased so that the lighter material provides the same weight and weight distribution as the specified material. As a general statement, use of material heavier than that specified may not be compensated by reducing the required scantling.

The scantlings include a sample construction plan for a Q boat. This plan is provided for illustration purposes and for clarity of the scantlings, **and not for the construction of a specific boat. No representation is made or intended that this construction is a complete or adequate construction plan from which to build a boat.**

*Note***:** If in any place there is minor discrepancy between dimensions listed on the drawing, versus maximums or minimums in the scantling text, the value in the text shall govern. The construction drawings are to be considered advisory illustrations, not necessarily exact rule values.

### *Scantling Review*

These scantlings have not yet completed design review, and therefore should not be relied upon for any purpose. They are provided for study and comment ONLY.

## PRELIMINARY MINIMUM CONSTRUCTION REQUIREMENTS for the ENGLISH SYSTEM

**FOR REVIEW AND COMMENT ONLY. NOT TO BE RELIED ON FOR ANY PURPOSE**

| STRUCTURAL ITEM | MINIMUM SCANTLING |
|---|---|
| Frame Spacing | While regular framing is not required in this strip plank & veneer system, regular frame spacing is used for purpose of floor location, and as a reference to ensure that the weight distribution is essentially identical for each boat, allowing for variations in the shape of the boat. Frame Spacing shall be on 1' 6" centers. Frame 1 is taken to be the aft ending of the stem head. |
| Wood Keel | Douglas Fir, molded 3 3/4", sided ≥ 6 5/8". |
| Stem | Douglas Fir, molded 3 5/8", sided 5" |
| Stem in Way of Mast | Increasing in molding in a straight line from Frame 12 until it has been totally scarfed into the keel. At Frame 12 molded 3 5/8", sided 5". At Frame 14 molded 6 9/16", sided 5", and continuing until scarfed fully into keel. |
| Counter | Douglas Fir, molded 3 3/4", sided 5" |
| Wood Floors | Douglas Fir, sided 2", molded 6 3/4" at Frame 12, tapering uniformly to 5" at Frame 9, then maintaining that molding to stem head; molded 6 3/4" at Frame 29, tapering uniformly to 3" at Frame 34. Wood floors are used at every frame space except Frames 13 through 22 (see immediately below). |
| Steel Plate Floors | Frame 13 through 22. Type 316L Stainless Steel, 7/16" thick x 6" high, extended to cover 4 frame attachment bolts on 4" centers or 33% of the beam of the boat at that transverse section, whichever is greater. Flange to be type 316L Stainless Steel, 5/16" thick x 3" wide. Plate floors shall have a shim between the hull planking and the vertical floor plate to prevent wear and hard spots on the surface of the hull. The shim shall be type 316L Stainless Steel, 1/4" thick x 3" wide. |
| Standard Frame: Bulkheads or Ring Frames | Every 4$^{th}$ Frame space, beginning with Frame 5. Bulkheads are assumed to set on standard frames or heavy frames, as indicated by the location (see below), and are to consist of two 1/4" sheets of sapele or equivalent wood, with a core of 1/2" end grain balsa between. Where bulkheads would unduly restrict the interior of the boat, ring frames may be substituted. Standard Ring Frames are to be molded 4 1/2" not counting the Frame on which they are built, and not counting a closure at the inboard end to protect the core. There should be at least one full bulkhead at or near the forward end and one at or near the aft end of the 'mast / keel' structural box. |
| Standard Frames | 2" x 2" square, sapele or equal, steam bent or laminated as required. Standard frames are used on every other frame space beginning at Frame 3. On Frames 5, 9, 13, ... the frame is the foundation for the bulkhead; on the remaining frame spaces, the frame is used by itself as a standard frame. |
| Additional Frames in Mast / Keel Region | In the vicinity of the Mast and external ballast Keel, added hull strength and stiffness is to be obtained by the use of additional frames and ring frames or bulkheads. |
| Standard Frames in Way of Chain Plates | Frames in way of chain plates, presumed to be frames 15 and 16 (but could be others depending on the hull, keel and rig configuration), both frames shall be bulkheads or ring frames, and both shall be extended beyond the minimum 4 1/2" molding, where needed to allow secure attachment of the chain plate, and to prevent the hull from distorting from the load on the chain plate. In this case, the core of the ring frame, in the area effected by the chain plate attachment or load, the balsa core is to be replaced with a sapele or equivalent hard wood core, making in that location essentially a solid ring or bulkhead. |
| Heavy Frames | Frames 13 through 22 are to be heavy frames. Heavy frames siding is to be increased to 2 1/2". |

| | |
|---|---|
| Hull Longitudinals: Bilge Stringer | There shall be one bilge stringer, running the length of the hull at approximately the center of each frame, except at the very bow of the boat where it may be higher to connect effectively to the deck structure of the boat. The bilge stringer shall be of Douglas Fir, molded 1 1/4", sided 7 9/16" over its center 1/3 fore and aft, and thence tapering to 5 1/4" siding at the extreme forward and aft ends. |
| Clamp | Douglas Fir, molded 1 7/8" sided 4 7/16" over its center 1/3 fore and aft, and thence tapering uniformly to 3 1/8" siding at the extreme ends fore and aft. |
| Diagonal Strapping | 2 sets of diagonal straps:<br>Forward, originating opposite mast, extending to stem forward of mast step, and originating opposite mast, extending to wood keel very roughly above fore/aft center of ballast;<br>Aft, originating near aft end of deck house, extending to keel top just aft of the forward ending of the previous strap, and originating near aft end of deck house and extending to after underbody at approximately 45 degree angle to vertical<br>Straps to be silicon bronze or equivalent, sided 2 3/8", molded 1/8". Alternately, an equivalent wood strapping could be used if the weight and weight location is maintained. |
| Deck Beams | Sapele or equivalent, molded 2 1/2", sided same as its frame. |
| Longitudinal Heavy Deck Beams | Heavy longitudinals are to be fitted such that the foredeck is reinforced against bending from running backstay loads. This longitudinal reinforcement is to be carried aft as far as the point of attachment of the aft-most running backstay, and should be in two pieces, one on each side of the boat, beginning at a point forward of the intersection of the headstay with the deck. Each piece shall be sapele sided 1 5/16", molded same as depth of the beam. These pieces shall join the deck house carlins at the forward and aft ends of the deck house. Forward and aft of the deck house, each shall have a cap, corresponding to the flange on a metal frame, molded 1", sided 4 1/2". Material is to be sapele or equivalent. |
| Horizontal Wood Keel | There shall be a horizontal wood keel which constitutes the lower limit of the hull, at a height which provides a good foundation for mounting of the ballast keel. The wood keel shall molded 3 3/4", sided as required but not less than 6 9/16" at its maximum width. Douglas Fir or equivalent. |
| Main Hull Planking | The main hull planking shall consist of one layer of 7/8" thick Douglas Fir, strip planked after being saturated in epoxy. Successive strips are to be edge-nailed to the adjacent strip. |
| Main Hull Outer Diagonal Veneer | There shall be 2 layers, each run at a 45 degree angle to the centerline, and at right angles to each other. Each layer shall be khaya or equivalent, 1/8" thick, and shall be stapled to the underlying layer, plank or veneer, after saturation in epoxy resin. |
| External Fiberglass Sheathing | The exterior of the hull shall be covered with one layer of 48 oz bi-axial glass in epoxy. |
| Deck Planking | The main deck planking shall be Douglas Fir, 7/8" thick, strip planked. |
| Deck Covering | The deck is to be covered with some efficient non-skid surface. This is to be a layer of teak or white pine, or some other wood or wood-like material. This rule assumes a 1/2" thick layer of white pine. If another wood is used, the thickness may be adjusted to keep the weight in line with the assumed white pine deck. The deck covering is assumed to be non-structural, and is assumed to stop at about 4" from the edge of the deck, and from the transom, and to stop about half-way between the headstay and the stem head. |
| Standard Deck Beams | Sapele, molded 2 1/2" sided 1 7/8". |
| Heavy Deck Beams | Frame spaces 13 through 22 have heavy frames. Deck beams for these locations are to be increased in siding to correspond to the siding of the heavy frames (2 1/2"). |

| | |
|---|---|
| Deck House Beams | Deck house beams are to be used only with ring frames. Where used, they are to have the same molding and siding as standard deck beams molded 2 1/2" sided 1 7/8" |
| Deck House Roof | To be 6 layers of 1/4" Khaya, each strip layed at 45 degrees to the fore/aft centerline, and alternating with the next strip at 90 degrees to the first. No regular framing is required. |
| Deck House Sides & Ends | 1 3/8" thick Khaya or equivalent |
| Cockpit Frames & Beams | Shall be the same scantlings as Standard (deck) Beams. |
| Cockpit Longitudinals | Sapele molded 1 1/2" sided 1", at least 2 per cockpit, not required on guest cockpit |
| Cockpit Sides & Sole Planking | Shall be not less than 1". |
| Transom | The transom shall be not less than 1 3/8" thick. |
| Transom Frames & Longitudinals | Transom Frames shall have Standard Frame scantlings. |

***Minimum Weight of Rudder Stock***

The rudder stock, excluding any attachments, for a rudder mounted at the aft end of LWL, shall weigh not less than 50 lbs (22.68 kg). NOTE: this value is preliminary.

A trim tab or rudder mounted on the trailing edge of the main ballast keel does not count as a rudder for purposes of this section of the rule.

## INTERIOR ARRANGEMENT AND RELATED REQUIREMENTS

### *Deck Houses*

At least one deck house shall be fitted, the dimensions of which shall be not less than:

Height of side above sheer line at mid-length of deck house: 1.417 ft (432 mm)
Height of center above sheer line at mid-length of deck house: 1.800 ft (549 mm)
Horizontal fore / aft length of deck house: 11.5 ft (3.505 m)
Horizontal athwartship width of deck house at widest point: 5.300 ft (1.615 m)

The deck house shall have essentially vertical sides and forward and aft endings. Non-vertical sides or endings are permitted, but when used, the minimum dimensions above shall be taken at the smallest position in the relevant fore/aft or thwart-ship plane. Cut-outs in the deck house sides or front / back are permitted provided that the total actual frontal or side 2-dimensional areas are maintained.

### *Interior Arrangements*

Interior arrangement shall include at least the following items:

- at least 2 built-in berths (not pipe berths) + 2 others (may be pipe berths); Note: swing-up ("Murphy") beds are built-in berths.
- at least 1 fully-enclosed head, including w.c. and sink;
- cooking and eating facilities including at least the following:
  - -- conventional oven, with burners: may be gas or electric, or fully functional microwave oven;
  - -- refrigerator;
  - -- canned goods storage sufficient for a 3-day trip for 4 people;
  - -- galley sink;
  - -- seating for at least 4 persons at one time;
- hanging lockers sufficient for 4 persons for routine 1-day use.

All of the preceding equipment is to be "off the shelf" equipment, unless there is a compelling reason for a custom-made piece of equipment. In that case, the owner or builder or manufacturer must show that there is no advantage in weight saving to using the custom-made piece of equipment.

## DECK LAYOUT AND RELATED REQUIREMENTS

### *Cockpits & Cockpit Areas*

The boat shall have at least two cockpits, which shall be fully self-draining, and separate from each other. One shall be the main working cockpit; the other, aft of the main working cockpit, shall be a cockpit dedicated to on-board, non-sailing guests.

The planform areas of these cockpits shall be not greater than:

Main Working Cockpit(s) total: 25.0 $ft^2$ (3.323 $m^2$)

Guest Observer Cockpit: 4.75 $ft^2$ (0.413 $m^2$)

Additional arrangements may be provided for on-deck sail storage, etc, but where these are actual openings in the deck, they must be self-draining, and must be closed by a cover of equal weight and vertical strength (for standing on) as the deck area that they replace. The cover shall be closed when these areas are not in use, and no person shall stand, sit or kneel in these areas for any purpose except storage / retrieval of sails into or from the storage area.

## PROVISIONAL ENGINE AND PROPELLER REQUIREMENTS

### *Engine Requirements*

The boat shall be equipped with a diesel engine which, in combination with the propeller and propeller mounting utilized, shall be demonstrably capable of driving the boat in the forward direction at a speed of at least 6.8 knots, sustainable for at least one nautical mile, in smooth water with no wind. The transmission used shall be capable of powering the boat in reverse.

### *Propeller and Propeller Mounting Requirements*

While the value of PIPA, as standardly defined (see Appendix 2), is not a direct component of the rating, each boat shall have a propeller and mounting which has a PIPA value of not less than 0.0072, and which meets the following additional requirements:

- the propeller used shall be a 3- or 4-blade feathering propeller;
- the propeller mounting shall meet all the requirements in Appendix 2 for an “out of aperture” propeller mount;
- ESL shall not exceed 3.8 ft (1.158 m).

## CREW LIMIT

### *Crew & Observer Limits*

The maximum number of crew on board during a race, not counting guest observers, shall be 9.

The maximum number of guest observers on board during a race shall be 1. While observers may make occasional suggestions or comments, they are not to be regular tacticians, navigators, or strategists during a race, and – except in a clear emergency (where immediate action is needed to avoid injury to a person or to avoid severe damage to the boat or its equipment) – they shall play no physical role in sailing the boat during a race.

## Provisional Formulas for Boats Measured Under the Metric System

## METRIC MEASUREMENT CERTIFICATES VALIDITY AND RESOLUTION IN CASE OF CONFLICT

The following Metric formulas and scantlings are provided for the use of those wishing to work under the Metric system of measurement. Rating Certificates developed under the Metric system are valid for all purposes. However, in case of question or conflict, the English units and their calculated results shall govern.

## CLASS RATING

The Class Rating shall be 7.620 meters.

## BASIC RATING FORMULA

The basic rating formula for the Universal Rule of Measurement is:

$$R = 0.18 \frac{L\sqrt{S}}{\sqrt[3]{D}}$$

Where:

R = Class Rating in Meters;
L = Rated Length in Meters;
S = Rated Sail Area in Square Meters;
D = Rated Displacement in Cubic Meters.

## LENGTH FORMULAS

The formulas for determining Rated Length are:

$$L = LWL + P_{qbl} + P_{fwd} + P_{aft} + P_{disp} + P_{beam} + P_{draft} + P_{fbd} \quad (2)$$

Where:

L = Rated Length In Meters;
LWL = Water Line Length in Meters, in Measurement Trim
$P_{qbl}$ = Quarter Beam Penalty in Meters;
$P_{fwd}$ = Excessive Breadth of Section Penalty at Forward End of LWL in Meters;
$P_{aft}$ = Excessive Breadth of Section Penalty at Aft End of LWL in Meters;
$P_{disp}$ = Insufficient Actual Displacement Penalty in Meters;
$P_{beam}$ = Excessive or Insufficient Breadth Penalty at Maximum Beam Station in Meters;
$P_{draft}$ = Excessive Draft at the Maximum Draft Station in Meters;
$P_{fbd}$ = Insufficient freeboard penalty in Meters.

***Maximum and Minimum LWL***

The Maximum LWL in Measurement Trim shall be:

$$LWL_{max} = (1.08 * \text{Class Rating}) + 1.524 \text{ meters.} \quad (3)$$

The Minimum LWL in Measurement Trim shall be:

$$LWL_{min} = (1.08 * \text{Class Rating}) + 0.914 \text{ meters.} \quad (4)$$

***Quarter Beam Length***

The maximum quarter beam length, in meters, without penalty shall be:

$$QBL_{max} = \frac{100 - \sqrt{\frac{LWL}{0.3048}}}{100} * LWL + 0.64 \quad (5)$$

If the quarter beam length is greater than the maximum permitted without penalty in (5), the quarter beam penalty shall be given by:

$$P_{qbl} = 0.5 \left[ QBL - \frac{100 - \sqrt{\frac{LWL}{0.3048}}}{100} * LWL \right] - 0.32 \quad (6)$$

***Forward Breadth***

The maximum forward breadth, taken at a height of 70 mm above LWL, without penalty shall be:

$$FWD_{max} = 0.04 * LWL \quad (7)$$

If the forward breadth as defined above is greater than the maximum allowed without penalty in (7), the penalty shall be given by:

$$P_{fwd} = 2 * (\text{actual forward breadth} - (0.04 * LWL)) \quad (8)$$

***Aft Breadth***

The maximum aft breadth, taken at a height of 70 mm above LWL, without penalty shall be:

$$AFT_{max} = 0.14 * LWL \quad (9)$$

If the aft breadth as defined above is greater than the maximum allowed without penalty in (9), the penalty shall be given by:

$$P_{aft} = \text{actual aft breadth} - (0.14 * LWL) \quad (10)$$

***Displacement***

The minimum displacement (in cubic meters) without penalty shall be

$$\text{Disp}_{min} = (0.2 * LWL + (0.5 * 0.3048))^3 \quad (11)$$

If the actual displacement (in cubic meters) is less than the minimum given by (11), then the displacement penalty shall be

$$P_{disp} = LWL - \frac{\sqrt[3]{(actual\ displacement)} - (0.5 * 0.3048)}{0.2} \quad (12)$$

Rated displacement, D, in the rating formula shall be the actual displacement of the boat as determined by weighing. D shall not be taken as greater than the rule minimum displacement as defined in (11) above. Therefore

$$\sqrt[3]{D} \leq (0.2\,LWL + (0.5 * 0.3048)) \quad (13)$$

***Beam***

The Beam, B, as defined above under Quarter Beam Length, shall be not less than

$$B_{min} = 0.277 * LWL \quad (14)$$

If B is less than the minimum defined in (14), the penalty shall be

$$P_{beam} = 0.277 * LWL - \text{actual LWL beam} \quad (15)$$

The Beam, B, as defined above under Quarter Beam Length, shall be not greater than

$$B_{max} = 0.300 * LWL \quad (16)$$

If B is greater than the maximum defined in (16), the penalty shall be

$$Pbeam = \text{actual LWL beam} - (0.300 * LWL) \quad (17)$$

***Draft***

The maximum draft shall be

$$H_{max} = 0.16 * LWL + 0.7803\ m \quad (18)$$

If the draft exceeds the maximum defined just above, the penalty shall be

$$Pdraft = 3 * (\text{actual draft} - (0.16 * LWL + 0.7803)) \quad (19)$$

***Freeboard***

The freeboard taken in measurement trim at the midship (50% LWL) station shall be not less than

$$F_{min} = 0.062 * LWL + 0.183\ m \quad (20)$$

The freeboard at the forward end of LWL, in measurement trim, shall be not less than

$$F_{min\ fwd} = F_{min} * 1.179 \quad (21)$$

and the freeboard at the aft end of LWL, in measurement trim, shall be not less than

$$F_{min\ aft} = F_{min} * 0.979 \quad (22)$$

If any of the above 3 freeboard measurements is less than the minimum required, the penalty shall be

$$P_{fbd} = 2 * (F_{rqd} – F_{act}) \quad (23)$$

where:

$F_{rqd}$ = Freeboard required at that station from (20), (21), or (22) above;

$F_{act}$ = Actual freeboard at that station.

If more than one of the measured freeboards is less than the required minimum, the penalty shall be based on the largest deficiency, not the sum of the deficiencies.

## SAIL AREA

### *Sail Area Formula*

Rated sail area, S, in the rating formula shall be the triangular area of the mainsail plus 85% of the area of the fore triangle, that is

$$S = \frac{P * E}{2} + 0.85\ \frac{I * J}{2} \quad (24)$$

Where:

P = Mainsail luff length in Meters;
E = Mainsail foot length in Meters;
I = Fore triangle height in Meters, taken from the sheer line abreast the mast;
J = Base of fore triangle in Meters.

### *Maximum Height of Sail Plan*

The maximum height of the sail plan above the sheer line, measured along the aft edge of the mast (not necessarily vertical), shall be given by

$$\text{Rig Height}_{max} = 1.85\sqrt{S} + 1.524 \quad (25)$$

### *Maximum Girth of Mainsail*

The maximum dimension of the mainsail, measured perpendicular to the luff at a height 65% of P above the base of P, shall be

$$Girth_{max} = 0.56 * E \quad (26)$$

### *Maximum Depth of Rudder Below LWL*

*The maximum depth of the tip of the rudder below the LWL shall be not greater than*

$$Rudder\ Depth_{max} = 0.425 * H_{max} \quad (27)$$

*Where*

$H_{max}$ = maximum draft without penalty per (18)

### *Centerboards & Daggerboards*

Centerboards and daggerboards are not permitted in Class Q.

### *Minimum Weight of Rudder Stock*

The rudder stock, excluding any attachments, for a single rudder mounted at the aft end of LWL, shall weigh not less than 22.68 kg. NOTE: this is a preliminary value.

A trim tab or rudder mounted on the trailing edge of the main ballast keel does not count as a rudder for purposes of this section of the rule.

## PRELIMINARY MINIMUM CONSTRUCTION REQUIREMENTS for the METRIC SYSTEM

**FOR REVIEW AND COMMENT ONLY. NOT TO BE RELIED ON FOR ANY PURPOSE**

| STRUCTURAL ITEM | MINIMUM SCANTLING |
|---|---|
| Frame Spacing | While regular framing is not required in this strip plank & veneer system, regular frame spacing is used for purpose of floor location, and as a reference to ensure that the weight distribution is essentially identical for each boat, allowing for variations in the shape of the boat. Frame Spacing shall be on 457 mm centers. Frame 1 is taken to be the aft ending of the stem head. |
| Wood Keel | Douglas Fir, molded 95 mm, sided ≥ 170 mm. |
| Stem | Douglas Fir, molded 92 mm, sided 125 mm. |
| Stem in Way of Mast | Increasing in molding in a straight line from Frame 12 until it has been totally scarfed into the keel. At Frame 12 molded 92 mm, sided 125 mm. At Frame 14 molded 165 mm, sided 125 mm, and continuing until scarfed fully into keel. |
| Counter | Douglas Fir, molded 95 mm, sided 125 mm. |
| Wood Floors | Douglas Fir, sided 50 mm, molded 170 mm at Frame 12, tapering uniformly to 125 mm" at Frame 9, then maintaining that molding to stem head; molded 170 mm at Frame 29, tapering uniformly to 75 mm at Frame 34. Wood floors are used at every frame space except Frames 13 through 22 (see immediately below). |
| Steel Plate Floors | Frame 13 through 22. Type 316L Stainless Steel, 11.25 mm thick x 150 mm high, extended to cover 4 frame attachment bolts on 100 mm centers or 33% of the beam of the boat at that transverse section, whichever is greater. Flange to be type 316L Stainless Steel, 7.0 mm thick x 75 mm wide. Plate floors shall have a shim between the hull planking and the vertical floor plate to prevent wear and hard spots on the surface of the hull. The shim shall be type 316L Stainless Steel, 6.40 mm thick x 75 mm wide. |
| Standard Frame: Bulkheads or Ring Frames | Every 4$^{th}$ Frame space, beginning with Frame 5. Bulkheads are assumed to be set on standard frames or heavy frames, as indicated by the location (see below), and are to consist of two 6 mm sheets of sapele or equivalent wood, with a core of 13 mm end grain balsa between. Where bulkheads would unduly restrict the interior of the boat, ring frames may be substituted. Standard Ring Frames are to be molded 115 mm not counting the Frame on which they are built, and not counting a closure at the inboard end to protect the core. There should be at least one full bulkhead at or near the forward end and one at or near the aft end of the 'mast / keel' structural box. |
| Standard Frames | 50 mm x 50 mm square, sapele or equal, steam bent or laminated as required. Standard frames are used on every other frame space beginning at Frame 3. On Frames 5, 9, 13, ... the frame is the foundation for the bulkhead; on the remaining frame spaces, the frame is used by itself as a standard frame. |
| Additional Frames in Mast / Keel Region | In the vicinity of the Mast and external ballast Keel, added hull strength and stiffness is to be obtained by the use of additional frames and ring frames or bulkheads. |
| Standard Frames in Way of Chain Plates | Frames in way of chain plates, presumed to be frames 15 and 16 (but could be others depending on the hull, keel and rig configuration), both frames shall be bulkheads or ring frames, and both shall be extended beyond the minimum 115 mm molding, where needed to allow secure attachment of the chain plate, and to prevent the hull from distorting from the load on the chain plate. In this case, the core of the ring frame, in the area effected by the chain plate attachment or load, the balsa core is to be replaced with a sapele or equivalent hard wood core, making in that location essentially a solid ring or bulkhead. |
| Heavy Frames | Frames 13 through 22 are to be heavy frames. Heavy frames siding is to be increased |

| | |
|---|---|
| | to 63 mm. |
| Hull Longitudinals: Bilge Stringer | There shall be one bilge stringer, running the length of the hull at approximately the vertical center of each frame, except at the very bow of the boat where it may be higher to connect effectively to the deck structure of the boat. The bilge stringer shall be of Douglas Fir, molded 32 mm, sided 192 mm over its center 1/3 fore and aft, and thence tapering to 135 mm siding at the extreme forward and aft ends. |
| Clamp | Douglas Fir, molded 50 mm sided 115 mm over its center 1/3 fore and aft, and thence tapering uniformly to 80 mm siding at the extreme ends fore and aft. |
| Diagonal Strapping | 2 sets of diagonal straps:<br>Forward, originating opposite mast, extending to stem forward of mast step, and originating opposite mast, extending to wood keel very roughly above fore/aft center of ballast;<br>Aft, originating near aft end of deck house, extending to keel top just aft of the forward ending of the previous strap, and originating near aft end of deck house and extending to after underbody at approximately 45 degree angle to vertical<br>Straps to be silicon bronze or equivalent, sided 60 mm, molded 3.2 mm. Alternately, an equivalent wood strapping could be used if the weight and weight location is maintained. |
| Deck Beams | Sapele or equivalent, molded 63 mm, sided same as its frame. |
| Longitudinal Heavy Deck Beams | Heavy longitudinals are to be fitted such that the foredeck is reinforced against bending from running backstay loads. This longitudinal reinforcement is to be carried aft as far as the point of attachment of the aft-most running backstay, and should be in two pieces, one on each side of the boat, beginning at a point forward of the intersection of the headstay with the deck. Each piece shall be sapele sided 33 mm, molded same as depth of the beam. These pieces shall join the deck house carlins at the forward and aft ends of the deck house. Forward and aft of the deck house, each shall have a cap, corresponding to the flange on a metal frame, molded 25 mm, sided 115 mm. Material is to be sapele or equivalent. |
| Horizontal Wood Keel | There shall be a horizontal wood keel which constitutes the lower limit of the hull, at a height which provides a good foundation for mounting of the ballast keel. The wood keel shall molded 95 mm, sided as required but not less than 167 mm at its maximum width. Douglas Fir or equivalent. |
| Main Hull Planking | The main hull planking shall consist of one layer of 22 mm thick Douglas Fir, strip planked after being saturated in epoxy. Successive strips are to be edge-nailed to the adjacent strip. |
| Main Hull Outer Diagonal Veneer | There shall be 2 layers, each run at a 45 degree angle to the centerline, and at right angles to each other. Each layer shall be khaya or equivalent, 3 mm thick, and shall be stapled to the underlying layer, plank or veneer, after saturation in epoxy resin. |
| External Fiberglass Sheathing | The exterior of the hull shall be covered with one layer of 1600 g/m^2 bi-axial glass in epoxy. |
| Deck Planking | The main deck planking shall be Douglas Fir, 22 mm thick, strip planked. |
| Deck Covering | The deck is to be covered with some efficient non-skid surface. This is to be a layer of teak or white pine, or some other wood or wood-like material. This rule assumes a 13 mm thick layer of white pine. If another wood is used, the thickness may be adjusted to keep the weight in line with the assumed white pine deck. The deck covering is assumed to be non-structural, and is assumed to stop at about 100 mm from the edge of the deck, and from the transom, and to stop about half-way between the headstay and the stem head. |
| Standard Deck Beams | Sapele, molded 65 mm sided 48 mm. |
| Heavy Deck Beams | Frame spaces 13 through 22 have heavy frames. Deck beams for these locations are |

| | |
|---|---|
| | to be increased in siding to correspond to the siding of the heavy frames (63 mm). |
| Deck House Beams | Deck house beams are to be used only with ring frames. Where used, they are to have the same molding and siding as standard deck beams molded 65 mm sided 48 mm. |
| Deck House Roof | To be 6 layers of 6 mm Khaya, each strip layed at 45 degrees to the fore/aft centerline, and alternating with the next strip at 90 degrees to the first. No regular framing is required. |
| Deck House Sides & Ends | 35 mm thick Khaya or equivalent |
| Cockpit Frames & Beams | Shall be the same scantlings as Standard (deck) Beams. |

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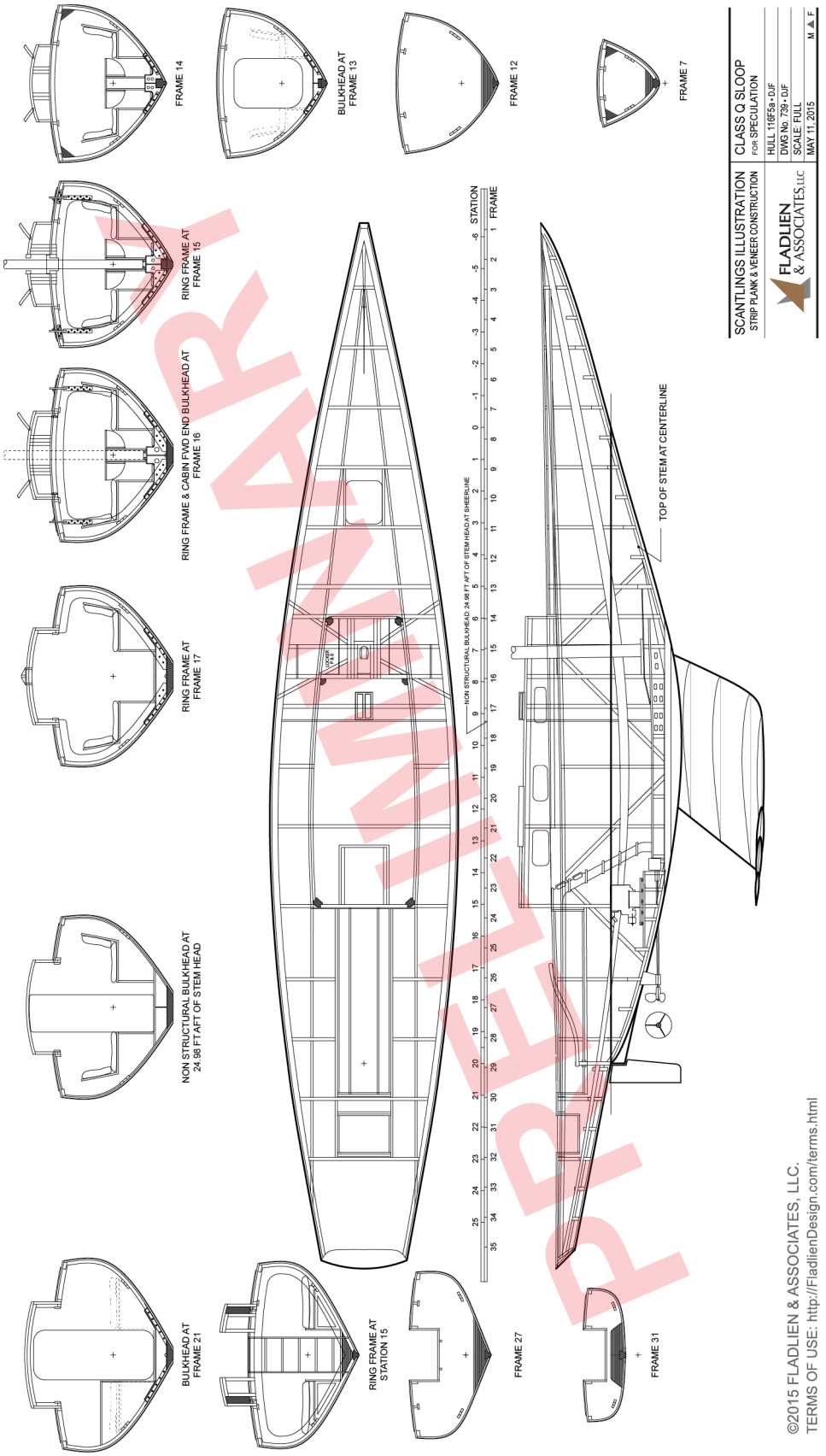


# APPENDIX 1

## *General Discussion of Permissible Hull Shapes Under This Measurement Rule*

The objective of this measurement rule is to produce a modernized version of the traditional M-Class, and is therefore a tightly-regulated development class. In doing so, the principle is that the boat which results should in a generalized way look, above the water in profile, like the last of the Universal Rule boats of the 1930s. This is not necessarily true of transverse sections, however, or even of the plan view, as those don't influence too greatly the impression left by the boat on the typical viewer. Hence, while the stem angle and counter angle are limited by the rule, the transverse sections may be “V”shaped, “U” shaped, or even round, flat, or square with a chine. This is true anywhere along the length of the boat. Similarly, the ends of the boat in plan view may be greatly “straightened” to make the corresponding sides more vertical.

However, the boat may not have protrusions from the hull. Those were never seen in the original Q Class, and so “humps” under the bow of the boat are not permitted, and neither are bulbs protruding forward of the waterline under water, even though in theory neither of these would affect the above-water appearance of the boat. However, it was common to have a hollow in the stem of the boat beginning slightly aft of the forward end of the waterline. This was most often in the R-Class, but was also seen in the J-Class *Rainbow* and (to some appearances) in *Endeavour*. These hollows are legal in Class Q, but see the Supplement for limits on the radius of such hollows.

It is desired to have a more modern boat, so that a separate rudder hung on a skeg at the aft end of the waterline is permitted, as is a greater-than-unity taper keel (“upside-down” keel) with or without winglets. And, for those who prefer them, a “reverse” or forward-sloping transom is also permitted.

Clearly not all of the above-mentioned characteristics can be represented in one drawing, but this rule does contain a lines plan which gives a general idea of what we expect a modern Q Boat to look like. This is the Hull 116F5 whose lines plan is attached, and which should therefore serve as a good guide for characteristics which are permitted, but not for characteristics which are prohibited. In other words, if Hull 116F5 contains a particular trait, then that the trait is permitted; however, the fact that Hull 116F5 does not embody some other characteristic should not be taken as a statement that the trait in question is prohibited.

For the guidance of anyone designing a boat to this measurement rule, if a trait or feature is contained in Hull 116F5, or is a *direct* extension of such a trait, or if the proposed trait is mentioned in this Appendix as being permitted, then that trait is permitted. If the trait is prohibited in this Appendix, or in the body of the rule itself (such as “humps” under the bow of the boat), then that trait is prohibited.

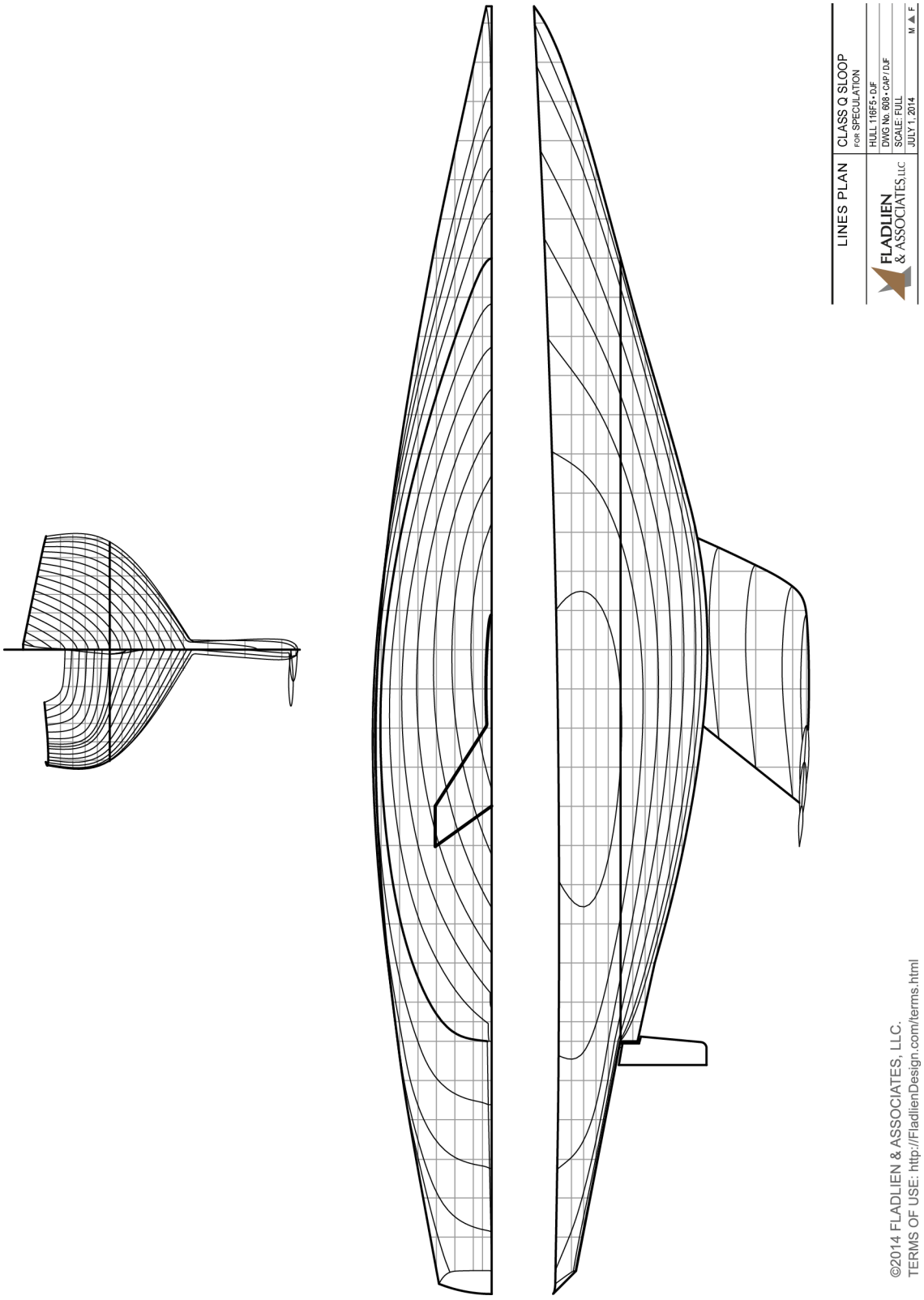
If a proposed trait is neither specifically permitted nor specifically prohibited, then the legality of the trait is questionable. The best keys to resolving that question are:

> First: does the proposed trait continue the kind of appearance, performance and handling characteristics of the class as described above? If so, this is an argument for the trait's acceptability.
>
> Second: does the proposed trait exist in any Universal Rule or International Rule boat in the 1920s, 1930s, 1940s, or 1950s? If it does exist, then this is a very strong case for the trait's acceptability.

Any designer should keep in mind, however, that anyone who contemplates building a boat to this measurement rule almost certainly wants a modernized, but still traditional, kind of boat. It is therefore assumed that the owners of these boats will have the authority to rule out any design concept which they collectively feel is contrary to the modernized traditional concept for this class as outline above, and as defined to some (definitely not all-inclusive) extent in the text of the rule. The designer should be prepared for the potential that a boat which clearly and significantly falls outside of these guidelines will not be permitted to race with the class, regardless of its compliance with the letter of the rule.

The order of precedence for evaluating legality of concepts is:

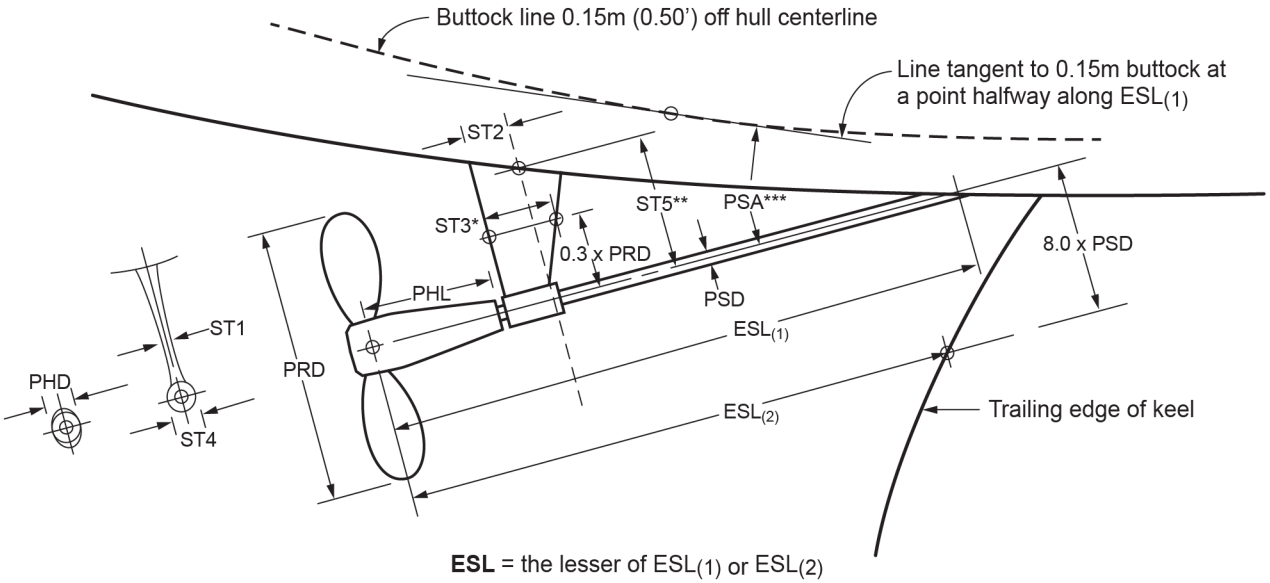
> First: The text of this rule, including this Appendix;
>
> Second: Lines Plan of Hull 116F5, included in this rule, as discussed in this appendix;
>
> Third: Historical precedent as discussed in this appendix.



# APPENDIX 2

## *Out of Aperture Propeller Mounts*

### *Calculation of PIPA – Parameters*




**ESL** = the lesser of $ESL_{(1)}$ or $ESL_{(2)}$

***ST3** is the maximum strut width measured parallel to the propeller shaft found not more than 0.3 x PRD above the shaft centerline.

****ST5** is measured perpendicular to the shaft centerline from the hull to the shaft centerline at the forward end of ST2.

*****PSA** (Propeller Shaft Angle) may be measured in two steps:
1. Angle between shaft centerline and level datum line
2. Angle between buttock tangent line and level datum line

Add angles to arrive at PSA.

### *Calculation of PIPA – Formulas*

$$IPA = (0.04 + \sin(PSA))^3 \times (PSD\,(ESL - ST\,2 - PHL) + ST\,4\,(ST\,2 + PHL)) + 0.03 \times ST\,1(ST\,5 - ST\,4/2)$$

$$PIPA = IPA + 0.70 \times (0.9\,PHD)^2$$

# APPENDIX 3

## *Special Rules for Exterior Decorum*

### *Advertising*

Except for a decal or similar emblem which may be placed on the boat during a specific regatta for a sponsor of that regatta, no advertising symbols may be displayed on the sides or transom of the boat, nor on the underbody, appendages or sails. Where a sponsor's mark of the kind permitted herein is displayed, it will have only one such mark on each side of the boat. Sponsors advertising in this manner must be sponsors of the entire event, or of the entire Q Class in that event, and not just of a particular boat or boats or team.

Advertising which complies with the requirements of the previous paragraph must further contain only words and/or logo clearly identifying the sponsor and/or his/her product. In no case shall there be any advertising containing any image which a reasonable person would deem lewd or marginal or debatable in that regard.

Sails may contain the standard maker's mark, of standard size, in the vicinity of the tack of the sail, or the clew if the sail is a symmetrical spinnaker.

Winches, spars, and fittings may contain standard manufacturer's marks of the standard size.

The designer(s) of the boat, and the builder(s) of the boat may place or cause to be placed an identifying plaque or engraving in a prominent place on a bulkhead below deck. As above, these marks or plaques are to be artful, or simple text, and serve only the purpose of identifying the designer(s) or builder(s), and shall not be done in a manner which a reasonable person would deem to be advertising.

### *Symbols on Hull or Transom*

In principle, there should not be symbols or markings on the hull or the transom other than wording stating the name and (if desired) the home port of the boat. A single small symbol (not larger in any dimension than the boat name) and which has special significance to the owner would be acceptable.

By tradition, a stripe or arrow has long been permitted on the topside a short distance below the sheer line. An additional strip of a color which contrasts with both the side and bottom paint (that is, “boot top”) has also been allowed at the connection of the bottom paint to the topside paint. This is particularly helpful when the construction or construction material of the boat dictates a bottom paint color which does not butt well with the desired topside color. These stripes, arrows, and boot tops are permitted providing that they are only large enough to be clearly visible and to accomplish their intended artistic purpose.

Placing of the boat's name on the side of the boat, on the bulwark or just below the deck line, is permitted, providing the name is in lettering not more than 6 in (152 mm) in height.

There are to be no pictures, artist's rendering of people or animals, or any other such displays on the topsides, underbody, appendages or transom of the boat, except that the home port of the boat may be displayed on the transom if the name of the boat is also displayed either on the transom or the side of the boat. In general, the paint job on the topsides of the boat should be of one color only. Speckles or light marbling of the color might be permissible if approved by the governing body, but multi-color topsides are not permitted.

## APPENDIX 4

### *Major Design Parameter Limits List for English Units*

| MEASUREMENT PARAMETER | DESCRIPTION | LIMIT |
|---|---|---|
| LWL | Line of Flotation in Measurement Trim | (1.08 * R +3.0) ≤ LWL ≤ (1.08 * R + 5.0) |
| QBL | Quarter Beam Length | Penalty if > |
| Forward end QBL | Forward end of QBL | Not to be taken as further aft than 0.11 * LWL |
| BWL | Maximum Beam along LWL | See Limit on B just below |
| B | Equal to BWL as defined just above | (0.277 * LWL) ≤ B ≤ (0.300 * LWL) |
| FWD | Breadth at +0.400 ft WL at fwd end LWL | Penalty if > (0.04 * LWL) |
| AFT | Breadth at +0.400 ft WL at aft end LWL | Penalty if > (0.14 * LWL) |
| DISP | Displacement in Measurement Trim | Penalty if < $(0.2 * LWL + 0.5)^3$ in $ft^3$ |
| Draft | Maximum depth of boat incl keel | Penalty if > 0.16 * LWL + 2.56 |
| Fmin | Minimum Freeboard | Penalty if < limits in (20), (21), or (22) page 11 |
| Stem Angle | Angle of Stem to LWL at line of flotation | Penalty if < 12.90 degrees |
| Counter Angle | Angle of Counter to LWL at line of flotation | Penalty if < 9.50 degrees |
| Tumble home | amount per side by which deck is narrower than maximum beam at that vertical location | Penalty if > 0.32 ft |
| Rig Height | Height of upper P band above deck at side of boat opposite mast | maximum allowed = $1.85\sqrt{S} + 5.0$ |
| Mainsail Max Girth | maximum dimension perpendicular to luff of sail at height = 0.65 * P | maximum allowed = 0.56 * E |
| Headboard length | length of headboard at longest point | maximum allowed = 1.40 ft |
| Maximum Height of Fore Triangle | Maximum height of halyard sheave intersection above sheer line | maximum allowed = 47.12 ft |
| Max height of Spin Halyard | Max height of Spinnaker halyard above top of I dimension | maximum allowed = 0.5 ft |
| Max length of spinnaker pole | maximum length of spinnaker pole from inboard end to bearing point of guy | max allowed = 1.08 * J |

| | | |
|---|---|---|
| min weight mast | minimum weight of mast in specified condition | minimum = 200 lbs |
| max mast motion | maximum fore/aft motion of mast at deck | maximum allowed = 0.333 ft |
| max boom width | maximum width of boom at any location | maximum allowed = 2.50 ft |
| max boom depth | maximum depth of boom at any location | maximum allowed = 1.375 ft |
| rudder aft of LWL | maximum distance leading edge of rudder or post can be aft of aft end of LWL | maximum allowed = 0.125 ft |
| Rudder Depth | maximum depth of rudder below LWL | maximum allowed = 0.425 * Maximum Draft |
| Maximum Keel Taper Ratio | maximum ration of keel tip chord / keel root chord | maximum allowed = 2.0 |
| Centerboard / Daggerboard max depth | maximum draft of a boat below LWL with a centerboard or daggerboard fully extended | centerboards & daggerboards are not allowed |
| Centerboard / Daggerboard max area | maximum exposed area of a centerboard or daggerboard with that board fully extended | centerboards & daggerboards are not allowed |
| Maximum Weight of Keel material | heaviest material from which a keel may be made | maximum allowed = 708 lbs / $ft^3$ |
| Maximum Chord Length of Trim Tabs | longest horizontal dimension of a trim tab as a function of the length of the keel itself at that vertical height | Maximum allowed = 20% of correspond keel chord length at that vertical height below LWL |
| Maximum Weight of Trim Tab material | heaviest material from which a trim tab may be made | Maximum allowed = 708 lbs / $ft^3$ |
| Maximum Weight of Winglets | heaviest material from which a winglet may be made | Maximum allowed = 518.2 lbs / $ft^3$ |
| Minimum Taper Ratio of Winglets | minimum ratio of tip chord / root chord for a winglet | Minimum allowed = 0.25 |
| Maximum Thickness Coefficient of Winglets | maximum ration of winglet thickness to winglet chord length at the corresponding distance from the keel centerline | Maximum allowed = 15% of chord length |
| Minimum Weight of Rudder Post | minimum weight of rudder post for rudder mounted near aft end of LWL | minimum allowed = 50 lbs |
| PIPA | minimum value per Appendix 2 | minimum allowed = 0.0072 |

# APPENDIX 5

## *Major Design Parameter Limits List for Metric Units*

| MESUREMENT PARAMETER | DESCRIPTION | LIMIT |
|---|---|---|
| LWL | Line of Flotation in Measurement Trim | (1.08 * R + 0.914) ≤ LWL ≤ (1.08 * R + 1.524) |
| QBL | Quarter Beam Length | Penalty if > $\frac{100-\sqrt{\frac{LWL}{0.3048}}}{100} * LWL + 1.1887$ |
| Forward end QBL | Forward end of QBL | Not to be taken as further aft than 0.12 * LWL |
| BWL | Maximum Beam along LWL | See Limit on B just below |
| B | Equal to BWL as defined just above | (0.277 * LWL) ≤ B ≤ (0.300 * LWL) |
| FWD | Breadth at +70 mm WL at fwd end LWL | Penalty if > (0.04 * LWL) |
| AFT | Breadth at +70 mm WL at aft end LWL | Penalty if > (0.14 * LWL) |
| DISP | Displacement in Measurement Trim | Penalty if < (0.2 * LWL + (0.5 * 0.3048))$^3$ in m$^3$ |
| Draft | Maximum depth of boat incl keel | Penalty if > 0.16 * LWL + 0.780 m |
| Fmin | Minimum Freeboard | Penalty if < limits in (20), (21), or (22) page 11 |
| Stem Angle | Angle of Stem to LWL at line of flotation | Penalty if < 12.90 degrees |
| Counter Angle | Angle of Counter to LWL at line of flotation | Penalty if < 9.50 degrees |
| Tumble home | amount per side by which deck is narrower than maximum beam at that vertical location | Penalty if > 97.5 mm |
| Rig Height | Height of upper P band above deck at side of boat opposite mast | maximum allowed = $1.85\sqrt{S} + 1.524$ |
| Mainsail Max Girth | maximum dimension perpendicular to luff of sail at height = 0.65 * P | maximum allowed = 0.56 * E |
| Headboard length | length of headboard at longest point | maximum allowed = 0.427 m |

| | | |
|---|---|---|
| Maximum Height of Fore Triangle | Maximum height of halyard sheave intersection above sheer line | maximum allowed = 14.36 m |
| Max height of Spin Halyard | Max height of Spinnaker halyard above top of I dimension | maximum allowed = 152 mm |
| Max length of spinnaker pole | maximum length of spinnaker pole from inboard end to bearing point of guy | max allowed = 1.08 * J |
| min weight mast | minimum weight of mast in specified condition | minimum = 90.7 kg |
| max mast motion | maximum fore/aft motion of mast at deck | maximum allowed = 101 mm |
| max boom width | maximum width of boom at any location | maximum allowed = 762 mm |
| max boom depth | maximum depth of boom at any location | maximum allowed = 419 mm |
| rudder aft of LWL | maximum distance leading edge of rudder or post can be aft of aft end of LWL | maximum allowed = 38.1 mm |
| Rudder Depth | maximum depth of rudder below LWL | maximum allowed = 0.425 * Maximum Draft |
| Maximum Keel Taper Ratio | maximum ration of keel tip chord / keel root chord | maximum allowed = 2.0 |
| Centerboard / Daggerboard max depth | maximum draft of a boat below LWL with a centerboard or daggerboard fully extended | centerboards and daggerboards are not permitted in Class Q |
| Centerboard / Daggerboard max area | maximum exposed area of a centerboard or daggerboard with that board fully extended | centerboards and daggerboards are not permitted in Class Q |
| Maximum Weight of Keel material | heaviest material from which a keel may be made | maximum allowed = 11,341 kg / $m^3$ |
| Maximum Chord Length of Trim Tabs | longest horizontal dimension of a trim tab as a function of the length of the keel itself at that vertical height | Maximum allowed = 20% of correspond keel chord length at that vertical height below LWL |
| Maximum Weight of Trim Tab material | heaviest material from which a trim tab may be made | Maximum allowed = 11,341 kg / $m^3$ |
| Maximum Weight of Winglets | heaviest material from which a winglet may be made | Maximum allowed = 8300 kg / $m^3$ |
| Minimum Taper Ratio of Winglets | minimum ratio of tip chord / root chord for a winglet | Minimum allowed = 0.25 |

| | | |
|---|---|---|
| Maximum Thickness Coefficient of Winglets | maximum ratio of winglet thickness to winglet chord length at the corresponding distance from the keel centerline | Maximum allowed = 15% of chord length |
| Minimum Weight of Rudder Post | minimum weight of rudder post for rudder mounted near aft end of LWL | minimum allowed = 22.68 kg |
| PIPA | minimum value per Appendix 2 | minimum allowed = 0.0072 |

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