

NEW UNIVERSAL RULE OF MEASUREMENT CLASS M

INSTRUCTIONS to MEASURERS



VERSION 2.2.1

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INTRODUCTION

The measurement of an M-Class yacht built to the New Universal Rule of Measurement consists of the taking of a set of dimensions indicated in the Measurement Rule itself, and specifically identified in this set of instructions, and of then recording those dimensions on the proper input mechanism, also defined in this document, and of then submitting that information to the M-Class Measurement Authority, as defined by the M-Class Measurement Committee.

The following assumptions are made:

- ◆ That the Measurer is familiar with general sound yacht measurement methods and practices;
- ◆ That the Measurer has completed the prerequisite conference or informational educational material so that he/she is thoroughly familiar with the nature and requirements of the New Universal Rule of Measurement for Class M;
- ◆ That the Measurer, is at the time of the measurement of the yacht, fully and properly equipped with the necessary tools for the task; and,
- ◆ That the yacht is located in a place which has all the necessary facilities for the measurement function, specifically including a mooring where calm water and essential zero wind speed can be obtained for an amount of time sufficient to perform the in-water portion of the measurement, and where the yacht can then be hauled out of the water for the ashore portion of the measurement process.

CHANGE HISTORY**NOTES TO v. 2.2.0 of THESE INSTRUCTIONS**

- ◆ Definition of Measurement Trim altered to no persons, animals, or ornamental pillows etc. be on board. Ladders are to be on board and in their normal location for racing.
- ◆ Added measurement of HDO (Hull Depth Offset) to instructions.
- ◆ Added Measurement of AFT₂ to instructions.
- ◆ Updated determination of Freeboard with respect to the requirement that all boats have a bulwark.

NOTES TO v. 2.0.0 of THESE INSTRUCTIONS

- ◆ Definition of Measurement Trim altered to require cooking and eating utensils to be off the boat.

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MEASUREMENT PROCESS

The measurement process consists of two parts, one performed with the yacht in the water in measurement trim, and a later portion performed with the yacht out of the water, in measurement trim, and level in both the transverse and horizontal axes.:

Part 1: the yacht is provided to the Measurer in measurement trim as defined herein, in a location where calm wind and water conditions can be reasonably anticipated, for the *afloat* portion of the measurement process, as defined herein;

Part 2: the yacht is provided to the Measurer in measurement trim as defined herein, in a location where it can be hauled out of the water, leveled in the transverse and longitudinal axes, and where the *ashore* portion of the measurement process can be performed.

While not a specific requirement, it is best if the afloat and ashore portions of the measurement process be done on the same day, or on consecutive days, and best if the yacht's condition is not altered between the two portions of the process. In the event that this is not possible, then the Measurer shall satisfy him/herself that the yacht is still in measurement trim at the time of the ashore test.

Note: while some discretionary latitude is left to the Measurer in regard to the times and locations of the two parts of the measurement process, it is a requirement that the afloat portion of the measurement be performed prior to the ashore portion. The principle reason for this requirement is that it is not possible to know where on the yacht the ashore measurements are to be made unless the flotation of the yacht in measurement trim has first been determined.

DEFINITION OF MEASUREMENT TRIM

The yacht shall be in measurement trim when measured. It is the responsibility of the owner to provide the yacht to the Measurer in measurement trim. It is the responsibility of the Measurer to ensure by inspection that the yacht is in measurement trim before proceeding with the measurement.

In order for the yacht to be in measurement trim, the following must be true:

- ◆ All ballast shall be in place, and all internal ballast shall be properly and essentially permanently fastened in its position;
- ◆ There shall be no persons or animals on board;
- ◆ The yacht shall contain no personal items such as clothing or hygienic items, ornamental or decorative items e.g. plants, paintings (unless fastened in place or built in), or hand held devices such as cell phones, calculators, etc., or entertainment devices such as commercial radios, televisions, etc, unless these are built in or permanently fastened in place;
- ◆ The yacht shall have on board no small items for cooking and eating, and for use in the head e.g. dishes, pots and pans, plates and silver;
- ◆ The yacht shall be free of all consumables and perishables, e.g. food in any form, beverages, etc.;
- ◆ The yacht's fresh, gray, and black water tanks shall be empty, or as nearly empty as is practical. The Measurer shall ensure by a method satisfactory to him/her that these tanks are essentially empty;
- ◆ The yacht's fuel tank(s) shall be full. The Measurer shall ensure by a method satisfactory to him/her that the fuel tank(s) is/are full;
- ◆ All permanently-rigged running rigging such as halyards and mainsheet shall be on board and in place. with all running backstays set up firmly, such that there is no slack, but with the minimum load thereon as will keep them from moving about or being slack;
- ◆ All movable running rigging, such as jib sheets and spinnaker sheets and guys, shall be coiled and piled in the transverse center of the yacht, approximately at the fore/aft center of flotation;

- ◆ The yacht shall contain all normal running rigging operating equipment, such as winch handles, blocks, cleats, etc., which shall be in their normal locations. Spares in a quantity deemed reasonable by the Measurer shall be located approximately amidship, as shall be snatch blocks and other items which may be used in a variety of places. As there is no inclining test in this rule, these items may be at any vertical height, but must be in the transverse center of the yacht, and must be located approximately at the fore/aft center of flotation;
- ◆ All hydraulic rams, pumps, distribution plumbing and other similar items shall be in place in their normal location, with hydraulic fluid in place, such that each system is ready for use;
- ◆ One full size mainsail shall be on board, furled on the boom, but no other sails may be on board;
- ◆ The boom shall be centered and reasonably secured in that location, and shall be essentially horizontal;
- ◆ Spinnaker poles, reaching struts, and any similar devices shall be secured in their normal storage location, that is, where they would be when the yacht is sailing but those items are not in use;
- ◆ All normal large pieces of navigation equipment and performance recording and analyzing equipment, such as computers, wind speed and direction recording equipment, readouts for performance equipment, etc., shall be in place and securely fastened down;
- ◆ All safety equipment, such as fire extinguishers, personal flotation devices, emergency flares and flare guns, at least one anchor of a type and size suitable for this size and type of yacht, etc, shall be properly stowed in their normal location;
- ◆ The yacht shall have no pulpit, pushpit, or lifelines rigged, unless instructions to the contrary are indicated in a directive from the M-Class Measuring Committee;
- ◆ There shall be no dinghy or tender or life raft on board;
- ◆ All mattresses and seating cushions shall be on board, but all ornamental pillows or cushions shall be removed, and all sheets, blankets and other such bedding shall be removed;
- ◆ All hatch covers shall be rigged and in place at their respective hatch. All ladders used in the routine operation of the boat shall aboard, and in the place normally occupied while racing.
- ◆ All batteries shall be in place and securely fastened
- ◆ All appliances for food preparation, such as ovens and microwaves and refrigerators shall be in place and properly mounted and secured
- ◆ There shall be no fire arms or ammunition on board (note that a flare gun is a safety device, not a fire arm, for purposes of the definition of measurement trim).

MEASUREMENT UNITS and DEGREES OF ACCURACY

Dimensions may be taken in either customary units or metric units, but not in a combination. That is, all dimensions must be in customary units, or all dimensions must be in metric units.

If customary units are used, all dimensions are to be in decimal feet, not in feet and inches.

Customary Units

Where customary units are used, measurements are to be taken to 0.01 foot. If a dimension seems precisely or almost precisely between two 0.01 foot marks, then a third decimal value of 0.005 may be used. For example: it is not clear whether the dimension is 54.50 feet or 54.51 feet, as the actual dimension seems almost equally between the two marks on the tape or measuring device. In this case, the dimension should be recorded as 54.505. However, no digit other than "5" shall be used in the third decimal position.

Metric Units

Where metric units are used, measurements are to be take to 0.001 metre. Where there is doubt, the dimension shall be rounded up.

MEASUREMENT MARKS and MEASUREMENT MARK LOCATION

Measurement marks, as defined herein, shall be placed on the boat as described herein, by the owner or someone under the direction of the owner, as determined by the measurer during the measurement process. The marks, once so placed, are not to be moved without remeasurement of the boat. If for some reason it is necessary to temporarily cover the marks (as in repainting the boat), then the measurer shall be informed and shall agree with the facility doing the work on the boat as to how the exact location of the marks is to be recorded and exactly duplicated. Lacking such prior agreement and evidence of compliance, the boat's measurement certificate and Measurement Information Form shall be deemed to have been invalidated.

The measurement marks are to be located as follows (also see Figure 1):

- ◆ Vertical rectangular stripes 1 inch (25 mm) long fore-and-aft and 1 foot (305 mm) in length shall be fixed at each end of the LWL, located such that the outboard end of each stripe is at the forward-most and aft-most ending the LWL with the boat in measurement trim;
- ◆ Crosses, as defined in Figure 2, shall be located on each side of the boat at the forward and aft ending points of QBL. Where it is necessary to relocate the forward end of QBL in accordance with the requirement that it not be taken as further aft than $0.12 * LWL$ aft of the forward end of LWL, the Cross indicating the forward ending of QBL shall be located in the relocated, not the original, position. If bridging of hollows requires the location of the cross marking the forward or aft ending of QBL to be moved, the cross indicating that location shall be position at the adjusted location of that ending of QBL;
- ◆ Crosses, as defined in Figure 2, shall be located on each side of the boat at the forward end of the LWL and the aft end of the LWL, at the height indicated in the Measurement Rule, to indicate the location of the measurement of FWD and AFT;
- ◆ Vertical rectangular stripes 1 inch (25 mm) long fore-and-aft and 2 inches (50 mm) in length shall be located at the sheerline on each side of the boat at each measurement station for measurement of the freeboard dimensions;
- ◆ A 90 degree triangle shall be located with the 90 degree angle pointed down such that the very bottom tip of the triangle just touches the water, and the point of maximum waterline beam (B in the measurement process) as determined by the Measurer (see Figures 3 and 4). Note that the triangle always has a *vertical* height of 2 inches (50.8 mm) *regardless of the angle that the side of the boat, in the transverse plane, makes with the water*. Thus the triangle will be of very slightly different angular dimension from one boat to another, but the same *vertical* height, so that each boat is allowed exactly 2 inches (50.8 mm) of additional depth when fully loaded, regardless of the cross-sectional shape of the boat at the point of measurement of B.

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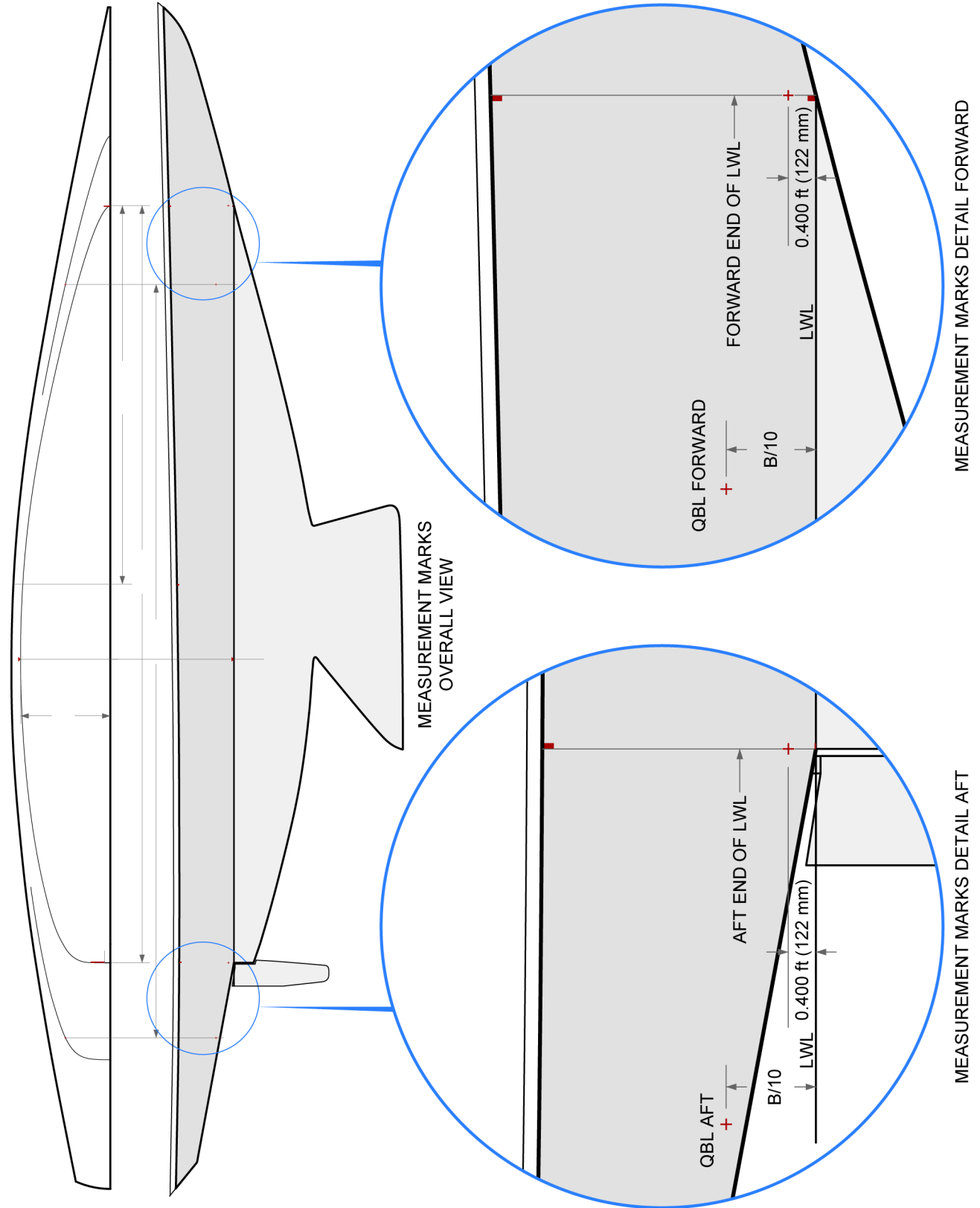


FIGURE 1. MEASUREMENT MARKS ON HULL

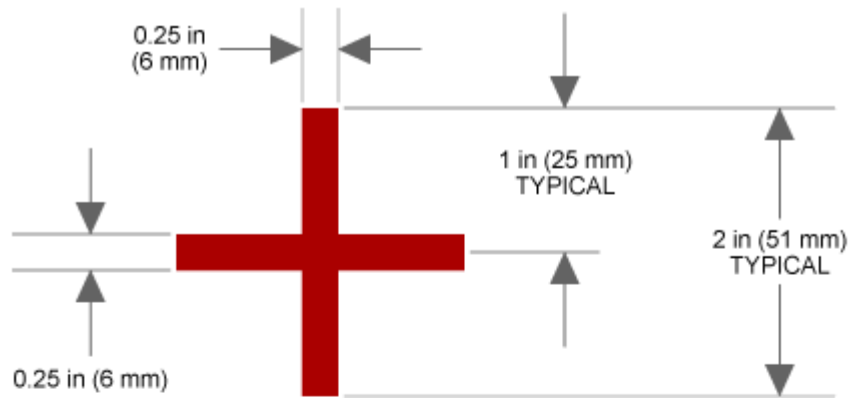


FIGURE 2. MEASUREMENT POINT CROSS

1. Use to indicate location of forward & aft ends of QBL.
2. Use to indicate location of measurement points for the FWD dimension and for the AFT dimension.

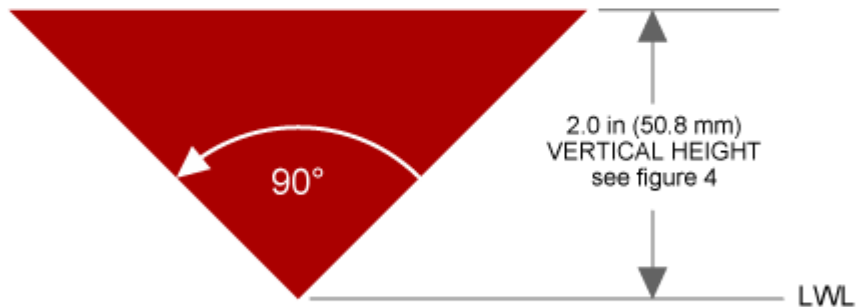


FIGURE 3. FLOTATION TRIANGLE

Use at point of maximum LWL Beam

Note: the 2 inch vertical height must be accurate as the legal loading of the boat depends on it

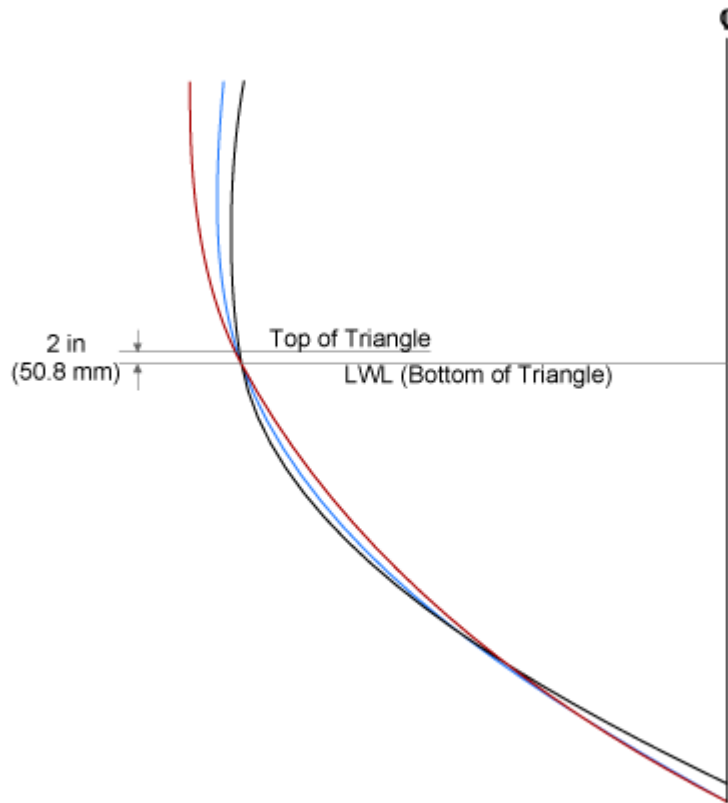


FIGURE 4. FLOTATION TRIANGLE HEIGHT

DETERMINING THE MEASUREMENTS

Determination of LWL

Determine LWL as follows, with the yacht afloat in measurement trim:

Step 1: Measure the Length Over All for the yacht as follows:

- a. Find the forward most point on the yacht, excluding rails, bulwarks, etc., and not including fittings or other items mounted on the yacht
- b. Find the aft most point on the yacht, excluding rails, bulwarks, etc.
- c. Measure the horizontal distance between the forward most point and the aft most point.
- d. Check to be sure that the LOA is at least 85.25 ft (25.984 m).
- e. If the LOA is less than the required dimension, the boat is illegal and must be modified.

Step 2: Determine the Forward Overhang as follows:

- a. Measure the horizontal distance from the forward most point on the line of flotation to the forward end of LOA.
- b. Check to be sure that the Forward Overhang is at least 14.25 ft (4.343 m).
- c. If the Forward Overhang is less than the required dimension, the boat is illegal and must be modified or re-floated in a manner which corrects the deficiency.

Step 3: Determine the Aft Overhang as follows:

- a. Determine the location of the aft most point on the line of flotation.
- b. Measure the horizontal distance from the aft most point on the LOA to the aft most point of the line of flotation.

Step 4: Calculate LWL as follows:

- a. $LWL = LOA - (FOH + AOH)$

Step 5: Verify that the maximum and minimum allowable values for LWL are complied with, that is

- a. $(1.08 * \text{Class Rating} + 5) \geq LWL \geq (1.08 * \text{Class Rating} + 3)$ for measurement in feet, or
- b. $(1.08 * \text{Class Rating} + 1.524) \geq LWL \geq (1.08 * \text{Class Rating} + 0.914)$ for measurement in metres.

Step 6: if the yacht has an LWL greater than the maximum or less than the minimum, then the yacht is illegal and must be re-floated before measurement can continue.

Angles of Stem and Counter

Determine that the stem angle and counter angles do not exceed their respective minimums by proceeding as follows with the yacht afloat and in measurement trim (see Figure 5):

Stem Angle: Using a straightedge tangent to the stem of the boat at the line of flotation, determine the angle that the stem of the yacht makes with the water at the line of flotation. Measure this angle. If this angle is less than the required minimum (12.80 degrees), note that fact in the Measurement Information Form, with the angle actually measured. Note that the stem angle to be measured is the angle of the stem to the LWL at the exact location where the stem enters the water.

Hence, while it will be necessary to project the stem angle at that point with the straight edge to measure the stem angle, care must be taken in the case of a boat with a convex stem in the vicinity of the measurement to ensure that the angle measure fairly represents the stem angle at the LWL. If the stem is concave below the LWL, care must be taken to ensure that the stem angle is measured at the LWL and is not influenced by the stem below the LWL.

Counter Angle: Using a straightedge, determine the angle that the counter of the yacht makes with the water at the line of flotation. Measure this angle. If this angle is less than the required minimum (8.10 degrees), note that fact in the Measurement Information Form along with the angle actually measured.

If the counter is concave, or contains a step, measure the counter angle from the intersection of the counter with the LWL to the point on the counter which gives the smallest angle. Record with a note on the measurement information form where that point was found to be, and enter the angle actually found in that manner on the measurement information form.

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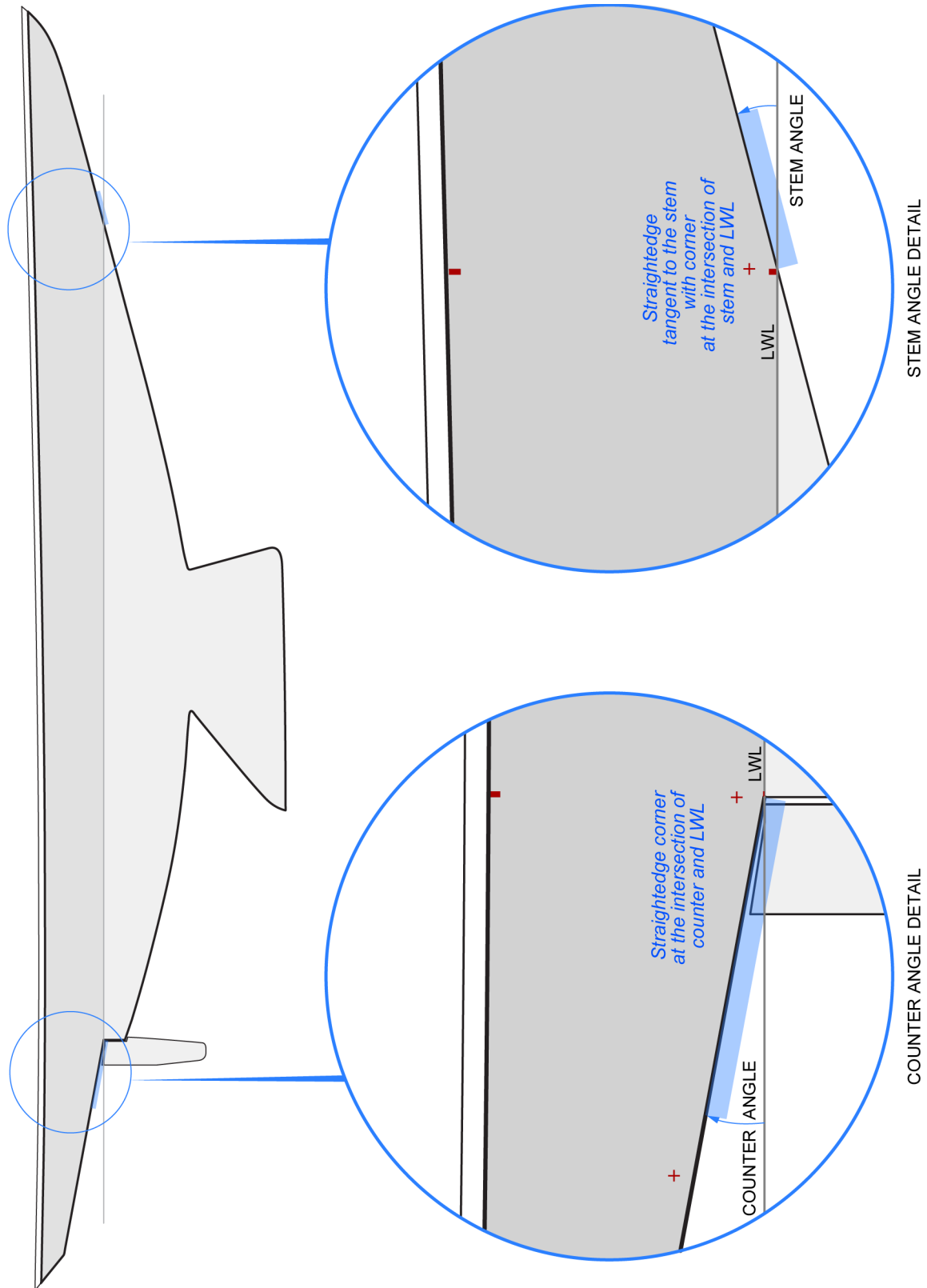


FIGURE 5. STEM AND COUNTER ANGLE MEASUREMENT

Determination of B

Determine B as follows, with the yacht afloat in measurement trim:

- Step 1: By trial and error, determine the approximate fore/aft location of BMAX.
- Step 2: Determine the amount by which BWL is less than BMAX on each side of the yacht at that fore/aft location.
- Step 3: Calculate BWL for that fore/aft location as follows:
 - a. $BWL = BMAX - [(BWL \text{ less than } BMAX \text{ port}) + (BWL \text{ less than } BMAX \text{ starboard})]$
- Step 4: Note that B may not be at the same fore/aft location as BMAX, therefore repeat Steps 1 through 3 slightly forward of, and slightly aft of BMAX until the maximum value of BWL is found. B is then the maximum value of BWL.

Tumble Home

Determine the amount of tumble home, if any, on each side of the yacht. This measurement can be done with the yacht afloat in any trim, or ashore:

Using the location of BMAX, as determined earlier in this measurement process under Determination of B, project the position of BMAX vertically upward. In the horizontal plane, project the top of the deck at the side of the yacht outward to the projected point directly above BMAX. Measure, in the horizontal plane, the distance from the top of the deck at the actual edge of the boat to the vertical project of the BMAX point of the boat. Do the same for the other side of the boat. The greater of the two measurements is the tumble home at that fore/aft location.

If it appears from inspection that another fore/aft location may have more tumble home, repeat the process at that location, using the maximum beam at that fore/aft location as the point projected vertically upward. When the maximum tumble home has been determined, record that dimension, its fore/aft location, and the dimension recorded for BMAX (not the maximum beam at the location of maximum tumble home unless that corresponds to BMAX) on the Measurement Information Form.

Determination of QBL

Determine QBL as follows, with the yacht afloat in measurement trim:

- Step 1: Calculate QB as follows:
 - a. $QB = B / 4$
- Step 2: Calculate QBH as follows:
 - a. $QBH = B / 10$
- Step 3: Using the values just calculated for QB and QBH, determine the locations of the forward and aft ends of QBL on one side of the hull, and mark them accordingly.
- Step 4: Using a long straightedge, check for hollows in the vicinity of, or anywhere forward of, the forward ending of QBL. Bridge all such hollows as appropriate in accordance with the New Universal Rule of Measurement, Class M, pages 14 and 15. Mark the corrected forward end of QBL. Check that the forward ending of QBL thus determined is not aft of a point $0.12 * LWL$ aft of the forward end of LWL. If the forward end of QBL is aft of a point $0.12 * LWL$ aft of the forward end of LWL, then move the forward end of QBL to a position $0.12 * LWL$ aft of the forward end of LWL.
- Step 5: Using the short straightedge, check for hollows in the vicinity of of the aft ending of QBL. Bridge all such hollows as appropriate in accordance with the New Universal Rule of Measurement, Class M, pages 14 and 15. Mark the corrected aft end of QBL.

- Step 6: Measure the horizontal distance between the corrected forward and corrected aft endings of QBL. The result of that measurement is QBL for that side of the boat.
- Step 7: Repeat Steps 3 through 6 for the other side of the boat, then average the two values of QBL thus obtained. That average is QBL for the purpose of rating the boat.

Determination of Forward Breadth

Determine FWD as follows, with the yacht afloat in measurement trim:

- Step 1: Determine the fore/aft location on the sheerline which is in the same transverse plane (i.e. directly above) the forward ending of LWL;
- Step 2: For each side of the yacht, determine the maximum 1/2 breadth in the transverse plane determined in Step 1;
- Step 3: For each side of the yacht, determine the location in that transverse plane of a point exactly 0.400 ft (122 mm) above the LWL;
- Step 4: For each side of the yacht, determine the amount by which the breadth at the height of 0.400 ft (122 mm) is less than maximum breadth of that side of the yacht in that transverse plane, call this dimension the Breadth Difference for that side;
- Step 5: Calculate FWD as follows:
- FWD = Total Breadth – [Breadth Difference port side + Breadth Difference starboard side].

Determination of Aft Breadth

Determine AFT as follows, with the yacht afloat in measurement trim:

- Step 1: Determine the fore/aft location on the sheerline which is in the same transverse plane (i.e. directly above) the aft ending of LWL;
- Step 2: For each side of the yacht, determine the maximum 1/2 breadth in the transverse plane determined in Step 1;
- Step 3: For each side of the yacht, determine the location in that transverse plane of a point exactly 0.400 ft (122 mm) above the LWL;
- Step 4: For each side of the yacht, determine the amount by which the breadth at the height of 0.400 ft (122 mm) is less than maximum breadth of that side of the yacht in that transverse plane. Call this dimension the Breadth Difference for that side of the yacht;
- Step 5: Calculate AFT as follows:
- AFT = Total Breadth – [Breadth Difference port side + Breadth Difference starboard side].

Determination of AFT₂

Determine AFT₂ as follows, with the yacht afloat in measurement trim:

- Step 1. Determine the fore/aft location on the sheerline which is 0.213 * LWL aft of the aft end of LWL;
- Step 2. For each side of the yacht, determine the maximum 1/2 breadth in the transverse plane determined in Step 1;
- Step 3. For each side of the yacht, determine the location in that transverse plane of a point exactly 2.417 ft (737 mm) above the LWL;

- Step 4. For each side of the yacht, determine the amount by which the breadth at the height of 2.417 ft (737 mm) is less than the maximum breadth of that side of the yacht in that transverse plane. Call this dimension the Breadth Difference for that side of the yacht;
- Step 5. Calculate AFT_2 as follows:
- $AFT_2 = \text{Total Breadth} - [\text{Breadth Difference port side} + \text{Breadth Difference starboard side}]$.

Determination of D

Determine D as follows, unless a directive has been received from the M-Class Measurement Committee directing that D is to be determined by weighing (note that the rule directs determination by weighing, but until the M-Class Measurement Committee is satisfied that suitable weighing facilities are available, the following methodology shall be used):

- Step 1: Obtain from the Designer of the yacht, or from the Owner or Owner's Representative, a written statement specifying the calculated displacement of the yacht in measurement trim, or confirming that the displacement of the yacht in measurement trim is at least the minimum specified by the New Universal Rule of Measurement: $(0.2 * LWL + 0.5)^3$ for measurement in feet, or $(0.2 * LWL + 0.152)^3$ for measurement in metres. Attach this declaration to the yacht's Measurement Information Form.
- Step 2: Record the actual displacement as D if the yacht's actual displacement is less than the rule minimum. Record the rule minimum displacement as D if the yacht's actual displacement is greater than or equal to the rule minimum.

Once it has been determined by the M-Class Measurement Committee that adequate weighing facilities are reasonably available, then carry out Step 2 immediately above, but using the results from the weighing, not the result indicated by written declaration.

Determination of F

Determine F as follows, with the yacht afloat in measurement trim:

- Step 1: Determine the sheerline configuration as follows:
- If the sides of the boat terminate at the deck, *and* there is a separate bulwark inset from the edge of the topsides, ignore the bulwark and measure the freeboard F_{port} and $F_{starboard}$ to the top of the deck at the edge of the side of the boat (if there is a radius at the intersection of the top of the deck and the side of the boat, project as best as possible the location of the intersection of the top of the deck and side as if there were there no radius);
 - If the bulwark is flush with the topsides of the boat, such that it is not self-evident where the sheerline is located, the sheerline shall be approximated as closely as possible by projection of the deck through the bulwark. In this case the height of the bulwark shall also be taken to this projection point.
- Step 2: Determine the location of the fore/aft midpoint of LWL. and place a mark at that location on the sheerline of each side of the yacht;
- Step 3: Determine F_{port} and $F_{starboard}$ by measuring the respective freeboards at each side of the yacht;
- Step 4: Calculate F as follows:
- $F = (F_{port} + F_{starboard}) / 2$
- Step 5: Determine the location of the forward ending of LWL, and place a mark at that location on the sheerline of each side of the yacht;
- Step 6: Determine $F_{portfwd}$ and $F_{stbdfwd}$ by measuring the respective freeboards at each side of the yacht at that fore/aft location;

Step 7: Calculate *F _{fwd}* as follows:

a. $F_{fwd} = (F_{portfwd} + F_{stbdfwd}) / 2$

Step 8: Determine the location of the aft ending of LWL, and place a mark at that location on the sheerline on each side of the yacht;

Step 9: Determine *F _{portaft}* and *F _{stbdaft}* by measuring the respective freeboards at each side of the yacht at that fore/aft location;

Step 10: Calculate *F _{aft}* as follows:

a. $F_{aft} = (F_{portaft} + F_{stbdaft}) / 2$

Determination of HDO

Determine HDO as follows, with the yacht ashore and level (see Figure 6):

Step 1. Mark a waterline on the yacht 5.500 ft (1.676 m) below the LWL;

Step 2. By inspection, determine the approximate fore / aft location of the deepest point on the hull;

Step 3. Referring to the Measurement Rule Figure 4a and 4b, conduct trials on several transverse sections at, just forward of, and just aft of the point of probable greatest hull depth determined in Step 2 just above;

Step 4. If the value of HDO at any of the test sections is zero or less than zero, enter zero for the HDO. The depth penalty is then zero;

Step 5. If none of the test sections has an HDO of zero or less than zero, compare the HDO obtained at each transverse section.

a. If there is at least one section forward of, and one section aft of, the section with the smallest value of HDO, and if the differences between the smallest value of HDO and the values just forward and just aft of it are small, then HDO is the smallest value of the values just obtained.

b. If HDO is the foremost, or aftermost, section checked, measure at least one more section just forward or just aft of the section at which HDO was found, so that there is at least one section forward of, and one section aft of, the minimal value of HDO. Then proceed as in 5a just above;

c. If there is a large difference between the minimal value of HDO just obtained and one or both of its adjacent values, then add additional sections between the previous sections, one forward of and one aft of, the section of minimal HDO value just obtained, until only a small difference in values obtained remains. HDO is then the smallest of the trial HDO values obtained.

Step 6. Record the fore/aft location of HDO from the forward end of LWL.

Determination of P

Determine P as follows (can be done afloat or ashore, and trim is irrelevant):

Step 1: The Measurer should satisfy himself / herself that the measurement marks are properly positioned on the mast at the top and bottom of the mainsail luff. Mainsail measurement marks are 1 inch (25 mm) stripes of a highly contrasting color painted on the spar in question such that the inner edge of the mark indicates the location to be used for determining the dimension. Mainsail measurements are taken to the trailing or upper edge of the sail track if a track is used (including to a transverse track in the case of a Burgess type "Park Avenue" boom); measurements are taken to the outer edge of a sail tunnel, that is the place on the tunnel that gives the lowest dimension. Thus the lower end of P is the top of a band which is at the height of the top of the track or top of the tunnel of the boom, projected horizontally onto the mast.

Step 2: Confirm that the height of the boom above the sheerline (as determined in this document under "Determination of F") is not less than 6.00 ft (1.828 m);

Step 3: Measure the height of P from upper band to lower band.

Determination of E

Determine E as follows (can be done afloat or ashore, and trim is irrelevant):

Step 1: The Measurer should satisfy himself / herself that the outer (boom) measurement mark is properly positioned at the outboard end of E.

Step 2: Measure the length of E from mast to black band at end of boom.

Determination of I

Determine I as follows (can be done afloat or ashore, and trim is irrelevant):

Step 1: Fasten a jib halyard to the jib tack fitting, and set up the halyard hand tight;

Step 2: Determine the bearing point of the halyard on the its sheave at the top of the halyard's hoist;

Step 3: Project the height of the halyard hoist, determined in Step 2 immediately above, onto the leading edge of the mast, by projecting the bearing point perpendicular to the trailing edge of the mast (note that this projection will rarely be horizontal). The purpose of this projection is to make the height of I independent of mast rake. If for any reason it appears to the Measurer that this instruction is not properly carrying out that objective, then he/she should take corrective measures, and note the correction on the measurement information sheet (see Figure 7);

Step 4: Determine the height of the base of I (which will be below the top of the deck if the yacht has camber in its deck). Record this height as I Below Deck (IBD);

Step 5: Measure the height from the top of the deck at the leading edge of the mast to the projection point of the top of I as determined in Step 3 immediately above;

Step 6: Calculate the correct dimension I as follows:

a. $I = (\text{height top of deck to top of I}) + \text{IBD}$.

[Text continues after illustration which follows]

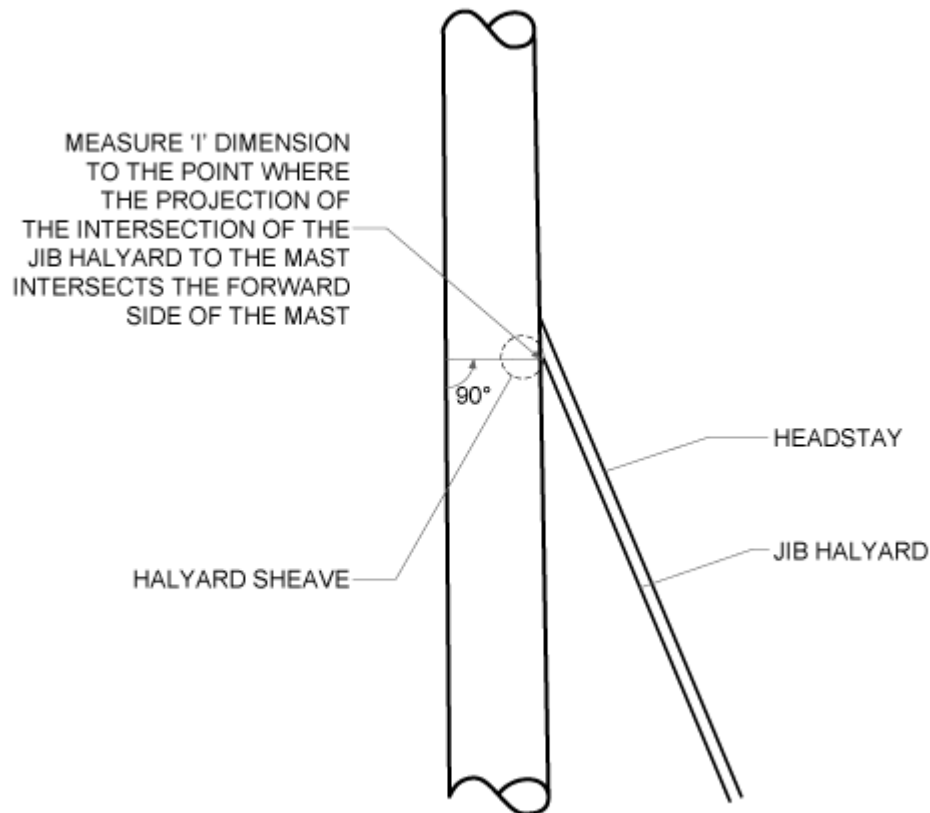


FIGURE 6. DETERMINING THE UPPER END OF THE 'I' DIMENSION

Determination of J

Determine J as follows (can be done afloat or ashore, and trim is irrelevant):

- Step 1: The Measurer should ensure that the mast is as far aft at the deck as possible. Any hydraulic ram or other device for moving the mast at the deck should be set up so that the mast at the deck is as far aft as the equipment will allow or cause.
- Step 2: Determine the forward end of J, which is the intersection point of the headstay and the top of the deck at centerline.
- Step 3: Determine J by measuring from the forward end of J, as determined in Step 2 immediately above, to the forward edge of the mast at the top of the deck at centerline (note this is not the same point as the base of the I dimension on yachts which have camber in their deck).

Determination of Draft

Determine Draft as follows, with the yacht out of water, and level in the transverse and fore/aft planes:

- Step 1: Ensure that all rudders and trim tabs are centered, and that any centerboard or daggerboard is fully retracted such that no part extends below the otherwise lowest point on the boat.

- Step 2: By trial and error, determine the deepest point (i.e. the point with the maximum distance below the LWL, perpendicular to the LWL), whether that point is on the hull, on a fixed appendage, or on a rudder. Note that the deepest point may not lie on the centerline of the yacht. Particular attention should be paid to testing along the length of the keel, at the after part of the rudder (if mounted on the keel) or trim tab, and on the underside of any winglets, especially if the winglets have a positive dihedral angle (slope downward toward the tips).
- Step 3: Determine Draft by measuring the vertical height from the lowest point on the yacht as determined in Step 2 immediately above to the LWL.

ADDITIONAL CHECKS TO BE MADE

While not directly contained in the rating formula, the following additional checks should be performed, with measurements where applicable, during the measurement process, and should be recorded on the Measurement Information Form.

Centerboard or Daggerboard Depth and Area:

Unless otherwise specified by the M-Class Measurement Committee, the area and depth of the centerboard or daggerboard, if any, shall be taken from a written information furnished by the Designer, Builder, Owner or Owner's Representative. The statement shall be attached to the Measurement Information Form.

Spinnaker Pole Length

Determine the length of the spinnaker pole by measuring from the inboard most point on the pole or on the attachment device for the pole on the forward side of the mast (whichever gives the greater dimension) to the outboard-most bearing point of an afterguy in the outboard end of the spinnaker pole.

Maximum Height of Sail Plan

Determine the maximum height of the sail plan by measuring the height of the band marking the upper limit of P above the sheerline opposite the mast.

Maximum Width and Depth of Boom

Determine the maximum height and depth of the boom as follows:

- a. Maximum width of boom is the largest transverse dimension which can be found on the boom, excluding fittings, tracks, etc., at any position along the length of the boom.
- b. Maximum depth of boom is the largest vertical dimension which can be found on the boom, excluding tracks, fittings, etc., at any position along the length of the boom.

Maximum Span of Winglets

Determine the maximum transverse dimension of winglets, if any, as follows, with the yacht ashore in level trim in the transverse plane:

Measure the transverse distance from the furthest point on the winglet from the fore/aft centerline of the boat on one side to the corresponding point on the opposite side. The result is the maximum winglet span.

Maximum Thickness Ratio of Winglets

Determine the maximum thickness ratio of the winglets as follows, with the boat ashore, trim of the boat is irrelevant:

By inspection, select several places on each winglet which appear that they may have the highest thickness with respect to the chord length at that transverse location;

For each location chosen, determine by gage the maximum thickness of the winglet along that chord;

For each location for which a maximum thickness was determined, measure the chord length of the winglet at that transverse location.

Determine the thickness ratio for each location as follows:

- a. Thickness Ratio = Maximum thickness at that chord / length of the chord at that transverse location.
- b. Record the highest thickness ratio found by this process on the Measurement Information Form

Determination of Propeller and Propeller Shaft Dimensions

Determine the dimensions indicated in Appendix 2 of the New Universal Rule of Measurement, Class M, by the customary methods for these measurements which are identical to those used in International Racing.

Testing Keel for Bulbs or Excessive Hollows

With the yacht ashore, the Measurer should check the keel for bulbs or excessive hollows per Rule Section 3.1.4.3, and Supplement 13.

Verification of Height of Bulwark

With the yacht ashore or afloat, the Measurer should make several checks along the length of the yacht to be certain that the bulwark is of at least the required height. The Measurer should count drain holes and make certain that there is not an excessive number.

MEASUREMENT INFORMATION FORM BEGINS ON NEXT PAGE

MEASUREMENT INFORMATION FORM

CLASS M

Yacht Name: _____

Owner's Name: _____

Designer's Name: _____

Designer's Address: _____

Builder's Name: _____

Builder's Address: _____

Measurer's Name: _____

Measurer's Address: _____

Measurement Units: _____

Location of Measurement Afloat: _____

Date of Measurement Afloat: _____

Location of Measurement Ashore : _____

Date of Measurement Ashore: _____

PARAMETER	DIMENSION	DESCRIPTION
LOA		Length Overall
FOH		Forward Overhang
AOH		Aft Overhang
LWL		Measurement Waterline Length
Stem Angle		Angle of Stem to Line of Flotation
Counter Angle		Angle of Counter to Line of Flotation
BMAX		Maximum Beam of the Yacht
BMAX Location		Fore/Aft Location of BMAX from forward end of LWL
BWL		Waterline Beam at its widest point
B		B in the rating formula = BWL
Tumble Home		Maximum Tumble Home of the Yacht
QB		Breadth of QBL measurement = B/4
QBH		Height of QBL measurement = B/10
QBL		Quarter Beam Length
FWD		Forward Breadth
AFT		Aft Breadth
AFT ₂		Aft Breadth 2
Disp		Actual displacement, by weighing or declaration
D		Rated Displacement calculated per Measurement Rule

F		Midship Freeboard
Ffwd		Forward Freeboard
Faft		Aft Freeboard
HDO		Hull Depth Offset
HDO Location		Fore/Aft Location of HDO from forward end of LWL
Draft		Maximum Draft excluding Daggerboards & Centerboards
P		Mainsail Luff Length
E		Mainsail Foot Length
I		Rated Height of Fore Triangle
J		Rated Base of Fore Triangle
Append Depth		Centerboard or Daggerboard maximum depth
Append Area		Centerboard or Daggerboard maximum area
Spin Pole Length		Spinnaker Pole Length
Sail Plan Max Ht		Maximum height of sail plan above sheerline at aft edge of Mast
Boom Max Wd		Maximum Width of Boom
Boom Max Depth		Maximum Depth of Boom
Max Wing Span		Maximum Span of Winglets from one side to the other
Max Wing t/c		Maximum Thickness Ratio for Winglets
ST1		Propeller / Shaft / Hub / Strut Dimension per Rule Appendix 2
ST2		Propeller / Shaft / Hub / Strut Dimension per Rule Appendix 2
ST3		Propeller / Shaft / Hub / Strut Dimension per Rule Appendix 2
ST4		Propeller / Shaft / Hub / Strut Dimension per Rule Appendix 2
ST5		Propeller / Shaft / Hub / Strut Dimension per Rule Appendix 2
PRD		Propeller Diameter per Rule Appendix 2
PHD		Propeller Hub Diameter per Rule Appendix 2
PHL		Propeller Hub Length per Rule Appendix 2
PSD		Propeller Shaft Diameter per Rule Appendix 2
PSA		Propeller Shaft Angle per Rule Appendix 2
ESL		Exposed Shaft Length per Rule Appendix 2

Signature of Measurer

Signature of Owner or Owner's Representative

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