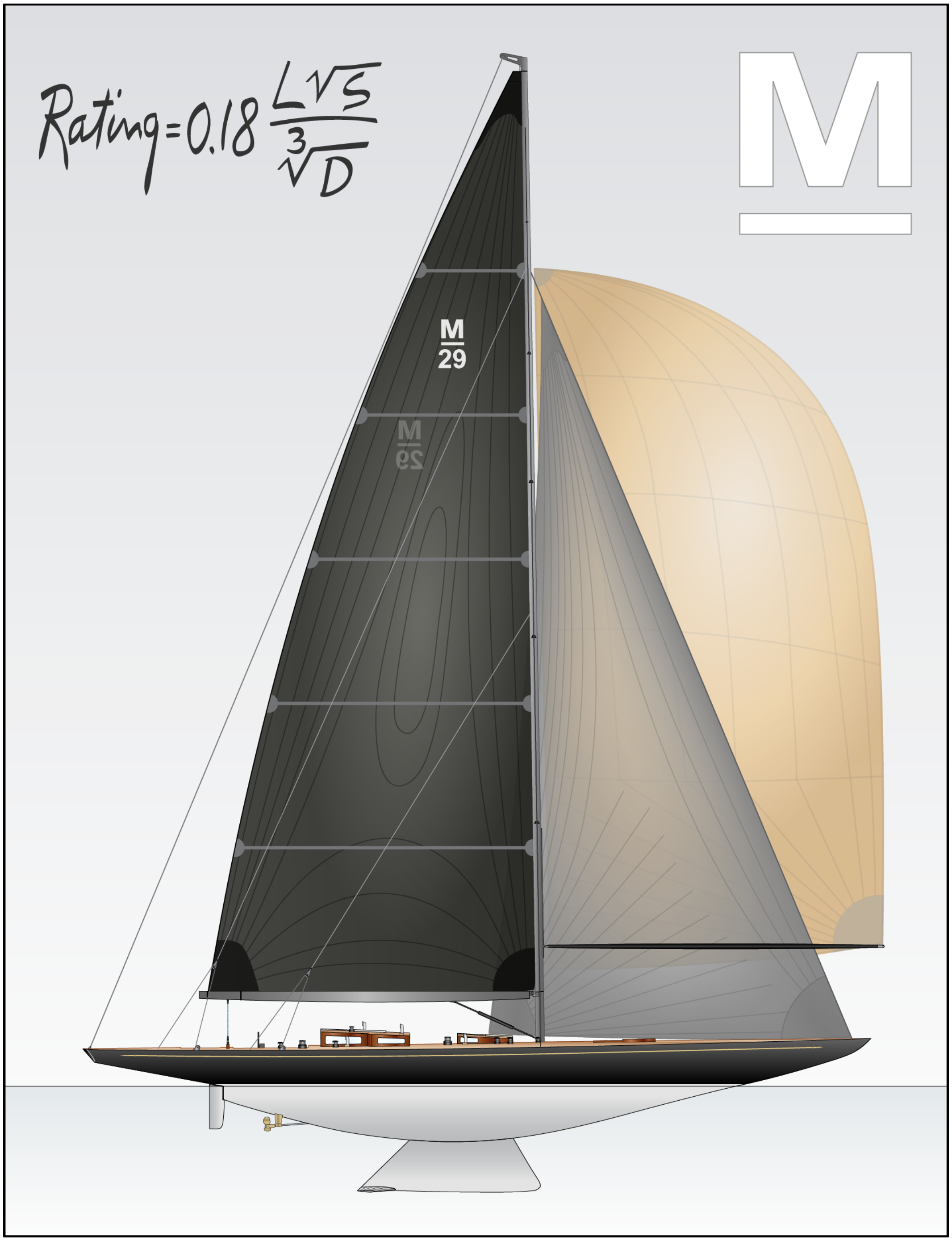
NEW UNIVERSAL RULE OF MEASUREMENT
CLASS M

SUPPLEMENTS TO THE MEASUREMENT RULE



VERSION 2.0.0

contact: info@universalrule.com

March 2017

SUPPLEMENTS to the MEASUREMENT RULE

USING THESE INTERPRETATIONS & CLARIFICATIONS

These Supplements to the New Universal Rule of Measurement for Class M are not part of the measurement rule itself, but rather clarify the rule, interpret parts of the rule that may be difficult to understand, and indicate the way in which the rule is to be interpreted or the methods by which it is to be applied. As such they have the same force and effect as if they were in fact part of the rule, but in some cases they will provide guidance which must be closely adhered to, but which does not set an absolute, exact limit.

Changes in Version 2.0.0

- Addition of guidance on maximum breadth of sterns
- Paragraph just above on use of the Supplements to the Measurement Rule re-worded to eliminate any ambiguity about whether the Supplements cover areas not covered by the Measurement Rule.

SUPPLEMENT 1

Hollows in the Stem of the Boat At or Below the LWL

The Universal Rule of Measurement used to read:

> "Any local concave jog or notch (curved or angular) at the plane of measurement of either end of the load waterline length, shall be bridged by a straight line and the L.W.L. shall be taken to the intersection of such lines with the established load waterline plane. The stem or stern profile lines where they cross the load waterline plane, may be **fair and easy curves**; but any concavity in the stem line shall be bridged by a straight line equal to one-third (1/3) of the greatest load waterline beam, placed equally above and below the waterline plane. The load waterline (L.W.L.) shall be measured to the intersection of this line with the established load waterline plane." -- Universal Rule of Measurement, 1927
>
> [emphasis added]

The clear implication of this statement is that the stem may be concave (although in the New Universal Rule for Class M, hollows in the profile are prohibited above the LWL in measurement trim). However, hollows close to the LWL were to be bridged.

The New Universal Rule for Class M also calls for the bridging, but in the new rule, the bridge is a function of LWL, not beam, since it seems to make more sense to bridge a length measurement with something that is a function of length. The length of the bridging straightedge has also been somewhat reduced. This should all be clear from the wording of the new rule, and from the discussion in Appendix 1 of the new rule dealing with legality of various design traits or characteristics.

In the section quoted above, it seems clear that "notches or jogs" are uniformly to be bridged. However, "fair and easy curves" are permitted and are to be bridged only over the defined length. The fact that, however the meaning of this paragraph may have been understood, it clearly differentiates between a sharp "jog" and a "fair and easy curve" strongly suggests that the "notches and jogs" are discouraged, whereas "fair and easy curves" are acceptable unless they are located such that they influence the measurement of LWL, in which case they are not discouraged per se, but are bridged over a limited length.

Following on that, the New Universal Rule for Class M accepts a "fair and easy curve" but does not accept "notches or jogs" at the forward end of LWL and immediately aft thereof.

A "fair and easy curve" is – for the moment – not directly defined, but rather is taken to be a curve of a relatively large radius, such that it is clearly not a "notch" or a "jog", but rather a curve. We avoid completely the use of the word "fair" in order avoid arguments over what one designer or measurer might consider a fair curve and another might not. Instead we accept any gradual curve, with a minimum radius clearly far larger than that of a "notch" or a "jog", as satisfying this requirement. As a guideline, but not a specific go or no-go definition, we accept a curve with a minimum radius of 0.95 * Class Rating or larger as satisfying all requirements of this section, provided that none of the hollow extends above the LWL in measurement trim, *and provided that from the LWL to a point 3.00 feet (914 mm) below the LWL, the minimum radius as just defined in this paragraph may be located such that it contacts the stem anywhere in that region, without the stem having a smaller radius at that location*.

-- David J. Fladlien

SUPPLEMENT 2

Engine & Gear Box Combinations Evaluated for Rule Minimum PIPA Value

Having decided that the boats should have good interior arrangements, it followed clearly that they would also need power for operation of appliances, and engines and propellers for maneuvering and motoring, as lack of these abilities would render the interiors useless for any practical purpose.

For the engine and propeller, the problem was how to limit what could be used so as to avoid one boat being advantaged or disadvantaged by its engine selection or its propeller or propeller mounting. The Universal Rule has always been a rule which was concerned with the major rating parameters such as length, displacement and sail area, not with very small elements such has propeller strut width or hub length. We wanted to continue that tradition. With that in mind, we avoided including the engine and propeller in the boat's rating. To do that, though, we needed a way to keep the drag of propellers and mountings, and the influence of the engine weight on stability and sea-keeping, reasonably under control.

To work all of this out, we retained again the services of our Primary Consultant for this project, John Robinson. We each proposed some requirements, then we put the best elements together to arrive at the final set of requirements.

Dealing with the engine first, we put in the requirement that the engine/propeller combination drive the boat at an appropriate speed. At John's suggestion, we settled on 9 knots, which in effect specifies an engine size. I had a strong desire to keep the engine out of the owner's cabin, which encouraged – without absolutely requiring – that the engine be more or less in the middle of the boat. The requirement to avoid the owner's cabin was also adopted.

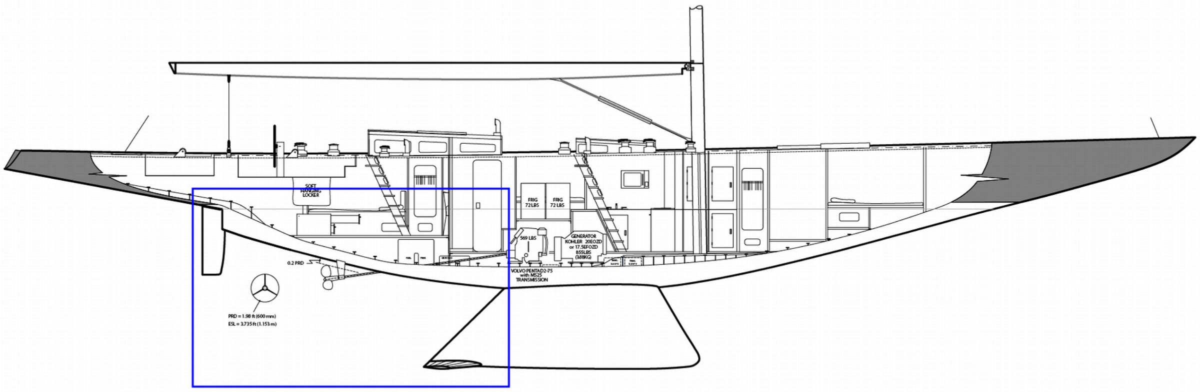
Propeller mountings were a different matter. John worked out a set of power requirements and proposed a 3 blade propeller to reduce noise and vibration. He provided a couple of engines as examples, and also a preliminary set of PIPA parameter values for a typical propeller mounting. I chose another engine as well, and I then worked out propeller mountings for each of those three engines, from which I determined the value of PIPA for each of those mountings. I then set the minimum PIPA as the lowest value that both hulls met. As I used a hull-to-propeller blade gap of at least 20% of PRD for each mounting, whereas good practice requires only 10% to 15%, it should not be hard to get a mounting down to this PIPA value by adjusting the PIPA factors during design.

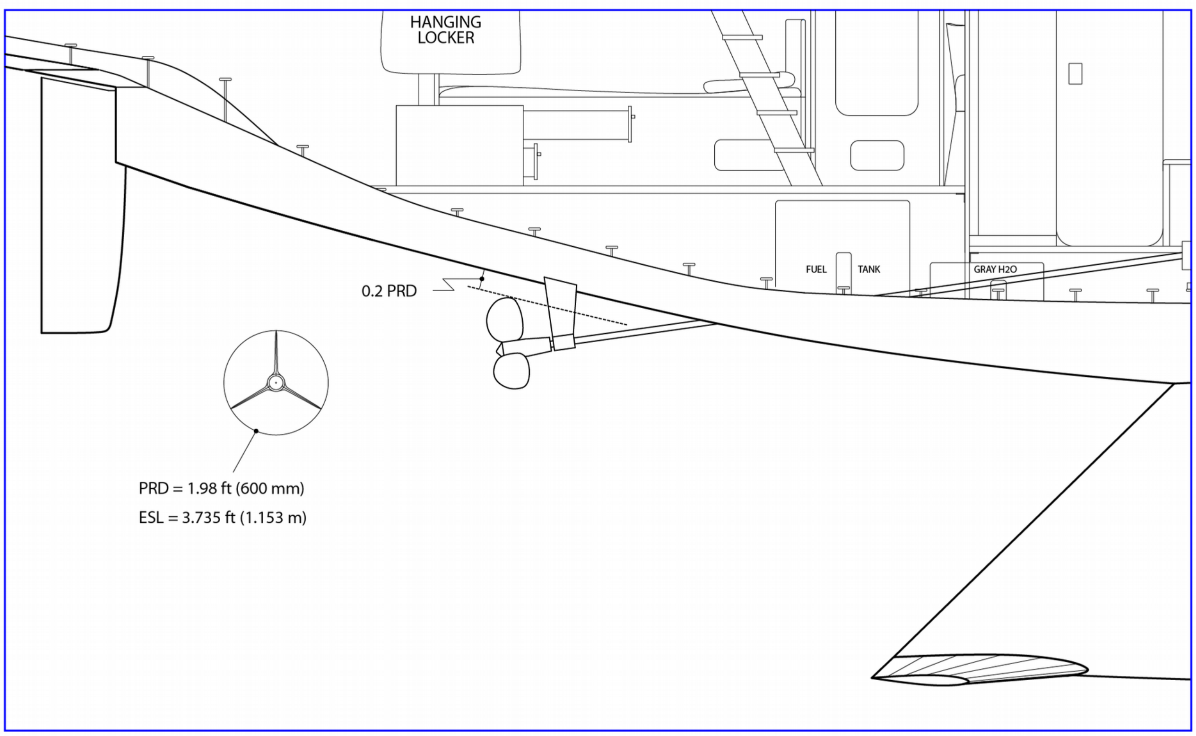
While PIPA is very sensitive, the actual effect of the various mountings on VMG varies little from one to another. The following pages contain the PIPA data for each engine and propeller mounting which we used, and two of the arrangement plans showing two fairly different mountings. We compared these mountings for the “demo” boat, my hull 66F2 (“Hull A”). and also for the fastest of my hulls at the time of this writing, referred to as “Hull B”. Comparative performance data shows the relative performance of Hull A with each mounting. The performance difference from one mounting to another is very small. Similarly, the performance data for Hull B shows how small the difference in boat performance is from one mounting to another on that hull. The six pages following the two arrangement plans give the PIPA parameter values for each mounting for each boat. These are followed by the VPP data for each hull, with all the different mountings represented.

These all presume a 3-blade feathering propeller, which is also included as a requirement.

Based on this work, from which we have demonstrated that a reasonable range of propeller mountings can be used with only trivial effect on performance in most wind ranges, we have settled on the requirements on Page 27 of the New Universal Rule of Measurement, and have not included engine and propeller in the rating itself.

-- David J. Fladlien





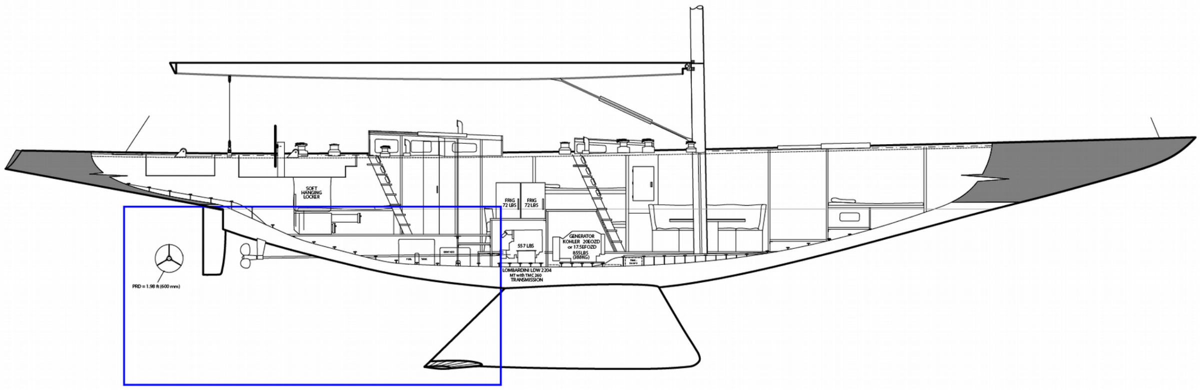
DO NOT SCALE

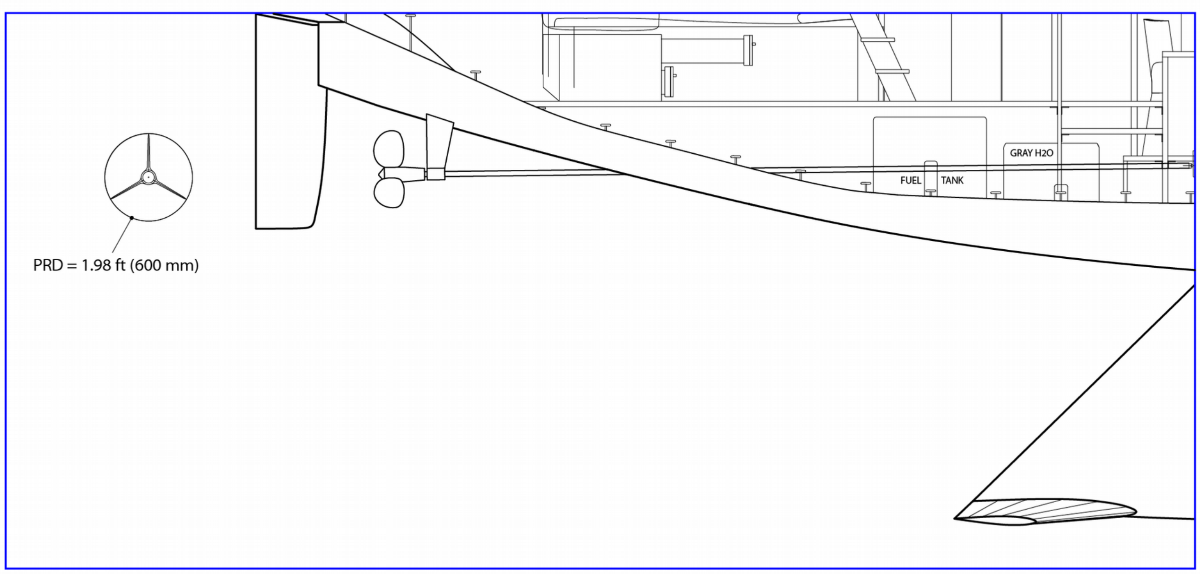
PROPELLER DETAIL B1

HULL 66F2 SCALE: 1"=1'0"
DRAWING No. 405 JULY 16, 2012

DAVID J. FLADLIEN
YACHT DESIGNER

M F





DO NOT SCALE

PROPELLER DETAIL F1

HULL 66F2 SCALE: 1"=1'0"
DRAWING No. 406 JULY 18, 2012

DAVID J. FLADLIEN
YACHT DESIGNER

M F

A1

Hull "A" Per Dwg 354 Rev 15Yanmar 4J H4-TE with KM4A -2 Gear Box

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	21.28	21.28
Propeller Shaft Length	ESL	3.837	1.170
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.394	0.120
Max Strut Width	ST3	0.481	0.147
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.997	0.304
Propeller Shaft Diameter	PSD	0.112	0.034
Propeller Hub Length	PHL	0.694	0.212
Base Propeller Shaft Angle		7.000	7.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.328	0.100
Propeller Hub Length	PHL	0.694	0.212
PIPA per WinDesign v4			0.0118372

A2

Hull "B" Dwg 403 -15d Yanmar 4J H4-TE with KM4A -2 Gear Box

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	22.75	22.75
Propeller Shaft Length	ESL	3.430	1.045
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.481	0.147
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.935	0.285
Propeller Shaft Diameter	PSD	0.112	0.034
Propeller Hub Length	PHL	0.706	0.215
Base Propeller Shaft Angle		7.000	7.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.706	0.215
PIPA per WinDesign v4			0.0120172

B1

Hull "A" Per Dwg 354 Rev 13Volvo Penta D2-75 with MS25 Transmission

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	21.62	21.62
Propeller Shaft Length	ESL	3.735	1.138
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.985	0.300
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.699	0.213
Base Propeller Shaft Angle		8.000	8.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.328	0.100
Propeller Hub Length	PHL	0.699	0.213
PIPA per WinDesign v4			0.0119557

B2

Hull "B" Dwg 403 -13e Volvo Penta D2-75 with MS25 Transmission

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	22.98	22.98
Propeller Shaft Length	ESL	3.444	1.050
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.963	0.294
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.683	0.208
Base Propeller Shaft Angle		8.000	8.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.683	0.208
PIPA per WinDesign v4			0.0121598

C1

Hull "A" Per Dwg 354 Rev 13Lombardini LDW 2204 MT with TM 345 A Transmission

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	21.62	21.62
Propeller Shaft Length	ESL	3.735	1.138
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.985	0.300
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.699	0.213
Base Propeller Shaft Angle		8.000	8.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.328	0.100
Propeller Hub Length	PHL	0.699	0.213
PIPA per WinDesign v4			0.0119557

C2

Hull "B" Dwg 403 -13eL Lombardini LDW 2204 MT with TM 345 A Transmission

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	22.98	22.98
Propeller Shaft Length	ESL	3.444	1.050
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.963	0.294
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.683	0.208
Base Propeller Shaft Angle		8.000	8.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.683	0.208
PIPA per WinDesign v4			0.0121598

D1

Hull "A" Per Dwg 354 Rev 13Lombardini LDW 2204 MT with TM 260 Transmission

at ~4 Degree Angle

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		22%	22%
Propeller Shaft Angle	PSA	19.42	19.42
Propeller Shaft Length	ESL	4.413	1.345
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	1.060	0.323
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.692	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.692	0.211
PIPA per WinDesign v4			0.0117419

D2

Hull "B" Dwg 403 -13eL AnglLombardini LDW 2204 MT with TMC 260 Transmission

at ~4 Degree Angle

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		20%	20%
Propeller Shaft Angle	PSA	20.63	20.63
Propeller Shaft Length	ESL	3.871	1.180
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.493	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	0.990	0.302
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.692	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.692	0.211
PIPA per WinDesign v4			0.0117

E1

Hull "A" Per Dwg 354 Rev 13e Lombardini LDW 2204 MT with TMC 260 Transmission

Engine Mounted at ~4 Degree Angle

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		24%	24%
Propeller Shaft Angle	PSA	19.42	19.42
Propeller Shaft Length	ESL	4.501	1.372
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	1.100	0.335
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.691	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.328	0.100
Propeller Hub Length	PHL	0.691	0.211
PIPA per WinDesign v4			0.0118235

E2

Hull "B" Dwg 403 -13eL Angle Lombardini LDW 2204 MT with TMC 260 Transmission

Engine Mounted at ~4 Degree Angle

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		28%	28%
Propeller Shaft Angle	PSA	20.5	20.5
Propeller Shaft Length	ESL	4.267	1.301
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	1.139	0.347
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.693	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.693	0.211
PIPA per WinDesign v4			0.012038

F1

Hull "A" Per Dwg 354 Rev 13e **Lombardini LDW 2204 MT with TMC 260 Transmission**

Engine Mounted at ~0.6 Degree Angle

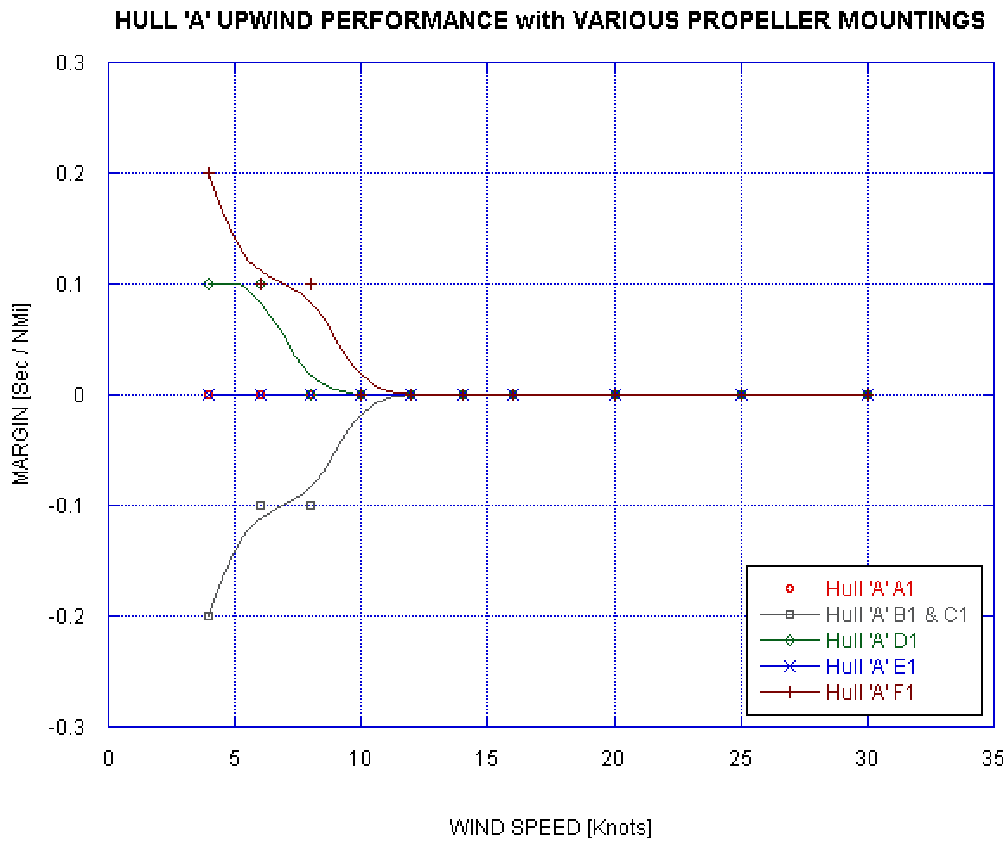
Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		22%	22%
Propeller Shaft Angle	PSA	17.96	17.96
Propeller Shaft Length	ESL	5.024	1.531
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	1.093	0.333
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.691	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.328	0.100
Propeller Hub Length	PHL	0.691	0.211
PIPA per WinDesign v4			0.0117133

F2

Hull "B" Dwg 403 -13eL Angle 2 **Lombardini LDW 2204 MT with TMC 260 Transmission**

Engine Mounted at ~1.0 Degree Angle

Item	Symbol	English	Metric
Hull : Prop Gap % of PRD		29%	29%
Propeller Shaft Angle	PSA	17.99	17.99
Propeller Shaft Length	ESL	5.018	1.529
Min Strut Thickness	ST1	0.082	0.025
Min Strut Width	ST2	0.395	0.120
Max Strut Width	ST3	0.492	0.150
Strut Hub Diameter	ST4	0.260	0.079
Strut Length	ST5	1.224	0.373
Propeller Shaft Diameter	PSD	0.114	0.035
Propeller Hub Length	PHL	0.693	0.211
Base Propeller Shaft Angle		0.000	0.000
Propeller Diameter	PRD	1.970	0.600
Blade Width	PBW	0.672	0.205
Propeller Hub Diameter	PHD	0.327	0.100
Propeller Hub Length	PHL	0.693	0.211
PIPA per WinDesign v4			0.117487



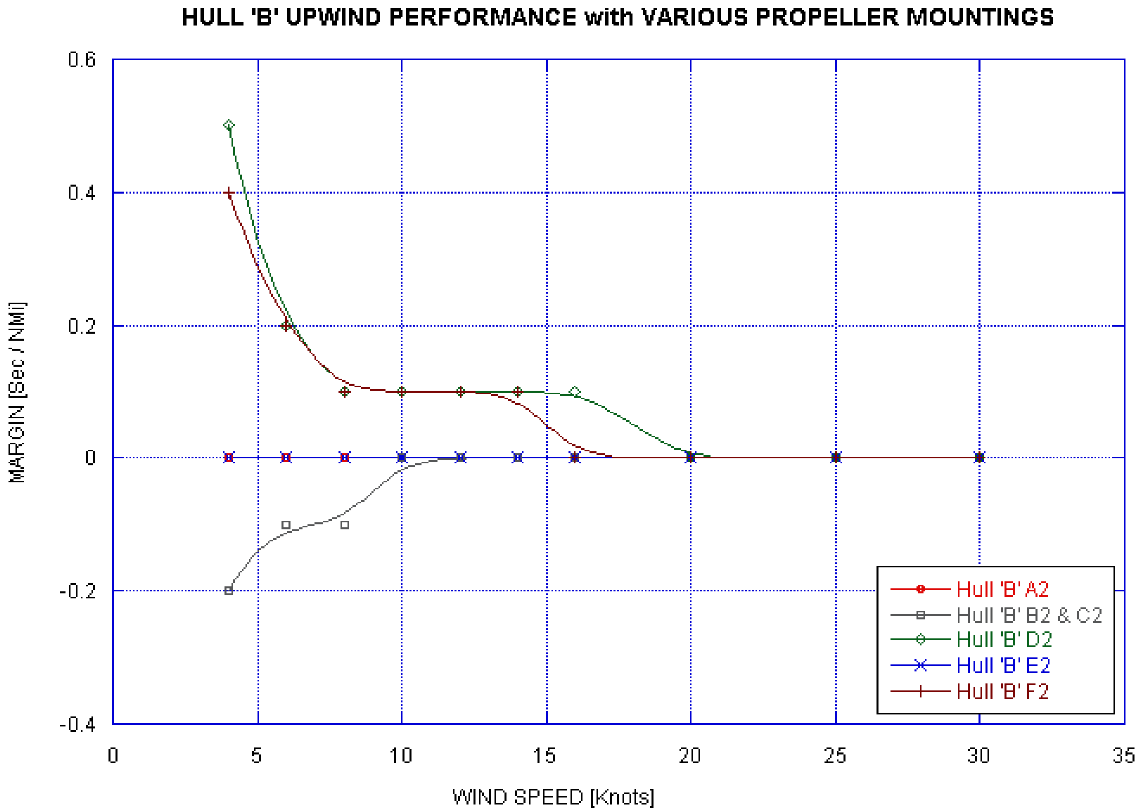
Above is the output of WinDesign v.4 for each of the propeller mountings evaluated, as used on Hull 'A', which is Hull 66F2, our “demo” boat.

Please note that the margins on the left-hand column are in tenths of a second per mile, not seconds per mile.

Since 1.0 seconds per mile is very roughly 1 boat length per weather leg (actually less in very light wind as it takes a given boat longer to go a given distance), the difference between the “best” and the “worst” propeller mounting evaluated on this hull was 0.4 seconds / mile, or considerably less than ½ boat length per weather leg. For most practical purposes, the difference is negligible.

If one were to modify those poorer mountings to lower the PIPA to an value closer to the rule minimum 0.0117 value, the performance difference between the various mountings would be even less.

In short, on this hull the use of a minimum PIPA value, as opposed to incorporating that PIPA value into the rule, is definitely satisfactory, even where mounting differences are considerable.



Above is the output of WinDesign v.4 for each of the propeller mountings evaluated, as used on Hull 'B', which is a much faster hull than Hull 'A' and is, therefore, not surprisingly a bit different from Hull 'A'.

Again noting that the margins in the left side of the graph are tenths of second per mile, it is clear comparing with the graph on the previous page that Hull 'B' is twice as susceptible to performance changes due to propeller mounting as is Hull 'A'.

However, again allowing for the fact that the high value differences in performance occur only in the lightest of wind, the difference between the “best” and the “worst” propeller mountings on this boat are still only about ½ boat length over a windward leg. By working those mountings down to a lower PIPA, that difference could probably be reduced somewhat. So again it seems valid to use the minimum PIPA value rather than including PIPA in the boat's rating.

Most racing is in 8 to 25 knots of wind, at least for this kind of boat, and there the largest difference is about 0.2 sec / mile, or about two tenths of one boat length per weather leg.

-- David J. Fladlien

SUPPLEMENT 3

Clarification of Hollows Rule for Keels Where NACA 6-Digit or Similar Foils Are Used

Version 8.2.1 of the New Universal Rule specifies as follows:

> "Below a plane parallel to the line of flotation, 6 in (152.4 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."

The purpose of this section is to prevent the creation of any bulbs or fin-and-bulb keel configuration, and to require that, while a keel may be of the inverted type (taper ratio > 1.0), there may not be any bulbs at the bottom of, or elsewhere along, a keel. This in effect draws a line at saying that boats can have a keel configuration that is a development of the 1983 12-Metre keel originated by Ben Lexcen, but may not go "beyond" that into bulbs to further lower the vertical center of gravity (VCG), or to permit a far smaller keel than is needed to house the ballast at an acceptable VCG.

While the rule's first sentence (above) actually says "...no hollows", the sentence following it clarifies that this means no hollows in a transverse (that is, athwartship) plane, or in the keel profile.

A question could arise in the use of the NACA 63-, 64-, 65-, or similar sections, which have a hollow in the trailing portion of their form. These would be longitudinal sections, not transverse sections, and would therefore avoid the prohibition in the rule which applies to transverse sections or profile, but which could conceivably create a hollow in a transverse section when combined with some form or other of keel profile, which would be legal in itself if the longitudinal section used were a 63A, 64A, 65A, or some similar section which does not have a hollow in the trailing portion.

It is not the intent of the rule to prevent the use of the "non-suffix-A" sections, or similar sections with hollows in the trailing 30% of the profile. Therefore, the use of the "non-suffix-A" section would be legal, notwithstanding the creation of a transverse section hollow, *providing that the hollow in the transverse section results immediately and solely from the hollow in the form of the longitudinal section*. In all cases, it will be the obligation of the designer or keel designer of the boat to demonstrate that the hollow in transverse section results immediately and solely from the permitted longitudinal section hollow. In practice this is probably best done by providing precise drawings of the same keel with the "A" section used instead, and demonstrating by projecting a number of transverse sections that there is no hollow in any transverse section when the "A" form of the longitudinal section is used.

-- David J. Fladlien

SUPPLEMENT 4

Thin Flow-Directing Plates

The New Universal Rule of Measurements specifies that there can be only 1 set of winglets on a keel. This could raise a question about small, thin flow directing plates, such as were used on the 12-Metre *Intrepid* in 1967. The very fact that they were used on a pre-1983 keel is itself a suggestion that it would be legal to use them today, but it is not clear if they would count as winglets.

For the purpose of this interpretation, a flow-directing plate will be considered to be a plate which appears on both sides of a keel or rudder, and which has an area *per side* of not more than 1 ft^2 (0.093 m^2), and which has a maximum thickness not exceeding 0.5 in (12.5 mm), and is made of a material not heavier than aluminum.

Flow directing plates may be placed anywhere on a keel or rudder. In case of doubt as to whether the location is in fact on a keel or rudder, a location below a point 5.900 ft (1.798 m) below the line of flotation in measurement trim shall be considered to be on a keel; a location such that all of the flow-directing plate is aft of the aft end of the LWL shall be considered to be on a rudder. For a location to be deemed below or aft of a certain point, all of the flow-directing plate must lie below or aft of that point.

A flow-directing plate which complies with the above restrictions may have any shape, but must be fixed in orientation (that is, it must not move or rotate, nor may it be allowed to move or rotate).

Flow-directing plates are not permitted on hulls, or on appendages other than rudders, trim tabs or keels, as defined in the New Universal Rule of Measurement.

NOTE: a flow-directing plate is not a turbulence stimulator for purpose of this interpretation.

-- Dave Fladlien

SUPPLEMENT 5

Legality of Hollows in Waterlines, Diagonals and Buttocks

There are several sections of the New Universal Rule of Measurement which deal directly with hollows other than those in the above-water profile and above-water deck planform of the hull, and other than those in the keel. In other words, these sections deal with hollows in the surface of the hull but which do not create hollows in the edges of the surface such as the sheerline planform or the above-water stem or counter profile of the boat.

A question could arise about these hollows since some of them seem to appear in boats built prior to 1960 and others do not, and in many cases it is not clear, or at least not readily clear, whether they did in fact occur historically in the time period with which we are concerned in Rule Appendix 1, which considers how to determine the legality of proposed hull shapes.

The guiding principle here is whether the traditional overall appearance and sailing characteristics of the boat is significantly compromised by the proposed shape, but as that requires some kind of formal determination, most likely by the Measurement Committee, to provide any reasonable level of confidence, the following guidance is offered with the view that, while it is – as part of the Supplement, not the Rule – not a formal rule element, this section of the Supplement is meant to be relied upon by the designer in determination the legality of shapes which include hollows in waterlines, diagonals and buttocks, *in cases where they do not create hollows in the above-water profile or sheerline planform of the boat, and where they do not extend into the keel*.

As a general statement, hollows are permitted in waterlines, diagonals and buttocks, even if those hollows are severe or sharp, and regardless of their location. However it should be noted that they are often subject to bridging, as specified in the Rule, and that the forward end of QBL may not under any conditions be taken as further aft than 0.12 x LWL aft of the forward end of LWL.

In terms of historical precedent, the famous R-boat *Lady Van,* designed by Charles E. Nicholson, demonstrates deep hollows in the forward diagonals, for example, and – while they are not nearly as severe as more “modern” hollows, there do seem to be hollows in the after diagonals of historical boats as well. Thus, while this Supplement indicates that even severe hollows are to be permitted if they meet the requirements of the above paragraphs, this Supplement is not in most ways grossly out of keeping with the tradition of the Universal Rule, as later shapes developed under the International Rule indicate. Those later shapes, while not covered by the historical sections of Appendix 1 of the New Universal Rule, do strongly suggest that it was only because the concepts had not yet been envisioned that they were not used in the relevant historical period.

Finally, as seen in the later International Rule boat development, such as the 12-Metre *Courageous* in its original form, even sharp notches in diagonals did not alter the inherent appearance or performance characteristics of the boat.

-- Dave Fladlien

SUPPLEMENT 6

Spade Rudders Located in the Wake of Skegs

A question arose about the application of the rule concerning definition of a skeg when there is a rudder immediately aft of the skeg, which complies with all the rules about a rudder at the aft end of the LWL, but which, because the skeg is small, is constructed as a spade rudder, and is therefore not actually attached to or supported by the skeg.

A literal reading of the rule would render such a rudder illegal, and would require that the designer arrange a minimal attachment of the rudder to the skeg, simply for compliance with the rule, even though such attachment is in no way related to the strength of the rudder or to the proper attachment of the rudder, and in fact might even be detrimental.

The need for such artificial attachment is not the intent of the relevant sections of the measurement rule, which were instead intended to prevent lack of clarity and thereby cause argument about how rudders at or aft of the aft end of the LWL are being used to increase the sailing length of the boat. The ability of a skeg, or a rudder trailing in the wake of a skeg, to add length to the boat is subject of the requirement that a rudder must be attached to a skeg in order for a skeg to be considered a skeg.

Where the only purpose of attachment of the rudder to the skeg would be to render the skeg legal under the rule, and otherwise the rudder would be fully satisfactory as a spade rudder, then the requirement that the rudder actually be physically attached to the skeg can be ignored. However, it is the responsibility of the designer to show that both the rudder and the skeg are, in fact, exactly the same as they would be if the rudder were attached to the skeg (ignoring very minor differences required to install the actual attachment mechanism). In general, this requirement can be met by providing drawings showing the installation with an attachment, then by showing that the shape of the rudder and the skeg remain unchanged (except for the direct consequence of removing the attachment) when the rudder is a spade rudder, and by showing the design calculations for the rudder as a spade rudder.

In case of serious doubt, the rudder will need to be attached to the skeg.

-- Dave Fladlien

SUPPLEMENT 7

Guidance with Respect to Breadth of Stern

The guiding principle for the New Universal Rule of Measurement is that the contemporary boat should maintain the same *basic* appearance and performance characteristics as the original M Class boats, but with modernized design concepts, construction methods, and equipment. It is further stated by way of clarification in Appendix 1 of the Rule that the profile of the boat above water must adhere fairly closely to the appearance of the above-water profile of the earlier M Class or other Universal Rule or International Rule boats built prior to 1960 (though the stem and counter angles are to be regulated by the minimums set in the Rule itself), but that the planform of the boat's sheerline could have considerably greater flexibility and still meet the requirements of the Rule.

The possibility has arisen that this freedom of shape in the planform of the hull could be abused, intentionally, or even unintentionally out of differing interpretations of the limits on form. Therefore the following is offered as guidance on maximum breadth of the stern of the boat.

The maximum beam of the boat, taken at any height in the transverse plane, at a horizontal distance 12% of the Class Rating (46.0 ft) aft of the aft end of LWL, shall be not greater than 10.25 ft (3.124 m).

The Class Rating is used as the basis for determining this location rather than B or LWL. At least with boats which have a vertical profile at the aft end of LWL, we then avoid the problem where the boat is floated higher due to change in balasting, and the LWL becomes shorter and B becomes narrower as a result of the higher flotation. The result would then be that the plane for measuring the breadth in question would move forward and the breadth with which the boat was built becomes too large, without anything other than the flotation having changed. As the Class Rating is not a function of flotation, this problem is for most boats avoided.

If it appears that for some reason having to do with the shape of the profile of the boat at or near the aft end of LWL, the particular boat in question is not treated fairly, the matter should be referred to the Rules Committee immediately.

This requirement is placed in the Supplement, not in the Rule itself, as it is meant to be a close guidance, which is to be enforced in the case of any significant violation. There is no penalty because this is not a restriction which is intended to be subject to violation as part of a legitimate development of a faster boat, in which case a penalty would be taken. Therefore, a tiny and inadvertent violation of this limit is to be ignored, as its impact on performance and appearance is insignificant, but any significant violation, even if very small, must be corrected.

-- Dave Fladlien