

CHALLENGER OF RECORD & DEFENDER AMERICA'S CUP 36

Interpretation 008 of AC75 Class Rule Version 1.2 issued 10 December 2018

Rule References:

5.1, 5.2, 20.1, 20.2, 20.3, 20.4, 35.77, mast drawing package

5.1 The components in the table below are restricted as detailed in the following rules:

| Component | Rule | Quantity | Change allowance |
|-----------------------|-----------|----------|------------------|
| Hull surfaces | Open | 2 | As per Protocol |
| Foil arm stocks | Supplied | 4 | - |
| Foil arm fairings | Open | 6 | 20% mass |
| Foil wings | Open | 6 | 20% mass |
| Foil flaps | Open | 20 | 20% mass |
| FCSs | Supplied | 2 | - |
| Rudder uppers | Open | 4 | 20% mass |
| Rudder lowers | Open | 4 | 20% mass |
| Mast tubes | Specified | 3 | 20% mass |
| Supplied rigging sets | Supplied | 3 | - |
| Mainsails | Open | *10 | 25% area |
| Headsails | Open | *29 | 25% area |

**See Rule 5.8.*

5.2 In Rule 5.1, the terms in the column "Rule" have the following meaning:

- (a) *Open*: The shape and construction is open to design, within the constraints specified for that component in this **AC75 Class Rule**.
- (b) *Specified*: The outer shape and some aspects of construction are specified by this **AC75 Class Rule**, but other aspects of construction are open to design.
- (c) *Supplied*: The component is supplied as standard to all **Competitors**. Modifications to supplied components are prohibited except where specifically permitted by this **AC75 Class Rule**.

5.3 **Competitors** may request clarification of the construction or operational requirements of items marked as "Specified" or "Supplied" from the **Rules Committee** who, after consultation with the designers of those parts, will issue a clarification notice to all **Competitors**.

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- 20.1 A drawing package for the **mast** will be issued according to Rule 34. This **mast** drawing package will include:
- (a) the **mast surface**;
 - (b) the minimum required **mast tube** laminate and construction details;
 - (c) details of the **supplied rigging**;
 - (d) details of **mast** fittings and spreaders, some of which may be specified as supplied components which must be sourced from a nominated supplier; and
 - (e) the rig plan, including required chainplate positions on the **hull**.
- 20.2 With the **mast** unloaded and supported in cradles, the external surface of the **mast tube** shall match the **mast surface** to within ± 3 mm for any cross-section parallel to the **mast lower plane**. The aft face of the **mast tube** shall be straight within ± 10 mm along the length of the **mast tube**. The **mast tube** may deviate from the **mast surface** within the **mainsail** attachment zones illustrated in Figure 20.1. Rebates for the attachment of components are permitted as long as such rebates are filled to match the **mast surface** within the aforementioned tolerances. The **mast surface** includes all cutouts for required fittings and no extra openings may be made in the **mast tube** other than those permitted in Rule 20.4.
- 20.3 The **mast tube** laminate provided by Rule 20.1 (b) is a minimum required laminate. Laminates resulting in greater fibre weight, resin content, **core** density, and/or **core** thickness than specified in the **mast** drawing package are permitted. Additional reinforcements are permitted and may be external to the **mast surface** but must remain within the tolerances given in Rule 20.2. The outer laminate of the **mast tube** shall not be sanded other than for local repairs and reinforcements performed after the **mast tube** has been cured. This shall not prevent the **mast tube** being painted or covered in branding material such as vinyl.

35.77 Mast tube

The principal spar of the rig. This includes the one design laminate provided in the **mast** drawing package described in Rule 20.1 as well as any team designed reinforcements permitted in Rule 20.3. The **mast tube** excludes any attached components such as **mainsail** support structures and **control systems** as well as taping or local reinforcements for the connection of such components.

Background:

According to Rule 5.1 the mast tube is a specified component. It is not forbidden to modify specified component; however, limitations apply to such modifications (5.2 (b)). Limitation to the possible modifications of the mast tube are set in Rule 20, 35.77 and through the one design mast drawing package:

- 35.77 states that the mast tube "... includes the one design laminate provided in the mast drawing package described in Rule 20.1 ..."
- Drawing "031 750 405B_Spar Bulkheads" is part of the mast drawing package and provides all the details (shape and laminate) of the mast bulkheads.
- 20.1 (b) states that "the minimum required mast tube laminate and construction details" are part of the mast drawing package.
- 20.2 states: "... no extra openings may be made in the mast tube other than those permitted in Rule 20.4"
- 20.3 states: "The mast tube laminate provided by Rule 20.1 (b) is a minimum required laminate."
- 20.4 allows additional openings in the aft face of the mast tube, but no other additional openings in the mast are explicitly allowed elsewhere.
- The Oxford English Dictionary defines "opening" as:
 - III. Physical senses.
 - 9.
 - a. A vacant space between portions of solid matter; a gap, hole, or passage; an aperture. Also: †a wound (*obsolete*).

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The definition of mast tube includes the mast bulkheads. According to the Oxford English Dictionary the word “opening” is not limited to the outer surface of an object (the mast) and synonyms for “opening” explicitly include the words gap, hole, passage and aperture.

Rules 20.1, 20.2 and 20.3 ban any kind of “openings” in the mast bulkheads (and elsewhere) and minimum laminate requirements as specified in the respective drawings must be satisfied. Rule 20.4 is an exception of that general ban.

Questions:

1. From the Rules, the drawings and the OED definition listed above we draw the conclusions listed under (a) to (d) below. Can the Rules Committee answer for each point if the conclusion is correct?
 - (a) the mast bulkheads are part of the mast tube (20.1, 35.77, “03I 750 05B_Spar_Bulkheads”).
 - (b) any additional openings in the mast bulkheads that are not contained in the one design mast drawing package and that are not explicitly permitted in 20.4 are not allowed (20.2, 35.77, “03I 750 405B_Spar_Bulkheads”).
 - (c) any holes in the mast bulkheads that are not contained in the one design mast drawing package and that are not explicitly permitted in 20.4 would violate the minimum laminate requirements in 20.3 (20.3, 35.77, “03I 750 405B_Spar_Bulkheads”) and are therefore not allowed.
 - (d) the arguments under (b) and (c) ban also very small holes or openings, e.g. for the passage of fibre optics or cables.
2. If any of our conclusions (a) to (d) are not correct can the Rules Committee give an explanation and reference the respective rules, drawings or definitions?
3. Is it permitted to add fibre optics anywhere into the laminate specified in the mast drawing package, provided that the constraints in 20.3 are satisfied?
4. If the answer to Q3 is “NO” can the Rules Committee reference the respective rules, drawings or definitions?

Interpretation:

A. OED Definitions:

1. As per the OED, an opening is defined as: “A vacant space between portions of solid matter; a gap, hole or passage, an aperture.” and “An aperture in the body; a bodily orifice.”
2. As per the OED, a passage is defined as: “The action of causing something to go past, across, or through; transmission, transference.”
3. As per the OED, a penetration is defined as: “the action, or an act, of penetrating or piercing, or passing into or through something”.

B. Geometric Explanations:

1. In geometric understanding, an opening occurs, when an area is reduced by a second area lying in the same plane, the cut-line being formed by the outer boundary line of the second area, see Fig. 1. This fulfils the definition of the OED as resulting in a gap, hole or passage, an aperture.

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Fig 1: Opening

2. In geometric understanding, a penetration occurs, when an area is intersected (pierced) by either a volume (e.g. a solid cylinder) or the areal envelope of a volume (e.g. a hollow cylinder). This action fulfils the definition of the OED, where the intersecting object is penetrating, piercing or passing through something (the initial area).
 - a. By this penetration, the initial area is reduced by the intersectional area (as in 1.), but no opening occurs, when the penetrating object is a volume.
 - b. An opening occurs only, if the penetrating object consists of the lateral surface of a volume, having two open ends (e.g. a hollow cylinder)

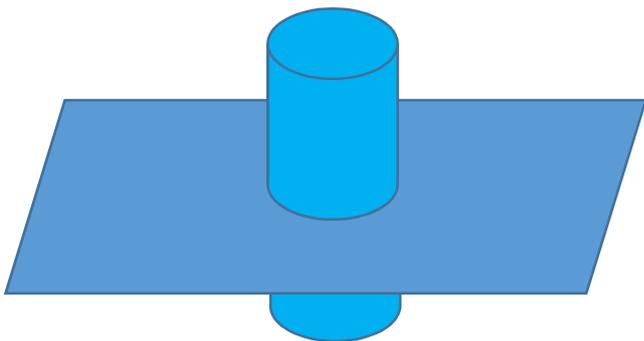


Fig 2a: Penetration not constituting opening

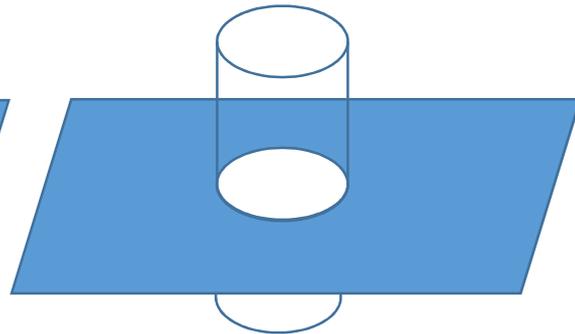


Fig 2b. Penetration constituting opening

C. Dissecting the wording of 20.4:

That part of the first sentence "..., as well as penetrations..." is not referenced by the location requirements ("in the aft face") for permitted additional "openings" in the very first clause of the first sentence "Openings in the aft face of the **mast tube**...". Thus, penetrations for control systems and instrument cables have no specific location requirements and are permitted not only in the aft face of the **mast tube**, but elsewhere in the **mast tube**.

D. Rule 35.77:

By the last sentence within rule 35.77 **Mast tube**: "...The **mast tube** excludes any attached components such as **mainsail** support structures and **control systems** as well as taping or local reinforcements for the connection of such components."

E. Conclusion:

While openings are subject to placement restrictions (permitted only in the aft face of the **mast tube**) and dimensional restrictions (size and boundary limitations as per the last two sentences of 20.4), penetrations are only subject to one conditional clause: that they are permitted for **control systems** and instrumentation cables.

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By the reasoning in B.2., above, types of penetrations fall into two categories:

1. Penetrations by **control systems** or instrumentation cables which are practically completely filling the volume by **control systems** or instrumentation cables and as described in preface B.2. fulfil stipulation of preface B.2.a and do not constitute openings for the purpose of the dimensional area, areal and location constraints of Rule 20.4.
2. Penetrations by **control systems** or instrumentation cables which are not practically completely filling the volume by **control systems** or instrumentation cables and as described in preface B.2., fulfil stipulation of preface B.2.b and constitute openings for the purpose of the dimensional area, areal and location constraints of Rule 20.4.

Passages of **control systems** or instrumentation cables which are leaving a gap or a void around the control system or the instrumentation cable are not fulfilling the provisions of a penetration.

Answers:

- 1.(a) Yes.
- 1.(b) Yes. The last sentence in 20.2 states that "... no extra openings may be made in the **mast tube** other than those permitted in Rule 20.4." Thus, the general rule (20.2) does not permit any opening in the **mast tube** that is not part of the **mast** drawing package. Since the bulkheads are part of the **mast tube** (Answer 1.(a)) extra openings are not permitted in the **mast tube** bulkheads. Rule 20.4 is an exception to the general rule, but it applies only to the aft face of the **mast tube**.

Penetrations which constitute openings as defined in the preface of these answers are bound by the restrictions on openings as specified in Rule 20.4.
- 1.(c) The term "hole" is not defined by the **AC75 Class Rule**. The answer is "Yes" if a hole is, by definition, an opening.
- 1.(d) The answer is contained in the answers above for either "openings" and "penetrations associated with openings or "penetrations not associated with an opening".
2. See answers for 1(a) to (d) above.
3. Yes, provided that the installation of an optical fiber does not constitute an opening as defined above.
4. Not applicable.

END