



Request for Interpretation No. 57

of

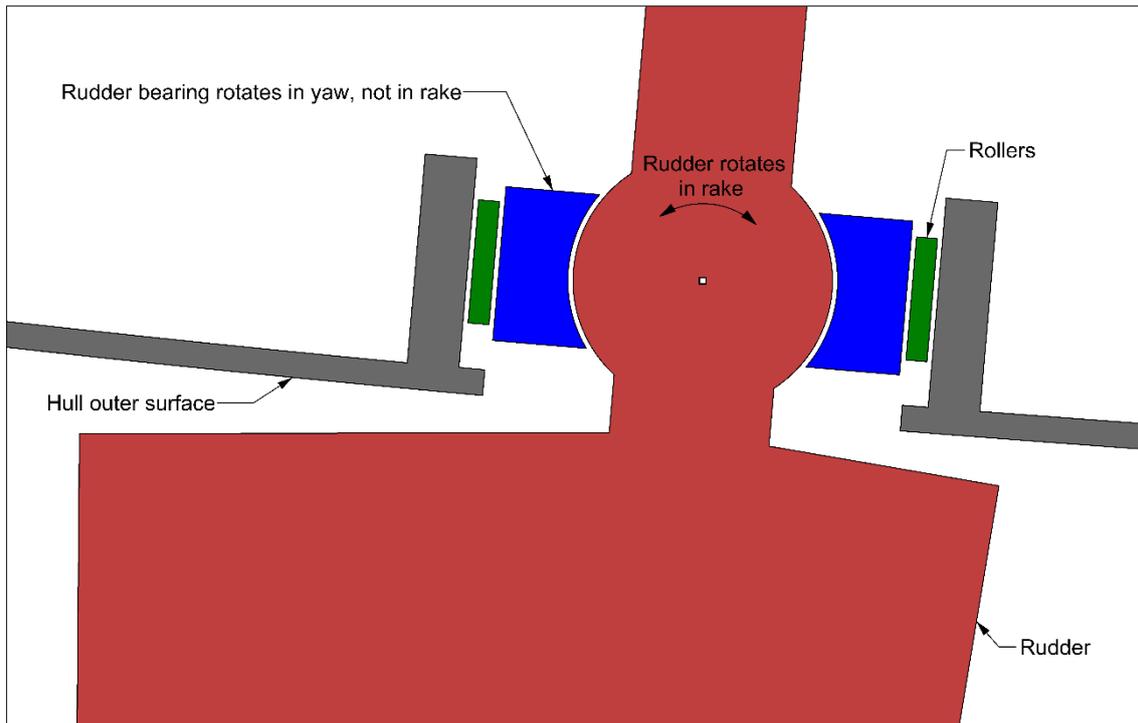
AC Class Rule Version 1.5: July 20th 2016

Rule References:

- 7.2 The **hulls** outer surfaces shall be built from a **Measurement Committee** approved mold referenced in Rule 6.2 except for **hull** surface that is:
- ...
- (b) on the lower outer surface of the **hull** surrounding the **rudder** penetration in accordance with Rule 10 and does not exceed 0.600 m **longitudinally** by 0.150 m **transversely** either side of the **hull centerplane**;
- ...
- 7.6 No part of a **hull** shall be adjusted or trimmed ...
- 10.1 Each **hull** shall have one **rudder** fitted with one **rudder wing**. The **rudder** or **rudderstock** shall penetrate the **hull**.
- 10.7 **Rudder** and **rudder wing** components shall be rigidly fixed to each other and their shapes shall not be adjusted while racing. The **rudder wings** shall be rigidly fixed to the **rudders** and shall not be adjusted relative to the **rudders** while racing.

Interpretations 4, 19, 46

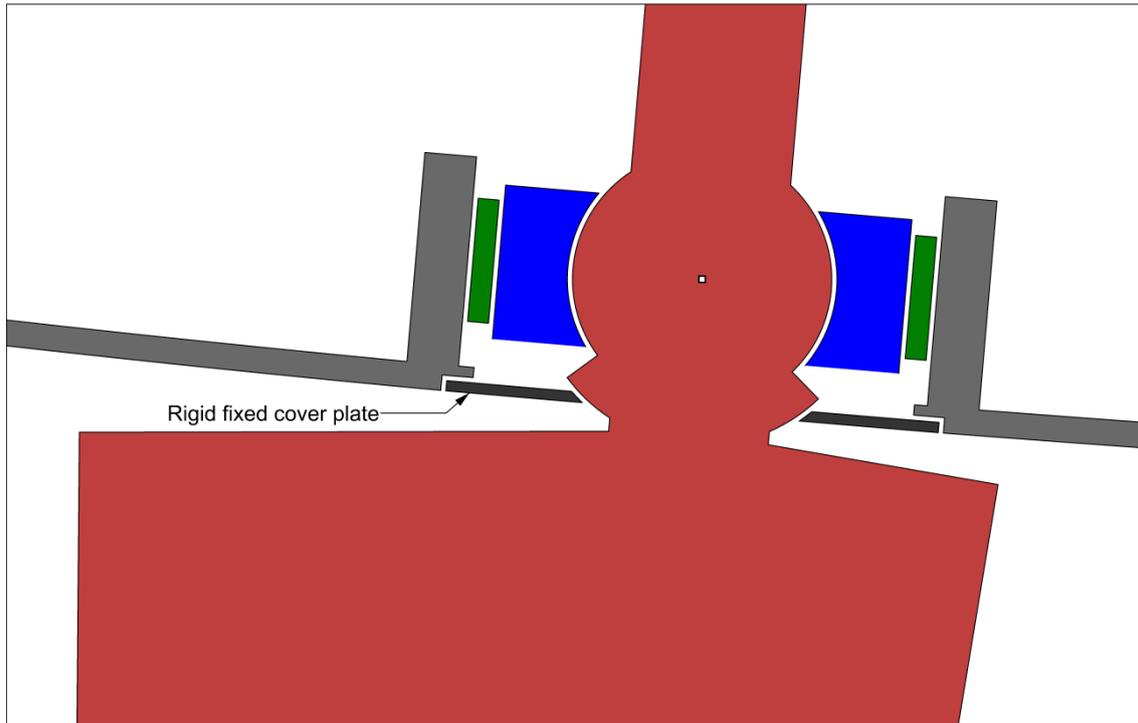
In the following questions, please assume that hull openings fall within those permitted by Rule 7.2 (c), that flooded volume requirements are met, and that details and concepts not explicitly shown in the diagrams satisfy the relevant Rules.

Question 1

This figure shows a cross-section of a rudder, rudder bearing and hull. The inner surface of the blue bearing material is spherical to allow both rudder rake rotation and lateral bending of the rudder stock. This blue component can rotate in yaw, but does not rotate in rake with the rudder. The green rollers allow the blue component and the rudder to rotate in yaw.

The hull surface is open, and water will fill the cavity up to the bottom of the blue component. At all rudder yaw and rake angles, the blue component will remain entirely within the IGES hull surface.

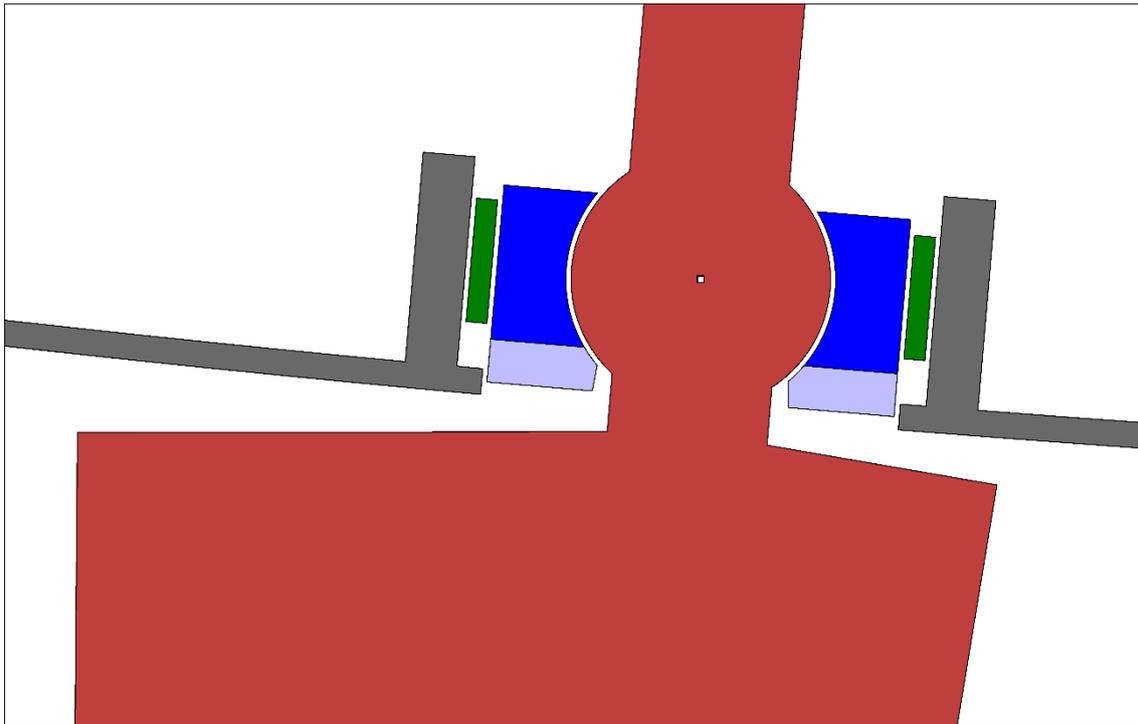
- (a) Is this concept of rudder bearing permitted?
- (b) If the answer to Question 1 (a) is 'Yes', is it permitted that the blue bearing component be assembled around the rudder prior to installation of the rudder in the yacht, then installed into the bearing housing when the rudder is fitted into the yacht? (Prior to installation, this blue bearing component would be loosely fitting around the rudder – it would not be rigidly fixed to it.)

Question 2

This figure shows a concept where a rigid cover plate is attached over a permitted rebate in the hull lower surface in order to improve the sealing of the hull. A spherical detail is added to the rudder to mate with the opening in the cover plate.

Is this arrangement permitted if:

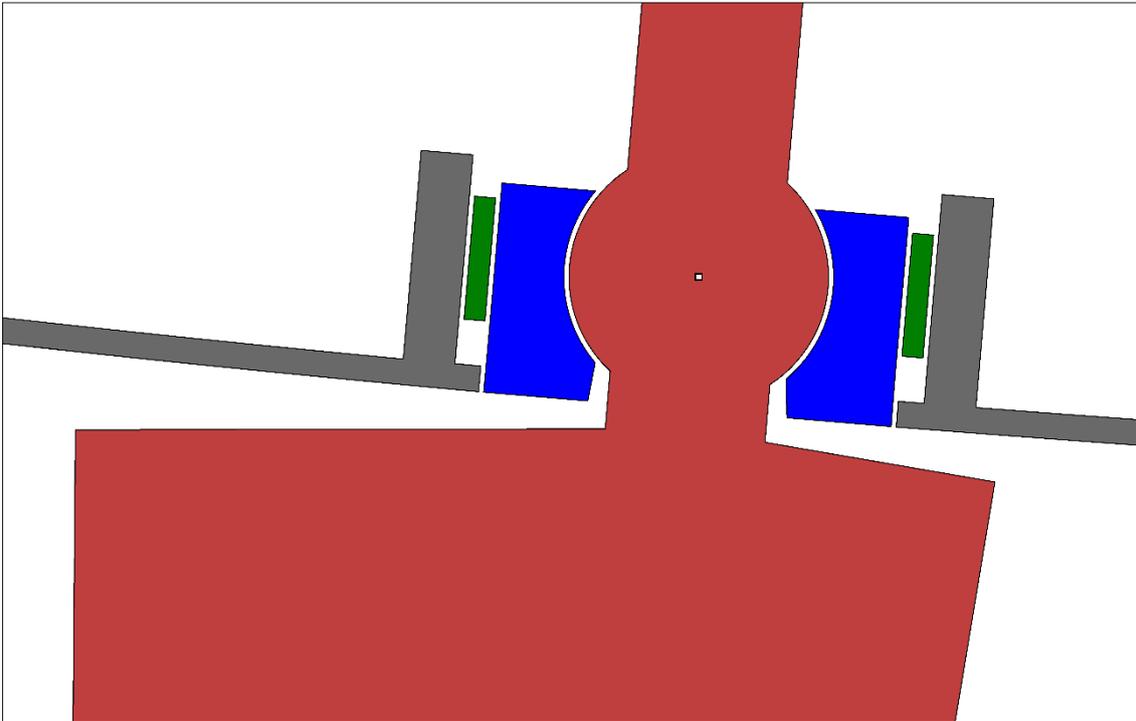
- (a) the cover plate is installed on the hull after the rudder has been installed?
- (b) the cover plate is assembled around the rudder prior to installation of the rudder in the yacht, then attached to the hull? (Prior to installation, this cover plate would be loosely fitting around the rudder – it would not be rigidly fixed to it.)

Question 3

In this figure, the blue bearing component has been extended down by a lavender component. The lavender component takes no bearing load, and its purpose is solely to better seal the hull opening. Once installed, the lavender component would be attached to the blue component and move with it – i.e. it would rotate in yaw, but not move with rake.

At all rudder yaw and rake angles, the lavender component will remain entirely within the IGES hull surface.

- (a) If the lavender component is attached to the blue component at all times is this concept of rudder bearing permitted?
- (b) If the answer to Question 3 (a) is 'No', are there any geometric restrictions on the blue bearing component, or can it be designed to extend down as far as the bottom of the lavender component?
- (c) If the blue bearing component is permanently installed in the hull, is it permitted for the lavender component to be assembled around the rudder prior to installation of the rudder in the yacht, then fitted against the blue bearing component when the rudder is fitted into the yacht? (Prior to installation, this lavender bearing component would be loosely fitting around the rudder – it would not be rigidly fixed to it. After installation, the lavender component would move as though rigidly attached to the blue bearing component.)

Question 4

This figure shows an arrangement very similar to that in Question 1. However, in this case the blue bearing component has been extended down so that when the rudder is aligned with the centerline of the hull the lower surface of the blue component is flush with the hull IGES surface.

Due to the double curvature of the hull in this region, when the rudder is at a non-zero yaw angle, parts of the blue component will protrude beyond the hull IGES surface.

Is this concept of rudder bearing permitted?

Interpretation:

1.
 - a) Rule 10.4 limits the rotation of the rudder to two axes; one axis shall be within 0.010 m of the **hull centerplane**, measured between the upper and lower bearings, and the other shall be on a **rake axis**. The spherical bearing illustrated in question 1 allows, in addition, rotation in the cant axis. This incidental cant axis rotation must only be due to the bending of the rudder shaft, and the stiffness of the shaft must not be optimized to permit additional cant rotation.
 - b) Interpretation 46 (answers 4 and 5) discusses Rudder penetration and permits openings in the hull around or below the rudder bearing. The arrangement shown in Question 1 is similar and would be permitted, pursuant to the first paragraph of this interpretation.
 - c) The method of assembly of the rudder bearing is not limited by the AC Rule.
2. All restrictions in Answer 1 apply to this configuration. Additionally:
 - a) and b) The rigid cover plate may be installed before or after the rudder is installed.

If the cover plate extends into the rudder rebate area, it must be made from an approved mold and match the hull IGES file. If the cover plate is only within the rudder penetration area (Rule 7.2 (b)) then it must match the hull IGES file, but need not be made from an approved mold. See also Interpretation 46 Answer 1.

The cover plate must not be flexible, and must not move due to contact with the 'spherical detail', or any other object, as the rudder rotates.

The portion of the 'spherical detail' which extends below the hull surface must comply with Rule 10.3 which states:

“No part of a **rudder**, external to the **hull**, and excluding the **rudder wing**, while in **appendage measurement condition**, shall be greater than 0.100 m from the **hull centerplane**.”

3. This arrangement is identical to question 1 except for the assembly process. The answer to Question 1 applies here. Additionally:

- a) Yes.
- b) Not applicable.
- c) The method of assembly of the rudder bearing is not limited by the AC Rule.

4. This arrangement is identical to question 1 except the bearing has been extended. The answer to Question 1 applies here. Additionally:

There is no restriction that the rudder bearing remain within the hull IGES file defined surface.

The rudder bearing must be rigid. If the lower surface changes shape as the rudder rotates it would be considered a bearing fairing which is not permitted.

If other configurations are being considered that are not accurately portrayed by these questions, the Measurement Committee recommends that further interpretations be requested.

END

Issued by the America's Cup Measurement Committee on October 8, 2016