Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings

Object of Amendment

Rules for the Survey and Construction of Steel Ships Parts D and I
Rules for High Speed Craft
Rules for the Survey and Construction of Inland Waterway Ships
Guidance for the Approval of Materials and Equipment for Marine Use

Reason for Amendment

IACS Unified Requirement (UR) M52 specifies requirements related to the length of stern tube bearings and the approval of bearing materials. These requirements have already been incorporated into the NK Rules.

Since the handling of shaft bracket bearings and of stern tube bearings with two bearings (i.e. a fore bearing and aft bearing) was unclear, IACS reviewed UR M52 to clarify said handling and adopted UR M52(Rev.3) as a result.

In addition, since there were no clear requirements on the type approval procedures for bearing materials, IACS also examined the matter, and newly established UR M85 as a result.

Accordingly, relevant requirements are amended based on UR M52(Rev.3) and UR M85.

Outline of Amendment

The main contents of this amendment are as follows:

(1) Clarifies that the requirements of stern tube bearings and shaft bracket bearings apply to aftmost bearings of these bearings.
(2) Amends the requirements for the approval of stern tube bearings and shaft bracket bearings used for oil lubricated and water lubricated propeller shafts.

Effective Date and Application

This amendment applies to bearings for which the date of application for approval is on or after 1 January 2026.

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

ID:DD25-02

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS **Part D MACHINERY INSTALLATIONS** **Chapter 6 SHAFTINGS** **6.2 Materials, Construction and Strength** **6.2.10 Stern Tube Bearings and Shaft Bracket Bearings*** **1** The aftmost stern tube bearing or the aftmost shaft bracket bearing which supports the weight of propeller is to comply with the following **(1)** to **(3)** requirements: (1) In the case of oil lubricated bearings. (a) In the case of white metal i) The length of the bearing is not to be less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**. However, where the nominal bearing pressure (determined by the static bearing reaction calculation taking into account shaft and propeller weight which is deemed to be exerted solely on the aftmost stern tube bearing (or aftmost shaft bracket bearing, if provided) divided by the projected area of the shaft in way of the	**RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS** **Part D MACHINERY INSTALLATIONS** **Chapter 6 SHAFTINGS** **6.2 Materials, Construction and Strength** **6.2.10 Stern Tube Bearings and Shaft Bracket Bearings*** **1** The aftermost stern tube bearing or shaft bracket bearing which supports the weight of propeller is to comply with the following requirements **(1)** to **(3)**: (1) In the case of oil lubricated bearings. (a) In the case of white metal i) The length of the bearing is not to be less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**. However, where the nominal bearing pressure (determined by the static bearing reaction calculation taking into account shaft and propeller weight which is deemed to be exerted solely on the aft bearing divided by the projected area of the shaft in way of the bearing, hereinafter defined the same way in this chapter) is not	Clarifies that "aftmost" is also applied to shaft bracket bearing according to M52(Rev.3). Amends to aftmost stern tube bearing from aft bearing.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
bearing, hereinafter defined the same way in this chapter) is not more than 0.8 *MPa* and special consideration is given on the construction and arrangement in accordance with requirements specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	more than 0.8 *MPa* and special consideration is given on the construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	
ii) The stern tube is to be always filled with oil. Adequate means are to be provided to measure the temperature of oil in the stern tube.	ii) The stern tube is to be always filled with oil. Adequate means are to be provided to measure the temperature of oil in the stern tube.	
iii) In cases where a gravity tank supplying lubricating oil to the stern tube bearing is fitted, it is to be located above the load water line and provided with a low level alarm device. However, in cases where the lubricating system is designed to be used under the condition that the static oil pressure of the gravity tank is lower than the water pressure, the tank is not required to be above the load water line.	iii) In cases where a gravity tank supplying lubricating oil to the stern tube bearing is fitted, it is to be located above the load water line and provided with a low level alarm device. However, in cases where the lubricating system is designed to be used under the condition that the static oil pressure of the gravity tank is lower than the water pressure, the tank is not required to be above the load water line.	
iv) The lubricating oil is to be cooled by submerging the stern tube in the water of the aftpeak tank or by some other suitable means.	iv) The lubricating oil is to be cooled by submerging the stern tube in the water of the after peak tank or by some other suitable means.	
(b) In the case of materials other than white metal (Deleted)	(b) In the case of materials other than white metal i) The materials, construction and arrangement are to be approved by the Society.	Deletes conventional test requirements for approval related to
i) For bearings of synthetic rubber, reinforced	ii) For bearings of synthetic rubber, reinforced	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
resin or plastics materials which are approved for use as oil lubricated stern tube bearings, the length of the bearing is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**. However, where nominal bearing pressure is not more than 0.6 *MPa* and bearings have a construction and arrangement in accordance with requirements specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	resin or plastics materials which are approved for use as oil lubricated stern tube bearings, the length of the bearing is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**. However, where nominal bearing pressure is not more than 0.6 *MPa* and bearings have a construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	materials, construction and arrangement.
ii) Notwithstanding the requirement **i)** above, the Society may allow use of bearings whose nominal bearing pressure is more than 0.6 *MPa* where the material has proven satisfactory testing and operating histories.	iii) Notwithstanding the requirement given in **ii)**, the Society may allow use of bearings whose nominal bearing pressure is more than 0.6 *MPa* where the material has proven satisfactory testing and operating histories.	
iii) The synthetic materials used for bearings are to be approved by the Society in accordance with **Part 6, Chapter 14, Guidance for the Approval of Materials and Equipment for Marine Use**.	(Newly added)	UR M52(Rev.3) Para.2.3 & 2.4 Describe as approval of synthetic material used for bearings.
(2) In the case of water lubricated bearings	(2) In the case of water lubricated bearings	
(Deleted)	(a) The materials, construction and arrangement are to be approved by the Society.	Same as above
(a) The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**, or 3 *times* the actual diameter, whichever is greater. However, for bearings of synthetic materials,	(b) The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**, or 3 *times* the actual diameter, whichever is greater. However, for bearings of synthetic materials,	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
such as rubber or plastics, that are approved for use as water lubricated stern tube bearings and where special consideration is given to their construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, minimum length is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**, or 1.5 *times* the actual diameter, whichever is greater.	such as rubber or plastics, that are approved for use as water lubricated stern tube bearings and where special consideration is given to their construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, minimum length is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**, or 1.5 *times* the actual diameter, whichever is greater.	
(b) Synthetic materials used for bearings are to be approved by the Society in accordance with **Part 6, Chapter 14, Guidance for the Approval of Materials and Equipment for Marine Use**.	(Newly added)	URM52(Rev.3) Para.3.3&3.4
(3) In the case of grease lubricated bearings In cases where the actual diameter of the propeller shaft is not more than 100 *mm*, grease lubricated bearings may be used. The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**.	(3) In the case of grease lubricated bearings In cases where the actual diameter of the propeller shaft is not more than 100 *mm*, grease lubricated bearings may be used. The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **6.2.4-1** or **-2**.	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
Part I SHIPS OPERATING IN POLAR WATERS, POLAR CLASS SHIPS AND ICE CLASS SHIPS **ANNEX 1 SPECIAL REQUIREMENTS FOR THE MATERIALS, HULL STRUCTURES, EQUIPMENT AND MACHINERY OF POLAR CLASS SHIPS** **Chapter 4 MACHINERY INSTALLATIONS** **4.5 Design** **4.5.5 Propulsion Line Components** (-1 and -2 are omitted.) **3** Propeller shafts (1) Blade failure loads F_{ex} (a) Blade failure loads F_{ex} (**4.4.9**) applied parallel to shafts (forwards or backwards) are not to cause yielding, bending moments need not be combined with other loads. In addition, the diameter d_p in way of aftmost stern tube bearing is not to be less than the value of the following formula: $d_p = 160^3 \sqrt{\frac{F_{ex} \cdot D}{\sigma_{0.2} \cdot \left(1 - \frac{{d_i}^4}{{d_p}^4}\right)}} \, (mm)$ where	**Part I SHIPS OPERATING IN POLAR WATERS, POLAR CLASS SHIPS AND ICE CLASS SHIPS** **ANNEX 1 SPECIAL REQUIREMENTS FOR THE MATERIALS, HULL STRUCTURES, EQUIPMENT AND MACHINERY OF POLAR CLASS SHIPS** **Chapter 4 MACHINERY INSTALLATIONS** **4.5 Design** **4.5.5 Propulsion Line Components** (-1 and -2 are omitted.) **3** Propeller shafts (1) Blade failure loads F_{ex} (a) Blade failure loads F_{ex} (**4.4.9**) applied parallel to shafts (forwards or backwards) are not to cause yielding, bending moments need not be combined with other loads. In addition, the diameter d_p in way of aft stern tube bearing are not to be less than the value of the following formula: $d_p = 160^3 \sqrt{\frac{F_{ex} \cdot D}{\sigma_{0.2} \cdot \left(1 - \frac{{d_i}^4}{{d_p}^4}\right)}} \, (mm)$ where	Amends to aftmost stern tube bearing from aft stern tube bearing.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
d_b : Propeller shaft diameter (*mm*) d_i : Propeller shaft inner diameter (*mm*) (b) Forward of aftmost stern tube bearings, shaft diameters may be reduced based on direct calculation of the actual bending moment, or on the assumption that the bending moments caused by F_{ex} are linearly reduced to 25 % at the next bearing and in front of this linearly to zero at the third bearing. (c) Bending due to maximum blade forces F_b and F_f is to be disregarded since the resulting stress levels are much lower than the stresses caused by the blade failure load. (2) (Omitted) (-4 to -9 are omitted.) **10** Bearings (1) Aftmost stern tube bearings and next shaft line bearings are to withstand the F_{ex} given in **4.4.9** in such a way that allows ships to maintain operational capability. (2) Rolling bearings are to have $L10a$ lifetimes of at least 40,000 *hours* according to *ISO* 281:2007. (3) Thrust bearings and their housings are to be designed to withstand with a safety factor $S = 1.0$ the maximum response thrusts in **4.4.11** and the axial forces resulting from the blade failure load F_{ex} in **4.4.9**. For the purpose of calculation, except for F_{ex}, shafts are assumed to rotate at rated speed. For pulling propellers, special consideration is to be given to loads from ice interaction on propeller hubs.	d_b : Propeller shaft diameter (*mm*) d_i : Propeller shaft inner diameter (*mm*) (b) Forward of aft stern tube bearings, shaft diameters may be reduced based on direct calculation of the actual bending moment, or on the assumption that the bending moments caused by F_{ex} are linearly reduced to 25 % at the next bearing and in front of this linearly to zero at the third bearing. (c) Bending due to maximum blade forces F_b and F_f has been disregarded since the resulting stress levels are much lower than the stresses caused by the blade failure load. (2) (Omitted) (-4 to -9 are omitted.) **10** Bearings (1) Aft stern tube bearings and next shaft line bearings are to withstand the F_{ex} given in **4.4.9** in such a way that allows ships to maintain operational capability. (2) Rolling bearings are to have $L10a$ lifetimes of at least 40,000 *hours* according to *ISO* 281:2007. (3) Thrust bearings and their housings are to be designed to withstand with a safety factor $S = 1.0$ the maximum response thrusts in **4.4.11** and the axial forces resulting from the blade failure load F_{ex} in **4.4.9**. For the purpose of calculation, except for F_{ex}, shafts are assumed to rotate at rated speed. For pulling propellers, special consideration is to be given to loads from ice interaction on propeller hubs.	Same as above Same as above

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
RULES FOR HIGH SPEED CRAFT **Part 9 MACHINERY INSTALLATIONS** **Chapter 5 SHAFTINGS, PROPELLERS, WATERJET PROPULSION SYSTEMS AND TORSIONAL VIBRATION OF SHAFTINGS** **5.1 Shafting** **5.1.7 Stern Tube Bearings and Shaft Bracket Bearings** The aftmost stern tube bearing or the aftmost shaft bracket bearing which supports the weight of propeller is to comply with **6.2.10-1, Part D of the Rules for the Survey and Construction of Steel Ships**.	**RULES FOR HIGH SPEED CRAFT** **Part 9 MACHINERY INSTALLATIONS** **Chapter 5 SHAFTINGS, PROPELLERS, WATERJET PROPULSION SYSTEMS AND TORSIONAL VIBRATION OF SHAFTINGS** **5.1 Shaftings** **5.1.7 Stern Tube Bearings and Shaft Bracket Bearings** The aftermost stern tube bearing or shaft bracket bearing which supports the weight of propeller is to comply with **6.2.10-1, Part D of the Rules for the Survey and Construction of Steel Ships**.	Same as above

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS **Part 7 MACHINERY INSTALLATIONS** **Chapter 4 SHAFTINGS** **4.2 Materials, Construction and Strength** **4.2.10 Stern Tube Bearings and Shaft Bracket Bearings*** **1** The aftmost stern tube bearing or the aftmost shaft bracket bearing which supports the weight of propeller is to comply with the following **(1)** to **(3)** requirements: (1) In the case of oil lubricated bearings (a) In the case of white metal i) The length of the bearing is not to be less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**. However, where the nominal bearing pressure (determined by the static bearing reaction calculation taking into account shaft and propeller weight which is deemed to be exerted solely on the aftmost stern tube bearing (or aftmost shaft bracket bearing, if provided.) divided by the projected area of the shaft in way of the	**RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS** **Part 7 MACHINERY INSTALLATIONS** **Chapter 4 SHAFTINGS** **4.2 Materials, Construction and Strength** **4.2.10 Stern Tube Bearings and Shaft Bracket Bearings*** **1** The aftermost stern tube bearing or shaft bracket bearing which supports the weight of propeller is to comply with the following requirements **(1)** to **(3)**: (1) In the case of oil lubricated bearings (a) In the case of white metal i) The length of the bearing is not to be less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**. However, where the nominal bearing pressure (determined by the static bearing reaction calculation taking into account shaft and propeller weight which is deemed to be exerted solely on the aft bearing divided by the projected area of the shaft in way of the bearing, hereinafter defined the same way in this chapter) is not	Same amendment as Part D of the Rules

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
bearing, hereinafter defined the same way in this chapter) is not more than 0.8 *MPa* and special consideration is given on the construction and arrangement in accordance with requirements specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	more than 0.8 *MPa* and special consideration is given on the construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	
ii) The stern tube is to be always filled with oil. Adequate means are to be provided to measure the temperature of oil in the stern tube.	ii) The stern tube is to be always filled with oil. Adequate means are to be provided to measure the temperature of oil in the stern tube.	
iii) In cases where a gravity tank supplying lubricating oil to the stern tube bearing is fitted, it is to be located above the designed maximum load line and provided with a low level alarm device. However, in cases where the lubricating system is designed to be used under the condition that the static oil pressure of the gravity tank is lower than the water pressure, the tank is not required to be above the designed maximum load line.	iii) In cases where a gravity tank supplying lubricating oil to the stern tube bearing is fitted, it is to be located above the designed maximum load line and provided with a low level alarm device. However, in cases where the lubricating system is designed to be used under the condition that the static oil pressure of the gravity tank is lower than the water pressure, the tank is not required to be above the designed maximum load line.	
iv) The lubricating oil is to be cooled by submerging the stern tube in the water of the aftpeak tank or by some other suitable means.	iv) The lubricating oil is to be cooled by submerging the stern tube in the water of the after peak tank or by some other suitable means.	
(b) In the case of materials other than white metal. (Deleted)	(b) In the case of materials other than white metal. i) The materials, construction and arrangement are to be approved by the Society.	
i) For bearings of synthetic rubber, reinforced	ii) For bearings of synthetic rubber, reinforced	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
resin or plastics materials which are approved for use as oil lubricated stern tube bearings, the length of the bearing is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**. However, where the nominal bearing pressure is not more than 0.6 *MPa* and bearings having a construction and arrangement in accordance with requirements specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	resin or plastics materials which are approved for use as oil lubricated stern tube bearings, the length of the bearing is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**. However, where the nominal bearing pressure is not more than 0.6 *MPa* and bearings having a construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, the minimum length is to be not less than 1.5 *times* the actual diameter of the propeller shaft.	
ii) Notwithstanding **i)** above, the Society may allow use of bearings whose nominal bearing pressure is more than 0.6 *MPa* where the material has proven satisfactory testing and operating histories.	iii) Notwithstanding **ii)** above, the Society may allow use of bearings whose nominal bearing pressure is more than 0.6 *MPa* where the material has proven satisfactory testing and operating histories.	
iii) Synthetic materials used for bearings are to be approved by the Society in accordance with **Part 6, Chapter 14, Guidance for the Approval of Materials and Equipment for Marine Use**.	(Newly added)	
(2) In the case of water lubricated bearings.	(2) In the case of water lubricated bearings.	
(Deleted)	(a) The materials, construction and arrangement are to be approved by the Society.	
(a) The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**, or 3 *times* the actual diameter, whichever is greater. However, for bearings of synthetic materials,	(b) The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**, or 3 *times* the actual diameter, whichever is greater. However, for bearings of synthetic materials,	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
such as rubber or plastics, that are approved for use as water lubricated stern tube bearings and where special consideration is given to their construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, minimum length is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**, or 1.5 *times* the actual diameter, whichever is greater.	such as rubber or plastics, that are approved for use as water lubricated stern tube bearings and where special consideration is given to their construction and arrangement in accordance with provisions specified elsewhere, the length of the bearing may be fairly shorter than that specified above. However, minimum length is to be not less than twice the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**, or 1.5 *times* the actual diameter, whichever is greater.	
(b) Synthetic materials used for bearings are to be approved by the Society in accordance with **Part 6, Chapter 14, Guidance for the Approval of Materials and Equipment for Marine Use**.	(Newly added)	
(3) In the case of grease lubricated bearings. In cases where the actual diameter of the propeller shaft is not more than 100 *mm*, grease lubricated bearings may be used. The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**.	(3) In the case of grease lubricated bearings. In cases where the actual diameter of the propeller shaft is not more than 100 *mm*, grease lubricated bearings may be used. The length of the bearing is to be not less than 4 *times* the required diameter of the propeller shaft given by the formulae in either **4.2.4-1** or **-2**.	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
GUIDANCE FOR THE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE	**GUIDANCE FOR THE APPROVAL AND TYPE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE**	
Part 6 MACHINERY	**Part 6 MACHINERY**	
Chapter 2 TYPE APPROVAL OF MACHINERY AND EQUIPMENT	**Chapter 2 TYPE APPROVAL OF USE OF MACHINERY AND EQUIPMENT**	
2.1 General	**2.1 General**	
2.1.1 Scope	**2.1.1 Scope**	
The requirements of this chapter deal with the tests and inspection relating to the approval of the machinery and equipment listed for which approval of the Society is to be obtained in advance before they are used in ships as required by the **Rules for the Survey and Construction of Steel Ships** (hereinafter referred to as "the Rules"). (1) Power transmission systems other than gearings (**5.2.4-1, Part D of the Rules**) (2) Kind 1 propeller shafts with rubber sleeve (**6.2.7-1, Part D of the Rules**) (3) Kind 1 propeller shafts with synthetic resin sleeve (**6.2.7-1, Part D of the Rules**) (4) Propeller shafts made of corrosion resistant materials (**6.2.7-1, Part D of the Rules**)	The requirements of this chapter deal with the tests and inspection relating to the approval of the machinery and equipment listed for which approval of the Society is to be obtained in advance before they are used in ships as required by **the Rules for the Survey and Construction of Steel Ships** (hereinafter referred to as "the Rules"). (1) Power transmission systems other than gearings (**5.2.4-1, Part D of the Rules**) (2) Kind 1 propeller shafts with rubber sleeve (**6.2.7-1, Part D of the Rules**) (3) Kind 1 propeller shafts with synthetic resin sleeve (**6.2.7-1, Part D of the Rules**) (4) Propeller shafts made of corrosion resistant materials (**6.2.7-1, Part D of the Rules**)	
(Deleted)	(5) Stern tube bearings (**6.2.10-1(1)(b)i) and (2)(a), Part**	Deletes the requirements

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
(5) Stern tube sealing devices (**6.2.10-2, Part D of the Rules**) (6) Pipes of special materials (**12.1.6, Part D of the Rules**) (7) Special valves and pipes fittings (**12.3.2, Part D of the Rules**) (8) Systems and equipment for ships carrying liquefied gases in bulk (**Part N of the Rules** and **Part N of the Guidance for the Survey and Construction of Steel Ships**) (9) Air pipe automatic closing devices (**13.6.2-2, Part D of the Rules**) (10) Flexible hose assemblies (**12.3.4-2, Part D of the Rules**) (11) Systems and equipment for ships using low-flashpoint fuels (**Part GF of the Rules** and **Part GF of the Guidance for the Survey and Construction of Steel Ships**) (12) Others which are considered necessary by the Society	**D of the Rules**) (6) Stern tube sealing devices (**6.2.10-2, Part D of the Rules**) (7) Pipes of special materials (**12.1.6, Part D of the Rules**) (8) Special valves and pipes fittings (**12.3.2, Part D of the Rules**) (9) Systems and equipment for ships carrying liquefied gases in bulk (**Part N of the Rules** and **Part N of the Guidance for the Survey and Construction of Steel Ships**) (10) Air pipe automatic closing devices (**13.6.2-2, Part D of the Rules**) (11) Flexible hose assemblies (**12.3.4-2, Part D of the Rules**) (12) Systems and equipment for ships using low-flashpoint fuels (**Part GF of the Rules** and **Part GF of the Guidance for the Survey and Construction of Steel Ships**) (13) Others which are considered necessary by the Society	relating to stern tube bearings from Chapter 2 due to establishment of Chapter 14.
2.4 Approval Tests	**2.4 Approval Tests**	
2.4.2 Details of Tests (Deleted)	**2.4.2 Details of Tests** **6** In the approval tests plan of stern tube bearings, the following items are to be included : (1) Drawing of the test rig (2) Drawing of the test product (specified the materials, dimensions, etc.) (3) Condition of tests (lubrication system, shaft speed, bearing load, hydraulic pressure, test time, etc.)	Deletes conventional test requirements for approval related to materials, construction and arrangement.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
	(4) Content of tests (a) Confirmation tests for the characteristics of materials i) In the case of vulcanized rubber, the following tests specified in *JIS K* 6251, 6252, 6253, 6256, 6257, 6258 and 6262 : 1) Tensile test 2) Hardness test 3) Tension permanent set test 4) Adhesion test 5) Test for adhesion to metals (except those not to be adhered to metals) 6) Tear test 7) Compression permanent test 8) Dipping test (in the case of a waterlubricated system, tests are to be carried out using sea water) ii) In the case of materials other than those specified above in **i)**, tests according to pertinent national standards or other equivalent standards concerning the contents of **i)** according to the materials. (b) Abrasion test (c) Seizure critical load test (d) Running test (in this case, confirm that the bearing pressures during the tests are to be verified are not less than 0.8 *MPa* for an oil lubricated system, and are not less than 0.2 *MPa* for a water lubricated system respectively.)	
6 In the approval tests of stern tube sealing devices, the following items are to be included: (Omitted)	**7** In the approval tests of stern tube sealing devices, the following items are to be included : (Omitted)	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
7 In the approval tests of pipes of special materials, the following items are to be included according to their applications and kinds of materials as deemed necessary by the Society: (Omitted) **8** In the approval tests of special valves and pipe fittings (except mechanical joints specified in **Chapter 9** and flexible hose assemblies specified in **-11**), the following **(1)** through **(7)** as deemed necessary by the Society are to be included according to the application and type: (Omitted) **9** Air pipe automatic closing devices are to be designed and tested in accordance with **(1)** and **(2)** respectively. (Omitted) **10** Flexible hose assemblies are to be approved for each size in accordance with the following tests. Hose assemblies with more than 3 different diameters are to be tested at least for the largest diameter, the smallest diameter and an intermediate diameter (intermediate diameters selected within a range of 2 *times* the smallest diameter to 0.5 *times* the largest diameter). For fire resistance tests, the specimens are to be selected in accordance with *ISO* 15540:2016. (Omitted)	**8** In the approval tests of pipes of special materials, the following items are to be included according to their applications and kinds of materials as deemed necessary by the Society : (Omitted) **9** In the approval tests of special valves and pipe fittings (except mechanical joints specified in **Chapter 9** and flexible hose assemblies specified in **-11**), the following items **(1)** through **(7)** as deemed necessary by the Society are to be included according to the application and type: (Omitted) **10** Air pipe automatic closing devices are to be designed and tested in accordance with **(1)** and **(2)** respectively. (Omitted) **11** Flexible hose assemblies are to be approved for each size in accordance with the following tests. Hose assemblies with more than 3 different diameters are to be tested at least for the largest diameter, the smallest diameter and an intermediate diameter (intermediate diameters selected within a range of 2 *times* the smallest diameter to 0.5 *times* the largest diameter). For fire resistance tests the specimens shall be selected in accordance with *ISO* 15540:2016. (Omitted)	

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
Chapter 14 TYPE APPROVAL OF SYNTHETIC MATERIALS USED FOR AFTMOST STERN TUBE BEARINGS AND AFTMOST SHAFT BRACKET BEARINGS **14.1 General** **14.1.1 Application** This chapter applies to the tests and inspections required for the type approval of synthetic materials used for aftmost stern tube bearings and aftmost shaft bracket bearings which supports the weight of propeller in accordance with **6.2.10-1(1)(b)iii)** and **6.2.10-2(2)(b), Part D of the Rules for the Survey and Construction of Steel Ships**. **14.1.2 Qualification** The qualification for design and application of aftmost propeller shaft bearings or aftmost shaft bracket bearings are to be provided and guaranteed by the manufacturer and these are not guaranteed by this type approval.	**(Newly added)**	Specifies according to URM85(New) URM85 Para.1.1 URM85 Para.1.3

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
14.2 Application		
14.2.1 Application Forms Manufacturers who intend to obtain type approval are to submit a completed appropriate application form (**Form 6-2**) to the Society's Head Office.		URM85 Para.2
14.2.2 Documents The following **(1)** through **(13)** documents are to be submitted together with the application forms specified in **14.2.1**. (1) Product name (2) Name and address of the manufacturer, including details for all relevant production places. (3) Reference of applicable rules and standards which the product are to comply with. (4) Product description; (a) Material type (b) Lubrication type (c) Isotropic or anisotropic behaviour (d) Elastomeric or non-elastomeric type (5) Limitations of the product (6) Product specification, technical data sheet, and installation manual including; (a) Maximum nominal surface pressure (b) Product dimensions(minimum and maximum dimensions, other if relevant) (c) Commonly acceptable matching material (type of shaft material, roughness, hardness, etc.)		URM85 Para.2.1

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
(d) Running clearance (e) Maximum operating temperature (7) Safety data sheet (8) Description of production processes (9) Description of quality assurance system or copy of ISO 9001 certificate (10) Records of manufacture and delivery (11) Test plan (including test items) (12) List of measuring equipment including calibration certificate (13) Outline of manufacturing plant		There are no requirements in UR M85 but add "outline of manufacturing plant" considering the requirements for other equipment.
14.2.3 Approval of Test Plan The Society is to examine test plans submitted for approval in accordance with **14.2.2**, approve such plans and return them to the applicants. In cases where the Society examines the documents in **14.2.2** and considers appropriate, a part of the approval test items may be omitted.		There are no requirements in UR M85 but add "Approval of test plan" considering the requirements for other equipment.
14.2.4 Confirmation of Manufacturing and Quality Control Procedure On the basis of the documents submitted in accordance with **14.2.2(8)**, **(9)**, **(10)** and **(13)**, the Society may investigate the condition of the manufacturing plant when deemed necessary.		There are no requirements in UR M85 but add "Confirmation of manufacturing and quality control procedure" considering the requirements for other equipment.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
14.3 Approval Test		URM85 Para.3
14.3.1 Test Plan		URM85 Para.3.1
1 Test plan is to include following items: (1) Description of products to be approved (2) Description of the selected test samples (3) Content of tests (test items, test standards, test conditions, acceptance criteria, etc.) (4) Description of the wear testing stands and the test conditions **2** The test plan is to include tests for the material properties specified in **14.3.3**. **3** In particular, a relaxation or complete omission of approval tests may be accepted by the Society taking into account the documentation of approval tests performed or proven track records.		
14.3.2 Wear Test		URM85 Para3.2
1 The wear test is to refer to *ASTM G*77-17 or other national or international standards deemed equivalent thereto, with respect to the following data: (1) Material of the shaft used in the test and its properties are to be specified and is to be equivalent to typical mating material (e.g. alloyed steel or stainless steel or copper alloy). (2) The shaft diameter is to depend on the bearing size and the running clearance is to be considered in the wear test. (3) Motion of shaft is to be continuous rotation.		

Amended	Original	Remarks
(4) Circumferential velocity is to be 6 *m/s* for oil or water lubrication. (5) Temperature of lubrication is to be as follows according to the applicable lubrication type. Sea water or substitute ocean water: 23 °C ± 2 °C Mineral oil: 80 °C ± 2 °C (6) Surface roughness (*Ra*) of test shaft is not to exceed following values according to shaft material. Stainless steel: 0.5 *μm* Copper alloy: 0.80 *μm* (7) Interface pressure is to be maximum nominal surface pressure ± 10 %. (8) Duration of test is to be until the coefficient of friction and wear rate remains constant at least 192 *hours*. Wear of bushings is to be measured continuously or regularly. If regularly, wear to be measured by disassembling every 48 *hours* until a constant wear rate is to be achieved (minimum of four points of measurements). **2** The following parameters are to be recorded. (1) Dimensions of test specimen (2) Wear versus time (3) Coefficient of friction versus time (4) Temperature of test specimen during test cycle (5) Deviation of load from the maximum nominal surface pressure **14.3.3 Material Properties** Material property tests are to comply with **Table 6.14-1** and **Table 6.14-2** according to non-elastomeric materials and elastomeric materials.		URM85 Para.3.3

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Table 6.14-1 Material Property Tests for Non-elastomeric Materials

Test items	Test standard (1)	Number of specimens for each sample, at least (2)	Test conditions	Acceptance criteria
Compressive strength (N/mm^2)	*ISO* 604:2002; *ASTM D* 695-2015	5 (3)		Isotropic materials; Minimum 85 N/mm^2 Anisotropic materials; For specimens parallel to sheet plane: Minimum 85 N/mm^2 For specimens normal to sheet plane: Minimum 100 N/mm^2
Compressive modulus (N/mm^2)	*ISO* 604:2002; *ASTM D* 695-2015	5 (3)		Isotropic materials; Minimum 850 N/mm^2 Anisotropic materials; For specimens parallel to sheet plane: Minimum 850 N/mm^2 For specimens normal to sheet plane: Minimum 1000 N/mm^2
Water swelling (*volume* %) Only required for water lubrication	*ISO* 175:2010	3	· Four weeks in substitute ocean water (*ASTM D* 1141-98(2021)) at 20 °C ± 2 °C and maximum temperature (60 °C ± 2 °C or advised maximum working temperature by manufacturer, whichever is higher) · Dimension of specimens: 50 x 50 x t *mm* ("t" is minimum 4 *mm* or the minimum thickness of the	Volumetric swelling ≤ 3 %

Amended	Original	Remarks
		Describes only Amended URM85 Table 1

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended			Original		Remarks
			bushing products) · Testing immediately after extraction (wet condition)		
Oil swelling (*volume* %) Only required for oil lubrication	*ISO* 175:2010	3	· For weeks in oil No.3 (*ISO* 1817:2022) at 20 °C ± 2 °C. · Dimension of specimens: 50 x 50 x t *mm* ("t" is minimum 4 *mm* or the minimum thickness of the bushing products) · Testing immediately after extraction (wet condition)	Volumetric swelling ≤ 3 %	
Compressive strength and modulus change when immersed in water Only required for water lubrication	*ISO* 604:2002; *ASTM D* 695-2015	5 (3)	· Four weeks in substitute ocean water (*ASTM D* 1141-98(2021)) at 20 °C ± 2 °C	Minimum 80 % retention of minimum specified compressive strength and modulus before water immersion.	
Temperature resistance	*ISO* 604:2002; *ASTM D* 695-2015	5 (3)	· Compressive strength and compressive modulus at maximum temperature (60 °C ± 2 °C or advised maximum working temperature by manufacturer, whichever is higher)	Minimum 80 % retention of minimum specified compressive strength and modulus at 20 °C ± 2 °C	
Wear	Refer to **14.3.2**	1			

Notes:

(1) Other testing standards may also be accepted, provided that they are suitable for testing of the synthetic material selected for application in aftmost stern tube bearings and aftmost shaft bracket bearings.

(2) The number of specimens is to be prepared for each sample.

(3) Test at least five specimens for each sample in the case of isotropic materials. Test at least ten specimens, five normal to and five parallel to sheet plane, for each sample in the case of anisotropic materials.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

<table>
<tr><th>Amended</th><th>Original</th><th>Remarks</th></tr>
<tr><td colspan="2">

Table 6.14-2 Material property test for elastomeric materials

Test items	Test standard (1)	Number of specimens for each sample, at least (2)	Test conditions	Acceptance criteria
Tensile strength (*N/mm²*)	*ISO* 37:2024 Method A of *ASTM D* 412-16(2021) *ASTM D* 638-22	3		Rubber bearing: Minimum 10 *N/mm²* Other elastomeric bearing: Minimum 30 *N/mm²*
Elongation (%)	*ISO* 37: 2024 Method A of *ASTM D* 412-16(2021) *ASTM D* 638-22	3		Rubber bearing: Minimum 150 % Other elastomeric bearing: Minimum 60 %
Hardness	*ISO* 48-4:2018 *ASTM D* 2240-15(2021)	3		
Water swelling (*volume* %) Only required for water lubrication	*ISO* 1817:2024	3	· Four weeks in substitute ocean water (*ASTM D* 1141-98(2021)) at 20 °C ± 2 °C and maximum temperature (60 °C ± 2 °C or advised maximum working temperature by manufacturer, whichever is higher) · Dimension of specimens: 50 x 50 x t *mm* ("t" is minimum 4 *mm* or the minimum thickness of the bushing products) · Testing immediately after extraction (wet condition)	Volumetric swelling ≤ 3 %
Oil swelling (*volume* %)	*ISO* 1817:2024	3	· For weeks in oil No.3 (*ISO* 1817:2022) at 20 °C ± 2 °C.	Volumetric swelling ≤ 3 %

</td><td>Describes only Amended

URM85 Table 2

ISO37:2017 has been revoked.

ISO1817:2022 has been revoked.</td></tr>
</table>

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended						Original						Remarks
Only required for oil lubrication			· Dimension of specimens: 50 x 50 x t *mm* ("t" is minimum 4 *mm* or the minimum thickness of the bushing products) · Testing immediately after extraction (wet condition)									
Tensile strength and elongation change when immersed in water Only required for water lubrication	*ISO* 37: 2024 Method A of *ASTM D* 412-16(2021) *ASTM D* 638-22	3	· Four weeks in substitute ocean water (*ASTM D* 1141-98(2021)) at 20 °C ± 2 °C	Minimum 80 % retention of minimum specified tensile strength and elongation before water immersion.								
Temperature resistance	*ISO* 37: 2024 *ISO* 7743:2017 Method A of *ASTM D* 412-16(2021) *ASTM D* 638-22	3	· Tensile strength and elongation at maximum temperature (60 °C ± 2 °C or advised maximum working temperature by manufacturer, whichever is higher)	Minimum 80 % retention of minimum specified tensile strength and elongation at 20 °C ± 2 °C								
Adhesion to metals (except those not to be adhered to metals)(*N/mm²*)	*ISO* 813:2019 *ISO* 1827:2022	3										
Change of properties due to aging (%)	*ISO* 37: 2024 *ISO* 7743:2017 Method A of *ASTM D* 412-16(2021) *ASTM D* 638-22	3	· After oven aging for tension and elongation tests · Test specimens are to be subjected to circulating air at maximum temperature (60 °C ± 2 °C or advised maximum working temperature by manufacturer, whichever is higher) for 96 *hours*. · Tensile and elongation tests	Minimum 75 % retention of tensile strength and elongation before aging								

Amended	Original	Remarks

			are to be performed not less than 20 *hours* but not more than 48 *hours* after removal from the aging environment.	
Wear	Refer to **14.3.2**	1		

Notes:
(1) Other testing standards may also be accepted, provided that they are suitable for testing of the synthetic material selected for application in aftmost stern tube bearings and aftermost shaft bracket bearings.
(2) The number of specimens is to be prepared for each sample.

14.3.4 Test Laboratories — URM85 Para.3.5

1 The selected test facility is to have accreditation according to *ISO/IEC* 17025:2017 for carrying out and recording the material property tests required by this chapter.
2 The Society's surveyor is to be present at the specified testing when the test laboratory does not have the relevant accreditation specified in **-1** above.

14.3.5 Test Reports

Manufacturers are to prepare test reports for the wear test specified in **14.3.2** and the material property test specified in **14.3.3** and submit them to the Society (branch office concerned). In case where a Society's surveyor attends the test according to **14.3.4-2**, the test reports are to be submitted to the Society (branch office concerned) upon receiving confirmation from the attending surveyor. — Specifies the case in which a Society's surveyor attends to the test.

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
14.4 Approval **14.4.1 Notification of Approval** The Society, when satisfied upon examination of the documents submitted in accordance with **14.2.2** and **14.3.5** and the attending surveyor's report, will issue a approval certificate specifying the approval number, approval date, items of approval and approval conditions (including at least the product description and properties in accordance with the material property test, maximum nominal surface pressure and maximum operating temperature). In addition, the Society will stamp those documents submitted in accordance with **14.2.2** and **14.3.5** that it deems necessary with approval stamps and return them back to applicants. **14.4.2 Term of Validity** **1** The term of validity of the approval certificate specified in **14.4.1** is 5 *years* from the date of approval. In cases where the renewal of approval is carried out in accordance with the requirements in **-2** and **-4**, the term of validity is 5 *years* from the next day after the expiry date of the previous term of validity. **2** In cases where renewal of validity is intended, manufacturers are to submit copies of existing certificates along with new copies of the materials required by **14.2**. In such cases, however, the data required per **14.2** may be limited to only that which has been modified. **3** When approval has been granted for applications with partial changes in the content of approval, the Society may		URM85 Para.4

Amended-Original Requirements Comparison Table
(Approval of Synthetic Materials Used for Aftmost Stern Tube Bearings and Aftmost Shaft Bracket Bearings)

Amended	Original	Remarks
require additional approval tests. **4** Manufacturers whose renewal is approved are to return the old approval certificate to the Society as soon as possible after receiving the new certificate and the term of validity of the old certificate expires. **14.4.3 Revocation of Approval** Where any of the following **(1)** through **(4)** is relevant, the Society may revoke approval and notify the applicant accordingly. (1) In association with the implementation or revision of international conventions, laws and regulations, products for which the approval was previously granted no longer satisfy relevant requirements. (2) In cases where the term of validity for the approval expires and no application for the renewal of the approval is submitted. (3) When serious shortcomings are found in the quality of materials already approved after being installed on ships. (4) When an application for revocation is made by the manufacturer.		
EFFECTIVE DATE AND APPLICATION **1.** The effective date of the amendments is 1 January 2026. **2.** Notwithstanding the amendments, the current requirements apply to bearings for which the application of approval is submitted before the effective date.		