# RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

**Rules for the Survey and Construction of Inland Waterway Ships**
**2022 AMENDMENT NO.1**
**Guidance for the Survey and Construction of Inland Waterway Ships**
**2022 AMENDMENT NO.1**

Rule No.56 / Notice No.41 30 June 2022
Resolved by Technical Committee on 26 January 2022

ClassNK
NIPPON KAIJI KYOKAI

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

# RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

RULES

**2022 AMENDMENT NO.1**

Rule No.56 30 June 2022

Resolved by Technical Committee on 26 January 2022

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

Rule No.56 30 June 2022
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

“Rules for the survey and construction of inland waterway ships” has been partly amended as follows:

Amendment 1-1

# Part 2 CLASS SURVEYS

## Chapter 2 CLASSIFICATION SURVEYS

### 2.1 Classification Survey during Construction

### 2.1.3 Submission of Other Plans and Documents

Sub-paragraph -1 has been amended as follows.

**1** When it is intended to build a ship to the classification with the Society, the following plans and documents are to be submitted~~,~~ in addition to those required in **2.1.2**:
((1) to (6) are omitted.)
(7) The following plans and documents related to machinery:
(a) Main and auxiliary engines (including their attachments):
Plans and data specified in **2.1.3-1(2)** ~~and (3),~~ **Part 7**
((b) to (f) are omitted.)
((8) and (9) are omitted.)

# Part 7 MACHINERY INSTALLATIONS

## Chapter 2 RECIPROCATING INTERNAL COMBUSTION ENGINES

### 2.1 General

Paragraph 2.1.3 has been amended as follows.

**2.1.3 Drawings and Data***

**1** Drawings and data to be submitted are generally as follows:

(1) Drawings and data for approval

Drawings and data specified in **Table 7.2.1(a)**

~~(a) Connecting rod bearings (including bolts details) of 4-stroke cycle engines~~

~~(b) High pressure oil pipes for driving exhaust valves with its shielding~~

~~(c) High pressure fuel oil pipes with its shielding and clamping~~

~~(d) Piping arrangements fitted to engines (including fuel oil, lubricating oil, cooling oil, cooling water, pneumatic and hydraulic systems, and information regarding the size, materials and working pressure of pipes)~~

~~(e) The drawings and data as specified in **(3)(d)** to **(f)**~~

~~(f) The drawings and data, etc. as required by the requirements of **2.1.4** (excluding those specified in **2.1.3-1(3))**~~

~~(g) The following drawings and data for exhaust driven turbochargers:~~

~~i) Category *A* turbochargers (upon request)~~

~~1) Sectional assembly (including principal dimensions and names of components)~~

~~2) Containment test report~~

~~3) Test procedures~~

~~ii) Category *B* turbochargers~~

~~1) Sectional assembly (including principal dimensions and materials of housing components for containment evaluation)~~

~~2) Documentation of containment in the event of the disc fracture specified in **2.5.1-6**~~

~~3) Documentation of the following operational data and limitations~~

~~• Maximum permissible operating speed (*rpm*)~~

~~• Maximum permissible exhaust gas temperature at the turbine inlet~~

~~• Minimum lubrication oil inlet pressure~~

~~• Maximum lubrication oil outlet temperature~~

~~• Maximum permissible vibration levels (self- and externally generated vibration)~~

~~• Alarm level for overspeed (levels are also to be indicated on engine control system diagrams)~~

~~• Alarm level for exhaust gas temperature at the turbine inlet (levels are also to be indicated on engine control system diagrams)~~

~~• Lubrication oil inlet pressure low alarm set point (levels are to also be indicated on engine control system diagrams)~~

~~• Lubrication oil outlet temperature high alarm set point (levels are to also be indicated on engine control system diagrams)~~

~~4) Diagram of lubrication oil systems (diagrams included in piping arrangements~~

~~fitted to engines may be accepted instead)~~

~~5) Test report of type test (only for type tests)~~

~~6) Test procedure (only for type tests)~~

~~iii) Category *C* turbochargers~~

~~1) Drawings listed in **ii)** above~~

~~2) Drawings of the housing and rotating parts (including details of blade fixing)~~

~~3) Material specifications of the parts mentioned in **2)** above (Mechanical property and chemical composition are to be provided.)~~

~~4) Welding details and welding procedures for the parts mentioned in **2)** above, if made of welded construction~~

(2) Drawings and data for reference

Drawings and data specified in **Table 7.2.1(b)**

~~(a) A list containing all drawings and data submitted (with relevant drawing numbers and revision status)~~

~~(b) Gudgeon pins~~

~~(c) Connecting rod bearings (including bolts details) of 2-stroke cycle engines~~

~~(d) Rocker valve gears~~

~~(e) Cylinder cover fixing bolts and valve box fixing bolts~~

~~(f) Engine control system diagram (including the monitoring, safety and alarm systems)~~

~~(g) Construction and arrangement of dampers, detuners, balancers or compensators, bracings as well as all calculation sheets related to engine balancing and engine vibration prevention~~

~~(h) Location of measures preventing oil from spraying out from joints in flammable oil piping (if fitted)~~

~~(i) The following drawings and data for exhaust driven turbochargers (only for category *C* turbochargers):~~

~~i) Documentation of the safe torque transmission specified in **2.5.1-6** when the disc is connected to the shaft by an interference fit~~

~~ii) Information on expected lifespan (Creep, low cycle fatigue and high cycle fatigue are to be considered.)~~

~~iii) Operation and maintenance manuals~~

~~(j) Other drawings and data deemed necessary by the Society~~

~~(3) Drawings and data for the purpose of inspection and testing of reciprocating internal combustion engines~~

~~(a) A list containing all drawings and data submitted (including relevant drawing numbers and revision status)~~

~~(b) Engine particulars to be in the form designated by the Society~~

~~(c) Material specifications of main parts with information on non-destructive testing and pressure testing as applicable to the material~~

~~(d) Bedplate and crankcase of welded design, with welding details and welding instructions for approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.~~

~~(e) Thrust bearing bedplate of welded design, with welding details and welding instructions for approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.~~

~~(f) Frame/framebox/gearbox of welded design, with welding details and instructions for approval of materials and weld procedure specifications. The weld procedure~~

specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.

(g) Crankshaft, assembly and details

(h) Thrust shaft or intermediate shaft (if integral with engine)

(i) Shaft coupling bolts

(j) Bolts and studs for main bearings

(k) Bolts and studs for cylinder heads and exhaust valve (two stroke design)

(l) Bolts and studs for connecting rods

(m) Tie rods

(n) Schematic layout or other equivalent drawings and data on the reciprocating internal combustion engine of the following **i)** to **vii)** (Details of the system so far as supplied by the licensee such as: main dimensions, operating media and maximum working pressures).

i) starting air system

ii) Fuel oil system

iii) Lubricating oil system

iv) Cooling water system

v) Hydraulic system

vi) Hydraulic system (for valve lift)

vii) Engine control and safety system

(o) Shielding of high pressure fuel pipes, assembly (All engines)

(p) Construction of accumulators for hydraulic oil and fuel oil

(q) High pressure parts for fuel oil injection system

The documentation to contain specifications for pressures, pipe dimensions and materials.

(r) Arrangement and details of the crankcase explosion relief valve (only for engines of a cylinder diameter of 200 *mm* or more or a crankcase volume of 0.6 $m^3$ or more)

(s) Oil mist detection and/or alternative alarm arrangements

(t) Cylinder head

(u) Cylinder block, engine block

(v) Cylinder liner

(w) Counterweights (if not integral with crankshaft), including fastening

(x) Connecting rod with cap

(y) Crosshead

(z) Piston rod

(aa) Piston, assembly, including identification (e.g. drawing number) of components

(ab) Piston head

(ac) Camshaft drive, assembly, including identification (e.g. drawing number) of components

(ad) Flywheel

(ae) Arrangement of foundation (for main engines only)

(af) Fuel oil injection pump

(ag) Shielding and insulation of exhaust pipes and other parts of high temperature which may be impinged as a result of a fuel system failure, assembly

(ah) Construction and arrangement of dampers

(ai) For electronically controlled engines, assembly drawings or arrangements of the following **i)** to **iv)**:

i) Control valves

ii) High pressure pumps

~~iii) Drive for high pressure pumps~~

~~iv) Valve bodies, if applicable~~

~~(aj) Operation and service manuals~~

~~Operation and service manuals are to contain maintenance requirements (servicing and repair) including details of any special tools and gauges that are to be used with their fitting/settings together with any test requirements on completion of maintenance.~~

~~(ak) Test program resulting from FMEA (for engine control system) in cases of engines that rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves~~

~~(al) Production specifications for castings and welding (sequence)~~

~~(am)Certification of an approval of use for environmental tests, control components. Documents modified for a specific application are to be submitted to the Society for information or approval, as applicable.~~

~~(an) Quality requirements for engine production~~

~~(ao) Other drawings and data deemed necessary by the Society~~

**2** The drawings and data for the inspection and testing specified in **-1~~(3) above~~** (the items represented by the mark ○ in **Table 7.2.1(a)** and **Table7.2.1(b)**, hereinafter indicated in the same way throughout this Chapter) are to be submitted in accordance with **2.1.4-1** by the engine manufacturer producing engines with the drawings and data whose approval of use has been obtained in accordance with **2.1.1-2** (hereinafter referred to as "licensee" in this Chapter) ~~but~~. Such drawings and data, however, may be submitted by the licensor in accordance with **2.1.4-2**.

Table 7.2.1(a) has been added as follows.

Table 7.2.1(a) Drawings and Data for Approval

| | Items | For inspection and testing |
|---|---|---|
| (1) | Engine particulars (in the format designated by the Society) | ○ |
| (2) | Material specifications of main parts with information on non-destructive testing and pressure testing as applicable to the material | ○ |
| (3) | Bedplate and crankcase of welded design, with welding details and welding instructions(1) | ○ |
| (4) | Thrust bearing bedplate of welded design, with welding details and welding instructions(1) | ○ |
| (5) | Frame/framebox/gearbox of welded design, with welding details and instructions(1) | ○ |
| (6) | Crankshaft, assembly and details | ○ |
| (7) | Thrust shaft or intermediate shaft (if integral with engine) | ○ |
| (8) | Shaft coupling bolts | ○ |
| (9) | Connecting rod bearings (four-stroke design) | － |
| (10) | Bolts and studs for connecting rods (four-stroke design) | ○ |
| (11) | Schematic layout or other equivalent drawings and data on the reciprocating internal combustion engine of the following **(a)** to **(g)** (details of the system so far as supplied by the licensee such as: main dimensions, operating media and maximum working pressures).<br>(a) Starting air system<br>(b) Fuel oil system<br>(c) Lubricating oil system<br>(d) Cooling water system<br>(e) Hydraulic system<br>(f) Hydraulic system (for valve lift)<br>(g) Engine control and safety system | ○ |
| (12) | High pressure oil pipes for driving exhaust valves with its shielding | － |
| (13) | Shielding of high pressure fuel pipes, assembly (all engines) | ○ |
| (14) | High pressure parts for fuel oil injection system<br>The documentation to contain specifications for pressures, pipe dimensions and materials. | ○ |
| (15) | Arrangement and details of the crankcase explosion relief valve (only for engines of a cylinder diameter of 200 *mm* or more or a crankcase volume of 0.6 $m^3$ or more) | ○ |
| (16) | Oil mist detection and/or alternative alarm arrangements | ○ |
| (17) | Connecting rod with cap (four-stroke design) | ○ |
| (18) | Arrangement of foundation (for main engines only) | ○ |
| (19) | The drawings, data, etc. required by **2.1.4**. | ○ |

Table 7.2.1(a) Drawings and Data for Approval (continued)

| | Items | For inspection and testing |
|---|---|---|
| (20) | The following drawings and data for exhaust driven turbochargers:<br>(a) Category *A* turbochargers (upon request)<br>i) Sectional assembly (including principal dimensions and names of components)<br>ii) Containment test report<br>iii) Test procedures<br>(b) Category *B* turbochargers<br>i) Sectional assembly (including principal dimensions and materials of housing components for containment evaluation.)<br>ii) Documentation of containment in the event of the disc fracture specified in **2.5.1-6**<br>iii) Documentation of following operational data and limitations<br>・Maximum permissible operating speed (*rpm*)<br>・Maximum permissible exhaust gas temperature at the turbine inlet<br>・Minimum lubrication oil inlet pressure<br>・Maximum permissible vibration levels (self- and externally generated vibrations)<br>・Alarm level for exhaust gas temperature at the turbine inlet (levels are also to be indicated on engine control system diagrams)<br>・Lubrication oil inlet pressure low alarm set point (levels are also to be indicated on engine control system diagrams)<br>・Lubrication oil outlet temperature high alarm set point (levels are also to be indicated on engine control system diagrams)<br>iv) Diagram of lubrication oil systems (diagrams included in piping arrangements fitted to engines may be accepted instead)<br>v) Test report of type test (only for type tests)<br>vi) Test procedure (only for type tests)<br>(c) Category *C* turbochargers<br>i) Drawings listed in **(b)** above<br>ii) Drawings of the housing and rotating parts (including details of blade fixing)<br>iii) Material specifications (including mechanical properties and chemical composition) of the parts mentioned in **ii)** above<br>iv) Welding details and welding procedures for the parts mentioned in **ii)** above, if made of welded construction | — |
| (21) | Other drawings and data deemed necessary by the Society | ○ |

Notes:

(1) For approval of materials and weld procedure specifications, the weld procedure specification is to include details of pre-and post-weld heat treatment, weld consumables and fit-up conditions.

Table 7.2.1(b) has been added as follows.

Table 7.2.1(b) Drawings and Data for Reference

| | Items | For inspection and testing |
|---|---|---|
| (1) | A list containing all drawings and data submitted (including relevant drawing numbers and revision status) | ○ |
| (2) | Bolts and studs for main bearings | ○ |
| (3) | Connecting rod bearings (two-stroke design) | – |
| (4) | Bolts and studs for cylinder heads and exhaust valve (two-stroke design) | ○ |
| (5) | Bolts and studs for connecting rods (two-stroke design) | ○ |
| (6) | Tie rods | ○ |
| (7) | Piston pins | – |
| (8) | Construction of accumulators for hydraulic oil and fuel oil | ○ |
| (9) | Cylinder head fixing bolts and valve box fixing bolts | – |
| (10) | Rocker valve gears | – |
| (11) | Cylinder head | ○ |
| (12) | Cylinder block, engine block | ○ |
| (13) | Cylinder liner | ○ |
| (14) | Counterweights (if not integral with crankshaft), including fastening | ○ |
| (15) | Connecting rod with cap (two-stroke design) | ○ |
| (16) | Crosshead | ○ |
| (17) | Piston rod | ○ |
| (18) | Piston, assembly, including identification (e.g. drawing number) of components | ○ |
| (19) | Piston head | ○ |
| (20) | Camshaft drive, assembly, including identification (e.g. drawing number) of components | ○ |
| (21) | Flywheel | ○ |
| (22) | Fuel oil injection pump | ○ |
| (23) | Shielding and insulation of exhaust pipes and other parts of high temperature which may be impinged as a result of a fuel system failure, assembly | ○ |
| (24) | Construction and arrangement of dampers | ○ |
| (25) | Construction and arrangement of detuners, balancers or compensators, bracings as well as all calculation sheets related to engine balancing and engine vibration prevention | – |
| (26) | For electronically controlled engines, assembly drawings or arrangements of the following **(a)** to **(d)**:<br>(a) Control valves<br>(b) High-pressure pumps<br>(c) Drive for high pressure pumps<br>(d) Valve bodies, if applicable | ○ |
| (27) | Operation and service manuals[(1)] | ○ |
| (28) | Engine control system diagram (including the monitoring, safety and alarm systems) | – |
| (29) | Test program resulting from FMEA (for engine control system) in cases of engines that rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves | ○ |
| (30) | Production specifications for castings and welding (sequence) | ○ |
| (31) | Certification of an approval of use for environmental tests, control components[(2)] | ○ |
| (32) | Quality requirements for engine production | ○ |
| (33) | Location of measures preventing oil from spraying out from joints in flammable oil piping (if fitted) | – |

Table 7.2.1(b) Drawings and Data for Reference (continued)

| | Items | For inspection and testing |
|---|---|---|
| (34) | The following drawings and data for exhaust driven turbochargers (only for category *C* turbochargers):<br>(a) Documentation of the safe torque transmission specified in **2.5.1-6** when the disc is connected to the shaft by an interference fit<br>(b) Information on expected lifespan (creep, low cycle fatigue and high cycle fatigue are to be considered)<br>(c) Operation and maintenance manuals | — |
| (35) | Other drawings and data deemed necessary by the Society | ○ |

Notes:

(1) Operation and service manuals are to contain maintenance requirements (servicing and repair) including details of any special tools and gauges that are to be used with their fitting/settings together with any test requirements on completion of maintenance.

(2) Drawings and data modified for a specific application are to be submitted to the Society for reference or approval, as applicable.

## 2.1.4 Approval of Reciprocating Internal Combustion Engines*

Sub-paragraph -1 has been amended as follows.

**1** Reciprocating internal combustion engines are to be approved in accordance with the following **(1)** to **(6)**:

(1) Development of documents and data for engine production

(a) Prior to the start of the reciprocating internal combustion engine approval process in accordance with the following **(2c)** and subsequent sub-paragraphs of this paragraph, a design approval is to be obtained as specified separately by the Society.

(b) Each type of reciprocating internal combustion engine is to be provided with a certificate of approval of use obtained by the licensor in accordance with **2.1.1-2**. For the first engine of a type or for those with no service records, the process of an approval of use and the approval process for production by the licensee may be performed simultaneously.

(c) The licensor is to review the drawings and data of the reciprocating internal combustion engine whose approval of use has been obtained for the application and develop, if necessary, application specific drawings and data for production of reciprocating internal combustion engines for the use of the licensee in developing the reciprocating internal combustion engine specific production drawings and data ~~listed~~ for the inspection and testing specified in **2.1.3-1~~(3)~~**.

(d) If substantive modifications to the ~~the~~ drawings and data of the reciprocating internal combustion engine whose approval of use has been obtained have been made in the drawings and data of reciprocating internal combustion engines to be produced, the affected drawings and data are to be resubmitted to the Society as specified separately by the Society.

(2) Drawings and data for the ~~purpose of~~ inspection and testing of reciprocating internal combustion engines

(a) The licensee is to develop the drawings and data ~~listed~~ for the inspection and testing specified in **2.1.3-1~~(3)~~** and a comparison list of these drawings and data to the drawings and data of the reciprocating internal combustion engine whose approval of use has been obtained by the licensor and submit these drawings and the comparison list to the Society.

(b) ~~In applying~~ As for the drawings and data for the inspection and testing specified in **2.1.3-1~~(3)~~**, if there are differences in the technical content on the licensee's production drawings and data of the reciprocating internal combustion engine compared to the drawings and data of the reciprocating internal combustion engine whose approval of use has been obtained by the licensor, the licensee is to submit "Confirmation of the licensor's acceptance of licensee's modifications" approved by the licensor and signed by the licensee and licensor. If the licensor acceptance is not confirmed, the reciprocating internal combustion engine manufactured by the licensee is to be regarded as a different engine type and is **2.1.1-2** is to apply to the reciprocating internal combustion engine.

(c) In applying **(b)** above, modifications applied by the licensee are to be provided with appropriate quality requirements.

(d) The Society returns the drawings and data specified in **(a)** and **(b)** above to the licensee with confirmation that the design has been approved.

(e) The licensee or its subcontractors are to prepare to be able to provide the drawings and data specified in **(a)** and **(b)** above so that the Surveyor can use the information for inspection purposes during manufacture and testing of the reciprocating internal combustion engine and its components.

(3) Additional drawings and data

In addition to the drawings and data ~~listed~~ for the inspection and testing specified in **2.1.3-1~~(3)~~**, the licensee is to be able to provide to the Surveyor performing the test specified in **2.6.1** upon request the relevant detail drawings, production quality control specifications and acceptance criteria. These drawings and data are for supplemental purposes to the survey only.

((4) to (6) are omitted.)

## 2.2 Materials, Construction and Strength

### 2.2.1 Materials

Sub-paragraph -1 has been amended as follows.

**1** Materials intended for the principal components of reciprocating internal combustion engines and their non-destructive tests as well as surface inspections and dimension inspections are to conform to the requirements given in **Table 7.2.~~1~~2**. However, with respect to ultrasonic testing as well as surface inspections and dimension inspections, submission or presentation of test results to the Surveyor may be considered sufficient. In cases where deemed necessary by the Society, tests or inspections may also be required for any parts not specified in **Table 7.2.~~1~~2**.

Table 7.2.1 has been renumbered to Table 7.2.2.

Table 7.2.~~1~~2 Application of Materials and Non-destructive Tests as well as Surface Inspections and Dimension Inspections to Principal Components of Reciprocating Internal Combustion Engines

(Omitted)

## 2.3 Crankshafts

### 2.3.1 Solid Crankshafts

Sub-paragraph -1 has been amended as follows.

**1** The diameters of crankpins and journals are to be not less than the value given by the following formula:

$$d_c = \left\{\left(M + \sqrt{M^2 + T^2}\right) D^2\right\}^{\frac{1}{3}} K_m K_s K_h$$

Where:

$d_c$: Required diameter of crankshaft (*mm*)
$M$: $10^{-2} A L P_{max}$
$T$: $10^{-2} B S P_{mi}$
$S$: Length of stroke (*mm*)
$L$: Span of bearings adjacent to crank measured from centre to centre (*mm*)
$P_{max}$: Maximum combustion pressure in cylinder (*MPa*)
$P_{mi}$: Indicated mean effective pressure (*MPa*)
$A$ and $B$: Coefficients given in **Table 7.2.~~2~~3** and **Table 7.2.~~3~~4** for engines having equal firing intervals (in the case of Vee engines, those with equal firing intervals on each bank.). Special consideration will be given to values *A* and *B* for reciprocating internal combustion engines having unequal firing intervals or for those not covered by the Tables.
$D$: (Omitted)
$K_m$: (Omitted)
$K_s$: (Omitted)
$K_h$: (Omitted)

Table 7.2.2 has been renumbered to Table 7.2.3.

Table 7.2.~~2~~3 Value of Coefficients *A* and *B* for Single Acting In-line Engines
(Omitted)

Table 7.2.3(1) and Table 7.2.3(2) have been renumbered to Table 7.2.4(1) and Table 7.2.4(2).

Table 7.2.~~3~~4(1) Value of Coefficients *A* and *B* for Single Acting 2-stroke cycle Vee Engines with Parallel Connecting Rods
(Omitted)

Table 7.2.~~3~~4(2) Value of Coefficients *A* and *B* for Single Acting 4-stroke cycle Vee Engines with Parallel Connecting Rods
(Omitted)

## 2.4 Safety Devices

### 2.4.3 Protection against Crankcase Explosion*

Sub-paragraph -2 has been amended as follows.

**2** The number and locations of the explosion relief valves specified in **-1** are to be in accordance with **Table 7.2.~~4~~5**.

Table 7.2.4 has been renumbered to Table 7.2.5.

Table 7.2.~~4~~5 Number and Location of Explosion Relief Valves
(Omitted)

## 2.5 Associated Installations

### 2.5.1 Exhaust Driven Turbochargers*

Sub-paragraph -8 has been amended as follows.

**8** For categories *B* and *C* turbochargers, the indications and alarms listed in **Table 7.2.~~5~~6** are to be provided. Indications may be provided at local locations, monitoring stations or control stations. Alarm levels may be equal to permissible limits~~,~~ but are not to be reached when operating the engine at 110 % power, or at any approved intermittent overload beyond 110 % in cases where the turbochargers are fitted to engines for which intermittent overload power is approved.

### 2.5.8 Accumulators and Common Accumulators for Electronically-controlled Engines which are used as the Main Propulsion Machinery

Sub-paragraph -1 has been amended as follows.

**1** Accumulators and common accumulators are to comply with the requirements in **Chapter 10, Part D of the Rules for the Survey and Construction of Steel Ships**. However, notwithstanding this requirement, material~~s~~ and non-destructive tests as well as surface inspections and dimension inspections are to be in accordance with **Table D2.~~1~~2, Part D of the Rules for the Survey and Construction of Steel Ships** and hydrostatic tests are to be in accordance with **Table D2.~~6~~7, Part D of the Rules for the Survey and Construction of Steel Ships**.

Table 7.2.5 has been renumbered to Table 7.2.6.

Table 7.2.~~5~~6 Alarms and Indications of Turbochargers
(Omitted)

Paragraph 2.5.11 has been amended as follows.

**2.5.11 Failure Mode Effect Analysis for Electronically-controlled Engines which are used as the Main Propulsion Machinery**

Failure Mode Effect Analysis (FMEA) is to be carried out, for electronic control systems, in order to confirm that any one equipment or circuits in such systems which lose function may not cause any malfunction or deterioration in other equipment or circuits, in accordance with the following:

((1) and (2) are omitted.)

(3) FMEA results are to be created in table form as shown in **Table 7.2.~~6~~7** or be of equivalent forms thereto.

((4) and (5) are omitted.)

Table 7.2.6 has been renumbered to Table 7.2.7.

Table 7.2.~~6~~7 Failure Mode Effect Analysis Table for Electronically-controlled Engines which are used as the Main Propulsion Machinery

(Omitted)

**2.6 Tests**

**2.6.1 Shop Tests***

Sub-paragraph -1 has been amended as follows.

**1** For components or accessories specified in **Table 7.2.~~7~~8**, hydrostatic tests are to be carried out on the water or oil side of the component at the pressures shown in the Table. In cases deemed necessary by the Society, tests may also be required for any components not specified in **Table 7.2.~~7~~8**.

Table 7.2.7 has been renumbered to Table 7.2.8.

Table 7.2.~~7~~8 Hydrostatic Test Pressure

(Omitted)

EFFECTIVE DATE AND APPLICATION

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Rules, the current requirements may apply to reciprocating internal combustion engines for which the application for approval is submitted to the Society before the effective date.

Amendment 1-2

# Part 7 MACHINERY INSTALLATIONS

## Chapter 1 GENERAL

### 1.1 General

#### 1.1.4 Modification of Requirements*

Sub-paragraph -1 has been amended as follows.

**1** For the following machinery installations, piping systems and all their respective control systems, some requirements of this Part may be modified appropriately provided that the Society considers such modifications acceptable:

(1) Small prime movers (including power transmission systems and shafting systems) for either driving generators or auxiliary machinery ~~(including power transmission systems and shafting systems)~~

(2) Auxiliary machineries for cargo handling and their prime movers (including power transmission systems and shafting systems)

(3) Machinery installations as deemed appropriate by the Society after considering their capacity, purpose and conditions of service

# Chapter 4 SHAFTINGS

## 4.2 Materials, Construction and Strength

### 4.2.2 Intermediate Shafts*

Table 7.4.2 has been amended as follows.

Table 7.4.2 Values of $k_1$

| Shaft with integral flange coupling (1) | Shaft with flange coupling either shrink fit, push fit or cold fit (~~1~~2) | Shaft with keyway (~~2~~3)(4) | Shaft with transverse hole (~~3~~5) | Shaft with longitudinal slot (~~4~~6) | Shaft with splines (~~5~~7) |
|---|---|---|---|---|---|
| 1.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.15 |

Notes:

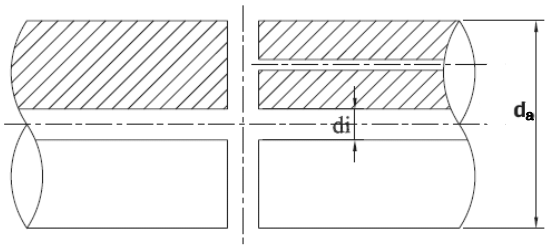
(1) The fillet radius at the base of the flange is not to be less 0.08 *times* the diameter of the shaft.

(~~1~~2) In cases where shafts, during continuous operation, experience torsional vibration stress exceeding 85 % of $\tau_1$ given in **6.2.2-1(1)**, an increase of 1 to 2 % in diameter to the fit diameter and a blending radius nearly equal to the change in diameter are to be provided.

(~~2~~3) After a length of not less than 0.2 $d_0$ from the end of the keyway, the diameter of a shaft may be reduced progressively to the diameter calculated with $k_1$=1.0.
The fillet radius in the transverse section of keyway bottom is to be 0.0125 $d_0$ or more.

(4) Keyways are in general not to be used in installations with a barred speed range in accordance with **6.3**.

(~~3~~5) The diameter of the hole is not to be more than 0.3 $d_0$. When a transverse hole intersects an eccentric axial hole (*See* below), the value is to be determined by the Society based on the submitted data in each case.




(~~4~~6) The shape of the slot is to be in accordance with the following: any edge rounding other than by chamfering is to be avoided in principle; the number of slots is to be 1, 2 or 3 and they are to be arranged 360, 180 or 120 *degrees* apart from each other respectively.

(a) $l < 0.8d_a$

(b) $d_i < 0.7d_a$

(c) $0.15d_a < e \leqq 0.2d_a$

(d) $r$ ~~=~~≧ $e / 2$

~~W~~where~~:~~

$l$: slot length

$d_a$: outside diameter of the hollow shaft

$d_i$: inside diameter of the hollow shaft

$e$: slot width

$r$: end rounding of the slot

(~~5~~7) The shape of the spline is to conform to *JIS B* 1601 or the equivalent thereof.

### 4.2.3 Thrust Shafts*

Sub-paragraph -3 has been renumbered to Sub-paragraph -4, and Sub-paragraph -3 has been added as follows.

**3** The fillet radius at the base of the thrust collar on both sides is not to be less 0.08 *times* the diameter of the shaft.
~~**3**~~**4** The diameter of the thrust shaft of material other than specified in **-1** above is to be deemed appropriate by the Society.

### 4.2.4 Propeller Shafts and Stern Tube Shafts*

Sub-paragraph -3 has been renumbered to Sub-paragraph -4, and Sub-paragraph -3 has been added as follows.

**3** The shaft diameter may be reduced by either a smooth taper or a blending radius nearly equal to the change in diameter to the diameter calculated by the formula given in **4.2.2-1** at the portion located forward of the fore end of the fwd stern tube seal. In cases where shafts are manufactured using stainless steel, shaft diameters calculated as $T_s = 400$ are to be used.
~~**3**~~**4** The diameters of propeller shafts and stern tube shafts other than those prescribed in **-1** and **-2** are to be deemed appropriate by the Society.

Table 7.4.3 has been amended as follows.

Table 7.4.3 Values of $k_2$

| | Application | | $k_2$ |
|---|---|---|---|
| 1 | The portion between the big end of the tapered part of propeller shaft (in cases where the propeller is fitted with a flange, the fore face of the flange) and the fore end of the aftermost stern tube bearing, or 2.5 $d_S$, whichever is greater | For a shaft carrying a keyless propeller, or where the propeller is attached to an integral flange | 1.22 |
| | | For a shaft carrying a keyed propeller | 1.26 |
| 2 | Excluding the portion given in 1 above, the portion up to the fore end of the fwd stern tube seal in the direction of the bow | | 1.15(1) |
| 3 | Stern tube shaft | | 1.15(1) |
| 4 | The portion located forward of the fore end of the fwd stern tube seal | | 1.15~~(2)~~ |

Notes:
(1) At the boundary, the shaft diameter is to be reduced with either a smooth taper or a blending radius nearly equal to the change in diameter.
~~(2) The shaft diameter may be reduced by either a smooth taper or a blending radius nearly equal to the change in diameter to the diameter calculated by the formula given in **4.2.2.**~~

Table 7.4.4 has been amended as follows.

Table 7.4.4 Values of $k_3$

| | Application | *KSUSF* 316<br>*KSUS*316-*SU* | *KSUSF* 316*L*<br>*KSUS*316*L*-*SU* |
|---|---|---|---|
| 1 | The portion between the big end of the tapered part of propeller shaft (in cases where the propeller is fitted with a flange) and the fore end of the aftermost stern tube bearing, or 2.5 $d_S$, whichever is greater | 1.28 | 1.34 |
| 2 | Excluding the portion given in 1 above, the portion up to the fore end of the fwd stern tube seal in the direction of the bow | 1.16(1) | 1.22(1) |
| 3 | The portion located forward of the fore end of the fwd stern tube seal | 1.16~~(2)~~ | 1.22~~(2)~~ |

Notes:

(1) At the boundary, the shaft diameter is to be reduced with either a smooth taper or a blending radius nearly equal to the change in diameter.

~~(2) The shaft diameter may be reduced by either a smooth taper or a blending radius nearly equal to the change in diameter to the diameter calculated by the formula given in **4.2.2-1** considering $T_S$=400.~~

### 4.2.7 Corrosion Protection of Propeller Shafts and Stern Tube Shafts*

Sub-paragraph -3 has been amended as follows.

**3** Spaces between the propeller cap or propeller boss and the propeller shaft are to be filled up with ~~tallow,~~ grease or provided with other effective means to protect the shaft against corrosion by water.

### 4.2.10 Stern Tube Bearings and Shaft Bracket Bearings*

Sub-paragraph -1 has been amended as follows.

**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 more than 0.8 *MPa* and special consideration is given on the construction and arrangement in accordance with provisions specified elsewhere ~~and specially approved by the Society~~, 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.

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 after peak tank or by some other suitable means.

(b) In the case of materials other than white metal~~:~~

i) The materials, construction and arrangement are to be approved by the Society.

ii) For bearings of synthetic rubber, reinforced 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 ~~specially approved by the Society~~ 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.

iii) Notwithstanding ~~the requirement given in~~ **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 ~~experience~~histories.

(2) In the case of water lubricated bearings~~:~~

(a) The materials, construction and arrangement are to be approved by the Society.

(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, 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.

(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**.

Paragraph 4.2.12 has been amended as follows.

**4.2.12 Shaft Alignment~~*~~**

For the main propulsion shafting having an oil-lubricated propeller shaft of which diameter is not less than 400 *mm*, the shaft alignment calculation in accordance with **Annex 6.2.13, Part D of the Rules for the Survey and Construction of Steel Ships** including bending moments, bearing loads and deflection curve of the shafting is to be ~~carried out for approval~~ submitted to the Society for approval.

# Chapter 6 TORSIONAL VIBRATION OF SHAFTINGS

## 6.2 Allowable Limit

### 6.2.2 Intermediate Shafts, Thrust Shafts, Propeller Shafts and Stern Tube Shafts*

Table 7.6.1 has been amended as follows.

Table 7.6.1 Values of $C_K$ (~~5~~4)

| Intermediate shaft with | | | | | | Thrust shaft | | Propeller shaft and stern tube shaft | |
|---|---|---|---|---|---|---|---|---|---|
| integral flange coupling | flange couplings either shrink fit, push fit or cold fit | keyway, tapered connection | keyway, cylindrical connection | transverse hole(~~1~~) | longitudinal slot(~~2~~1) | on both sides of thrust collar | in way of part subjected to axial load of roller bearing | near the big end of the tapered part of propeller shaft(~~3~~2) | excluding the portion given in the left column(~~4~~3) |
| 1.0 | 1.0 | 0.6 | 0.45 | 0.50 | 0.30 | 0.85 | 0.85 | 0.55 | 0.80 |

Notes:

~~(1) To be in accordance with **note (3) of Table 7.4.2.**~~

(~~2~~1) ~~To be in accordance with **note (4) of Table 7.4.2.**~~ For intermediate shafts with longitudinal slots, values of $C_K$ may be determined using the following formulae:

$C_K = 1.45/scf$

$$scf = \alpha_{t(hole)} + 0.80\frac{(l-e)/d_a}{\sqrt{\left(1-\frac{d_i}{d_a}\right)\frac{e}{d_a}}}$$

where

$scf$ : Stress concentration factor at the end of slots defined as the ratio between the maximum local principal stress and $\sqrt{3}$ times the nominal torsional stress determined for the hollow shafts without slots (values obtained through Finite Element Calculation may be used as well)

$l$ : Slot length

$e$ : Slot width

$d_i$ : Inside diameter of the hollow shaft at the slot

$d_a$ : Outside diameter of the hollow shaft

$\alpha_{t(hole)}$: Stress concentration factor of radial holes (in this context, $e$ = hole diameter) determined by the following formula (an approximate value of 2.3 may be used as well)

$$\alpha_{t(hole)} = 2.3 - 3\frac{e}{d_a} + 15\left(\frac{e}{d_a}\right)^2 + 10\left(\frac{e}{d_a}\right)^2\left(\frac{d_i}{d_a}\right)^2$$

(~~3~~2) The portion between the big end of the tapered part of the propeller shaft (in cases where the propeller is fitted with a flange, the fore face of the flange) and the fore end of the aftermost stern tube bearing, or 2.5 $d_s$, whichever is greater. In this case $d_s$ is the required diameter of the propeller shaft or stern tube shaft.

(~~4~~3) The portion in the direction of the bow up to the fore end of the fwd stern tube seal.

(~~5~~4) Any value of $C_K$ other than those above is to be determined by the Society based on the submitted data in each case.

## 6.3 Barred Speed Range

Paragraph 6.3.1 has been amended as follows.

### 6.3.1 Barred Speed Range for Avoiding Continuous Operation*

**1** In cases where the torsional vibration stresses exceed the allowable limit $\tau_1$ specified in **6.2**, barred speed ranges are to be marked with red zones on the engine tachometers and these ranges are to be passed through as quickly as possible. In this case, barred speed ranges are to be imposed in accordance with the following:

(1) The barred speed ranges are to be imposed between the following speed limits.

$$\frac{16N_c}{18-\lambda} \leq N_0 \leq \frac{(18-\lambda)N_c}{16}$$

~~W~~where~~:~~

$N_0$: The number of revolutions to be barred (*rpm*)

$N_c$: The number of revolutions at the resonant critical (*rpm*)

$\lambda$: Ratio of the number of revolutions at the resonant critical to the number of maximum continuous revolutions

(2) For controllable pitch propellers, both full and zero pitch conditions are to be considered.

(3) The tachometer tolerance is to be considered.

(4) The engine is to be stable in operation at each end of the barred speed ranges.

(~~3~~5) Restricted speed ranges in one cylinder misfiring conditions are to enable safe navigation even where the ship is provided with only one propulsion engine.

**2** In cases where the range in which the stresses exceed the allowable limit $\tau_1$ specified in **6.2** is verified by measurements, such range may be taken as the barred speed range for avoiding continuous operation, notwithstanding the required range specified in **-1**~~, having regard to the tachometer accuracy~~.

**3** For engines ~~where~~for which clearing the barred speed range for avoiding continuous operation specified in **-1** and **-2** above is not readily available, transferring of the resonant points of torsional vibrations and other necessary measures are to be taken.

# Chapter 10 PIPES, VALVES, PIPE FITTINGS AND AUXILIARIES

## 10.1 General

### 10.1.2 Terminology

Sub-paragraph -4 has been amended as follows.

**4** Flexible Hose Assemblies

Flexible hose assemblies are ~~those~~ short length metallic or non-metallic hoses that are normally flexible ~~hoses~~ with end fittings. Flexible hose assemblies for essential services or containing either flammable or toxic media are not to exceed 1.5 *m* in length.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

**1.** The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

**2.** The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

**3.** If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

**4.** If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-3

# Part 7 MACHINERY INSTALLATIONS

## Chapter 2 RECIPROCATING INTERNAL COMBUSTION ENGINES

### 2.1 General

#### 2.1.2 Terminology

Sub-paragraph -2 has been amended as follows.

**2** The terminology used in the application of ~~**-1(3)** and **-2 of**~~ **2.1.3** ~~as well as~~and **2.1.4** is as specified in the following **(1)** to **(36)**:
((1) to (25) are omitted.)
(26) "Quality assurance" means all the planned and systematic activities implemented within the quality system, and demonstrated as needed to provide adequate confidence that an entity will fulfil requirements for quality. Refer to *ISO* ~~9000 series~~9001:2015.
((27) to (36) are omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

**1.** The effective date of the amendments is 1 July 2022.
**2.** Notwithstanding the amendments to the Rules, the current requirements may apply to reciprocating internal combustion engines whose type is the same type of those for which the application for approval of use is submitted to the Society before the effective date.

Amendment 1-4

# Part 7 MACHINERY INSTALLATIONS

## Chapter 3 POWER TRANSMISSION SYSTEMS

### 3.2 Materials and Construction

#### 3.2.1 Materials*

Sub-paragraph -1(1) has been amended as follows.

**1** Materials used for the following components (hereinafter referred to as "the principal components of the power transmission system") are to comply with the requirements in **Part K of the Rules for the Survey and Construction of Steel Ships**.

(1) Power transmission shafts (including power take-off(PTO) shafts) and gears
(2) Power transmission parts of couplings
(3) Power transmission parts of clutches
(4) Coupling bolts

### 3.3 Strength of Gears

Paragraph 3.3.1 has been amended as follows.

#### 3.3.1 Application*

The requirements in **3.3** apply to external tooth cylindrical gears having an involute tooth profile. All other gears are to be as deemed appropriate by the Society. In addition enclosed gear strength calculations are to be in accordance with **Annex 5.3.1 "CALCULATION OF STRENGTH OF ENCLOSED GEARS", Part D of the Rules for the Survey and Construction of Steel Ships**.

Paragraph 3.3.5 has been amended as follows.

#### 3.3.5 Detailed Evaluation for Strength*

Special consideration will be given to the gearing devices, notwithstanding the requirements in **3.3.3** and **3.3.4**, provided that detailed data and calculations on their strength are submitted to the Society and considered appropriate. In addition, the wording "detailed data and calculations on their strength" means calculations based on **Annex 5.3.1 "CALCULATION OF STRENGTH OF ENCLOSED GEARS", Part D of the Rules for the Survey and Construction of Steel Ships**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Rules, the current requirements apply to all gears previously approved by the Society prior to the effective date for which no failure has occurred, and no changes related to strength, such as the scantlings of the gear meshes, materials, etc. have been made.

Amendment 1-5

# Part 7 MACHINERY INSTALLATIONS

## Chapter 10 PIPES, VALVES, PIPE FITTINGS AND AUXILIARIES

Table 7.10.8 has been amended as follows.

Table 7.10.8 Application Classifications of Mechanical Joints[1]

| Application Purpose | System | Kind of Connections[2] | | | Classification of pipe system | Fire endurance test condition[11] |
|---|---|---|---|---|---|---|
| | | Pipe Union | Compression Coupling | Slip-on Joint[10] | | |
| Flammable fluids[8] (Flash point > 60 °C) | Fuel oil lines[4][5] | + | + | + | wet | 30 min wet[2] |
| | Lubricating oil lines[4][5] | + | + | + | wet | |
| | Hydraulic oil[4][5] | + | + | + | wet | |
| | Thermal oil[4][5] | + | + | + | wet | |
| River water | Bilge lines[6] | + | + | + | dry/wet | 8 min dry + 22 min wet[2] |
| | Water filled fire extinguishing systems, e.g. fire main, sprinkler systems[5] | + | + | + | wet | 30 min wet[2] |
| | Non water filled fire extinguishing systems, e.g. foam, drencher systems and fire main [5] | + | + | + | dry/wet | 8 min dry + 22 min wet[2] (comply with Chapter 26, Part R) |
| | ~~Fire main[5]~~ | ~~+~~ | ~~+~~ | ~~+~~ | | |
| | Ballast systems[6] | + | + | + | wet | 30 min wet[2] |
| | Cooling water systems[6] | + | + | + | wet | 30 min wet[2] |
| | Tank cleaning services | + | + | + | dry | Fire endurance test not required |
| | Non-essential systems | + | + | + | dry<br>dry/wet<br>wet | Fire endurance test not required |
| Fresh water | Cooling water systems[6] | + | + | + | wet | 30 min wet[2] |
| | Condensate returns[6] | + | + | + | wet | 30 min wet[2] |
| | Non-essential systems | + | + | + | dry<br>dry/wet<br>wet | Fire endurance test not required |

Table 7.10.8 Application Classifications of Mechanical Joints(1) (continued)

| Application Purpose | System | Kind of Connections(2~~3~~) | | | | |
|---|---|---|---|---|---|---|
| | | Pipe Union | Compression Coupling | Slip-on Joint(~~9~~10) | Classification of pipe system | Fire endurance test condition(11) |
| Sanitary/ Drains/ Scuppers | Deck drains (internal)(~~6~~7) | + | + | + | dry | Fire endurance test not required |
| | Sanitary drains | + | + | + | dry | |
| | Scuppers and discharges (overboard) | + | + | - | dry | |
| Sounding/Vents | Sounding/Vents for water tanks/cofferdam | + | + | + | dry, wet | Fire endurance test not required |
| | Sounding/Vents for oil tanks (f.p.> 60 °C)(4)(5) | + | + | + | dry | |
| Miscellaneous | Starting/Control air(~~3~~6) | + | + | - | dry | 30 min dry(2) |
| | Service air (non-essential) | + | + | + | dry | Fire endurance test not required |
| | Brine | + | + | + | wet | |
| | $CO_2$ systems(~~2~~) (outside protected space) | + | + | - | dry | 30 min dry(2) |
| | $CO_2$ systems (inside protected space) | + | + | - | dry | Mechanical joints shall be constructed of materials with melting point above 925°C. (refer to Chapter 25, Part R) |
| | Steam | + | + | +(~~8~~9) | wet | Fire endurance test not required |

Notes:

(1) +: Application is allowed; -: Application is not allowed

(2) Fire endurance test in accordance with **9.3.2(6), Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.**

(~~2~~3) If mechanical joints include any components which readily deteriorate in case of fire, they are to be of a Society approved fire resistant type under consideration of the following **(~~3~~4)** to **(~~5~~6)**:

~~(3) Only Society approved fire resistant types may be used inside machinery spaces of category A.~~

(4) May not be used inside machinery spaces of category *A* or accommodation spaces. May be used in machinery spaces other than category *A* ones provided that the joints are located in easily visible and accessible positions.

(5) Only Society approved fire resistant types may be used except in cases where such mechanical joints are installed on exposed open decks, as defined in Regulation 9.2.3.3.2.2(10), Chapter II-2, *SOLAS* Convention, except for the cargo areas of tankers, ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, and are not used for fuel oil lines, fire extinguishing systems and fire main.

(6) Fire endurance test is to be applied when mechanical joints are installed inside machinery spaces of category *A*

(~~6~~7) May only be used above the free board deck.

(~~7~~8) The number of mechanical joints in flammable fluid systems is to be kept to a minimum. In general, flanged joints which conform to recognized standards are to be used.

(~~8~~9) Slip type slip-on joints as shown in **Fig. 7.10.1** may be used for pipes on deck with a design pressure of 1.0 *MPa* or less.

(~~9~~10) The use of slip joints is to comply with the requirements specified in **11.2.4**.

(11) If a connection has passed the “30 min dry test”, it is considered suitable also for applications for which the “8 min dry + 22 min wet” and/or “30 min wet” tests are required. If a connection has passed the “8 min dry+22 min wet” test, it is considered suitable also for applications for which the “30 min wet” test is required.

EFFECTIVE DATE AND APPLICATION (Amendment 1-5)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Rules, the current requirements apply to mechanical joints other than those that fall under the following:

(1) mechanical joints for which the application for approval is submitted to the Society on or after 1 July 2022.

(2) mechanical joints for which the date of renewal of approval of use is on or after 1 July 2022.

Amendment 1-6

# Part 8 ELECTRICAL INSTALLATIONS

## Chapter 1 GENERAL

### 1.1 General

Paragraph 1.1.7 has been amended as follows.

**1.1.7 Ambient Conditions~~*~~**

(-1 and -2 are omitted.)

**3** Ambient temperatures for electrical equipment installed in environmentally controlled spaces are to comply with following requirements:

(1) Where electrical equipment is installed within environmentally controlled spaces the ambient temperature for which the equipment is to be suitable may be reduced from 45 °C and maintained at a value not less than 35 °C provided:

(a) The equipment is not for use for emergency services or automatic and remote control systems.

(b) Reduced ambient temperatures are to be controlled by at least two air conditioning units (including refrigerating units, hereinafter referred to as the same) which can work at a 45 °C ambient temperature. In the event of the loss of any one air conditioning unit, all remaining units are to be capable of maintaining such reduced ambient temperatures.

(c) The equipment is able to be initially set to work safety within a 45 °C ambient temperature until such a time that the lesser ambient temperature may be achieved; the cooling equipment is to be rated for a 45°C ambient temperature.

(d) If the temperature rise over the upper limit of these reduced ambient temperatures, audible and visual alarms are to be activated at continually manned spaces, e.g., navigation bridges or machinery control rooms.

(2) In accepting a lesser ambient temperature than 45 °C, it is to be ensured that electrical cables for their entire length are adequately rated for the maximum ambient temperature to which they are exposed along their length.

### 1.2 Testing

#### 1.2.1 Shop Tests*

Sub-paragraphs -1 and -4 have been amended as follows.

**1** The electrical equipment specified below is to be tested in accordance with the respective requirements in this Part at the place of manufacture or at other locations having adequate apparatus for testing and inspections. However, to implement tests, in lieu of traditional ordinary surveys where the Surveyor is in attendance, the Society may approve other survey methods which it considers to be appropriate. In addition, tests for any equipment with small capacities as specified in **(4)** and **(5)** are to be conducted as deemed appropriate by the Society.

(1) Rotating machines for propulsion and their respective control equipment

(2) Main generators

(3) Main switchboards

(4) Motors for auxiliary machinery specified in **1.1.5-1(1)** to **1.1.5-1(3), Part 7** (hereinafter referred to as "motors for essential services" in this Part)
(5) Controlgears for those motors specified in **(4)** above
(6) Transformers for power and lighting of single phase 1 *kVA* or more and three phase 5 *kVA* or more. However, those transformers used only for special services such as those ones for Suez Canal Search Lights, etc. are to be excluded
(7) Semiconductor converters for power of not less than 5 *kW* and their respective accessories that are used for supplying power to the electrical equipment specified in **(1)** to **(3)** above
(~~7~~8) Other electrical equipment as deemed necessary by the Society

**2** Any electrical equipment used for auxiliary machinery for specific use for those ships specified in **1.1.5-1(4)** and **1.1.5-1(5), Part 7** as well as those deemed necessary by the Society are to be tested in accordance with the respective requirements in this Part.

**3** For those electrical equipment manufactured by mass production, test procedures suited to their production methods, notwithstanding the requirements given in **-1**, may be applied subject to Society approval.

**4** Electrical equipment and cables shown in the following items **(1)** to **(5)** are to be subjected to type tests for each type of product~~s~~. However, in cases where it is inadequate to deal with them under the requirements for type tests (e.g. those used only for specific ships or purposes with little possibility of continued use, or items for which the acquisition of individual test/inspection certificates is desired), tests and inspections of individual products may be accepted in place of type tests when requested by application.

(1) Circuit breakers
(2) Electromagnetic contactors
(3) Explosion-protected electrical equipment
(4) Cables for power, lighting and internal communications
(5) Semiconductor converters for power of not less than 5 *kW* that are used for ~~supplying power to~~ the electrical equipment specified in **-1(~~1~~4)** ~~to~~and **(5)** above

**5** Electrical equipment and cables having a certificate considered acceptable to the Society may be exempted partially or wholly from the tests and inspections.

# Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

## 2.1 General

### 2.1.3 Construction, Materials, Installations, etc.*

Sub-paragraph -11 has been added as follows.

**11** Electrical equipment allowed in paint stores and adjacent areas are to comply with the requirements in **2.1.3-11, Part H of the Rules for the Survey and Construction of Steel Ships**.

## 2.2 System Design (General)

### 2.2.5 Lighting Circuits*

Sub-paragraph -2 has been amended as follows.

**2** The number of lighting points supplied by final sub-circuits of ratings 16 *A* or less is not to exceed:
(1) 10 for those circuits up to ~~50~~55 *V*
(2) 14 for those circuits from ~~51~~56 *V* up to ~~130~~120 *V*
(3) 24 for those circuits from ~~131~~121 *V* up to 250 *V*

In cases where the number of lighting points and total load currents are invariable, a number of points greater than those specified above may be connected to final sub-circuits provided that aggregate load currents do not exceed 80 % of the ratings of protective devices in such circuits.

## 2.4 Rotating Machines

### 2.4.14 *A.C.* Generators

Sub-paragraph -3 has been amended as follows.

**3** In cases where generators are driven at rated speeds, giving rated voltages and they are subjected to sudden changes of symmetrical loads within the limits of specified currents and power factors (~~See~~see **2.4.15-~~3~~1(2)**), voltages are not to fall below 85 % nor exceed 120 % of the rated voltages. Voltages of such generators are then to be restored to within $\pm$3 % of their rated voltage in a period of not more than 1.5 *seconds*.

Paragraph 2.4.15 has been amended as follows.

### 2.4.15 Shop Tests*

~~**1**~~ Rotating machines are to be tested in ~~accordance with the requirements given in this **2.4.15-2 to -13**~~ the following **(1)** to **(12)** in accordance with **Table 8.2.5**. In addition, all tests are to be carried out in accordance with *IEC* 60092-301:1980/AMD2:1995. However, those tests required by ~~**-6**~~**(5)** and ~~**-8**~~**(7)** below may be omitted subject to the Society's permission for each generator or motor which is produced in series having identical type with their unit. ~~In addition~~Furthermore, those tests required by ~~**-5**~~**(4)** below may be omitted for each generator or motor which is of small capacity and which is produced in a series of identical types with their unit.
~~**2**~~(1) (Omitted)

~~3~~(2) (Omitted)

~~4~~(3) (Omitted)

~~5~~(4) Overcurrent or excess torque tests for rotating machines are to be carried out in accordance with **2.4.5** and such machines are to have the capability to withstand such tests (see *IEC* 60034-1:2017).

~~6~~(5) Steady short-circuit tests for synchronous generators are to be carried out and comply with the requirements given in **2.4.6-2**. However, the duration of steady short-circuit may be of any time delay which will be fitted in the tripping device for selective tripping where precise data showing such time delay is available in accordance with the following **(~~1~~a)** and **(~~2~~b)**. The manufacturer's simulation model for the generator and the voltage regulator may be used where this has been validated through tests of identical types of the same model.

(~~1~~a) In order to provide sufficient information to the party responsible for determining the discrimination settings in the distribution system where the generator is going to be used, the generator manufacturer is to provide documentation showing the transient behaviour of the short-circuit current upon a sudden short-circuit occurring when excited~~,~~ and running at nominal speed.

(~~2~~b) The influence of the automatic voltage regulator is to be taken into account, and the setting parameters for the voltage regulator are to be noted together with the decrement curve. Such a decrement curve is to be available when the setting of the distribution system's short-circuit protection is calculated. The decrement curve need not be based upon physical testing.

~~7~~(6) Overspeed tests for rotating machines are to be carried out and comply with the requirements given in **2.4.7** (see *IEC* 60034-1:2017). Such tests, however, are not applicable to squirrel cage motors.

~~8~~(7) After rotating machines are run continuously under actual load methods at their rated output voltages, frequencies, and those duties for which they are being rated until their temperatures have reached a steady state, the temperature rise of each part is to be measured and is not exceed the value given in **2.4.3** (see *IEC* 60034-1:2017). In cases where it is considered to be acceptable by the Society, such tests may be carried out in accordance with separately specified procedures.

~~9~~(8) The high voltage levels specified in **Table 8.2.6** are to be applied for a period of 1 *minute* between live parts and frames of rotating machines, with those cores and windings not undergoing testing connected to such frames (see *IEC* 60034-1:2017). Furthermore, where those temperature rise tests specified in **~~8~~(7)** above are applied, high voltage tests are to be carried out after the test.

~~10~~(9) Immediately after those high voltage tests specified in **~~9~~(8)** above have been performed, the insulation resistance of such rotating machines is to be measured in accordance with **Table 8.2.7** and all values are not to be less than any of those specified in **Table 8.2.7**. In addition, during such measuring, temperatures of rotating machines are to be near operating temperature. However, in cases where this is difficult, appropriate methods of calculation may be used instead.

~~11~~(10) (Omitted)

~~12~~(11) (Omitted)

~~13~~(12) (Omitted)

Notes of Table 8.2.6 has been amended as follows.

Table 8.2.6 Testing Voltages
(Table is omitted.)

Notes:
(1. to 3. are omitted.)
4. In the case of semiconductor elements for exciters, the requirements ~~for semiconductor converters for power~~ given in **2.12** are to be applied.

## 2.5 Switchboards, Section Boards and Distribution Boards

Table 8.2.8 has been amended as follows.

Table 8.2.8 Minimum Air Clearances for Busbars

| Rated voltage (*V*) | Air clearance (*mm*) |
|---|---|
| 250 or less | 15 |
| over 250 to 690 inclusive | 20 |
| over 690 to 1,000 inclusive | ~~35~~25 |

Paragraph 2.5.10 has been amended as follows.

### 2.5.10 Shop Tests

~~**1**~~ Switchboards are to be tested and inspected in accordance with the requirements given in ~~this **2.5.10**~~ the following **(1)** to **(4)**. However, those tests required by ~~**-2**~~**(1)** below may be omitted subject to the Society's permission for each switchboard which is produced in series having the identical type with its first unit.

~~**2**~~(1) (Omitted)
~~**3**~~(2) (Omitted)
~~**4**~~(3) (Omitted)
~~**5**~~(4) (Omitted)

## 2.8 Controlgears for Motors and Magnetic Brakes

Paragraph 2.8.4 has been amended as follows.

### 2.8.4 Shop Tests

~~**1**~~ Controlgears for motors are to be tested in accordance with the requirements given in ~~this **2.8.4**~~ the following **(1)** to **(4)**. However, those tests required by ~~**-2**~~**(1)** below may be omitted subject to the Society's permission for each controlgear and magnetic brakes which is produced in series having identical type with its first unit.

~~**2**~~(1) (Omitted)
~~**3**~~(2) (Omitted)
~~**4**~~(3) (Omitted)
~~**5**~~(4) (Omitted)

## 2.9 Cables

Paragraph 2.9.1 has been amended as follows.

### 2.9.1 General

Cables are to comply with one of *IEC ~~Publication~~* ~~60092~~ standards listed in the following **(1)**

to **(7)** or any equivalent thereto. However, cables such as flexible cables, fibre-optic cables, etc. used for special purposes may be accepted provided they comply with relevant standards deemed appropriate by the Society or any equivalent thereto. Installation of cables is to comply with the requirements given in this **2.9**.

(1) *IEC* 60092-350:2020
(2) *IEC* 60092-352:2005
(3) *IEC* 60092-353:2016
(4) *IEC* 60092-354:2020
(5) *IEC* 60092-360:2014
(6) *IEC* 60092-370:2019
(7) *IEC* 60092-376:2017

## 2.10 Transformers for Power and Lighting

Paragraph 2.10.6 has been amended as follows.

### 2.10.6 Shop Tests

**1** Transformers are to be tested in accordance with the requirements in ~~this **2.10.6**~~ the following **(1)** to **(4)**. However, those tests required by ~~**2**~~**(1)** may be omitted for those transformers which are produced in a series of identical types from the second unit onward subject to Society approval.

~~**2**~~(1) (Omitted)
~~**3**~~(2) (Omitted)
~~**4**~~(3) (Omitted)
~~**5**~~(4) (Omitted)

## 2.11 Accumulator Batteries

### 2.11.1 General*

Sub-paragraph -1 has been amended as follows.

**1** The requirements given in this **2.11** apply to all permanently~~-~~installed vented type secondary batteries. ~~Vented type secondary batteries are those ones in which electrolytes can be replaced and which may release gases when they are being charged and/or overcharged.~~ However, the requirements specified in **2.11.5-4** are also applicable to valve-regulated sealed type batteries.

### 2.11.5 Ventilation*

Sub-paragraph -4 has been added as follows.

**4** The ventilation arrangements for installation of vented type batteries which have charging power higher than 2 *kW* are to be such that the quantity of air expelled is at least equal to:

$$Q = 110 \times I \times n \ (l/h)$$

$I$ : Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes
$n$ : Number of cells in series
$Q$ : Quantity of air expelled in litres/hour

The ventilation rate for compartments containing valve-regulated sealed type batteries may be reduced to 25 % of that given above.

## 2.12 Semiconductor Converters for Power

Paragraph 2.12.4 has been added as follows.

**2.12.4 Shop Tests***

The converters and accessories specified in **1.2.1-1(7)** are to be tested in accordance with the following **(1)** to **(5)**. However, those tests required by **(1)** below may be omitted, subject to Society approval, for products which are produced in a series of identical types from the second unit onward.

(1) Temperature rise tests for converters and their accessories are to be carried out under normal working conditions. In addition, the temperature rise for the interiors of converters is not to exceed manufacturer specified values while the temperature rise for the exteriors of converters (*e.g.* the connecting parts of busbars and cables for switchboards as well as coils, contactors and resistors) is not to exceed the values specified in the requirements given in **2.8.3**. Furthermore, temperature test methods for semiconductor element connections are to be as deemed appropriate by the Society.

(2) Instruments, switching devices and protective devices fitted in converters are to be checked for normal operation under operating conditions.

(3) High voltage tests specified in *IEC* 60146-1-1 or *IEC* 61800-5-1

(4) High voltage tests between live parts and earths for accessories charged with auxiliary circuit potential are to be in accordance with the requirements given in **2.8.4(3)**.

(5) Immediately after such high voltage tests have been carried out, insulation resistance between live parts of converters and their accessories and earths is not to be less than 1 *MΩ* when tested with *d.c.* voltages of at least 500 *V*.

# Chapter 3 DESIGN OF INSTALLATIONS

## 3.2 Sources of Electrical Power and Lighting Systems

Paragraph 3.2.4 has been added as follows.

**3.2.4 Generators and Generator Systems, Having the Propulsion Machinery as their Prime Mover, not Forming Part of the Main Source of Electrical Power**

Generators and generator systems, having the ship's propulsion machinery as their prime mover but not forming part of the ship's main source of electrical power (hereinafter referred to as "shaft driven generator systems, etc."), may be used whilst the ship is at sea to supply electrical services required for normal operational and habitable conditions provided that:

(1) There are sufficient and adequately rated additional generators fitted, which constitute the main source of electrical power specified in **3.2.1-1**.

(2) Arrangements are fitted to automatically start one or more of the generators within a period of 45 seconds, constituting the main source of electrical power specified in **3.2.1-1**, and also upon the frequency variations exceeding ± 10% of the limits specified in **(3)** and the event of any shaft driven generator systems, etc. being stopped.

(3) Within the declared operating range of shaft driven generator systems, etc. the specified limits for the voltage variations in *IEC* 60092-301:1980/AMD2:1995 and the frequency variations in **Table 8.2.1** can be met.

(4) The short circuit current of the shaft driven generator systems, etc. is sufficient to trip the circuit-breaker taking into account the selectivity of the protective devices for the distribution system.

(5) Where considered appropriate, load shedding arrangements are fitted to protect the generators against sustained overload.

(6) In those ships having remote control of the ship's propulsion machinery from the navigating bridge means are provided, the following requirements are to be complied with:

(a) Means are provided, or procedures be in place, so as to ensure that supplies to essential services are maintained during manoeuvring conditions in order to avoid a blackout situation.

(Note)

A "blackout situation" means that the main and auxiliary machinery installations, including the main power supply, are out of operation but the services for bringing them into operation (e.g. compressed air, starting current from batteries etc.) are available.

(b) The declared operating range is to be shown on navigation bridges, and devices to indicate the condition of shaft driven generator systems, etc. are to be established.

EFFECTIVE DATE AND APPLICATION (Amendment 1-6)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction is before the effective date.

Amendment 1-7

# Part 1 GENERAL RULES

## Chapter 1 GENERAL

### 1.2 Class Notations

Paragraph 1.2.4 has been amended as follows.

**1.2.4 Application of Special Survey Scheme***

**1** For ships approved for In-water Surveys in accordance with the provisions of **6.1.2, Part 2**, the notation of "*In Water Survey*" (abbreviated to *IWS*) is affixed to the Classification Characters.

**2** The notation "*Propeller Shaft Condition Monitoring System*" (abbreviated to *PSCM*) is affixed to the classification characters of ships whose propeller shafts surveys are carried out based upon the preventive maintenance system specified in the provisions of **8.1.~~3(1)~~2, Part 2**.

~~**3** The notation "*Propeller Shaft Condition Monitoring System • A*" (abbreviated to *PSCM • A*) is affixed to the classification characters of ships whose propeller shafts surveys are carried out based upon the preventive maintenance system specified in the provisions of **8.1.3(2), Part 2.**~~

~~**4** The notation "*Alternative Propeller Shaft Survey • Oil*" (abbreviated to *APSS • O*) is affixed to the classification characters of ships having oil lubricated stern tube bearings (excluding those affixed with the notation "*PSCM*" or "*PSCM • A*") whose propeller shaft surveys use the alternative survey methods specified in **1.1.3-1(6)(h), Part 2**.~~

~~**5** The notation of "*Alternative Propeller Shaft Survey • Water*" (abbreviated to *APSS • W*) is affixed to the classification characters, of ships having freshwater lubricated stern tube bearings utilising inboard freshwater (excluding those affixed with the notation "*PSCM*" or "*PSCM • A*") whose propeller shaft surveys use the alternative surveys methods specified in **1.1.3-1(6)(h), Part 2**.~~

~~**6**~~**3** In consideration of the navigating area and operating mode, ships whose surveys are to be carried out in accordance with standards deemed appropriate by the Society in accordance with the provisions of **1.1.3, Part 2**, a notation deemed appropriate by the Society is affixed.

# Part 2 CLASS SURVEYS

## Chapter 1 GENERAL

### 1.1 Surveys

### 1.1.3 Intervals of Class Maintenance Surveys*

Sub-paragraph -1(6) has been amended as follows.

**1** Periodical Surveys are to be carried out in accordance with the requirements specified in **(1)** through **(6)** below. However, in consideration of the navigating area and operating mode, the intervals of Class Maintenance Surveys may be accordance mutatis mutandis with standards deemed appropriate by the Society.

((1) to (5) are omitted.)

(6) Propeller Shaft and Stern Tube Shaft Surveys

~~(a) Surveys of propeller shafts and stern tube shafts are to be carried out as specified in the following **i)** to **iii)** corresponding to the kind of shaft, etc., unless alternative means are provided to assure the condition of the propeller shaft assembly.~~

~~i) Surveys of propeller shafts Kind 1 or stern tube shafts Kind 1 (hereinafter referred to as "shafts Kind 1" in this Part) are to be carried out within 6 *years* from the date of completion (i.e. the survey due date) of the Classification Survey or the previous Ordinary Survey.~~

~~ii) Ordinary Surveys of propeller shafts Kind 2 and stern tube shafts Kind 2 (hereinafter referred to as "shafts Kind 2" in this chapter) are to be carried out as prescribed in **1)** and **2)**.~~

~~1) Concurrently with Special Surveys; and~~

~~2) Concurrently with Intermediate Surveys~~

~~iii) For keyless connection shafts lubricated with water lubricated bearings, the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (*NDE*) is not to exceed 18 *years*.~~

~~(b) For oil lubricated or freshwater lubricated shafts Kind 1, the Partial Surveys specified in **8.1.2** can be carried out instead of the Ordinary Surveys specified in **8.1.1**. The survey interval of the Ordinary Surveys specified in **8.1.1** is, however, not to exceed the limits specified separately by the Society.~~

~~(c) For the surveys referred to in **i)** and **ii)** of **(a)** as well as in **(b)** above completed within 3 *months* before the survey due date, the next period will start from the survey due date.~~

~~(d) Surveys of the propeller shafts and stern tube shafts of ships affixed with the notation "*PSCM*" or "*PSCM ・A*" are to be carried out as specified in **8.1.3**.~~

~~(e) Regardless of **(a)** to **(d)** above, surveys of the propeller shafts and stern tube shafts of ships affixed with the notation "*APSS ・O*" or "*APSS ・W*" are to be carried out as specified separately by the Society.~~

Propeller shaft and stern tube shaft surveys are to be carried out as specified in **Chapter 8**.

## 1.3 Definitions

Paragraph 1.3.1 has been amended as follows.

### 1.3.1 Terms*

The ~~definitions of~~ terms which appear in this ~~P~~part are defined as ~~specified in the~~ follow~~ing~~s. Terms not defined here are as defined in other parts of the Rules.

((1) to (8) are omitted.)

(9) The terminology used in the application of propeller shaft and stern tube shaft surveys is as specified in ~~the following **(a)** to **(p):**~~ **8.1.1**.

~~(a) "Shafts" mean propeller shafts as specified in the following **(b)** and stern tube shafts as specified in the following **(c)** but exclude the intermediate shaft(s) which is(are) considered part of the propulsion shafting inside the vessel.~~

~~(b) "Propeller shaft" is the part of the propulsion shaft to which the propeller is fitted.~~

~~(c) "Stern tube shaft" is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.~~

~~(d) "Stern tube" is a tube or pipe fitted in the shell of a ship at the stern (or rear part of the ship), through which passes the stern tube shaft or aftermost section of the propeller shaft. "Stern tube" is the housing of the shaft bearings that sustain the shaft and also accommodates the shaft sealing arrangement.~~

~~(e) "Stern tube sealing system" means the equipment installed on the inboard extremity and, for oil or freshwater lubricated bearings, at outboard extremity of the stern tube. An "inboard seal" is the device fitted on the fore part of the stern tube that achieves the sealing against the possible leakage of the lubricant media into the ship internal. An "outboard seal" is the device fitted on the aft part of the stern tube that achieves the sealing against the possible sea water ingress and the leakage of the lubricant media.~~

~~(f) "Oil lubricated" means closed loop oil lubricating systems which use oil to lubricate the bearings and are sealed against the environment by adequate sealing or gland devices.~~

~~(g) "Freshwater lubricated" means closed loop water lubricating systems which use fresh water to lubricate the bearings and are sealed against the environment by adequate sealing or gland devices.~~

~~(h) "Water lubricated" means open water lubricating systems where bearings are cooled and lubricated by water (salt or fresh) which are exposed to the environment.~~

~~(i) "Service records" are regularly recorded data showing in-service conditions of the shaft(s) and include, as applicable: lubricating oil temperature, bearing temperature and oil consumption records (for oil lubricated bearings) or water flow, water temperature, salinity, pH, make-up water and water pressure (for closed loop fresh water lubricated bearings depending on design).~~

~~(j) "Oil sample examination" is a visual examination of the stern tube lubricating oil taken in the presence of the Surveyor with a focus on water contamination.~~

~~(k) "Lubricating oil analysis" is the analysis to be carried out as specified in the following **i)** to **iii):***~~

~~i) The lubricating oil analysis is to be carried out at regular intervals not exceeding 6 *months*.~~

~~ii) The documentation on lubricating oil analysis is to be available on board.~~

~~iii) Oil samples to be submitted for the analysis are, in principle, to be taken under service conditions.~~

~~(l) "Fresh water sample test" is the test to be carried out in accordance with the following **i)** to **iv):***~~

~~i) The fresh water sample test is, in principle, to be carried out at regular intervals not~~

~~exceeding 6 *months*.~~

~~ii) Fresh water samples are to be taken in accordance with the following **1)** to **4)**:~~

~~1) The sample is to be taken under service conditions (i.e. with a rotating shaft and the system at service temperature) and are to be representative of the water circulating within the stern tube.~~

~~2) The sample is to be taken from the same agreed position in the system, before the filters, if any fitted in the freshwater lubrication system, which is to be positively identified.~~

~~3) At time of survey the sample for the test is to be taken in the presence of the Surveyor.~~

~~4) The sample, unless supervised by the Surveyor, is to be collected under the direct supervision of the Chief Engineer.~~

~~iii) Analysis results are to be retained on board and made available to the Surveyor.~~

~~iv) The fresh water sample test is to include the following **1)** to **3)** parameters:~~

~~1) chlorides content;~~

~~2) pH value; and~~

~~3) presence of bearing particles or other particles (only for laboratory analysis, and not required for tests carried out in the presence of the Surveyor).~~

~~(m) "Keyless connection" is the forced coupling methodology between the shaft and the propeller without a key achieved through the interference fit of the propeller boss on the shaft tapered end.~~

~~(n) "Keyed connection" is the forced coupling methodology between the shaft and the propeller with a key and keyway achieved through the interference fit of the propeller boss on the shaft tapered end.~~

~~(o) "Flanged connection" is the coupling methodology, between the shaft and the propeller, achieved by a flange, built in at the shaft aft end, bolted to the propeller boss.~~

~~(p) "Alternative means" means shafting arrangements such as, but not limited to, an approved condition monitoring scheme and/or other reliable approved means for assessing and monitoring the condition of the tail shaft, bearings, sealing devices and the stern tube lubricant system capable to assure the condition of the propeller shaft assembly with an equivalent level of safety as obtained by survey methods specified in this Part; this, however, excludes propeller shafts adopting the preventive maintenance system specified in **8.1.3**.~~

((10) to (12) are omitted.)

# Chapter 3 ANNUAL SURVEYS

## 3.3 Annual Surveys for Machinery

### 3.3.1 General Examinations*

Sub-paragraph -1(3) has been amended as follows.

**1** At Annual Surveys for Machinery, a general examination of all the machinery in the engine room as well as the following **(1)** to **(4)** inspections are to be carried out:
((1) to (2) are omitted.)
(3) For ships affixed with the notation "*PSCM*" ~~or "*PSCM • A*"~~, the records of the parameters monitored are to be reviewed, in addition to a general examination, so as to ascertain that the relevant installations are well maintained.
(4) (Omitted)

# Chapter 6 DOCKING SURVEYS

## 6.1 Docking Surveys

### 6.1.3 Other Surveys*

Sub-paragraph -1 has been amended as follows.

**1** For ships affixed with the notation "*PSCM*" ~~or "*PSCM • A*"~~, the records of the parameters monitored are to be reviewed, in addition to a general examination, so as to ascertain that the system is well maintained.

Chapter 8 has been amended as follows.

# Chapter 8 PROPELLER SHAFT AND STERN TUBE SHAFT SURVEYS

## ~~8.1 Propeller Shaft and Stern Tube Shaft Surveys~~

### ~~8.1.1 Ordinary Surveys*~~

~~Ordinary Surveys of propeller and stern tube shafts are to be carried out in accordance with **Table 2.8.1**.~~

### ~~8.1.2 Partial Surveys~~

~~Partial Surveys for propeller shafts Kind 1 with oil lubricated or freshwater lubricated stern tube bearings are to be carried out in accordance with the following **(1)** and **(2)**:~~

~~(1) Examinations are to be carried out in accordance with the following **(a)** to **(i)** after confirming that the results of the examinations specified in the following **(2)** are satisfactory. In cases where the results of the examinations specified in the following **(2)** or the examinations specified in the following **(a)** to **(i)** are not satisfactory, the Ordinary Survey specified in **8.1.1** is to be carried out.~~

- ~~(a) In the case of keyed connections, the examinations specified in item 2 of **Table 2.8.1** are to be carried out.~~
- ~~(b) Checking and recording the bearing weardown measurements are to be carried out.~~
- ~~(c) A visual inspection of all accessible parts of the shafting system is to be carried out.~~
- ~~(d) The examinations specified in item 6 of **Table 2.8.1** are to be carried out.~~
- ~~(e) Confirmation that the seal liner is found to be or placed in a satisfactory condition is to be carried out.~~
- ~~(f) Verification of satisfactory conditions of inboard and outboard seals, and of the satisfactory installation of the propeller is to be carried out.~~
- ~~(g) In the case of keyed connections, the examinations specified in item 9 of **Table 2.8.1** are to be carried out.~~
- ~~(h) The examinations specified in items 12 and 13 of **Table 2.8.1** are to be carried out.~~
- ~~(i) Verification that the main engines have not been operated within the barred speed range for torsional vibration is to be carried out.~~

~~(2) The examinations required by **(1)** above are to be carried out in accordance with the following **(a)** to **(d)**:~~

- ~~(a) Review of service records is to be carried out. Confirmation of bearing temperature may, however, be omitted in cases where the installation of devices to measure temperature is not required.~~
- ~~(b) The review specified in the following **i)** and **ii)** is to be carried out.~~
  - ~~i) For oil lubricated shafts, review of test records of the lubricating oil analysis is to be carried out to confirm that the reference standards deemed appropriate by the Society are complied with.~~
  - ~~ii) For freshwater lubricated shafts, review of test records of the fresh water sample test is to be carried out to confirm that the reference standards deemed appropriate by the Society are complied with.~~
- ~~(c) An oil sample examination (for oil lubricated shafts) or fresh water sample test (for closed system fresh water lubricated shafts) is to be carried out.~~
- ~~(d) Verification of no reported repairs by grinding or welding of shafts and/or propellers is to be carried out.~~

**8.1.3 Preventive Maintenance System***

Notwithstanding the requirements in **8.1.1** above, where the ship is equipped with oil lubricated stern tube bearings and appropriate stern tube oil sealing devices as approved by the Society, the survey items of 1, 3, 4, 5 and 7 in **Table 2.8.1** may be replaced with a general examination of the shafting system and, for the weardown measuring and recording specified in item 8 in **Table 2.8.1**, they may be carried out while the propeller is installed in lieu of the timing after re-installation; this, however, is provided that all condition monitoring data taken according to the approved preventive maintenance system is found to be within permissible limits. Furthermore, omission of the survey items of 2, 9 and 10 in **Table 2.8.1** may be allowed except in the case of keyed connections.

(1) Based upon Society approved preventive maintenance systems, at least the following **(a)** to **(d)** are to be properly monitored and recorded for diagnosing lubricating conditions of shafting systems and performing preventive system maintenance. Moreover, the notation "*Propeller Shaft Condition Monitoring System*" (abbreviated as "*PSCM*") is to be affixed to the classification characters of ships whose preventive maintenance systems are approved by the Society.

(a) Lubricating oil sampling and analysis is to be carried out regularly at intervals not exceeding 6 *months*, with at least the following **i)** through **iv)** being analysed each time:

i) water content;

ii) salinity (sodium);

iii) content of shaft metal and bearing metal particles; and

iv) oxidation of oil.

(b) Lubricating oil consumption rate

(c) Bearing temperature. In the case of azimuth thrusters which use roller bearings as the bearings for propeller shafts, however, vibrations of the power transmission systems in the propulsion systems or the Fe-density of the lubricating oil in the azimuth thruster casings may be acceptable.

(d) Weardown of the propeller shaft at the stern tube

(2) Based upon Society approved preventive maintenance systems, at least the following **(a)** to **(e)** are to be properly monitored and recorded for diagnosing lubricating conditions of shafting systems and performing preventive system maintenance. Moreover, the notation "*Propeller Shaft Condition Monitoring System・A*" (abbreviated as "*PSCM・A*") is to be affixed to the classification characters of ships whose preventive maintenance systems are approved by the Society.

(a) Lubricating oil sampling and analysis is to be carried out regularly at intervals not exceeding 6 *months*, with at least the following **i)** to **iv)** being analysed each time:

i) water content;

ii) salinity (sodium);

iii) content of shaft metal and bearing metal particles; and

iv) oxidation of oil.

(b) The monthly onboard checking of lubricating oil water content. Such checking, however, may be omitted when the oil sampling and analysis specified in **(a)** above is carried out regularly at intervals not exceeding 3 *months*.

(c) Lubricating oil consumption rate

(d) Bearing temperature. In the cases of azimuth thrusters which use roller bearings as the bearings for propeller shafts, however, the vibrations of the power transmission systems in the propulsion systems or the Fe-density of the lubricating oil in the azimuth thruster casings may be acceptable.

(e) Weardown of the propeller shaft at the stern tube

~~**8.1.4 Propeller Shaft and Stern Tube Shaft Surveys of Ships Affixed with Notation "*APSS • O*" or "*APSS • W*"***~~

~~Notwithstanding the requirements in **8.1.1** to **8.1.3** above, propeller shaft and stern tube shaft surveys of ships affixed with the notation "*APSS •O*" or "*APSS •W*" are to be carried out as specified separately by the Society.~~

Table 2.8.1 Ordinary Surveys of Propeller Shaft and Stern Tube Shaft

| Items | Examinations |
|---|---|
| 1 Drawing out of the propeller shaft and the stern tube shaft | |
| .1 for oil or freshwater lubricated bearings | Drawing the propeller shaft and the stern tube shaft and examining the entire shafts, seals system and bearings |
| .2 for water lubricated bearings | Drawing the propeller shaft and the stern tube shaft and examining the entire shaft (including liners, corrosion protection system and stress reducing features, where provided), inboard seal system and bearings |
| 2 Propeller connections | |
| .1 Keyed connections | Removing the propeller to expose the forward end of the taper, and performing a non-destructive examination (*NDE*) by an approved surface crack detection method deemed appropriate by the Surveyor all around the shaft in way of the forward portion of the taper section, including the keyway. For shafts provided with liners, the *NDE* is to be extended to the after edge of the liner. |
| .2 Keyless connections | Removing the propeller to expose the forward end of the taper, and performing a non-destructive examination (*NDE*) by an approved surface crack detection method deemed appropriate by the Surveyor all around the shaft in way of the forward portion of the taper section. For shafts provided with liners, the *NDE* is to be extended to the after edge of the liner.[4] When the propeller is force fitted to the shaft, it is to be ascertained that the pull up length is within the upper and lower limits given in **5.3.1-1, Part 7.** |
| .3 Flanged connections | Whenever the coupling bolts of any type of flange connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the Surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection method deemed appropriate by the Surveyor. |
| 3 Propeller shaft, stern tube shaft, and coupling bolts | Examination of the sleeves, the fillet of the coupling flange to the intermediate shaft or to the stern tube shaft and the coupling bolts with the shaft drawn from the stern tube bearings. However, coupling bolts are to be examined by an efficient crack detection method in cases where the Surveyor, based on the results of external examinations, deems such addition testing to be necessary. In addition, anti-corrosion covers are to be removed for shafts Kind 2. |
| 4 Stern tube bearing[1] | Examination of the stern tube bearings |
| 5 Clearances between bush of the stern tube bearing[2] and either the propeller shaft or the stern tube shaft | Checking and recording the bearing clearances between the bush and the shaft |
| 6 Propellers | Verification that the propeller is free of damages which may cause the propeller to be out of balance |
| 7 Sealing device for stern tube[3] | Verification of the satisfactory conditions of inboard and outboard seals during the re-installation of the shaft and propeller |

~~Table 2.8.1 Ordinary Surveys of Propeller Shaft and Stern Tube Shaft (continued)~~

| ~~Items~~ | ~~Examinations~~ |
|---|---|
| ~~8 For oil lubricated or freshwater lubricated stern tube bearings, weardown of the propeller shaft or the stern tube shaft at the stern tube bearing~~ | ~~Measuring and recording the bearing weardown (after re-installation)~~ |
| ~~9 Propeller boss surfaces in contact with the propeller shaft taper~~ | ~~Examination of the propeller boss surface~~ |
| ~~10 Controllable pitch propeller connections~~ | ~~Examination of the pitch control gear and working parts as well as, by an efficient crack detection method, the propeller blade fixing bolts~~ |
| ~~11 Water lubrication lines~~ | ~~Where water lubricated stern tube bearings are adopted, the water piping for lubrication is to be examined.~~ |
| ~~12 Low oil level alarms of the lubricating oil or lubricating freshwater tanks, lubricating oil or lubricating freshwater temperature measuring devices, oil or freshwater lubrication lines as well as lubricating oil or lubricating freshwater circulation pumps, etc.~~ | ~~Where oil or freshwater lubricated stern tube bearings are adopted, examination of the systems for verifying whether stern tube bearings are being maintained in good working condition~~ |
| ~~13 Lubricating oil or lubricating freshwater~~ | ~~Examination of the lubricating oil or lubricating freshwater record book~~ |

~~(Notes)~~

~~1 This includes shaft bracket bearings. The same applies hereinafter in this Chapter.~~

~~2 This includes bush of shaft bracket bearings. The same applies hereinafter in this Chapter.~~

~~3 This includes sealing devices for shaft bracket bearings. The same applies hereinafter in this Chapter.~~

~~4 For shafts with water lubricated bearings, it is recommended that the survey specified in **1.1.3 1(6)(a)iii)** also be carried out in cases where the date 18 *years* after the date of completion of the previous survey specified in **1.1.3 1(6)(a)iii)** is earlier than the next survey due date.~~

## 8.1 General

### 8.1.1 Definitions

The terms which appear in this chapter are defined as follows.

(1) "Shafts" mean propeller shafts and stern tube shafts as specified in the following **(2)** and **(3)** but does not include intermediate shafts which are considered to be part of the propulsion shafting inside the ships.

(2) "Propeller shaft" is the part of the propulsion shaft to which the propeller is fitted.

(3) "Stern tube shaft" is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.

(4) "Shaft Kind 1" is a propeller shaft which is effectively protected against corrosion by sea water, outboard fresh water and inboard fresh water with a means approved by the Society or which is made of corrosion resistant materials approved by the Society.

(5) "Shaft Kind 1*A*" is "Shaft Kind 1" with water lubricated stern tube bearing.

(6) "Shaft Kind 1*B*" is "Shaft Kind 1" with oil lubricated stern tube bearing.

(7) "Shaft Kind 1*W*" is "Shaft Kind 1" with fresh water lubricated stern tube bearing.

(8) "Shaft Kind 2" is a propeller shaft other than "Shaft Kind 1".

(9) "Stern tube shaft" is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.

(10) "Stern tube" is a tube or pipe fitted in the shell of a ship at the stern (or rear part of the ship), through which passes the stern tube shaft or aftermost section of the propeller shaft.

(11) "Stern tube sealing system" means the sealing system installed for the following **(a)** or **(b)**, depending on the kind of shaft. The sealing system for the inboard extremity of the stern tube

prevents any the possible leakage of the lubricant media into the ship internal. The sealing system for the outboard extremity of stern tube prevents any possible sea water ingress or the leakage of the lubricant media.

(a) "Shaft Kind 1*A*" or "Shaft Kind 2": Inboard extremity of stern tube

(b) "Shaft Kind 1*B*" or "Shaft Kind 1*W*": Inboard and outboard extremity of stern tube

(12) "Oil lubricated" means closed loop oil lubricating systems which use oil to lubricate the bearings and are sealed against the environment by adequate sealing devices.

(13) "Water lubricated" means open water lubricating systems where bearings are lubricated by water (sea water or outboard fresh water) and cooled.

(14) "Fresh water lubricated" means closed loop water lubricating systems which use fresh water to lubricate the bearings and are sealed against the environment by adequate sealing devices.

(15) "Service records" are regularly recorded data showing in-service conditions of the shafts and stern tube include, as applicable : service conditions of lubricating water pumps (for "Shaft Kind 1*A*" or "Shaft Kind 2"), lubricating oil temperature, bearing temperature and oil consumption records (for "Shaft Kind 1*B*") or water flow, water temperature, salinity, pH, make-up water and pressure of lubricating fresh water pumps (for "Shaft Kind 1*W*").

(16) "Oil sample examination" is a visual examination of the stern tube lubricating oil taken in the presence of a surveyor with a focus on water contamination.

(17) "Lubricating oil analysis" is the analysis to be carried out in accordance with the following **(a)** to **(c)**:

(a) The lubricating oil analysis is to be carried out at regular intervals not exceeding 6 *months*.

(b) The documentation on lubricating oil analysis is to be available on board.

(c) Oil samples to be submitted for the analysis are to be taken in accordance with following **i)** to **ii)**:

i) The sample is to be taken from the same identified position in the system under service conditions.

ii) The sample, unless supervised by a surveyor, is to be collected under the direct supervision of the chief engineer and to be identified.

(18) "Fresh water sample test" is the test to be carried out in accordance with the following **(a)** to **(d)**:

(a) The fresh water sample test is to be carried out at regular intervals not exceeding 6 *months*.

(b) Fresh water samples are to be taken in accordance with the following **i)** to **iv)**:

i) The sample is to be taken under service conditions (i.e. with a rotating shaft and the system at service temperature) and are to be representative of the water circulating within the stern tube.

ii) The sample is to be taken from the same agreed position in the system, before the filters, if any fitted in the fresh water lubrication system, which is to be positively identified.

iii) At time of survey the sample for the test is to be taken in the presence of a surveyor.

iv) The sample, unless supervised by a surveyor, is to be collected under the direct supervision of the chief engineer.

(c) Analysis results are to be retained on board and made available to the Surveyor.

(d) The fresh water sample test is to include the following **i)** to **iii)** parameters:

i) chlorides content;

ii) pH value; and

iii) presence of bearing particles or other particles (only for laboratory analysis, and not required for tests carried out in the presence of a surveyor).

(19) “Keyless connection” is the forced coupling methodology between the shaft and the propeller without a key achieved through the interference fit of the propeller boss on the shaft tapered end.

(20) “Keyed connection” is the forced coupling methodology between the shaft and the propeller with a key and keyway achieved through the interference fit of the propeller boss on the shaft tapered end.

(21) “Flanged connection” is the coupling methodology, between the shaft and the propeller, achieved by a flange, built in at the shaft aft end, bolted to the propeller boss

(22) “*Propeller Shaft Condition Monitoring System*” (abbreviated as *PSCM*) is affixed to the classification characters of ships whose preventive maintenance system are approved in accordance with the requirements of **8.1.2**.

(23) “Alternative means” means shafting arrangements such as an approved condition monitoring scheme or other reliable approved means for assessing and monitoring the condition of the shafts, sealing devices and the stern tube lubricant system capable to assure the condition of the propeller shaft assembly with an equivalent level of safety as obtained by survey methods specified in this part.

### 8.1.2 Preventive Maintenance System of Shafts

The notation *PSCM* is affixed to the classification characters of ships equipped with following **(1)** to **(3)** and whose preventive maintenance system are approved in accordance with the procedures specified in **Table 2.8.1**.

(1) Oil lubricated stern tube bearing

(2) Stern tube sealing devices can be repaired or replaced without drawing out the shafts

(3) One or more temperature sensors embedded into the metal at the aft end bottoms of stern tube

Table 2.8.1 Approval Procedure of Preventive Maintenance System for Oil Lubricated Propeller Shafts

| Item | Procedures |
|---|---|
| 1 General | (1) These procedures will apply to ships intended for the preventative maintenance of propeller shafts. This system permits the shipowners to maintain the shafts using preventive measures such as by carrying out lubricating oil analysis regularly and diagnosing the lubricating condition of the shaft based on the results. |
| 2 Application | (1) The executive management (hereinafter referred to as "management") responsible for adopting the preventive maintenance system according to the procedures is to submit to the Society three copies of the maintenance manual specifying at least the following **(a)** to **(f)**.<br>(a) Management's policy for implementing the preventive maintenance system<br>(b) Procedures and personnel responsible for sampling oil, monitoring parameters such as oil analysis results and recording the necessary data<br>(c) Procedures and personnel responsible for selecting and controlling the analytical testing machines (or testing laboratory) and the measuring devices for monitoring parameters<br>(d) Procedures and personnel responsible for review of each parameter monitored and diagnosing the lubricating condition thereby<br>(e) Procedures and personnel responsible for handling any abnormalities found (including those for reporting to the Society)<br>(f) Procedures and personnel responsible for ensuring that proper maintenance is carried out according to the maintenance manual<br>(2) The Society returns two copies of the documents to the applicant after review and approval. Management is to keep one copy of the approved documents on board the ship and the other copy of the approved documents either on hand or at the shipowner's office.<br>(3) The application is to be submitted within 6 *months* from the date of completion of the Classification Survey or the previous Ordinary Survey of the propeller shaft. However, this 6 *months* period may be waived in cases where supplementary documentation confirming the soundness of the propeller shafting system is submitted. |
| 3 Approval and Notation | (1) The Society examines the documents submitted and bases its approval on items such as the management system, the maintenance procedures and the criteria for parameters (including the criteria for alarm and abnormal conditions) of oil analysis results. The Society assigns approved ships with the notation *PSCM* as classification characters. |

Table 2.8.1 Approval Procedure of Preventive Maintenance System for Oil Lubricated Propeller Shafts (Continued)

| Item | Procedures |
|---|---|
| 4 Approval Conditions | (1) Management system<br>(a) Management is to state clearly that it will take responsibility for proper implementation of the preventive maintenance of the related parts according to the manual and familiarize the crew concerned with the procedures.<br>(b) Management is to verify that parameters such as oil analysis results are all within their limits and to take suitable measures as necessary. Management is to report to the Society immediately where any abnormality is found.<br>(c) Management is to verify that suitable maintenance is carried out according to the manual.<br>(d) The items monitored or reviewed according to the manual are to be recorded.<br>(2) Maintenance procedures<br>(a) Oil sampling for analytical testing is to be carried out regularly at the intervals of at least 6 *months* and the procedures are in accordance with the following.<br>i) Sampling is to be carried out at sea as much as possible. The sampling oil quantity is about 200 *ml* and it is to be always from a fixed place after fully draining. For example, the air purge pipe at the pump exit or oil sample cock; places where the sampled oil can be representative of the system.<br>ii) Where the sampling can only be conducted at port, the sampling is to be carried out after sufficient circulation of the oil with an oil pump if one is available, and according to the method in **i)** above. Otherwise, the oil is to be sampled from a few points at different levels and all the samples are mixed together as the testing sample.<br>(b) Monitoring and recording of each parameter is to be properly carried out and the following data is to be recorded at each sampling.<br>i) Temperature of the circulation oil<br>ii) Temperature of the aft stern tube bearing<br>iii) Sampling date, service oil name, service hours, total oil quantity and oil consumption rate (*l*/*day*)<br>(c) The testing machines and measuring devices for monitoring the parameters are to have their accuracy<br>(3) Criteria for parameters<br>Management is to determine the criteria for each parameter for the ship based on the reference standards below and by taking into account its experience and knowledge.<br>(a) Analytical items and methods:<br>i) Analytical items and methods: Refer to **Table 1** as a standard. However, alternative analytical items and methods can be adopted instead when deemed appropriate by the Society.<br>ii) Standard criteria: To be within the max. values specified in **Table 1** counting from the values of the new oil<br>iii) Alarm values: To be less than double the standard criteria (where any parameter exceeds the alarm value, the testing oil is to be re-sampled and re-analysis for all the items is to be carried out immediately)<br>(b) Lubricating oil consumption rate: 2 *l/day* or less<br>(c) Temperature at aft. stern tube bearing: 55°C or less<br>(d) Wear down for oil lubricated bearing: 0.3 *mm* or less |

Standard criteria (Reference)

| analytical items | max. values | analytical methods |
|---|---|---|
| Fe (*ppm*) | 50 | ICP (SOAP) |
| Sn (*ppm*) | 20 | ICP (SOAP) |
| Pb (*ppm*) | 20 | ICP (SOAP) |
| Na (*ppm*) | 80 | ICP (SOAP) |
| IR Oxidation @ 5.85 *μm* (Abs. *unit/cm*) | 10 | FT-IR |
| Separated Water (%) | 1.0 | Visual (24 settling hours) |

Table 2.8.1 Approval Procedure of Preventive Maintenance System for Oil Lubricated Propeller Shafts (Continued)

| Item | Procedures |
|---|---|
| 5 General | (1) The parameters at least following **(a)** to **(e)** are to be monitored and recorded onboard the ship in accordance with the approved manual, and the lubricating condition of the propeller shafts is to be diagnosed thereby.<br>(a) Lubricating oil sampling and analysis is to be carried out regularly at intervals not exceeding 6 *months*, with at least the following **i)** to **iv)** being analyzed each time:<br>i) water content;<br>ii) salinity (sodium);<br>iii) content of shaft metal and bearing metal particles; and<br>iv) oxidation of oil.<br>(b) The monthly onboard checking of lubricating oil water content.<br>(c) Lubricating oil consumption rate<br>(d) Bearing temperature*1<br>(e) Weardown of the propeller shaft at the stern tube bearing<br>(2) Where any abnormality is found, management is to report it to the Society as soon as possible and withdraw the shaft for a thorough examination or carry out maintenance to the shaft as necessary.<br>(3) Management is to maintain onboard records of the analysis data in **4.(2)(b)** above after every analysis of the sample oil. In the documents, management's opinion, such as on the necessity for withdrawing the shaft, is to be included.<br>(4) The Society will carry out general examinations on the related shafting parts and review each record of parameters monitored at the ship's periodical surveys to verify that appropriate maintenance is carried out in compliance with the approved manual, and notify the ship's management of any necessary maintenance. Where any abnormality or improper maintenance is found out through the examination, management is required to apply for an Ordinary Survey of the shaft. |
| 6 Cancellation of Approval | (1) Where the following **(a)** to **(c)** is applicable, the Society may cancel the ship's approval to adopt the preventive maintenance system for propeller shafts. In such cases, the Society is to notify the ship's management of the cancellation, and the ship is to be carried out Ordinary Survey immediately in accordance with **Table B2.8.3**.<br>(a) Where any improper conduct is found regarding entries in the records such as those for oil analysis results.<br>(b) Where it is regarded by the Society that proper maintenance is not carried out according to the approved manual.<br>(c) Where the shipowner or ship management company has changed, or cancellation of the approval to adopt the preventive maintenance system has been requested by the ship's management. |

Notes

*1: In the cases of azimuth thrusters which use roller bearings as the bearings for propeller shafts, however, the vibrations of the power transmission systems in the propulsion systems or the Fe-density of the lubricating oil in the azimuth thruster casings may be acceptable. In such cases, the instruments specified in **(1)** or **(2)** are used, the data and the result of the analysis are to be evaluated prior to the survey and are to be retained on board at all times. However, the following requirements specified in **(3)** are to be satisfied.

(1) A vibration measurement system to measure vibration of power transmission system in the azimuth thrusters complying with the following **(a)** to **(c)**. Where the system is fixed type, the environmental tests specified in **18.7.1(1), Part D of the Rules for the Survey and Construction of Steel Ships** are to be carried out.

(a) The measurement is to be carried out regularly at intervals not exceeding 3 *months*.

(b) Measurement points and the relevant data are to be in accordance with those described in the guidance for measurement in the management manual concerning the vibration measurement system.

(c) A trend display and frequency analysis of the measurement data is to be provided.

(2) A Fe-density measurement system of lubricating oil in the azimuth thruster casings complying with the following **(a)** to **(c)**. Where the system is fixed type, the environmental tests specified in **18.7.1(1), Part D of the Rules for the Survey and Construction of Steel Ships** are to be carried out.

(a) Sampling is to be carried out regularly at intervals not exceeding 3 *months*.

(b) The measurement data is to be the amount of Fe per hour, considering the change of new lubricating oil. A trend display of the data is to be provided.

(c) Sampling is to be carried out when the azimuth thrusters are operating at sea as far as possible. When the

sampling can only be conducted at port, the sampling is to be carried out within 30 *minutes* after said thrusters stop.

(3) Measurement data

(a) The executive management (hereinafter referred to as "management") is to determine the criteria for each parameter (including the criteria for alarm and abnormal conditions) for the ship taking into account its experience and knowledge.

(b) Management is to submit the analysis records with the data after every analysis of the sample oil. In this document, management's opinion, such as on the necessity for withdrawing the azimuth thrusters, is to be included.

## 8.2 Surveys of Water Lubricated Shafts

### 8.2.1 Surveys of Shafts Kind 1*A*

**1** Surveys of shaft Kind 1*A* are to be the Ordinary Surveys specified in **Table 2.8.2** carried out within 6 *years* from the date of completion (survey due date) of the Classification Survey or the previous Ordinary Survey.

**2** In addition to **-1** above, surveys for shafts Kind 1*A* which are used corrosion resistant materials specified in **6.2.7-1.(3), Part D of the Rules for the Survey and Construction of Steel Ships** are to be the Partial Surveys specified in **Table 2.8.2** and are to be carried out within 36 *months* from the date of completion (survey due date) of the Classification Survey or the previous Ordinary Survey specified in **-1** above. In cases where the results of the Partial Survey are not satisfactory, the Ordinary Survey specified in **Table 2.8.2** is to be carried out.

**3** For the surveys referred to **-1** and **-2** above completed with 3 *months* prior to the survey due date, the next period is to start from the survey due date.

**4** The survey due date may be extended in cases where a survey is carried out in accordance with following **(1)** to **(4)** and the shafts condition is confirmed to be satisfactory. The interval of the Ordinary Survey specified in **Table 2.8.2** is not to exceed 7 *years*.

(1) The survey due date may be extended for up to 1 *year* in cases where the 1Year Extension Survey specified in **Table 2.8.2** is carried out. No further extension survey can be carried out.

(2) The survey due date may be extended for up to 3 *months* in cases where the 3Month Extension Survey specified in **Table 2.8.2** is carried out. No further 3Month Extension Survey may be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 1 *year* in cases where the 1Year Extension Survey specified in **Table 2.8.2** is carried out.

(3) The period of extension counts from the survey due date in cases where the extension survey is carried out within 1 *month* within the survey due date.

(4) The period of extension counts from the date on which the extension survey in cases where the extension survey is carried out more than 1 *month* prior to the survey due date.

### 8.2.2 Surveys of Shafts Kind 2

**1** Surveys of shafts Kind 2 are to be the Ordinary Survey specified in **Table 2.8.2** and are to be carried out in accordance with the following **(1)** and **(2)** periods (survey due dates).

(1) Concurrently with Special Surveys, and

(2) Within 36 *months* from the date of completion of the Classification Survey or the previous Ordinary Surveys.

**2** For the surveys referred to **-1** above completed within 3 *months* prior to the survey due date, the next period is to start from the survey due date.

Table 2.8.2 Surveys of Water Lubricated Shafts – Shafts Kind 1*A* and Kind 2

| Items | Examinations | Ordinary Survey | Partial Survey | Extension Survey | |
|---|---|---|---|---|---|
| | | | | 1Year | 3Month |
| 1 Drawing out of the shafts<br>-1 Entirely drawing out | (1) Drawing the propeller shaft and the stern tube shaft and examining the entire shaft (including liners, corrosion protection system and stress reducing features, where provided), inboard seal system and bearings. | ○ | | | |
| -2 Partially drawing out | (1) Drawing the propeller shaft to confirm the contacting parts to stern tube bearing. The propeller shaft may be withdrawn with the condition fitting propeller to propeller shaft. | | ○ | | |
| 2 Propeller connections<br>-1 Keyed connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section, including the keyway with the method deemed appropriate by a surveyor (When shafts are provided with liners, the *NDE* is to be extended to the after edge of the liner). | ○ | | | |
| -2 Keyless connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section with the method deemed appropriate by a surveyor. For shafts provided with liners, the *NDE* is to be extended to the after edge of the liner.<br>(3) Notwithstanding **(2)** above, with the interval not to exceed 18 *years*, performing a non-destructive examination (*NDE*) to whole corn parts of shaft including the forward portion of the taper section with the method deemed appropriate by a surveyor. | ○ | | | |
| -3 Flanged connections | (1) Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by a surveyor, performing a non-destructive examination (*NDE*) to the coupling bolts and flange radius with the method deemed appropriate by the surveyor. | ○ | | | |
| 3 Clearance between bush of the stern tube bearing and propeller shaft | (1) Checking and recording the clearance between bush of the stern tube and propeller shaft.<br>(2) Confirm the clearance does not exceed the following values.<br>(a) Shaft diameter no more than 230*mm*: 6 *mm*<br>(b) Shaft diameter more than 230*mm* but no more than 305*mm*: 8 *mm*<br>(c) Shaft diameter more than 305*mm*: 9.5 *mm* | ○ | ○ | ○ | |

Table 2.8.2 Surveys of Water Lubricated Shafts – Shafts Kind 1*A* and Kind 2 (Continued)

| Items | Examinations | Ordinary Surveys | Partial Survey | Extension Survey | |
|---|---|---|---|---|---|
| | | | | 1Year | 3Month |
| 4 Propeller | (1) Verification that the propeller is free of damages which may cause the propeller to be out of balance. (For extension survey, the information is confirmed by the record etc.)<br>(2) For ordinary surveys, checking propeller fitting condition to shaft. When the propeller shaft with keyless connection is force fitted to the shaft, it is to be ascertained that the pull-up length is within the upper and lower limits given in **7.3.1-1, Part D**. | ○ | ○ | ○ | ○ |
| 5 Sealing device for stern tube | (1) Verification of the satisfactory conditions of inboard seals during the re-installation of the shaft and propeller. (For ordinary surveys, the verification is carried out during the re-installation of the shaft and propeller.) | ○ | ○ | ○ | ○ |
| 6 Shaft and coupling bolts | (1) Examination of shaft and coupling bolts (For extension survey, visual inspection of accessible parts of shaft and coupling bolts.). However, performing a non-destructive examination (*NDE*) to coupling bolts with the method deemed appropriate by a surveyor in cases where the surveyor, based on the results of external examinations, deems such addition examination to be necessary. In addition, anti-corrosion covers are to be removed for shafts Kind 2. | ○ | | ○ | ○ |
| 7 Stern tube bearing | (1) Examination of the stern tube bearings. | ○ | | | |
| 8 Propeller boss surfaces in contact with the propeller shaft taper | (1) Examination of the propeller boss surface. | ○ | | | |
| 9 Controllable pitch propeller connections (Only applies to shafts with flanged connections) | (1) Open-up examination of the pitch control gear and working parts as well as performing a non-destructive examination (*NDE*) to the propeller blade fixing bolts with the method deemed appropriate by a surveyor. | ○ | | | |
| 10 Water lubrication lines | (1) Examination of water lubrication lines. | ○ | ○ | ○ | ○ |
| 11 Review of records, etc. | (1) Review of following **(a)** to **(d)**.<br>(a) Previous clearance recording<br>(b) Service records<br>(c) No report to repairs by grinding or welding of shafts or propellers<br>(d) The information the shafting arrangement is in good working condition by the chief engineer | | | ○ | ○ |

## 8.3 Surveys of Oil Lubricated Shafts

### 8.3.1 Surveys of Shafts Kind 1*B* and Kind 1*C*

**1** Surveys of shafts Kind 1*B* and shafts Kind 1*C* are to be the Ordinary Surveys specified in **Table 2.8.3** and are to be carried out within 6 *years* from the date of completion (survey due date) of the Classification Survey or the previous Ordinary Survey.

**2** Notwithstanding **-1** above, for shafts which are subject to the lubricating oil analysis specified in **8.1.1(17)**, the Partial Survey specified in **Table 2.8.3** may be carried out instead of an Ordinary Survey. In cases where the results of Partial Survey is not satisfactory, Ordinary Survey specified in **Table 2.8.3** is to be carried out.

**3** Notwithstanding **-1** and **-2** above, for shafts with keyless or flanged connections and which are subject to the lubricating oil analysis specified in **8.1.1(17)**, the Simplified Partial Survey specified in **Table 2.8.3** may be carried out instead of an Ordinary Survey or Partial Survey. In cases where the results of the Simplified Partial Survey are not satisfactory, the Ordinary Survey specified in **Table 2.8.3** is to be carried out.

**4** Notwithstanding **-2** and **-3** above, for shafts Kind 1*B* and shafts Kind 1*C*, the interval of the Ordinary Survey specified in **Table 2.8.3** above is not to exceed 18 *years*. This interval may be extended for up to 3 *months*. No further extension may be granted.

**5** For the surveys referred to **-1** to **-4** above completed with 3 *months* prior to the survey due date, the next period is to start from the survey due date.

**6** For shafts which are subject to the lubricating oil analysis specified in **8.1.1(17)**, the survey due date may be extended in cases where a survey is carried out in accordance with the following **(1)** to **(5)**.

(1) The survey due date may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.3** is carried out. No further extension survey can be carried out.

(2) The survey due date may be extended for up to 1 *year* in cases where 1Year Extension Survey specified in **Table 2.8.3** is carried out. No more than two consecutive 1Year Extension Surveys may be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.3** is carried out.

(3) The survey due date may be extended for up to 3 *months* in cases where the 3Month Extension Survey specified in **Table 2.8.3** is carried out. No further 3Month Extension Surveys may be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 1 *year* or 2.5 *years* in cases where the 1Year Extension Survey or 2.5Year Extension Survey specified in **Table 2.8.3** is carried out.

(4) The period of extension counts from the survey due date in cases where the extension survey is carried out within 1 *month* prior to the survey due date.

(5) The period of extension counts from the date on which the extension survey in cases where the extension survey is carried out more than 1 *month* prior to the survey due date.

### 8.3.2 Surveys of Shaft of the ships affixed with the notation *PSCM*

**1** Surveys of shafts of ships affixed with the notation *PSCM* are to be the Ordinary Surveys or Partial Surveys specified in **Table 2.8.3** and are to be carried out within 6 *years* from the date of completion (survey due date) of the Classification Survey or the previous Ordinary Survey Surveys. In cases where Partial Survey is carried out and the result is not satisfactory, Ordinary Survey specified in **Table 2.8.3** is to be carried out.

**2** Notwithstanding **-1** above, for shafts with keyless or flanged connections, the Simplified Partial Survey specified in **Table 2.8.3** may be carried out instead of an Ordinary Survey or Partial Survey. In cases where the results of the Simplified Partial Survey is not satisfactory, Ordinary Survey specified in **Table 2.8.3** is to be carried out.

**3** Notwithstanding **-2** above, for shafts with keyless connection, the interval of the Ordinary Survey or Partial Survey specified in **Table 2.8.3** above is not to exceed 18 *years*. This interval may be extended for up to 3 *months*. No further extension may be granted. In cases where a Partial Survey is carried out and the result is not satisfactory, the Ordinary Survey specified in **Table 2.8.3** is to be carried out.

**4** For the surveys referred to **-1** to **-3** above completed within 3 *months* prior to the survey due date, the next period is to start from the survey due date.

**5** The survey due date may be extended in cases where a survey is carried out in accordance with following **(1)** to **(5)**.

(1) The survey due date may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.3** is carried out. No further extension survey may be carried out.

(2) The survey due date may be extended for up to 1 *year* in cases where the 1Year Extension Survey specified in **Table 2.8.3** is carried out. No more than two consecutive 1Year Extension Survey can be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.3** is carried out.

(3) The survey due date may be extended for up to 3 *months* in cases where the 3Month Extension Survey specified in **Table 2.8.3** is carried out. No further 3Month Extension Surveys may be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 1 *year* or 2.5 *years* in cases where the 1Year Extension Survey or 2.5 Year Extension Survey specified in **Table 2.8.3** is carried out.

(4) The period of extension counts from the survey due date in cases where the extension survey is carried out within 1 *month* prior to the survey due date.

(5) The period of extension counts from the date on which the extension survey in cases where the extension survey is carried out more than 1 *month* prior to the survey due date.

Table 2.8.3 Surveys of Oil Lubricated Shafts – Shafts Kind 1*B* or Shafts of Ships Affixed with Notation *PSCM*

| Items | Examinations | Ordinary Survey | Partial Survey | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5Years | 1Year | 3Month |
| 1 Drawing out of the shafts | (1) Drawing the propeller shaft and the stern tube shaft and examining the entire shafts, seals system and bearings.<br>(2) Checking and recording the bearing clearances between the bush and the shafts. | ○ | | | | | |
| 2 Propeller connections<br>-1 Keyed connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section, including the keyway with the method deemed appropriate by a surveyor. (When shafts are provided with liners, the *NDE* is to be extended to the after edge of the liner.) | ○ | ○ | | | | |
| -2 Keyless connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section with the method deemed appropriate a surveyor. (When shafts are provided with liners, the *NDE* is to be extended to the after edge of the liner.) | ○ | ○ | | | | |
| -3 Flanged connections | (1) Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by a surveyor, performing a non-destructive examination (*NDE*) to the flange radius and coupling bolts with the method deemed appropriate by the surveyor. | ○ | ○ | | | | |
| 3 Weardown of shaft at the stern tube bearing | (1) Checking and recording the weardown (For extension surveys, the checking and recording are to be carried out as far as practicable.)<br>(2) Confirm the weardown value does not exceed 0.3 *mm* (0.3 *mm* is standard value). In addition, factors such as the characteristics of the lubricating oil, the temperature fluctuation history of the lubricating oil or bearing material are to be taken into account. | ○ | ○ | ○ | ○ | | |
| 4 Propeller | (1) Verification that the propeller is free of damages which may cause the propeller to be out of balance. (For extension surveys, the information is confirmed by records, etc.)<br>(2) For ordinary surveys, checking propeller fitting condition to shaft. When the propeller shaft with keyless connection is force fitted to the shaft, it is to be ascertained that the pull-up length is within the upper and lower limits given in **7.3.1-1, Part D of the Rules for the Survey and Construction of Steel Ships**. | ○ | ○ | ○ | ○ | ○ | |

Table 2.8.3 Surveys of Oil Lubricated Shafts – Shafts Kind 1*B* or Shafts of Ships Affixed with Notation *PSCM* (Continued)

| Items | Examinations | Ordinary Surveys | Partial Surveys | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5Years | 1Year | 3Month |
| 5 Sealing device for stern tube | (1) Verification of the satisfactory conditions of inboard and outboard seals. (For ordinary surveys, the verification is carried out during the re-installation of the shaft and propeller.) For 3month extension surveys, verification of inboard seals may be accepted.<br>(2) Confirmation that the seal liner is placed in a satisfactory condition. For extension, this examination is not applied. | ○ | ○ | ○ | ○ | ○ | ○ |
| 6 Shaft and coupling bolts | (1) Examination of shaft and coupling bolts (For the surveys except Ordinary Survey, visual inspection of accessible parts of shaft and coupling bolts.). However, performing a non-destructive examination (*NDE*) to coupling bolts with the method deemed appropriate by a surveyor in cases where the surveyor, based on the results of external examinations, deems such addition examination to be necessary. | ○ | ○ | ○ | ○ | ○ | ○ |
| 7 Stern tube bearing | (1) Examination of the stern tube bearings. | ○ | | | | | |
| 8 Propeller boss surfaces in contact with the propeller shaft taper | (1) Examination of the propeller boss surface. | ○ | | | | | |
| 9 Controllable pitch propeller connections (Only applies to shaft with flanged connections) | (1) Open-up examination of the pitch control gear and working parts as well as performing a non-destructive examination (*NDE*) to the propeller blade fixing bolts with the method deemed appropriate by a surveyor. | ○ | ○ | | | | |
| 10 Low oil level alarms of the lubricating oil tanks, lubricating oil temperature measuring devices, oil lubricating lines and lubricating oil circulating pumps, etc. | (1) Examination of the systems for verifying whether stern tube bearings are being maintained in good working condition. | ○ | ○ | ○ | ○ | ○ | ○ |

Table 2.8.3 Surveys of Oil Lubricated Shafts – Shafts Kind 1*B* or Shafts of Ships Affixed with Notation *PSCM* (Continued)

| Items | Examinations | Ordinary Surveys | Partial Surveys | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5Years | 1Year | 3Month |
| 11 Review of records etc. | (1) Examinations are to be carried out in accordance with the following **(a)** to **(g)**.<br>(a) Service records are to be reviewed.<br>(b) Review of test records of the lubricating oil analysis is to be carried out to confirm that the reference standards specified in following **i)** and **ii)** are complied with.<br>i) Metal particles (upper limit) *1:<br>1) Iron (Fe): 50 *ppm*<br>2) Tin (Sn): 20 *ppm*<br>3) Lead (Pb): 20 *ppm*<br>4) Sodium (Na): 80 *ppm*<br>ii) IR oxidation and separated water*2:<br>1) IR oxidation @ 5.85*μm*: 10 (*Abs.unit*/*cm*)<br>2) Separated water: 1.0 %<br>(c) Oil sample examination is to be carried out.<br>(d) Verification of no reported repairs by grinding or welding of shafts and/or propellers is to be carried out.<br>(e) Examination of the lubricating oil record book.<br>(f) For 1 year and 3 month extension survey, review of the previous clearance recordings is to be carried out.<br>(g) Confirmation from the Chief Engineer that the shafting arrangement is in good working condition is to be obtained. | | ○ | ○ | ○ | ○ | ○ |

Notes

*1: If the test results of the oil analysis suggest that the sample oil does not represent the lubricating oil in the stern tube and is suspected to be invalid (e.g. when only iron (Fe) exceeds the upper limit of **(b)i)**, item **11**, it is suspected that rust in the lubricating oil tank is the cause.), the surveyor is to instruct the shipowner (or the ship management company) to promptly re-perform the oil analysis and to be verified the test results of the oil analysis by the time of the first periodical survey (excluding those specified in **1.1.3-1(5), Part B of the Rules for the Survey and Construction of Steel Ships**) on or after the day 3 *months* after the day of receiving the said instruction.

*2: Notwithstanding **(b)ii)**, item **11**, in the case of environmentally acceptable lubricants (EAL), observation of any trends (such as TAN (total acid number), viscosity and change in colour etc.) based on periodical oil analysis may be made. In such cases, observations of TAN trends are to be made based on sequential analyssis in conjunction with limits for continued use in service defined by oil makers.

## 8.4 Surveys of Fresh Water Lubricated Shafts

### 8.4.1 Surveys of Shaft Kind 1*W*

**1** Surveys of shafts Kind 1*W* are to be the Ordinary Surveys specified in **Table 2.8.4** and are to be carried out within 6 *year* from the date of completion (survey due date) of the Classification Survey or the previous Ordinary Survey.

**2** Notwithstanding **-1** above, for shafts which are subject to the lubricating fresh water analysis specified in **8.1.1(18)**, the Partial Survey specified in **Table 2.8.4** may be carried out instead of an Ordinary Survey. In cases where the results of the Partial Survey are not satisfactory, the Ordinary Survey specified in **Table 2.8.4** is to be carried out.

**3** Notwithstanding **-1** and **-2** above, for shafts with keyless or flanged connections and which are subject to the lubricating oil analysis specified in **8.1.1(18)**, the Simplified Partial Survey specified in **Table 2.8.4** may be carried out instead of an Ordinary Survey or Partial Survey. In cases where the results of the Simplified Partial Survey are not satisfactory, the Ordinary Survey specified in **Table 2.8.4** is to be carried out.

**4** Notwithstanding **-2** and **-3** above, the interval of the Ordinary Survey specified in **Table 2.8.4** above is not to exceed 18 *years*. This interval may be extended for up to 3 *months*. No further extension may be granted.

**5** For the surveys referred to **-1** to **-4** above completed with 3 *months* prior to the survey due date, the next period is to start from the survey due date.

**6** For shafts which are subject to the lubricating fresh water analysis specified in **8.1.1(18)**, the survey due date may be extended in cases where the survey is carried out in accordance with the following **(1)** to **(5)**.

(1) The survey due date may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.4** is carried out. No further extension survey may be carried out.

(2) The survey due date may be extended for up to 1 *year* in cases where the 1Year Extension Survey specified in **Table 2.8.4** is carried out. No more than two consecutive 1Year Extension Survey can be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 2.5 *years* in cases where the 2.5Year Extension Survey specified in **Table 2.8.4** is carried out.

(3) The survey due date may be extended for up to 3 *months* in cases where the 3Month Extension Survey specified in **Table 2.8.4** is carried out. No further 3Month Extension Surveys may be carried out. In the event an additional extension is requested, the survey due date, prior to the previous extension, may be extended for up to 1 *year* or 2.5 *years* in cases where the 1Year Extension Survey or 2.5Year Extension Survey specified in **Table 2.8.4** is carried out.

(4) The period of extension counts from the survey due date in cases where the extension survey is carried out within 1 *month* prior to the survey due date.

(5) The period of extension counts from the date on which the extension survey in cases where the extension survey is carried out more than 1 *month* prior to the survey due date.

Table 2.8.4 Surveys of Water Lubricated Shafts – Shafts Kind 1*W*

| Items | Examinations | Ordinary Survey | Partial Survey | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5Year | 1Year | 3Month |
| 1 Drawing out of the shafts | (1) Drawing the propeller shaft and the stern tube shaft and examining the entire shafts, seals system and bearings.<br>(2) Checking and recording the bearing clearances between the bush and the shafts. | ○ | | | | | |
| 2 Propeller connections<br>-1 Keyed connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section, including the keyway with the method deemed appropriate by a surveyor. (When shafts are provided with liners, the *NDE* is to be extended to the after edge of the liner.) | ○ | ○ | | | | |
| -2 Keyless connections | (1) Removing the propeller to expose the forward end of the taper.<br>(2) Performing a non-destructive examination (*NDE*) to all around the shaft in way of the forward portion of the taper section with the method deemed appropriate by a surveyor. (When shafts are provided with liners, the *NDE* is to be extended to the after edge of the liner.) | ○ | ○ | | | | |
| -3 Flanged connections | (1) Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by a surveyor, performing a non-destructive examination (*NDE*) to the flange radius and coupling bolts with the method deemed appropriate by the surveyor. | ○ | ○ | | | | |
| 3 Weardown of shaft at the stern tube bearing | (1) Checking and recording the weardown (For extension surveys, the checking and recording are to be carried out as far as practicable.)<br>(2) Confirm the weardown value does not exceed the value used as reference for repairs specified by the manufacturer. | ○ | ○ | ○ | ○ | | |
| 4 Propeller | (1) Verification that the propeller is free of damages which may cause the propeller to be out of balance. (For extension surveys, the information to be confirmed by records, etc.)<br>(2) For ordinary surveys, checking propeller fitting condition to shaft. When the propeller shaft with keyless connection is force fitted to the shaft, it is to be ascertained that the pull-up length is within the upper and lower limits given in **7.3.1-1, Part D**. | ○ | ○ | ○ | ○ | ○ | |

Table 2.8.4 Surveys of Water Lubricated Shafts – Shafts Kind 1*W* (Continued)

| Items | Examinations | Ordinary Surveys | Partial Surveys | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5 years | 1 year | 3 months |
| 5 Sealing device for stern tube | (1) Verification of the satisfactory conditions of inboard and outboard seals. (For ordinary surveys, the verification is carried out during the re-installation of the shaft and propeller.) For 3 month extension surveys, verification of inboard seals may be accepted.<br>(2) Confirmation that the seal liner is placed in a satisfactory condition. For extension, this examination is not applied. | ○ | ○ | ○ | ○ | ○ | ○ |
| 6 Shaft and coupling bolts | (1) Examination of shaft and coupling bolts (For the surveys except Ordinary Survey, visual inspection of accessible parts of shaft and coupling bolts.) However, performing a non-destructive examination (*NDE*) to coupling bolts with the method deemed appropriate by a surveyor in cases where the surveyor, based on the results of external examinations, deems such addition examination to be necessary. | ○ | ○ | ○ | ○ | ○ | ○ |
| 7 Stern tube bearing | (1) Examination of the stern tube bearings. | ○ | | | | | |
| 8 Propeller boss surfaces in contact with the propeller shaft taper | (1) Examination of the propeller boss surface. | ○ | | | | | |
| 9 Controllable pitch propeller connections (Only applies to shafts with flanged connections) | (1) Open-up examination of the pitch control gear and working parts as well as performing a non-destructive examination (*NDE*) to the propeller blade fixing bolts with the method deemed appropriate by a surveyor. | ○ | ○ | | | | |
| 10 Low level alarms of the lubricating fresh water tanks, lubricating fresh water temperature measuring devices, fresh water lubricating lines and lubricating fresh water circulating pumps, etc. | (1) Examination of the systems for verifying whether stern tube bearings are being maintained in good working condition. | ○ | ○ | ○ | ○ | ○ | ○ |

Table 2.8.4 Surveys of Water Lubricated Shafts – Shafts Kind 1*W* (Continued)

| Items | Examinations | Ordinary Surveys | Partial Surveys | Simplified Partial Survey | Extension Survey | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2.5 years | 1 year | 3 months |
| 11 Review of records etc. | (1) Examinations are to be carried out in accordance with the following **(a)** to **(g)**.<br>(a) Service records are to be reviewed.<br>(b) Review of test records of the fresh water analysis is to be carried out to confirm that the reference standards specified in following **i)** and **ii)** are complied with.<br>i) Chloride content and sodium content (upper limit)<br>1) Chloride: 60 *ppm*<br>2) Sodium (Na): 70 *ppm*<br>ii) pH:<br>Lower limit values determined based upon characteristics of the correction inhibitors used, but not to be less than 11<br>iii) Metal particles (upper limit) :<br>1) Iron (Fe): 25 *ppm*<br>2) Chromium (Cr): 5 *ppm*<br>3) Nickel (Ni): 5 *ppm*<br>4) Copper (Cu): 40 *ppm*<br>5) Silicon (Si): 30 *ppm*<br>iv) Bearing particles (non-metallic content) :<br>No polymer resins are to be found by micro-filter or microscopic testing<br>(c) Fresh water sample test is to be carried out.<br>(d) Verification of no reported repairs by grinding or welding of shafts or propellers is to be carried out.<br>(e) Examination of the lubricating fresh water record book.<br>(f) For 1year and 3month extension surveys, review of the previous clearance recordings is to be carried out.<br>(g) Confirmation from the chief engineer that the shafting arrangement is in good working condition is to be obtained. | | ○ | ○ | ○ | ○ | ○ |

EFFECTIVE DATE AND APPLICATION (Amendment 1-7)

**1.** The effective date of the amendments is 1 October 2022.

# GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

GUIDANCE

**2022 AMENDMENT NO.1**

Notice No.41 30 June 2022

Resolved by Technical Committee on 26 January 2022

Notice No.41 30 June 2022
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

"Guidance for the survey and construction of inland waterway ships" has been partly amended as follows:

Amendment 1-1

# Part 2 CLASS SURVEYS

## Chapter 2 CLASSIFICATION SURVEYS

### 2.3 River Trials and Stability Experiments

#### 2.3.1 River Trials

Sub-paragraph -1(3) has been amended as follows.

**1** The Astern test required by **2.3.1-1(1), Part 2 of the Rules** is to be carried out in accordance with the following **(1)** to **(4)** below.

(1) (Omitted)

(2) It is to be confirmed that the machinery is functioning normally while the ship is running astern. The main engine is to be kept at a rate of more than 70% of the maximum continuous revolutions. The ship is to be kept running astern until the astern speed (rotational speed in rpm) stabilizes and the performance is to be confirmed in accordance with **1.3.2, Part 7 of the Rules**.

(3) For low pressure gas-fuelled dual fuel engines, the confirmation specified in **(2)** is to be carried out for all operating modes (gas mode, diesel mode, etc.). This test is to be carried out at the maximum power available in gas mode (*See* **2.5.1-1(1) in Annex 4, Part GF** or **2.5.1-1.(1) in Annex 4, Part N of the Guidance for the Survey and Construction of Steel Ships**).

(4) (Omitted)

Sub-paragraph -3(8) has been amended as follows.

**3** The performance tests of machinery installations required by **2.3.1-1(3), Part 2 of the Rules** are to include the following **(1)** to **(9)** in order to verify that the machinery installations have sufficient normal functions and reliability and are free from detrimental vibration within the numbers of revolutions used. However, these tests may be dispensed with where such tests have been conducted while the ship was anchored or at dockside. The details of these tests may be found in *JIS F* 0801 "Test Code of Propelling Machinery at Sea Trials" or other documents considered equivalent thereto. The preparations specified in **1.4.2-8** are to be made before tests are carried out.

(1) For reciprocating internal combustion engines, the output test shown in **Table 2.2.3.1-5**, is to be used as the standard. For reciprocating internal combustion engines driving generators or auxiliary machinery (excluding auxiliary machinery for specific uses), operating tests may be carried out at the appropriate time after installation on board.

(2) Operating tests for starting devices
It is to be confirmed that the diesel engines start continuously for the number required by **2.5.3-2, Part 7 of the Rules**.

(3) Function tests of the alarms and safety devices
Function tests of the alarms and safety devices required by **2.4, Part 7 of the Rules** are to be carried out.

(4) Fuel suitability
The suitability of residual and other special fuels for use in the engine is to be confirmed. However, this test may be dispensed with where the suitability has already been demonstrated at the shop trial.

(5) Governor tests
For reciprocating internal combustion engines driving main sources of electrical power (including reciprocating internal combustion engines driving generators for both propulsion and main power supply), the characteristics for governors specified in **2.4.1-5(1), Part 7 of the Rules** are to be confirmed.

(6) (Omitted)

(7) (Omitted)

(8) Low pressure (i.e. pressure less than 1 *MPa*) gas-fuelled engines are to comply with the requirements specified in **(1)** and **(5)**. For low pressure gas-fuelled dual-fuel engines, the output tests and governor tests are to be carried out for all operating modes (i.e. the gas mode, diesel mode, etc.~~ specified in **1.4.3 of Annex 4, Part GF** or **1.4.3 of Annex 4, Part N of the Guidance for the Survey and Construction of the Steel Ships**~~). This test is to be carried out at the maximum power available in gas mode (*See* **2.5.1-1(1) in Annex 4, Part GF** or **2.5.1-1(1) in Annex 4, Part N of the Guidance for the Survey and Construction of the Steel Ships**). The 110% load test is not required for the gas mode.

(9) (Omitted)

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Guidance, the current requirements apply to gas-fuelled engines other than those which fall under the following:
(1) gas-fuelled engines for which the application for approval of use is submitted to the Society on or after the effective date; or
(2) gas-fuelled engines for which the date of renewal of approval of use is on or after the effective date.

Amendment 1-2

# Part 7 MACHINERY INSTALLATIONS

## Chapter 2 RECIPROCATING INTERNAL COMBUSTION ENGINES

### 2.1 General

Paragraph 2.1.3 has been amended as follows.

**2.1.3 Drawings and Data**

For the following data, those represented by two sizes in a generic range of turbochargers (i.e. the same components, materials, etc., with the only difference being the size) are acceptable.

(1) The documentation for safe torque transmission specified in ~~**2.1.3-1(2)(i)i)**~~ **(34)(a), Table 7.2.1(b), Part 7 of the Rules**.

(2) The operation and maintenance manuals listed in ~~**2.1.3-1(2)(i)iii)**~~ **(34)(c), Table 7.2.1(b), Part 7 of the Rules**.

## Chapter 8 PRESSURE VESSELS

### 8.9 Tests

#### 8.9.1 Shop Tests

Sub-paragraph -2 has been amended as follows.

**2** Notwithstanding the requirements in **8.9.1-2, Part 7 of the Rules**, hydrostatic tests of heat exchangers fitted to engines having cylinder bores of 300 *mm* or less may be omitted~~.~~ (see **Table 7.2.~~7~~8, Part 7 of the Rules**).

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Guidance, the current requirements apply to reciprocating internal combustion engines for which the application for approval is submitted to the Society before the effective date.

Amendment 1-3

# Part 7 MACHINERY INSTALLATIONS

## Chapter 3 POWER TRANSMISSION SYSTEMS

### 3.2 Materials and Construction

Paragraph 3.2.3 has been added as follows.

**3.2.3 General Construction of Gears**

The words "enough" and "sufficient" in **3.2.3, Part 7 of the Rules** mean being designed in accordance with national or international standards such as *JIS.*

### 3.3 Strength of Gears

#### 3.3.1 Application

Sub-paragraph (2) has been amended as follows.

In the case of bevel gear, the wording "deemed appropriate by the Society" in **3.3.1, Part 7 of the Rules** means as follows:

(1) The bending strength at the root sections of gear teeth and limiting tooth surface strength are to be according to *ISO* standards or as deemed appropriate by the Society.

(2) Evaluation of the strength of the interior of gear teeth may be required where deemed necessary by the Society. In such cases, the Vickers hardness (*HV*) of the interior of gear teeth is not to be less than the value obtained from the following formula. However, this requirement does not apply to bevel gears for which the tip diameter (outer end) is smaller than 1,100 *mm*:

If $\frac{z}{w} < 0.79$ then $\frac{z}{w}$ is to be taken as $0.79$.

$$HV = 1.11 S_H p \left[ \frac{z}{w} - \frac{\left(\frac{z}{w}\right)^2}{\sqrt{1 + \left(\frac{z}{w}\right)^2}} \right]$$

$HV$: Vickers hardness

$S_H$: Safety factor for contact stress is to comply with the requirements in **Annex ~~D5.3.5~~5.3.1 "~~GUIDANCE FOR~~ CALCULATION OF STRENGTH OF ENCLOSED GEARS" 1.6.3-9, Part D of the ~~Guidance~~Rules for the Survey and Construction of Steel Ships**.

$p$: Real hertzian stress (*MPa*). The upper limit of the value of $p$ used in this calculation is to be 1,500 *MPa.*

$p = AS_c$

$S_c$: Contact stress (*MPa*), to be calculated according to *ISO 10300* standards.

$A$: If $S_c$ is calculated according to *ISO 10300* standards, then the coefficients are to be determined, in consideration of analysis results, by the Society on a case by case basis. In addition, if $S_c$ is calculated according to *ISO 10300* standards, $A$ is to be taken as 1.32

$w$: Half the hertzian contact width (*mm*), to be calculated by the following formula:

$$w = \frac{p\rho_C}{56300}$$

$$\rho_C = \frac{\rho_1\rho_2}{\rho_1 + \rho_2}$$

$$\rho_1 = 0.5 d_{vn1} \sin\alpha_n$$

$$\rho_2 = 0.5 d_{vn2} \sin\alpha_n$$

$$d_{vn1} = d_{m1} \frac{\sqrt{1+u^2}}{u} \frac{1}{\cos^2\beta_{vb}}$$

$d_{m1}$: Mean pitch diameter of pinion（*mm*）

$u$: Gear ratio

$\beta_{vb} = \arcsin(\sin\beta_m \cos\alpha_n)$

$\beta_m$: Mean spiral angle

$\alpha_n$: Normal pressure angle

$d_{vn2} = u^2 d_{vn1}$

$z$: Depth from teeth surface to evaluation point (*mm*)

Paragraph 3.3.5 has been deleted.

~~**3.3.5 Detailed Evaluation for Strength**~~

~~It is acceptable that the bending and surface strength of gears are calculated based on **Annex D5.3.5 "GUIDANCE FOR CALCULATION OF STRENGTH OF GEARS", Part D of the Guidance for the Survey and Construction of Steel Ships.**~~

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Guidance, the current requirements apply to all gears previously approved by the Society prior to the effective date for which no failure has occurred, and no changes related to strength, such as the scantlings of the gear meshes, materials, etc. have been made.

Amendment 1-4

# Part 7 MACHINERY INSTALLATIONS

## Chapter 4 SHAFTINGS

### 4.2 Materials, Construction and Strength

#### 4.2.4 Propeller Shafts and Stern Tube Shafts

**1** As for the diameter of propeller shaft Kind 2 or stern tube shafts Kind 2 made of carbon steel or low alloy steel, the wording "to be deemed appropriate by the Society" specified in **4.2.4-1, Part 7 of the Rules** means to calculate the required diameter by the following formula:

$$d_s = 100k_3 \cdot \sqrt[3]{\frac{H}{N_0}}$$

$d_s$: Required diameter of propeller shaft (*mm*)
$H$: Maximum continuous output of main propulsion machinery (*kW*)
$N_0$: Number of revolutions of shaft at maximum continuous output (*rpm*)
$k_3$: Factor concerning shaft design, given in **Table 7.4.2.4-1**

**2** The value of $k_3$ for propeller shafts and stern tube shafts made of stainless steel forgings, etc. other than those indicated in the **Table 7.4.4** which is for $k_3$ specified in **4.2.4-2, Part 7 of the Rules**, is to be in accordance with **Table 7.4.2.4-2**. Furthermore, this requirement may be applied to propeller shafts Kind 2 and stern tube shafts Kind 2.

Note of Table 7.4.2.4-1 has been amended as follow.

Table 7.4.2.4-1 Values of $k_3$

| | Application | $k_3$ |
|---|---|---|
| 1 | The portion from the big end of the tapered part of a propeller shaft (in the case of a flange connected propeller, the forward end of the of the flange) to the forward end of the after most stern tube bearing or to $2.5d_s$, whichever is larger | 1.33 |
| 2 | Excluding any portion specified in 1 above, the portion in the direction toward the bow side up to the forward end of the forward stern tube sealing assembly | 1.21(1) |
| 3 | The portion between the forward end of the forward stern tube sealing assembly and the intermediate shaft coupling | 1.21(2) |

Notes:

(1) The diameter of the boundary portion ~~should~~is to be reduced with either a smooth taper or a blending radius nearly equal to the change in diameter.

(2) The diameter may be reduced~~, by either a smooth taper or a blending radius nearly equal to the change in diameter, up to the diameter calculated by the formula given~~ in accordance with **4.2.2~~4~~-1~~3~~, Part 7 of the Rules** ~~where it is assumed that $T_s$ = 400 $N/mm^2$~~.

Note of Table 7.4.2.4-2 has been amended as follow.

Table 7.4.2.4-2 Values of $k_3$

| Application | | Shaft material | |
|---|---|---|---|
| | | Austenitic stainless steel with 0.2 % proof stress not less than 205 $N/mm^2$ | Precipitation hardened martensite stainless steel with 0.2 % proof stress not less than 400 $N/mm^2$ |
| 1 | The portion from the big end of the tapered part of a propeller shaft (in the case of a flange connected propeller, the forward end of the flange) to the forward end of the after most stern tube bearing or to $2.5d_s$, whichever is larger | 1.28 | 1.05 |
| 2 | Excluding the portion shown in 1 above, the portion in the direction toward the bow side up to the forward end of the forward stern tube sealing assembly | 1.16(1) | 0.94(1) |
| 3 | The portion between the forward end of the forward stern tube sealing assembly and the intermediate shaft coupling | 1.16(2) | 0.94(2) |

Notes:

(1) The diameter of the boundary portion ~~should~~is to be reduced with either a smooth taper or a blending radius nearly equal to the change in diameter.

(2) The diameter may be reduced~~, by either a smooth taper or a blending radius nearly equal to the change in diameter, up to the diameter calculated by the formula given~~ in accordance with **4.2.2~~4~~4-~~1~~3, Part 7 of the Rules~~ where it is assumed that $T_g$ = 400 $N/mm^2$~~.

Paragraph 4.2.10 has been amended as follows.

**4.2.10 Stern Tube Bearings and Shaft Bracket Bearings**

**1** The wording "provisions specified elsewhere" in **4.2.10-1(1)(a)i), Part 7 of the Rules** means the following **(1)** and **(2)** in principle:

~~When the length of a bearing is less than twice the required diameter in accordance with **4.2.10-1(1)(a)i), Part 7 of the Rules**, the following **(1)** and **(2)** are, in principle, to be satisfied.~~

(1) Shaft alignment calculations are to be carried out in accordance with the requirements in **Annex ~~D~~6.2.13 "~~GUIDANCE FOR C~~ALCULATION~~alculation OF~~of S~~HAFT~~haft A~~LIGNMENT~~lignment~~", **Part D of the ~~Guidance~~Rules for the Survey and Construction of Steel Ships**.

(2) For improving the lubricating condition of the bearing, the following measures are to be taken:

(a) A lubricating oil inlet is to be provided at the aft end of the bearing to ensure the forced circulation of the lubricating oil.

(b) Either of the following devices to measure stern tube bearing metal temperature at the aft end bottom along with high temperature alarms (with a preset value of 60 °C or below) is to be provided:

i) Two or more temperature sensors embedded in the metal; or

ii) An embedded temperature sensor, replaceable from inboard the ship, and a spare temperature sensor.

In this case, the replacement of such sensors according to procedures submitted beforehand is to be demonstrated.

(c) Low level alarms are to be provided for lubricating oil sump tanks.

**2** The wording "~~construction and arrangement specially approved by the Society~~provisions specified elsewhere" in **4.2.10-1(1)(b)ii), Part 7 of the Rules** means the following **(1)** and **(2)** in principle:

~~When the length of a bearing is less than twice the required diameter in accordance with **4.2.10-1(1)(b)ii), Part 7 of the Rules**, the following **(1)** and **(2)** are, in principle, to be satisfied.~~

(1) Nominal bearing pressure, etc. calculated in accordance with **Annex ~~D~~6.2.13** "**~~GUIDANCE FOR CALCULATION~~alculation ~~OF~~of SHAFT~~haft ALIGNMENT~~lignment**", **Part D of the ~~Guidance~~Rules for the Survey and Construction of Steel Ships** are to be within the allowable limits specified in the Type Approval Certificate.

(2) The measures for lubricating condition specified in **-1(2)** are to be taken.

**3** The wording "provisions specified elsewhere" in **4.2.10-1(2)(b), Part 7 of the Rules** means the following **(1)** and **(2)** in principle:

~~When the length of a bearing is less than 4 *times* the required diameter of the propeller shaft or less than 3 *times* the actual diameter, whichever is greater, in accordance with **4.2.10-1(2)(b), Part 7 of the Rules**, the following **(1)** and **(2)** are, in principle, to be satisfied.~~

(1) Nominal bearing pressure is to be within the allowable limit specified in the Type Approval Certificate.

(2) Forced lubrication using water pumps is to be adopted and a non-flow alarm is to be provided at the lubricating water inlet.

Paragraph 4.2.12 has been deleted.

~~**4.2.12 Shaft Alignment**~~

~~For the approval of the shaft alignment calculation required in **4.2.12, Part 7 of the Rules**, a calculation sheet in accordance with **Annex D6.2.13 "GUIDANCE FOR CALCULATION OF SHAFT ALIGNMENT"**, **Part D of the Guidance for the Survey and Construction of Steel Ships** is to be submitted.~~

# Chapter 6 TORSIONAL VIBRATION OF SHAFTINGS

## 6.2 Allowable Limit

### 6.2.6 Detailed Evaluation for Strength

Sub-paragraph -3 has been deleted.

~~**3 In cases where intermediate shafts with longitudinal slots given in Table 7.6.1, Chapter 6, Part 7 of the Rules are equipped, the value of $C_k$ may be determined by using the following formulae:**~~

~~$C_k = 1.45/scf$~~

~~$$scf = \alpha_{t(hole)} + 0.80 \frac{(l - e)/d_o}{\sqrt{\left(1 - \frac{d_i}{d_o}\right)\frac{e}{d_o}}}$$~~

~~Where:~~

~~$scf$: Stress concentration factor at the end of slots defined as the ratio between the maximum local principal stress and $\sqrt{3}$ *times* the nominal torsional stress determined for the hollow shafts without slots (Values obtained through Finite Element Calculation may be used as well)~~

~~$l$ : Slot length~~

~~$e$ : Slot width~~

~~$d_i$ : Inside diameter of the hollow shaft at the slot~~

~~$d_o$ : Outside diameter of the hollow shaft~~

~~$\alpha_{t(hole)}$: Stress concentration factor of radial holes (in this context, $e$= hole diameter) determined by the following formula (an approximate value of 2.3 may be used as well)~~

~~$$\alpha_{t(hole)} = 2.3 - 3\frac{e}{d_o} + 15\left(\frac{e}{d_o}\right)^2 + 10\left(\frac{e}{d_o}\right)^2\left(\frac{d_i}{d_o}\right)^2$$~~

## EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

### IACS PR No.29 (Rev.0, July 2009)

**1.** The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

**2.** The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

**3.** If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

**4.** If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-5

# Part 8 ELECTRICAL INSTALLATIONS

## Chapter 1 GENERAL

### 1.1 General

Paragraph 1.1.7 has been deleted.

~~**1.1.7 Ambient Conditions**~~

~~In the case of electrical installations, except those used for automatic and remote control systems, which are installed in enclosed spaces having air conditioning units and are able to be initially set to work safely within a 45 °C ambient temperature, the upper limit of those ambient temperatures specified in **Table 8.1.1, Part 8 of the Rules** may be reduced to any value not less than 35 °C subject to the following requirements:~~

~~(1) Reduced ambient temperatures are to be controlled by at least two air conditioning units (including refrigerating units, hereinafter referred to as the same) which can work at 45 °C ambient temperature. In the event of the loss of any one air conditioning unit, all remaining units are to be capable of maintaining such reduced ambient temperatures.~~

~~(2) If the temperature rise over the upper limit of these reduced ambient temperatures, audible and visual alarms are to be activated at continually manned spaces, *e.g.*, navigation bridges or machinery control rooms.~~

### 1.2 Testing

#### 1.2.1 Shop Tests

Sub-paragraph -7 has been deleted.

~~**7** In the electrical appliances and cables specified in **1.2.1-4, Part 8 of the Rules** in cases where it is inadequate to deal with them under the requirements for type tests (*e.g.* those used only for specific ships or purposes with little possibility of continued use, or items for which the acquisition of individual test/inspection certificates is desired), tests and inspection on individual product items may be accepted by application in place of type tests.~~

# Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

## 2.1 General

### 2.1.3 Construction, Materials, Installations, etc.

Sub-paragraph -6 has been deleted, and Sub-paragraph -7 has been renumbered to Sub-paragraph -6.

~~**6 Electrical installations in paint lockers and adjacent areas are to be in accordance with Table 8.2.1.3-7.**~~

~~**7**~~**6** (Omitted)

Table 8.2.1.3-7 has been deleted.

Table 8.2.1.3-7 Electrical Installations Permitted in Paint Lockers and Their Adjacent Areas

| Areas | | Permitted electrical installations |
|---|---|---|
| (a) | Paint lockers | (1) Certified safe type equipment specified below at least with respect to gasses and vapours of group *II*B and of temperature class *T*3 as well as their associated cables<br>-intrinsic safety type (*Exi*)<br>-flameproof type (*Exd*)<br>-pressurized type (*Exp*)<br>-increased safety type (*Exe*)<br>(2) Through run cables<br>(3) Non-sparking type ventilation fans complying with **3.5.5-1(2), Part 9**. Protection screens of not more than 13*mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck. |
| (b) | Inlet and exhaust ventilation ducts | |
| (c) | Areas on open decks within 1 *m* of inlet and exhaust ventilation openings | (1) Electrical installations permitted for those areas specified in **(a)** and **(b)**<br>(2) Electrical equipment with a type of protection '*n*' as well as their associated cables<br>(3) Electrical equipment of those types which ensure the absence of sparks or arcs and which no parts of such equipment haves operating temperatures which can cause the ignition of gases or vapours of those flammable liquids being stored as well as their associated cables<br>(4) Electrical equipment with simplified pressurized enclosures or vapour proof enclosures (minimum degree of protection is IP55) and which no parts of such equipment have operating temperatures which can cause the ignition of gases or vapours of those flammable liquids being stored as well as their associated cables |
| (d) | Areas on open decks within 3 *m* of exhaust mechanical ventilation openings | |
| (e) | Enclosed spaces having direct openings into paint lockers | These spaces may be considered as non-hazardous, provided that:<br>(1) Doors to paint lockers are gastight doors with self-closing devices;<br>(2) Paint lockers are provided with independent natural ventilation systems which are deemed appropriate by the Society; and,<br>(3) Warning notices are fitted adjacent to paint locker entrances stating that such lockers contain flammable liquids. |

## 2.4 Rotating Machines

### 2.4.15 Shop Tests

Sub-paragraphs -3 and -5 have been amended as follows.

(-1 and -2 are omitted.)
**3** The wording "separately specified procedures" referred to in **2.4.15-~~8~~1(7), Part 8 of the Rules** means as follows:
((1) and (2) are omitted.)
(-4 is omitted.)
**5** In those commutation tests specified in **2.4.15-~~4~~1(3), Part 8 of the Rules**, any sparks arising between commutator segments and brushes in *d.c.* machines are categorized into eight types as shown in **Fig. 8.2.4.15-3**, and categories 5 through 8 are deemed to be harmful.
(-6 and -7 are omitted.)

## 2.5 Switchboards, Section Boards and Distribution Boards

### 2.5.10 Shop Tests

Sub-paragraphs -3 to -5 have been amended as follows.

**3** The wording "auxiliary apparatus" referred to in **2.5.10-~~4~~1(3), Part 8 of the Rules** means the indicator lights, small transformers, relays, etc. which are connected between different poles or phases.
**4** In the requirements given in **2.5.10-~~4~~1(3), Part 8 of the Rules**, instruments and auxiliary apparatuses can be removed for high voltage tests of switchboards. However, it is necessary to carry out a high voltage test on individual instrument and auxiliary apparatus, and to comply with the requirements given in **2.5.10-~~4~~1(3), Part 8 of the Rules**.
**5** Except where otherwise specified, the requirements given in **2.5.10-~~4~~1(3), Part 8 of the Rules** need not be applied to electronic equipment or apparatuses incorporated into switchboards that are not directly connected to the main circuit of the switchboard and the main power distribution circuits on board the ship.

## 2.10 Transformers for Power and Lighting

### 2.10.6 Shop Tests

Sub-paragraph -3 has been amended as follows.

**3** Calculations for voltage regulation specified in **2.10.6-~~3~~1(2), Part 8 of the Rules** may be performed using the following method.
(Omitted)

## 2.11 Accumulator Batteries

### 2.11.5 Ventilation

Sub-paragraph -2 has been deleted, and Sub-paragraphs -3 and -4 have been renumbered to Sub-paragraphs -2 and -3.

~~**2** The capacity of exhaust ventilation of battery compartments is to be greater than or equal to the value obtained by the following formula:~~

~~Exhaust capacity $Q = 110 \times I \times n$ (*litre /h*)~~

~~*I*: maximum charging current at end (in cases where no specific limitations are imposed, charging currents in a period of 10 *hours* is to be regarded as the standard)~~

~~*n*: number of batteries~~

~~**3**~~**2** (Omitted)

~~**4**~~**3** (Omitted)

## 2.12 Semiconductor Converters for Power

Paragraph 2.12.4 has been added as follows.

**2.12.4 Shop Tests**

**1** Regarding the temperature rise tests for semiconductor element connections mentioned in **2.12.4-1(1), Part 8 of the Rules**, temperature rise measurements for individual element parts such as cooling fins, cases and coolant parts, etc. may be accepted. However, such temperature rise tests may be carried out on the aforementioned element parts only in cases where manufacturers specify in advance that the temperature rise of semiconductor element connections will not exceed their maximum allowable temperature if the temperature rise of their parts is within allowable limits.

**2** With respect to **2.12.4-1(2), Part 8 of the Rules**, tests which may inadvertently inflict serious damage on the protective devices of semiconductor elements may be omitted in cases where the proper operation of semiconductor element protective fuses, etc. can be confirmed.

**3** With respect to **2.12.4-1(3), Part 8 of the Rules**, test voltages for high voltage tests may be in accordance with **Table 8.2.12.4-1.** The test voltage is to be applied for one minute; however, one second may be allowed for products produced in a series of identical types from the second unit onward.

Table 8.2.12.4-1 Test voltages for high voltage tests

| Rated *a.c.* voltage (*V*) | Test voltages | |
|---|---|---|
| | *a.c. r.m.s* (*V*) | *d.c* (*V*) |
| ≤ 50 | 1,250 | 1,770 |
| 100 | 1,300 | 1,840 |
| 150 | 1,350 | 1,910 |
| 300 | 1,500 | 2,120 |
| 600 | 1,800 | 2,550 |
| 1,000 | 2,200 | 3,110 |
| > 1,000 | 3,000 | 4,250 |
| 3,600 | 10,000 | 14,150 |
| 7,200 | 20,000 | 28,300 |
| 12,000 | 28,000 | 39,600 |
| 17,500 | 38,000 | 53,700 |

Note:

Interpolation is permitted.

# Chapter 3 DESIGN OF INSTALLATIONS

## 3.2 Sources of Electrical Power and Lighting Systems

Paragraph 3.2.1 has been deleted.

~~**3.2.1 Main Sources of Electrical Power**~~

~~**1** Generators driven by main propulsion machinery (hereinafter referred to as "shaft driven generator systems") are to comply with the following requirements **(1)** to **(6)** if they are provided as the main sources of electrical power specified in **3.2.1-1, Part 8 of the Rules**.~~

~~(1) Voltage and frequency fluctuations of shaft driven generator systems are to be maintained within those specified limits given in **Table 8.3.2.1-1** under all weather conditions during sailing and maneuvering as well as when vessels are stopped and are in crash astern conditions.~~

~~(2) Shaft driven generator systems are to be equipped with devices to start main machinery independently of other generators belonging to the same main generator set.~~

~~(3) In those ships which have bridge control devices for main propulsion machinery, running indicators of shaft driven generator systems are to be provided on navigating bridges.~~

~~(4) In cases where main sources of electrical power are such that operation of generating sets is to be changed over to those generating sets not depending upon propulsion plants according to ship speed (*e.g.* ahead, stop, astern), such changeovers need to be made both automatically along with the control of propulsion plants and by remote operation from those positions where such propulsion plants are being controlled. In such cases power supplies are not to be interrupted by such changeovers.~~

~~(5) Shaft driven generator systems are to be capable of providing sufficient short circuit currents to trip generator circuit-breakers taking into account any selective tripping of protective devices for distribution systems on board.~~

~~(6) Protection is to be arranged in order to safeguard shaft driven generator systems in case of a short circuit in main busbars. Shaft driven generator systems are to be suitable for further use after fault clearances of the short circuit.~~

~~**2** Shaft driven systems are to comply with the following requirements **(1)** to **(4)** if they are provided on board ships in addition to main sources of electrical power required by **3.2.1-1, Part 8 of the Rules**.~~

~~(1) Voltage and frequency fluctuations of shaft driven generator systems are to be maintained within those specified limits given in **Table 8.3.2.1-1** under their operating ranges which are to be previously arranged.~~

~~(2) In the event of any shaft driven generator systems being stopped and their frequency exceeding those limit given in **(1)** above, automatic changeovers to other main generating sets are to be carried out within a period of 45 *seconds*.~~

~~(3) In those ships which have bridge control devices for their main propulsion machinery, the following requirements are to be complied with:~~

~~(a) Measures which allow the continued operation of those installations for the prevention of blackouts specified in **3.2.1-3** to be provided, or such systems to allow the operation of such measures without fail are to be established.~~

~~(b) Those operating ranges which have been previously arranged are to be shown on navigation bridges, and devices to indicate the condition of shaft driven generating systems are to be established.~~

~~(4) Shaft driven generator systems are to be capable of providing sufficient short circuit currents to trip generator circuit-breakers taking into account any selective tripping of protective~~

~~devices for distribution systems on board.~~

Table 8.3.2.1-1 has been deleted.

~~Table 8.3.2.1-1 Voltage and Frequency Fluctuations for Shaft driven Generator Systems~~

| Type of fluctuations | Fluctuations | |
|---|---|---|
| | Permanent | Transient |
| Voltage | ±2.5% | -15%, 20% (±3% within 1.5 *sec*) |
| Frequency | ±5% | ±10%(within 5 *sec*) |

EFFECTIVE DATE AND APPLICATION (Amendment 1-5)

**1.** The effective date of the amendments is 1 July 2022.

**2.** Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction is before the effective date.

Amendment 1-6

# Part 1 GENERAL RULES

## Chapter 1 GENERAL

### 1.2 Class Notations

Paragraph 1.2.4 has been amended as follows.

**1.2.4 Application of Special Survey Scheme**

For ships for which surveys are to be carried out in accordance with "***HIDROVIA Parana - Paraguay***" as the "standards deemed appropriate by the Society" specified in **1.2.4-~~6~~3, Part 2 of the Rules**, the notation of "*HIDROVIA*" is affixed to the Classification Characters.

# Part 2 CLASS SURVEYS

## Chapter 1 GENERAL

### 1.1 Surveys

Paragraph 1.1.3 has been amended as follows.

**1.1.3 Intervals of Class Maintenance Surveys**

(-1 and -2 are omitted.)

~~**3** Survey due dates of Ordinary Surveys of the propeller shafts Kind 1 and stern tube shafts Kind 1 specified in **1.1.3-1(6)(a)i), Part 2 of the Rules** may be extended in accordance with the following **(1)** to **(3)** after carrying out an Occasional Survey, except for propeller shafts of ships affixed with the notation "*PSCM*" or "*PSCM - A*" subject also to Note 1 of **Table 2.8.1.3-1**.~~

~~(1) The following **(a)** and **(b)** apply in the case of oil lubricated or freshwater lubricated shafts subject to the following **-4(1).**~~

~~(a) Extension of 1 *year*~~

~~The survey due date may be extended for up to 1 *year* in cases where a survey is carried out in accordance with the following **i)** to **v)** and the shaft condition is confirmed to be satisfactory.~~

~~i) Examinations are to be carried out in accordance with the following **1)** to **3):**~~

~~1) Review of the previous weardown and/or clearance (between the bush and the shaft) recordings is to be carried out.~~

~~2) The examinations specified in **8.1.2(2), Part 2 of the Rules** are to be carried out.~~

~~3) Confirmation from the Chief Engineer that the shafting arrangement is in good working condition is to be obtained.~~

~~ii) A visual inspection of all accessible parts of the shafting system is to be carried out.~~

~~iii) Verification that the propeller is free of damages which may cause the propeller to be out of balance is to be carried out.~~

~~iv) Verification of the effectiveness of the inboard seal and outboard seals is to be carried out.~~

~~v) The examinations specified in items 12 and 13 of **Table 2.8.1, Part 2 of the Rules** are to be carried out.~~

~~(b) Extension of 3 *months*~~

~~The survey due date may be extended for up to 3 *months* in cases where a survey is carried out in accordance with the following **i)** to **iv)** and the shaft condition is confirmed to be satisfactory.~~

~~i) Examinations are to be carried out in accordance with the following **1)** to **3):**~~

~~1) Review of the previous weardown and/or clearance (between the bush and the shaft) recordings is to be carried out.~~

~~2) The examinations specified in **8.1.2(2), Part 2 of the Rules** are to be carried out.~~

~~3) Confirmation from the Chief Engineer that the shafting arrangement is in good working condition is to be obtained.~~

~~ii) A visual inspection of all accessible parts of the shafting system is to be carried out.~~

~~iii) Verification of the effectiveness of the inboard seal is to be carried out.~~

~~iv) The examinations specified in items 12 and 13 of **Table 2.8.1, Part B of the Rules**~~

are to be carried out.

(2) The following **(a)** and **(b)** apply in the case of water lubricated shafts, subject to the following **-4(2).**

(a) Extension of 1 *year*

The survey due date may be extended for up to 1 *year* in cases where a survey is carried out in accordance with the following **i)** to **vi),** and the shaft condition is confirmed to be satisfactory.

i) Examinations are to be carried out in accordance with the following **1)** to **4):**

1) Review of the previous clearance (between the bush and the shaft) recordings is to be carried out.

2) Service records are to be reviewed.

3) Verification of no reported repairs by grinding or welding of shafts and/or propellers is to be carried out.

4) Confirmation from the Chief Engineer that the shafting arrangement is in good working condition is to be obtained.

ii) A visual inspection of all accessible parts of the shafting system is to be carried out.

iii) Verification that the propeller is free of damages which may cause the propeller to be out of balance is to be carried out.

iv) Checking and recording the clearances between the bush and the shaft are to be carried out.

v) Verification of the effectiveness of the inboard seal is to be carried out.

vii) The examinations specified in items 11 of **Table 2.8.1, Part 2 of the Rules** are to be carried out.

(b) Extension of 3 *months*

The survey due date may be extended for up to 3 *months* in cases where a survey is carried out in accordance with the following **i)** to **v)** and the shaft condition is confirmed to be satisfactory.

i) Examinations are to be carried out in accordance with the following **1)** to **4):**

1) Review of the previous clearance (between the bush and the shaft) recordings is to be carried out.

2) Service records are to be reviewed.

3) Verification of no reported repairs by grinding or welding of shafts and/or propellers is to be carried out.

4) Confirmation from the Chief Engineer that the shafting arrangement is in good working condition is to be obtained.

ii) A visual inspection of all accessible parts of the shafting system is to be carried out.

iii) Verification that the propeller is free of damages which may cause the propeller to be out of balance is to be carried out.

iv) Verification of the effectiveness of the inboard seal is to be carried out.

v) The examinations specified in items 11 of **Table 2.8.1, Part 2 of the Rules** are to be carried out.

(3) Occasional Surveys specified in **(1)** and **(2)** above are, in principle, to be carried out within 1 *month* of the survey due date, and the extension specified in **(1)** and **(2)** above counts from the survey due date. If the Occasional Survey is carried out more than 1 *month* prior to the survey due date, then the period of extension counts from the date on which the Occasional Survey was completed.

**4** The following **(1)** and **(2)** apply in the case of an extension of the survey due date specified in **(1)** and **(2)** of **-3** above.

(1) The following **(a)** and **(b)** apply in the case of an extension of the survey due date specified in

~~**-3(1)** above until an Ordinary Survey specified in **8.1.1, Part 2 of the Rules** or a Partial Survey specified in **8.1.2, Part 2 of the Rules** is completed.~~

~~(a) No more than two consecutive "1 *year*" extensions can be granted. No further extension of another type (that in accordance with **-3(1)(b)** above) can be granted.~~

~~(b) No more than one "3 *months*" extension can be granted. In the event an additional extension is requested, an Occasional Survey in accordance with **-3(1)(a)** above is to be carried out, and the survey due date, prior to the previous extension, is to be extended for up to 1 *year*.~~

~~(2) The following **(a)** and **(b)** apply in the case of an extension of the survey due date specified in **-3(2)** above until an Ordinary Survey specified in **8.1.1, Part 2 of the Rules** is completed.~~

~~(a) No more than one "1 *year*" extension can be granted. No further extension of another type (that in accordance with **-3(2)(b)** above) can be granted.~~

~~(b) No more than one "3 *months*" extension can be granted. In the event an additional extension is requested, an Occasional Survey in accordance with **-3(2)(a)** above is to be carried out, and the survey due date, prior to the previous extension, is to be extended for up to 1 *year*.~~

~~**5** Upon postponement of the Ordinary Surveys of propeller shafts Kind 1 other than those of ships affixed with the notation "*PSCM*" or "*PSCM - A*" and stern tube shafts Kind 1 facilitated by the Occasional Survey specified in **-3** above or the Partial Survey specified in **1.1.3-1(6)(b), Part 2 of the Rules**, the interval of the Ordinary Surveys is not to exceed the following limits:~~

~~(1) 7 *years* for shafts Kind 1*A*~~

~~(2) 14 *years* for shafts Kind 1*B* and shafts Kind 1*W*~~

~~**6**~~**3** In applying the requirements specified in **1.1.3-1, Part 2 of the Rules**, the ship's owner/operator is to submit the statement of "the ship's operating period in salt water" to the Society.

~~**7** Due dates of the "non-destructive examination (*NDE*)" specified in **1.1.3-1(6)(a)iii), Part 2 of the Rules** may be extended for up to 3 *months* in cases where a survey specified in **i)** to **v)** of **-3(2)(b)** above is carried out and the shaft condition is confirmed to be satisfactory. In such cases, further extension of the due date according to **(a)** or **(b)** of **-3(2)** above is not allowed, until the non-destructive examination (*NDE*) is completed. The provisions of **-3(3)** above apply to the calculation of the extension of the due date.~~

~~**8** The wording "as specified separately by the Society" in **1.1.3-1(6)(e), Part 2 of the Rules** means that surveys are to be carried out in accordance with **Annex B1.1.3-7 "Alternative Propeller Shaft Survey Methods", Part B of the Guidance for the Survey and Construction of Steel Ships.**~~

~~**9**~~**4** (Omitted)

~~**10**~~**5** (Omitted)

~~**11**~~**6** (Omitted)

# Chapter 3 ANNUAL SURVEYS

## 3.3 Annual Surveys for Machinery

### 3.3.1 General Examinations

Sub-paragraph -2 has been amended as follows.

**2** The "reference standards deemed appropriate by the Society" referred to in **3.3.1(4), Part 2 of the Rules** refer to the following **(1)** and **(2)**:
(1) those specified in ~~**8.1.2-1**~~ **(1)(b)**, item **11**, **Table 2.8.3** for oil lubricated shafts; and
(2) those specified in ~~**8.1.2-2**~~ **(1)(b)**, item **11**, **Table 2.8.4** for fresh water lubricated shafts.

# Chapter 6 DOCKING SURVEYS

## 6.1 Docking Surveys

Paragraph 6.1.3 has been amended as follows.

### 6.1.3 Other Surveys

The "reference standards deemed appropriate by the Society" referred to in **6.1.3-2, Part 2 of the Rules** refer to the following **(1)** and **(2)**:
(1) those specified in ~~**8.1.2-1**~~ **(1)(b)**, item **11**, **Table 2.8.3** for oil lubricated shafts; and
(2) those specified in ~~**8.1.2-2**~~ **(1)(b)**, item **11**, **Table 2.8.4** for fresh water lubricated shafts.

Chapter 8 has been deleted.

~~**Chapter 8 PROPELLER SHAFT AND STERN TUBE SHAFT SURVEYS**~~

~~**(Omitted)**~~

EFFECTIVE DATE AND APPLICATION (Amendment 1-6)

**1.** The effective date of the amendments is 1 October 2022.