16-410

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part D Machinery Installations

Rules for the Survey and Construction of Steel Ships
Part D 2016 AMENDMENT NO.2
Guidance for the Survey and Construction of Steel Ships
Part D 2016 AMENDMENT NO.2

Rule No.82 / Notice No.83 27th December 2016
Resolved by Technical Committee on 27th July 2016
Approved by Board of Directors on 20th September 2016

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 STEEL SHIPS

RULES

Part D Machinery Installations

2016 AMENDMENT NO.2

Rule No.82 27th December 2016
Resolved by Technical Committee on 27th July 2016
Approved by Board of Directors on 20th September 2016

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

Rule No.82 27th December 2016
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Rules for the survey and construction of steel ships" has been partly amended as follows:

Part D MACHINERY INSTALLATIONS

Amendment 2-1

Chapter 2 DIESEL ENGINES

2.1 General

2.1.1 General*

Sub-paragraph -2 has been amended as follows.

2 For diesel engines which are used for driving emergency generators, in addition to all of the requirements in this Chapter (excluding **2.2.4**, section **2.3**, **2.4.1-4** and the requirement for "devices to stop the operation of the engine" specified in **2.5.5-1**), the requirements of **18.5.2** (if controlled automatically or by remote ~~for non-emergency purposes~~) as well as those in **3.3** and **3.4, Part H** also apply.

Chapter 18 AUTOMATIC AND REMOTE CONTROL

18.5 Automatic and Remote Control of Electric Generating Sets

Paragraph 18.5.2 has been amended as follows.

18.5.2 Emergency Source of Electric Power

Automatic or remote control devices for diesel engines driving emergency generators ~~for non-emergency purposes~~ are to comply with the following requirements:

(1) Alarm devices, to be activated in the event of any of the abnormal conditions given in **Table D18.2**, are to be provided.

(2) Devices referred to in **(1)** are to provide alarms at both local and navigation bridge ~~control positions~~. Visual alarms at navigation bridge ~~control positions~~ may be of group indication.

(3) Each diesel engine with a maximum continuous output of 220 *kW* or over is to be provided with an overspeed protective device specified in **2.4.1-4**.

(4) When devices, other than those referred to in **(3),** are provided to shutdown diesel engines, means are to be provided to override those devices automatically during navigation.

(5) The silencing of the audible alarms from control positions is not to cause the silencing of the audible alarms at navigation bridge ~~local positions~~.

Table D18.2 Alarms for Diesel Engines to Drive Emergency Generators

Monitored Variables		Alarms	Remarks
Temperature	L.O. inlet	H	Applicable to engines with maximum continuous output of 220 *kW* or over.
	Cooling water or air outlet	H	
Pressure	L.O. inlet	L	
	Cooling water inlet	L	Applicable to engines with maximum continuous output of 220 *kW* or over. Low flow may be accepted.
Others	Leakage from F.O. burning pipe, level in leakage trunk	○	
	Overspeed	○	Applicable to engines with maximum continuous output of 220 *kW* or over.

Note: "H" and "L" mean high and low. "○" means abnormal condition has occurred.

18.6 Automatic and Remote Control of Auxiliary Machinery

18.6.9 Diesel Engines

Sub-paragraph -2 has been amended as follows.

2 The requirements in **18.5.2** apply correspondingly to the automatic or remote control devices for emergency diesel engines ~~used for non-emergency purposes~~ other than those mentioned in **18.5.2**.

EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

1. The effective date of the amendments is 27 December 2016.

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

Amendment 2-2

Chapter 1 GENERAL

1.3 General Requirements for Machinery Installations

Paragraph 1.3.5 has been amended as follows.

1.3.5 Ventilating Systems for Machinery Spaces*

1 Machinery spaces of category *A* are to be adequately ventilated so as to ensure that when any of the machinery or boilers therein are operating at full power, that an adequate supply of air is maintained to the spaces for the safety and comfort of personnel and the operation of the machinery in all weather conditions. Any other machinery spaces other than those classified as category *A* are to be adequately ventilated in a manner that is appropriate for the purpose of that machinery space.

2 In cases where ventilation louvers are fitted to emergency generator rooms or closing appliances are fitted to ventilators serving emergency generator rooms, such louvers or closing appliances are to comply with the requirements specified in the following **(1)** to **(4)**:

(1) Louvers and closing appliances may either be hand-operated or power-operated (hydraulic, pneumatic or electric) and are to be operable under fire conditions.

(2) Hand-operated louvers and closing appliances are to comply with the following **(a)** and **(b)**:
  (a) Louvers and closing appliances are to be kept open during normal operation of the vessel; and
  (b) Corresponding instruction plates are to be provided at the location where hand-operation is provided.

(3) Power-operated louvers and closing appliances are to comply with the following **(a)** to **(c)**:
  (a) Louvers and closing appliances are to be of a fail-to-open type;
  (b) Closed louvers and closing appliances are acceptable during normal operation of the vessel; and
  (c) Power-operated louvers and closing appliances are to open automatically whenever the emergency generator is starting or in operation.

(4) Ventilation openings, louvers and closing appliances are to comply with the following **(a)** to **(c)**:
  (a) It is to be possible to close ventilation openings by a manual operation from a clearly marked safe position outside the space where the closing operation can be easily confirmed;
  (b) The louver status (open or closed) is to be indicated at the position of the manual operation specified in **(a)** above; and
  (c) Closing of the louvers and closing appliances is not to be possible from any other remote position than the position of manual operation specified in **(a)** above.

Chapter 6 SHAFTINGS

6.2 Materials, Construction and Strength

6.2.2 Intermediate Shafts*

Sub-paragraph -1 has been amended as follows.

1 The diameter of the intermediate shafts of steel forgings (excluding stainless steel forgings, etc.) is not to be less than the value given by the following formula:

$$d_0 = F_1 k_1 \sqrt[3]{\frac{H}{N_0}\left(\frac{560}{T_s + 160}\right)K}$$

where

d_0 : Required diameter of intermediate shaft (*mm*)

H : Maximum continuous output of engine (*kW*)

N_0 : Number of revolutions of intermediate shaft at maximum continuous output (*rpm*)

F_1 : Factor given in **Table D6.1**

k_1 : Factor given in **Table D6.2**

T_s : Specified tensile strength of intermediate shaft material (N/mm^2)

The upper limit of the value of T_S used for the calculation is to be 760 N/mm^2 for carbon steel forgings and 800 N/mm^2 for low alloy steel forgings. The upper limit of the value of T_s used for the calculation may be increased to 950 N/mm^2 where deemed appropriate by the Society.

K : Factor for hollow shaft and given by the following formula. In cases where $d_i \leq 0.4 d_a$, it may be considered that $K = 1$

$$K = \frac{1}{1 - \left(\frac{d_i}{d_a}\right)^4}$$

d_i : Inside diameter of hollow shaft (*mm*)

d_a : Outside diameter of hollow shaft (*mm*)

2 The diameter of the intermediate shaft of material other than specified in **-1** above is to be deemed appropriate by the Society.

Chapter 8 TORSIONAL VIBRATION OF SHAFTINGS

8.2 Allowable Limit

8.2.2 Intermediate Shafts, Thrust Shafts, Propeller Shafts and Stern Tube Shafts*

1 For diesel ships, the torsional vibration stresses on the intermediate shafts, thrust shaft, propeller shafts and stern tube shafts made of steel forgings (excluding stainless steel, etc.) are to be in accordance with the following requirements **(1)** and **(2)**. However, those shafts classified as either propeller shafts Kind 2 or stern tube shafts Kind 2 are to be deemed appropriate by the Society.

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

(1) For continuous operation, when the number of revolutions is within the range of 80% to 105% of the number of maximum continuous revolutions, the torsional vibration stresses are not to exceed τ_1 given in the following formulae:

$$\tau_1 = \frac{T_s + 160}{18} C_K C_D (3 - 2\lambda^2) \ (\lambda \le 0.9)$$

$$\tau_1 = 1.38 \frac{T_s + 160}{18} C_K C_D \ (0.9 < \lambda)$$

τ_1 : Allowable limit of torsional vibration stresses for the range of $0.8 < \lambda \le 1.05$ (N/mm^2)

λ : Ratio of the number of revolutions to the number of maximum continuous revolutions

T_s : Specified tensile strength of shaft material (N/mm^2)

However, the value of T_s for using in the formulae is not to exceed 800N/mm^2 (600N/mm^2 for carbon steels in general) in intermediate shafts and thrust shafts, and 600 N/mm^2 in propeller shafts and stern tube shafts. <u>The upper limit of the value of T_s used for the calculation may be increased to 950 N/mm^2 in intermediate shafts where deemed appropriate by the Society.</u> Where propeller shafts and stern tube shafts are made of the approved corrosion resistant materials or other materials having no effective means against corrosion by sea water, the value of T_s for use in the formulae is to be as deemed appropriate by the Society.

C_K : Coefficient concerning to the type and shape of the shaft, given in **Table D8.1**.

C_D : Coefficient concerning to the shaft size and determined by the following formula:

$$C_D = 0.35 + 0.93 d^{-0.2}$$

d = Diameter of the shaft (mm)

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

1. The effective date of the amendments is 1 January 2017.

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 2-3

Chapter 9 BOILERS, ETC. AND INCINERATORS

9.9 Fittings, etc.

9.9.7 Burning Systems*

Sub-paragraph -1 has been amended as follows.

1 Fuel ~~Oil~~ Burners

(1) Fuel ~~oil~~ burners are to be so arranged that they cannot be withdrawn ~~unless~~ without shutting off the fuel ~~oil~~ supply to those burners ~~is shut off~~.

(2) For top firing boilers, in order to absorb vibrations, flexible joints approved by the Society are to be provided at the connections between the ~~fuel oil burner~~boiler and the fuel ~~oil~~ supply pipe.

Chapter 13 PIPING SYSTEMS

13.15 Feed Water Systems for Boilers

Paragraph 13.15.4 has been amended as follows.

13.15.4 Pipes Passing through Tanks

Boiler feed water pipes are not to be led through tanks which contain oil or fuel, and oil or fuel pipes are not to be led through boiler feed water tanks.

Chapter 18 AUTOMATIC AND REMOTE CONTROL

18.4 Automatic and Remote Control of Boilers

Paragraph 18.4.1 has been amended as follows.

18.4.1 General

1 Automatic control systems for both combustion and feed water of oil-fired, dual-fuel-fired, gas-fired and multi-fuel-fired boilers are to comply with the requirements in **18.4.2** to **18.4.5** respectively.

2 Automatic control systems for either combustion or feed water of oil-fired, dual-fuel-fired, gas-fired and multi-fuel-fired boilers are to comply with the relevant requirements in **18.4.2** or **18.4.3** as well as the requirements in **18.4.4** and **18.4.5**.

3 Automatic control of boilers other than oil-fired, dual-fuel-fired, gas-fired and multi-fuel-fired boilers or those having special features is to be deemed appropriate by the Society.

4 In cases where boilers are remotely controlled, control devices and monitoring devices necessary for the operation of such boilers are to be provided at all relevant control stations.

5 Remote water level indicators are to comply with the requirements in **9.9.8**.

18.6 Automatic and Remote Control of Auxiliary Machinery

Paragraph 18.6.8 has been amended as follows.

18.6.8 Fuel ~~Oil~~ Filling Arrangements

In cases where arrangements for filling fuel ~~oil~~ into their respective fuel ~~oil~~ tanks from outside of the ships (hereinafter referred to as "fuel ~~oil~~ filling arrangements" in this Part) are provided with remote control devices, the fuel ~~oil~~ filling arrangements are to be such as not to interfere with the filling of fuel, even in the event of failure of any of the remote control devices.

EFFECTIVE DATE AND APPLICATION (Amendment 2-3)

1. The effective date of the amendments is 1 January 2017.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships other than ships that fall under the following:

(1) for which the building contract is placed on or after the effective date; or

(2) in the absence of a building contract, the keels of which are laid or which are at *a similar stage of construction* on or after 1 July 2017; or

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1%* of the estimated mass of all structural material, whichever is the less.

* For high speed craft, "1%" is to be read as "3%".

(3) the delivery of which is on or after 1 January 2021.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Rules apply to the ships that fall under the following:

(1) which convert to using low-flashpoint fuels on or after the effective date; or

(2) which, on or after the effective date, undertake to use low-flashpoint fuels different from those which it was originally approved to use before the effective date.

Amendment 2-4

Chapter 12 PIPES, VALVES, PIPE FITTINGS AND AUXILIARIES

12.3 Construction of Valves and Pipe Fittings

12.3.3 Mechanical Joints*

Sub-paragraph -2 has been amended as follows.

2 Mechanical joints which in the event of damage could cause a fire or flooding are not to be used in piping sections directly connected to ~~sea openings~~ the ship's side below the freeboard deck or tanks containing flammable fluids.

Sub-paragraph -4 has been amended as follows.

4 Slip-on joints are not to be used inside tanks except for those used for pipes for the same medium as in the tank. ~~Unrestrained slip-on joints are to be used only in cases where compensation of lateral pipe deformation is necessary.~~ Usage of ~~these~~ slip type slip-on joints as the main means of pipe connection is not permitted except in cases where compensation of axial pipe deformation is necessary.

12.3.4 Flexible Hose Assemblies*

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

3 Installation, design and construction of flexible hose assemblies are to comply with follows.

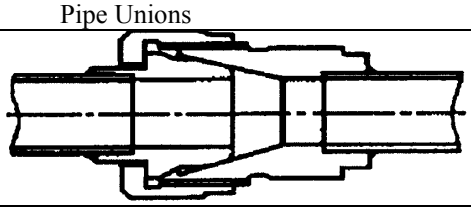
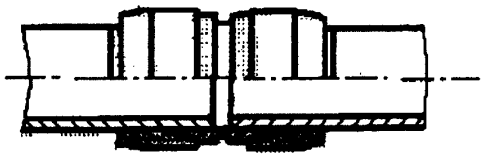
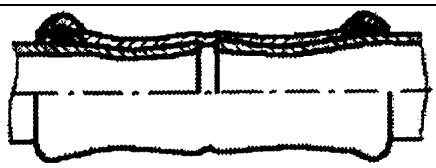
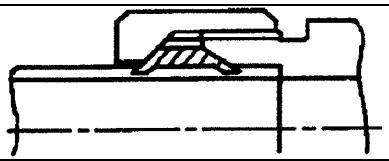
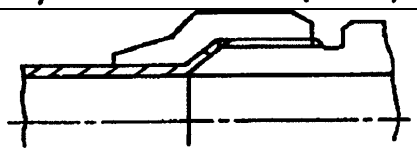
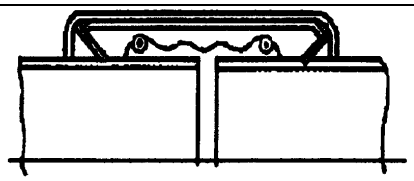
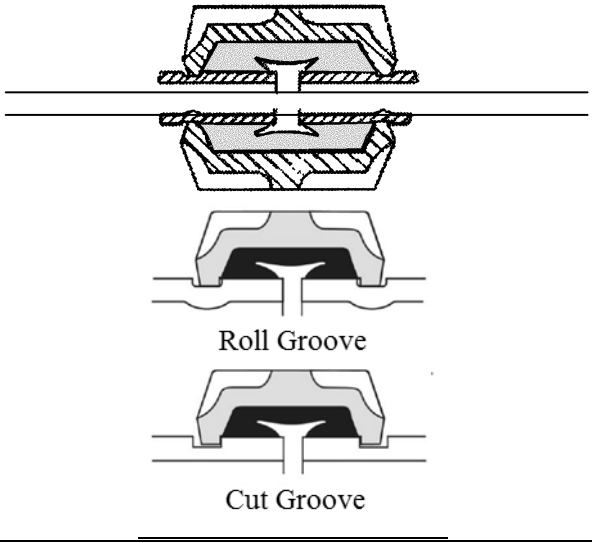
(3) Construction requirements

Non-metallic flexible hoses are to conform to the following requirements:

(c) Non-metallic flexible hoses used for flammable oil and sea water pipes, where failure may result in flooding, are to be of a fire resistant type except in cases where such hoses are installed on exposed open decks and are not used for fuel oil lines.

Fig.D12.1 has been amended as follows.

Fig D12.1 Examples of Mechanical Joints

Pipe Unions	
Welded and Brazed Types	
Compression Couplings	
Swage Type	
Press Type	
Bite Type	
Flared Type	
Slip-on Joints	
Grip Type	
Machine Grooved Type	

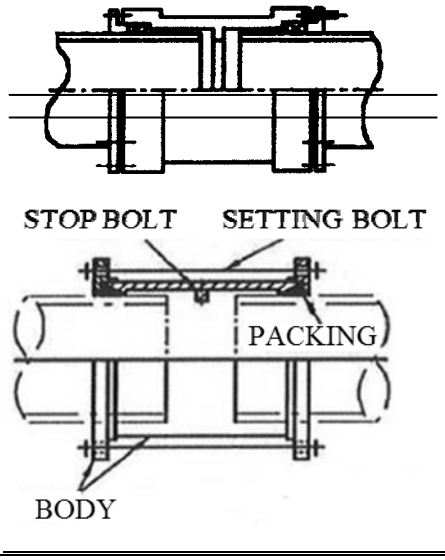
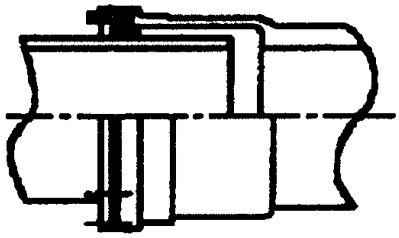
Slip Type		

Table D12.8 has been amended as follows.

Table D12.8 Application Classifications of Mechanical Joints(1)

Application Purpose	System	Kind of Connections(2)		
		Pipe Union	Compression Coupling(7)	Slip-on Joint(10)
Flammable fluids(8) (Flash point ≦60 Material ˚C)	Cargo oil lines(6)	+	+	+(6)
	Crude oil washing lines(6)	+	+	+(6)
	Vent lines(5)	+	+	+(4)
Inert gases	Water seal effluent lines	+	+	+
	Scrubber effluent lines	+	+	+
	Main lines(4)(6)	+	+	+(3)(6)
	Distributions lines(6)	+	+	+(6)
Flammable fluids(8) (Flash point > 60 ˚C)	Cargo oil lines(6)	+	+	+(6)
	Fuel oil lines(4)(5)	+	+	+(3)(4)
	Lubricating oil lines(4)(5)	+	+	+(3)(4)
	Hydraulic oil(4)(5)	+	+	+(3)(4)
	Thermal oil(4)(5)	+	+	+(3)(4)
Sea Water	Bilge lines(3)	+	+	+(2)
	Water filled fire extinguishing systems, e.g. sprinkler systems(5) ~~Fire main and water spray~~	+	+	+(4)
	Non water filled fire extinguishing systems, e.g. foam, drencher systems(5) ~~Foam systems~~	+	+	+(4)
	Fire main(5) ~~Sprinkler systems~~	+	+	+(4)
	Ballast systems(3)	+	+	+(2)
	Cooling water systems(3)	+	+	+(2)
	Tank cleaning services	+	+	+
	Non-essential systems	+	+	+
Fresh water	Cooling water systems(3)	+	+	+(2)
	Condensate returns(3)	+	+	+(2)
	Non-essential systems	+	+	+
Sanitary/ Drains/ Scuppers	Deck drains (internal)(7)	+	+	+(5)
	Sanitary drains	+	+	+
	Scuppers and discharges (overboard)	+	+	-
Sounding/Vents	Water tanks/Dry spaces	+	+	+
	Oil tanks (f.p.> 60 ˚C)(4)(5)	+	+	+(3)(4)
Miscellaneous	Starting/Control air~~(2)~~(3)	+	+	-
	Service air (non-essential)	+	+	+
	Brine	+	+	+
	CO_2 systems~~(2)~~(3)	+	+	-
	Steam	+	+	-(9)

Notes:

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

(2) 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)** to **(6)**:

(~~2~~3) Only Society approved fire resistant types may be used inside machinery spaces of category A.

(~~3~~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.

(~~4~~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 **9.2.3-2(10)**, **Part R of the Rules**, 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 mains.

(6) Only Society approved fire resistant types may be used in pump rooms and on open decks.

(~~5~~7) May only be used above the freeboard deck.

~~(7) If compression couplings include any components which readily deteriorate in case of fire, they are to be of a Society approved fire resistant type as required for slip-on joints.~~

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

(9) Slip type slip-on joints as shown in **Fig. D12.1** may be used for pipes on deck with a design pressure of 1.0 *MPa* or less~~, provided that they are restrained on the pipes~~.

(10) The use of slip joints is to comply with the requirements specified in **13.2.4**.

EFFECTIVE DATE AND APPLICATION (Amendment 2-4)

1. The effective date of the amendments is 1 January 2017.

2. Notwithstanding the amendments to the Rules, the current requirements apply to mechanical joints or flexible hose assemblies for which the application for approval is submitted to the Society before the effective date.

Amendment 2-5

Chapter 9 BOILERS, ETC. AND INCINERATORS

9.9 Fittings, etc.

9.9.8 Water Level Indicators

1 Each boiler is to be provided with at least two independent water level indicators, one of which is to be a glass water gauge and the other which is to comply with either of the following requirements:

(1) A glass water gauge that is located at a position where the water level may be readily sighted.

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

(2) A remote water level indicator~~. However, for boilers whose design pressure is 1*MPa* or less, this may be replaced by a high/low water level alarm device.~~

Chapter 13 PIPING SYSTEMS

13.8 Sounding Pipes

Paragraph 13.8.2 has been amended as follows.

13.8.2 Upper Ends of Sounding Pipes

Sounding pipes are to be led to positions above the bulkhead deck which are at all times readily accessible, and are to be provided with an effective closing means at their upper ends. However, sounding pipes may be led to readily accessible positions from the platform of a machinery space provided that the closing means specified in **4.2.2(3)(e)**, **4.2.2(9)** and **4.2.3(2)**, **Part R** are provided according to the kinds of tanks. Sounding pipes for tanks other than those for flammable oil and cofferdams may be led to readily accessible positions from the platform of a machinery space provided that sluice valves, cocks or screw caps attached to the pipes by chain are provided.

EFFECTIVE DATE AND APPLICATION (Amendment 2-5)

1. The effective date of the amendments is 27 June 2017.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.
(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part D Machinery Installations

2016 AMENDMENT NO.2

Notice No.83 27th December 2016

Resolved by Technical Committee on 27th July 2016

Notice No.83 27th December 2016
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part D MACHINERY INSTALLATIONS

Amendment 2-1

D13 PIPING SYSTEMS

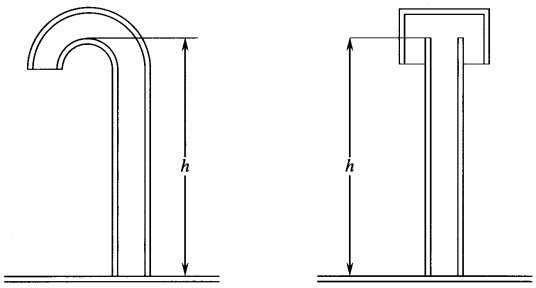
D13.6 Air Pipes

Paragraph D13.6.4 has been amended as follows.

D13.6.4 Height of Air Pipes

1 The height of air pipes above deck is to be measured as shown in **Fig. D13.6.4-1**.

Fig. D13.6.4-1 The Height of Air Pipe



2 In the application of the requirements of **13.6.4, Part D of the Rules**, the term "superstructure deck" includes top decks of superstructures, deckhouses, companionways and other similar deck structures.

3 The term "freeboard deck" specified in **13.6.4, Part D of the Rules** includes superstructure decks lower than h_S specified in **V2.2.1** above the freeboard deck.

4 The term "superstructure deck" specified in **13.6.4, Part D of the Rules** means superstructure decks located at least h_S specified in **V2.2.1** above the freeboard deck and lower than $2h_S$ specified in **V2.2.1** above the freeboard deck.

EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

1. The effective date of the amendments is 27 December 2016.

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 2-2

D1 GENERAL

D1.3 General Requirements for Machinery Installations

Paragraph D1.3.5 has been added as follows.

D1.3.5 Ventilating Systems for Machinery Spaces

The wording "louvers" specified in **1.3.5-2, Part D of the Rules** means the following:

(1) Those which are hand-operated;
(2) Those which are power-operated;
(3) Those which are of fixed type with a hand-operated closing door; and
(4) Those which are of fixed type with an automatic closing door.

D6 SHAFTINGS

D6.2 Materials, Construction and Strength

Paragraph D6.2.2 has been added as follows.

D6.2.2 Intermediate Shafts

The wording "where deemed appropriate by the Society" in **6.2.2-1, Part D of the Rules** means cases where the intermediate shaft is manufactured using steel forgings (excluding stainless steel forgings, etc.) which have specified tensile strengths greater than 800 N/mm^2 and are in accordance with the requirments of **Annex D6.2.2** "GUIDANCE FOR USE OF HIGH-STRENGTH MATERIALS FOR INTERMEDIATE SHAFTS".

D8 TORSIONAL VIBRATION OF SHAFTINGS

D8.2 Allowable Limit

D8.2.2 Intermediate Shafts, Thrust Shafts, Propeller Shafts and Stern Tube Shafts

Sub-paragraph -3 has been added as follows.

3 The wording "where deemed appropriate by the Society" in **8.2.2-1(1), Part D of the Rules** means cases where the intermediate shaft is manufactured using steel forgings (excluding stainless steel forgings, etc.) which have specified tensile strengths greater than 800 N/mm^2 and are in accordance with the requirments of **Annex D6.2.2** "GUIDANCE FOR USE OF HIGH-STRENGTH MATERIALS FOR INTERMEDIATE SHAFTS".

Annex D6.2.2 has been added as follows.

Annex D6.2.2 GUIDANCE FOR USE OF HIGH-STRENGTH MATERIALS FOR INTERMEDIATE SHAFTS

1.1 Application

This Guidance applies to low alloy steel forgings (excluding stainless steel forgings, etc.) which have specified tensile strengths greater than 800 N/mm^2, but less than 950 N/mm^2 and which are intended for use as intermediate shaft material.

1.2 Torsional fatigue test

1.2.1 General requirements

A torsional fatigue test is to be performed to verify that the material exhibits similar fatigue life as conventional steels. The torsional fatigue strength of said material is to be equal to or greater than the allowable limit of torsional vibration stresses τ_1 given by the formulae in **8.2.2-1(1), Part D of the Rules**.

The test is to be carried out with notched and unnotched specimens respectively. For calculation of the stress concentration factor of the notched specimen, the notch factor is to be evaluated in consideration of the severest torsional stress concentration in the design criteria.

1.2.2 Test conditions

Test conditions are to be in accordance with **Table 1.1**. Mean surface roughness is to be less than 0.2μm for R_a and the absence of localised machining marks is to be verified by visual examination at low magnification (x20) as required by *Section* 8.4 of *ISO* 1352.

Test procedures are to be in accordance with *Section* 10 of *ISO* 1352.

Table 1.1 Test conditions

Loading type	Torsion
Stress ratio	R = −1
Load waveform	Constant-amplitude sinusoidal
Evaluation	S-N curve
Number of cycles for test termination	1 x 10^7 cycles

1.2.3 Acceptance criteria

Measured high-cycle torsional fatigue strength τ_{C1} and low-cycle torsional fatigue strength τ_{C2} are to be equal to or greater than the values given by the following formulae:

$$\tau_{C1} \geq \tau_{1,\lambda=0} = \frac{\sigma_B + 160}{6} \cdot C_K \cdot C_D$$

$$\tau_{C2} \geq 1.7\tau_{C1} / \sqrt{C_K}$$

C_K: Coefficient related to the type and shape of the shaft. To be determined using the formulae (modified as needed) specified in **8.2.6-3, Part D of the Guidance**. However, the stress concentration factor for computing C_K can be determined in

consideration of the actual design conditions. For unnotched specimens, the stress concentration factor is 1.0.

C_D: Coefficient related to shaft size. To be determined using the formula (modified as needed) specified **8.2.2-1(1), Part D of the Rules**.

σ_B: Specified tensile strength of the shaft material (N/mm^2)

1.3 Cleanliness requirements

Low alloy steel forgings are to have a degree of cleanliness shown in **Table 1.2** when tested according to *ISO* 4967 *method A*. Representative samples are to be obtained from each heat of forged or rolled products. In addition, the forgings are also to comply with the minimum requirements of **Table K6.2, Part K of the Rules**, with particular attention given to minimising the concentrations of sulphur, phosphorus and oxygen in order to achieve the cleanliness requirements. The specific steel composition is required to be approved by the Society.

Table1.2 Cleanliness requirements

Inclusion group	Series	Limiting chart diagram index I
Type A	Fine	1
	Thick	1
Type B	Fine	1.5
	Thick	1
Type C	Fine	1
	Thick	1
Type D	Fine	1
	Thick	1
Type DS	-	1

1.4 Inspection

Low alloy steel forging are to be subjected to the ultrasonic testing specified in **6.1.10-1(1), Part K of the Rules**.

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

1. The effective date of the amendments is 1 January 2017.

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 2-3

D12 PIPES, VALVES, PIPE FITTINGS AND AUXILIARIES

D12.3 Construction of Valves and Pipe Fittings

D12.3.4 Flexible Hose Assemblies

Sub-paragraph -2 has been amended as follows.

2 The wording “exposed open decks” in **12.3.4-3, Part D of the Rules** means “open decks” as defined in **9.2.3-2(10)** ~~**and 9.2.4-2(10),**~~ **Part R of the Rules** except for the cargo areas of tankers, ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk.

EFFECTIVE DATE AND APPLICATION (Amendment 2-3)

1. The effective date of the amendments is 1 January 2017.
2. Notwithstanding the amendments to the Guidance, the current requirements apply to flexible hose assemblies for which the application for approval is submitted to the Society before the effective date.

Amendment 2-4

Annex D1.1.3-3 GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF AZIMUTH THRUSTERS

1.4 Construction and Strength

Paragraph 1.4.6 has been amended as follows.

1.4.6 Strengthening for Navigation in Ice

Thrusters in ships intended to be registered with the ice-strengthened class notation are to comply with the requirements specified in **Chapter ~~5~~8**, **Part I of the Rules**.

Annex D5.3.5 GUIDANCE FOR CALCULATION OF STRENGTH OF GEARS

1.5 Loading Factors

1.5.1 Application Factor, K_A

2 In cases where drive systems are operating at level near their critical speed, a careful analysis of conditions is to be made. The application factor K_A is to be determined either by direct measurements or by a system analysis that is acceptable to the Society. In cases where values determined in such ways cannot be provided, the following values may be used:

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

(1) Main propulsion
K_A = 1.00 (diesel engines with hydraulic or electromagnetic slip couplings)
= 1.30 (diesel engines with high elasticity couplings)
= 1.50 (diesel engines with other couplings)
However, in cases where vessels, on which reduction gear is being used, are receiving Ice Class Notation, as required in ~~5~~**8.6, Part I of the Rules**.

EFFECTIVE DATE AND APPLICATION (Amendment 2-4)

1. The effective date of the amendments is 1 January 2017.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date except for in cases where the amendments are to be retroactively applied.
(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.