

# **RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

**Part H**

**Electrical Installations**

**Rules for the Survey and Construction of Steel Ships**  
**Part H** **2021 AMENDMENT NO.1**  
**Guidance for the Survey and Construction of Steel Ships**  
**Part H** **2021 AMENDMENT NO.1**

Rule No.29 / Notice No.28 30 June 2021  
Resolved by Technical Committee on 27 January 2021

**ClassNK**  
NIPPON KAIJI KYOKAI

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

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# **RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**RULES**

**Part H**

**Electrical Installations**

**2021 AMENDMENT NO.1**

Rule No.29      30 June 2021

Resolved by Technical Committee on 27 January 2021

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

Rule No.29 30 June 2021

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 H ELECTRICAL INSTALLATIONS**

Amendment 1-1

**Chapter 1 GENERAL**

**1.2 Testing**

**1.2.1 Shop Tests\***

Sub-paragraph -1 has 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 the 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) to (7) are omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 1 July 2021.

## Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

### 2.4 Rotating Machines

Paragraph 2.4.5 has been amended as follows.

#### 2.4.5 Overload and Overcurrent Capability\*

Rotating machines are to withstand the following ~~excess~~ overcurrent or torque tests by maintaining their voltage, rotating speed and frequency as near to their rated values as possible. In the case of special types of deck machinery motors (winch, windlass, capstan, etc.), overload scaling may be dealt with as considered appropriate by the Society.

(1) ~~Excess~~ Overcurrent capability

(a) (Omitted)

(b) A.C. motors

150 % of rated current for 2 *minutes*.

However, in the case of A.C. motors having rated outputs exceeding 315 *kW* or rated voltages exceeding 1 *kV*, the load and time of ~~excess~~ overcurrent capability may be increased or decreased in consideration of use conditions and the like.

(c) (Omitted)

(2) (Omitted)

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 in accordance with Table H2.5. However, those tests required by ~~-6,-7~~ and ~~-8~~ 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, those tests required by ~~-5~~ 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** ~~No load tests of rotating machines are to be carried out. During such tests, machine vibrations and bearing lubrication system operations are to be within the order.~~ Visual examinations of rotating machines are to be carried out. Such visual examinations are to ensure, as far as is practicable, that rotating machines comply with their technical documentation (e.g. design drawings, specifications).

**3** (Omitted)

**4** (Omitted)

**5** (Omitted)

**6** (Omitted)

**7** Overspeed tests for rotating machines are to be carried out and comply with the requirements given in 2.4.7. Such tests, however, are not applicable to squirrel cage motors.

**8** (Omitted)

**9** The high voltage levels specified in Table H2.56 are to be applied for a period of 1 *minute* between live parts and frames of rotating machines, with those cores and windings not under-going testing connected to such frames. In the cases where of machines with rated voltage above 1 *kV* having both ends of each phase individually accessible, tests voltages are to be applied between each phase and frames carried out in accordance with the requirements given in 2.17.6-4. Furthermore, where those temperature rise tests specified in ~~-8~~ above are applied, high voltage tests are to be carried out after the test.

**10** Immediately after those high voltage tests specified in -9 above have been performed, the insulation resistance of such rotating machines is to be measured in accordance with **Table H2.67** and all values are not to be less than any of those specified in **Table H2.67**. 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** Machine winding resistance is to be measured. The resistances of the machine windings are to be measured and recorded using either an appropriate bridge method, or a voltage and current method.

**12** No-load tests of rotating machines are to be carried out. Machines are to be operated at no load and rated speed whilst being supplied at rated voltage and frequency when used as a motor, or are to be driven by a suitable means and excited to give rated terminal voltage when used as a generator. During such tests, machine vibrations and bearing lubrication system operations are to be checked and confirmed to be in good order.

**123** (Omitted)

Table H2.5 to H2.17 have been renumbered to Table H2.6 to H2.18, and Table H2.5 has been added as follows.

**Table H2.5 Tests for Rotating Machines**

No.	Tests	Generators		Motors	
		First generator produced in a series of identical type units <sup>(1)</sup>	Other generators produced in a series of identical type units <sup>(2)</sup>	First motor produced in a series of identical type units <sup>(1)</sup>	Other motors produced in a series of identical type units <sup>(2)</sup>
1	<u>Examination of the technical documentation, as appropriate and visual examination</u>	x	x	x	x
2	<u>Insulation resistance measurement</u>	x	x	x	x
3	<u>Winding resistance measurement</u>	x	x	x	x
4	<u>Verification of the voltage regulation system<sup>(7)</sup></u>	x	x <sup>(3)</sup>		
5	<u>Rated load test and temperature rise measurements</u>	x		x	
6	<u>Overload/overcurrent test</u>	x	x <sup>(4)</sup>	x	x <sup>(4)</sup>
7	<u>Verification of steady short circuit conditions<sup>(5)</sup></u>	x			
8	<u>Overspeed test</u>	x	x	x <sup>(6)</sup>	x <sup>(6)</sup>
9	<u>High voltage tests</u>	x	x	x	x
10	<u>No-load test</u>	x	x	x	x
11	<u>Verification of degree of protection</u>	x		x	
12	<u>Verification of bearings</u>	x	x	x	x

Notes:

- (1) Type tests on prototype machine or tests on at least the first batch of machines.
- (2) The report of machines produced as part of a series of identical type units are to contain the manufacturer's serial number of the machine which has been type tested and the corresponding test results.
- (3) Only functional tests of voltage regulator systems.
- (4) Only applicable to machines with rated outputs above of 100 kW used for essential services.
- (5) Verification of steady short circuit condition applies to synchronous generators only.
- (6) Not applicable to squirrel cage motors.
- (7) Not applicable to D.C. generators.

Table H2.56 Testing Voltages  
(Omitted)

Table H2.67 Minimum Values of Test Voltages and Insulation Resistance  
(Omitted)

Table H2.78 Minimum Air Clearances for Busbars  
(Omitted)

Table H2.89 Instruments for *d.c.* Generator Panels  
(Omitted)

Table H2.910 Instruments for *a.c.* Generator Panels  
(Omitted)

Table H2.101 Limits of Temperature Rise of Electrical Appliances for Switch Boards  
(Omitted)

Table H2.142 Minimum Clearances and Creepage Distances for Control Appliances  
(Omitted)

Table H2.123 Limits of Temperature Rise of Controlgears for Motors  
(Omitted)

Table H2.134 Current Ratings of Cables (for continuous service)<sup>(1)</sup>  
(Omitted)

Table H2.145 Correction Factor for Various Ambient Temperatures  
(Omitted)

Table H2.156 Limits of Temperature Rise of Transformers  
(Omitted)

Table H2.167 Minimum Air Clearances  
(Omitted)

Table H2.178 Minimum Insulation Resistance  
(Omitted)

## **2.5 Switchboards, Section Boards and Distribution Boards**

### **2.5.3 Construction and Materials\***

Sub-paragraph -7(1) has been amended as follows.

**7** Wiring materials are to conform to the following requirements:

(1) Insulated wires for switchboards are to be flame-retardant and non-hygroscopic which have

appropriate maximum permissible conductor temperatures of not less than 75 °C.  
((2) and (3) are omitted.)

#### **2.5.4 Busbars\***

Sub-paragraph -5 has been amended as follows.

**5** Air clearances (phase-to-phase, pole-to-pole and phase-to-earth) of non-insulated busbars are not to be less than the values given in **Table H2.78**.

Paragraphs 2.5.6 and 2.5.7 have been amended as follows.

#### **2.5.6 Measuring Instruments for *d.c.* Generators**

Ship service *d.c.* generator panels are to be at least provided with the instruments given in **Table H2.89**.

#### **2.5.7 Measuring Instruments for *a.c.* Generators**

Ship service *a.c.* generator panels are at least to be provided with the instruments given in **Table H2.910**.

#### **2.5.10 Shop Tests**

Sub-paragraph -2 has been amended as follows.

**2** Temperature rises of switchboards are not to exceed those values given in **Table H2.101** under the specified currents and/or rated voltages, except in those cases specified in the chapters of this Part.

### **2.7 Control Appliances**

#### **2.7.1 Clearances and Creepage Distances**

Sub-paragraph -2 has been amended as follows.

**2** Minimum clearances and creepage distances of control appliances (*e.g.*, electromagnetic contactors, control switches, terminal boards) are not to be less than those values given in **Table H2.112** if such appliances are designed and constructed in consideration of moisture, dust, etc. or if they are operated in ambient conditions not affected by extremely high humidity and heavy deposit of dusts.

### **2.8 Controlgears for Motors and Magnetic Brakes**

#### **2.8.1 Controlgears for Motors**

Sub-paragraph -7 has been amended as follows.

**7** In cases where controlgears for motors of essential services ~~installed in duplicate~~ are built in grouped starter panels; busbars, appliances and others are to be arranged so that a single fault in any one of the appliances or circuits of controlgears for motors in grouped starter panels does not render all of the other motors designated for the same use simultaneously of essential services unusable. In addition, contorolgears of essential services are to be partitioned by fire-retardant walls, and they

are also to be separated from other current carrying parts.

Paragraph 2.8.3 has been amended as follows.

### **2.8.3 Temperature Rise**

Temperature rises of controlgears for motors are not to exceed, under specified currents or rated voltages, the values given in **Table H2.123**, except as separately specified in this Part.

### **2.8.4 Shop Tests**

Sub-paragraph -2 has been amended as follows.

**2** Controlgears for motors are to undergo the temperature tests under normal working condition, and any temperature rise of each is not to exceed those values given in **Table H2.122.8.3**.

## **2.9 Cables**

Paragraph 2.9.9 has been amended as follows.

### **2.9.9 Current Rating of Cables**

The current rating of cables is to comply with the following (1) to (5).

(1) The current rating of cables for continuous service is not to exceed the values given in **Table H2.134**.

(2) The current rating of cables for short-time services (30 *minutes* or 60 *minutes*) may be increased by multiplying the value given in **Table H2.134** by the following correction factor.

$$\text{correction factor: } \sqrt{1.12 / (1 - \exp(-ts / 0.245 / d^{1.35}))}$$

$ts$  : 30 or 60 (*min*)

$d$  : overall diameter of the finished cable (*mm*)

(3) The current rating of cables for intermittent services (for periods of 10 *minutes*, of which 4 *minutes* are with constant loads and 6 *minutes* without any loads at all) may be increased by multiplying the value given in **Table H2.134** by the following correction factor.

$$\text{correction factor: } \sqrt{\frac{1 - \exp(-10 / 0.245 / d^{1.35})}{1 - \exp(-4 / 0.245 / d^{1.35})}}$$

$d$  : overall diameter of the finished cable (*mm*)

The current rating for other intermittent ratings is to be deemed appropriate by the Society.

(4) In cases where more than 6 cables belonging to the same circuit are bunched together, a correction factor of 0.85 is to be applied.

(5) In cases where ambient temperatures are different from those specified in (1) to (3), the correction factor in **Table H2.145** may be applied.

## **2.10 Transformers for Power and Lighting**

Paragraph 2.10.3 has been amended as follows.

### **2.10.3 Temperature Rise**

Temperature rises of transformers are not to exceed those values given in **Table H2.156** during any continuous operation at rated outputs.

## **2.10.4 Modification of the Limits of Temperature Rise\***

Sub-paragraphs -1 and -3 have been amended as follows.

- 1** In cases where ambient temperatures exceed 45 °C, limits of temperature rise are to be decreased by the difference from those values given in **Table H2.156**.
- 2** (Omitted)
- 3** In cases where ambient temperatures do not exceed 45 °C, limits of temperature rise may be increased by the difference from those values given by **Table H2.156**. In such cases, ambient temperatures are not to be set below 40 °C.

## **2.17 High Voltage Electrical Installations**

### **2.17.3 Construction and Location\***

Sub-paragraph -22 has been amended as follows.

**22** In general, phase-to-phase air clearances and phase-to-earth air clearances between non-insulated parts are not to be less than the values given in **Table H2.167**. In **Table H2.167**, intermediate values may be accepted for nominal voltages provided that the next higher air clearance is observed. In the case of smaller distances, an impulse voltage test carried out in accordance with paragraph 4.2 of *IEC 62271-1* and it is confirmed to have sufficient insulation performance.

### **2.17.5 Cables**

Sub-paragraph -3(2) has been amended as follows.

- 3** The segregation of high voltage cables is to be as follows:
  - (1) (Omitted)
  - (2) Where high voltage cables of different voltage ratings are installed on the same cable tray, the air clearance between cables is not to be less than the minimum air clearance for the higher voltage side as given in **Table H2.167**. However, high voltage cables are not to be installed on the same cable tray for the low voltage cables.

## **2.18 Tests after Installation On Board**

### **2.18.1 Insulation Resistance Test**

Sub-paragraphs -1 and -3 have been amended as follows.

- 1** In the case of circuits of electric propulsion, auxiliary power and lighting, insulation resistance between conductors and earths as well as between conductors is to be measured and its value is not to be less than those values specified in **Table H 2.178**.
- 2** (Omitted)
- 3** The insulation resistance of generators and motors under working temperatures is to be those values specified in **Table H2.67**.

## EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2021.
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.

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# **GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**Part H**

**Electrical Installations**

**GUIDANCE**

**2021 AMENDMENT NO.1**

Notice No.28      30 June 2021

Resolved by Technical Committee on 27 January 2021

Notice No.28 30 June 2021

## 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 H ELECTRICAL INSTALLATIONS**

#### Amendment 1-1

#### **H1 GENERAL**

##### **H1.2 Testing**

##### **H1.2.1 Shop Tests**

Sub-paragraph -1 has been amended as follows.

**1** The wording “survey methods which it considers to be appropriate” in **1.2.1-1, Part H of the Rules** and the wording “tests for any equipment with small capacities as specified in (4) and (5) are to be conducted as deemed appropriate by the Society” specified in **1.2.1-1, Part H of the Rules** mean to be in accordance with the following (1) and (2) respectively:

- (1) The wording “survey methods which it considers to be appropriate” means survey methods which the Society considers to be able to obtain information equivalent to that obtained through traditional ordinary surveys where the Surveyor is in attendance, notwithstanding any of the requirements in this Part.
- (2) The wording “tests for any equipment with small capacities as specified in (4) and (5) are to be conducted as deemed appropriate by the Society” means those shop tests for electrical motors whose capacities at continuous ratings are less than 100 kW and controlgears of those motors may be substituted for by manufacturer tests. In such cases, submission or presentation of test records may be required by the Society.

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

1. The effective date of the amendments is 1 July 2021.

## H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

### H2.4 Rotating Machines

Title of Paragraph H2.4.5 has been amended as follows.

#### H2.4.5 **Overload and Overcurrent Capability**

Paragraph H2.4.15 has been amended as follows.

##### H2.4.15 Shop Tests

1 (Omitted)

2 Procedures, etc. for omitting temperature rise tests, overcurrent or excess torque tests, and steady short-circuit tests (hereinafter referred to as “temperature rise tests, etc.”), are to comply with the following:

(1) Scope

Rotating machines to which 2.4.15-1, Part H of the Rules applies and for which temperature rise tests, etc. for the same type of rotating machines are applied are to be recognized as being acceptable products in view of the results of tests and inspections previously carried out by the Society when they are products manufactured at plants according to quality control standards approved by the Society in accordance with 1.2.1-3, Part H of the Rules.

(2) Application

Applications for omission of temperature rise tests, etc. are to be submitted in duplicate for each manufacturing plant to the Society branch office in charge of the required testing. The branch office is to examine the application and, in those cases where deemed appropriate, stamp one of copies of the submitted application with its seal of acceptance (i.e. the branch office stamp) and then return the stamped copy to the applicant.

(3) Representative machine tests

Prior to accepting the omission of temperature rise tests, etc., for products for which the application referred to in (2) above is submitted, all specified tests are to be carried out for a representative machine in the presence of the Surveyors, and a corresponding representative machine tests report is to be prepared. In addition to the standard measurement items, representative machine test reports are to contain those items related to the temperature rise and the definition of the same type specified in -1 above.

(4) Representative machine test reports

The Surveyors are to examine the test reports specified in (3) above and, in those cases where deemed appropriate, sign them and require the quality control manager of the manufacturing plant to keep them together with the copy of the application specified in (2) above. In cases where the margin between the actual measured temperature rise value of the representative machine and the specified standard measured value is small, it is to be confirmed that there is no possibility of any of the subsequently produced units exceeding the specified value due to machine differences. For cases where the same or a similar model was approved in the past, confirmation may be made by examining prior test reports; however, for cases where a model is being produced for the first time, confirmation is to be made by carrying out temperature rise tests, etc. on additional units.

(5) Individual machine tests

The consent of the party ordering the machines is to be obtained by manufacturer in cases where the omission of temperature rise tests, etc. is permitted for each subsequent unit

produced of a machine for which representative machine tests are passed. In addition, the quality control manager is to make a checklist (such as that shown in Table H2.4.15-1) for each unit so that it is possible to easily confirm that the unit is of the same type as the representative machine. (However, checklist need not be provided when it is clear that the same type is used; for example, in the case of main generators for the same ship in which all required tests are carried out for a single generator, and temperature rise tests, etc. are omitted for the other generators.)

(6) Individual machine test reports

The temperature rise test results for a representative machine are to be entered into the corresponding column of the individual machine test report, and the wording “TYPE TESTED” is to also be entered or stamped next to results.

(7) Checklists

The checklist shown in Table H2.4.15-1 is an example of checklist that allows easy confirmation of an individual machine being of the same type as a representative machine in the individual testing of a product. Appropriate checklists are to be prepared by the manufacturer after discussion among relevant parties according to the type of the product to be tested with reference made to Table H2.4.15-1. In addition, values for entries with checkboxes in the “Identical” column only are required to be the same as that of the representative machine, whereas the values for entries with checkboxes in both the “Identical” and “Almost identical” column may be equal to or less than those of the representative machine.

~~23~~ (Omitted)

~~34~~ (Omitted)

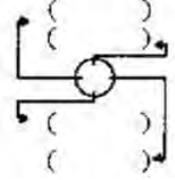
~~45~~ (Omitted)

~~56~~ Notwithstanding ~~45~~ above, sparks which cause any scorching or damage to the commutator surfaces or which wear out or break up brushes during temperature tests and overload tests are deemed to be harmful.

~~67~~ (Omitted)

Table H2.4.15-1 has been added as follows.

**Table H2.4.15-1 Checklist for Rotating Machines**

CHECKLIST for omission of temperature rise tests, overcurrent or excess torque tests, and steady short-circuit tests		Date: _____	
Nippon Kaiji Kyokai _____ Branch Office		Manufacturer name: _____	
Representative rotating machines:			
Factory		Representative rotating machines test date: _____	
Item <input type="checkbox"/> Generator <input type="checkbox"/> Motor	Capacity: _____ [kVA/kW] Voltage: _____ [V] Load current: _____ [A] Number of poles: _____ [P] Revolutions: _____ [r.p.m] Thermal class: _____ Degree of protection: _____ Principal dimensions: Shaft length: _____ [mm] Shaft axis height: _____ [mm] Inlet / outlet area: _____ / _____ [m <sup>2</sup> ] Air gap measurements [mm] Ventilation method: _____ Inlet / outlet filter: Available / Not available Air cooler: Available / Not available Cooling area: _____ [m <sup>2</sup> ] Cooling water flow rate: _____ [m <sup>3</sup> /h] Winding resistance (75°C): _____ [Ω] Air volume: _____ [m <sup>3</sup> /h] Rated load revolution (or slip): _____ [r.p.m] Total weight: _____ [kg]		
Test result list no.:	_____		
Drawing no.:	_____		
The items for omission of temperature rise tests, etc. in 2.4.15-1, Part H of the Rules [compared to representative rotating machines]			
(Ship builder: _____ Hull number: _____ Shipowner: _____) (Intended use: _____ Number of units: _____ Serial number(s): _____)			(Check if applicable)
			Identical      Almost identical
1	Capacity: _____ [kVA/kW] Voltage: _____ [V] Load current: _____ [A] Number of poles: _____ [P] Revolutions: _____ [r.p.m] Thermal class: _____ Degree of protection: _____	<input type="checkbox"/>	<input type="checkbox"/>
2	Shaft length: _____ [mm] Shaft axis height: _____ [mm] Air gap measurements _____ to _____ [mm]	<input type="checkbox"/>	<input type="checkbox"/>
3	Ventilation method: _____ Inlet / outlet area: _____ / _____ [m <sup>2</sup> ] Inlet / outlet filter: Available / Not available Air cooler: Available / Not available Cooling area: _____ [m <sup>2</sup> ] Cooling water flow rate: _____ [m <sup>3</sup> /h]	<input type="checkbox"/>	<input type="checkbox"/>
4	Shaft material: _____ Machining method, accuracy and degree of finishing Shaft bearings or shaft bearing metal type Fans and fans guide structures and dimensions Stator core stacking dimensions and structure, coil insulation, and processing method	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5	Terminal arrangement and shape, cable connection parts structure, wiring type and structure Rotor balancing test	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
6	Results of bearing metal mating results Winding resistance measurement results (75°C): _____ [Ω] No load current value _____ [A] Air volume measurement results: _____ [m <sup>3</sup> /h] Rated load revolution (or slip): _____ [r.p.m]	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7	The use of subcontracted products is managed by incoming inspection standards Key working standards, equipment, and operator skills with respect to the production method remain the same or have been improved. The facilities, procedures and criteria for testing and inspection are under sufficient management.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
As stated above, we certify that the _____, which are tested in this time, is of the same type, manufactured at the same factory and by the same production method as the representative rotating machines mentioned above.			
Testing and Inspection Director: _____			

## H2.5 Switchboards, Section Boards and Distribution Boards

Paragraph H2.5.3 has been amended as follows.

### H2.5.3 Construction and Materials

~~1~~ Flame-retardant tests for insulating materials are to be carried out in accordance with the following:

- ~~(1) Such tests are to be carried out at normal ambient temperatures. The standard size of test specimens is to be 120 mm long, 10 mm wide and 3 mm thick.~~
- ~~(2) Test specimens are to be fastened to thin metal wires so that their longitudinal axis are inclined to an angle of approximately 45 degrees to the horizontal and their transverse axis are horizontal.~~
- ~~(3) Conventional bunsen burners fed with town gas are to be used, the flames of which, when adjusted in still air and in vertical positions, are approximately 125 mm long with the blue part of these flames being about 35 mm long.~~
- ~~(4) Burner axis are to be set vertically in such positions that the tips of the blue parts of these flames just touches the lower ends of any specimens.~~
- ~~(5) Flames are to be applied five times for 15 seconds at a time, with intervals of 15 seconds between each application. During such tests, specimens are not to be allowed to burn themselves.~~
- ~~(6) Materials are deemed to be flame-retardant if any burnt or damaged parts of specimens are not more than 60 mm long.~~

~~2~~1 The following may be regarded as the “other approved means” specified in 2.5.3-2(2), Part H of the Rules:

- (1) Circuit breakers without tripping elements
- (2) Disconnecting switches (including sliding type disconnecting devices)

2 In applying 2.5.3-6, Part H of the Rules, flame-retardant tests for insulating materials are to be carried out in accordance with the following:

- (1) Such tests are to be carried out at normal ambient temperatures. The standard size of test specimens is to be 120 mm long, 10 mm wide and 3 mm thick.
- (2) Test specimens are to be fastened to thin metal wires so that their longitudinal axes are inclined to an angle of approximately 45 degrees to the horizontal and their transverse axes are horizontal.
- (3) Conventional Bunsen burners fed with town gas are to be used, the flames of which, when adjusted in still air and in vertical positions, are approximately 125 mm long with the blue part of these flames being about 35 mm long.
- (4) Burner axes are to be set vertically in such positions that the tips of the blue parts of these flames just touches the lower ends of any specimens.
- (5) Flames are to be applied five times for 15 second intervals for 15 seconds between each application, and materials are deemed to be flame-retardant if any burnt or damaged parts of specimens are not more than 60 mm long. During such tests, specimens are not to be allowed to burn themselves.

Paragraph H2.5.8 has been added as follows.

### H2.5.8 Instrument Scales

“Instrument scales” means the effective measuring range. When an extended scale is required for the starting current as in the case of ammeters for motors, it is not necessary to apply the requirements given in 2.5.8, Part H of the Rules to the extended part.

Paragraph H2.5.10 has been added as follows.

**H2.5.10 Shop Tests**

**1** The wording “switchboard which is produced in series having the identical type with its first unit” referred to in **2.5.10-1, Part H of the Rules** means those switchboards which are manufactured according to the same process at the same plant and which comply with the following requirements:

- (1)** The outer dimensions, internal volume and ventilation method of generator panels (including synchronization panels) are almost the same.
- (2)** The types and ratings of circuit breakers and switches for generators are the same, and the dimensions, layout and structure of busbars and connecting conductors are almost the same.
- (3)** The load currents of busbars and connecting conductors are almost the same or less.
- (4)** The layout of the mounting devices in the board that generate heat (e.g. transformers, relays, fuses, and resistors) is almost the same, and the total power consumption is almost the same or less.
- (5)** The structure and arrangement of the terminals are almost the same except for the control circuits, instrument circuits, etc.

**2** The procedures for omitting the temperature rise tests specified in **2.5.10-1, Part H of the Rules** are the same as those specified for rotating machines in **H2.4.15-2(1) to (7)**; however, the term “rotating machines” is to be read as “switchboards”. In addition, the sample checklist given in **H2.4.15-2(7)** is to be in accordance with **Table H2.5.10-1**.

**3** The wording “auxiliary apparatus” referred to in **2.5.10-4, Part H 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, Part H 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, Part H of the Rules**.

**5** Except where otherwise specified, the requirements given in **2.5.10-4, Part H 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.

Table H2.5.10-1 has been added as follows.

**Table H2.5.10-1 Checklist for Switchboards**

CHECKLIST for omission of temperature rise tests			
Nippon Kaiji Kyokai _____ Branch Office		Date: _____	
Representative switchboards:		Manufacturer name: _____	
Factory		Representative switchboard test date: _____	
Item <input type="checkbox"/> Main switchboard <input type="checkbox"/> Emer. switchboard <input type="checkbox"/> Charging/discharging board  Test result list no.: _____  Drawing no.: _____	Configuration: Generator panel No.1, _____, _____ Synchronization panels: Available / Not available Generator capacity: _____ [kVA/ kW] Number: _____ Rated voltage: _____ [V] Rated current: _____ [A] Circuit-breakers for generator: Type _____ Rating _____ (Manufacturer: _____) Switches: Rated voltage: _____ [V] Rated current: _____ [A] Dimensions: _____ x _____ x _____ [mm] (Generator panels including synchronization panels) Internal volume: _____ [m <sup>3</sup> ] Opening area: _____ [m <sup>2</sup> ] In-board mounting devices (transformers, relays, resistors, etc.) total power consumption: _____ [W]  Generator panel (including synchronization panels, but excluding feeder panels) total weight: _____ [kg]		
The items for omission of temperature rise tests, etc. in 2.5.10-1, Part H of the Rules [compared to representative switchboards]			
		(Check if applicable)	
{ Ship builder: _____ Shipowner: _____ Intended use: _____ Serial number(s): _____ }		Identical	Almost identical
1	Configuration: Number of generator panels: _____ Synchronization panels: Available / Not available	<input type="checkbox"/>	
2	Circuit-breakers for generator: Type _____ Rating _____ (Manufacturer: _____) Switches: Rated voltage: _____ [V] Rated current: _____ [A]	<input type="checkbox"/>	
3	Dimensions: _____ x _____ x _____ [mm] Internal volume: _____ [m <sup>3</sup> ] Opening area: _____ [m <sup>2</sup> ] Ventilation method: _____	<input type="checkbox"/>	<input type="checkbox"/>
4	Busbars and connecting conductor dimensions, layout and structure Busbars and connecting conductors load currents Terminals structure and arrangement (except for the control circuits, instrument circuits, etc.)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5	In-board mounting devices (transformers, relays, resistors, etc.) arrangement Total power consumption: _____ [W]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
6	The use of subcontracted products is managed by incoming inspection standards Key working standards, equipment, and operator skills with respect to the production method remain the same or have been improved. The facilities, procedures and criteria for testing and inspection are under sufficient management.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
As stated above, we certify that the _____, which are tested in this time, is of the same type, manufactured at the same factory and by the same production method as the representative switchboards mentioned above.			
Testing and Inspection Director: _____			

Section 2.8 has been added as follows.

## **H2.8 Controlgears for Motors and Magnetic Brakes**

### **H2.8.1 Controlgears for Motors**

The wording “their equivalent” in 2.8.1-5, Part H of the Rules means those methods in which each pole fuse of the main circuit can be easily removed and stored by the person in charge is permitted.

### **H2.8.4 Shop Tests**

1 The wording “each controlgear and magnetic brakes which is produced in series having identical type with its first unit” in 2.8.4-1, Part H of the Rules means those controlgears and magnetic brakes which are manufactured according to the same process at the same plant and which comply with the following:

- (1) Outer dimensions, internal volume and ventilation method of containers such as boards and boxes are to be almost the same.
- (2) The types and ratings of circuit breakers, switches, and electromagnetic contactors of the main circuit are to be the same, and the dimensions, layout, connections, and terminal structures of the main circuit conductors are to be almost the same.
- (3) The load current of the main circuit is to be almost the same or less.
- (4) The layout of the mounting devices in the board that generate heat such as transformers, relays, fuses, and resistors are to be almost the same, and the total power consumption is to be almost the same or less.

2 The procedure for omitting the temperature rise tests, etc. specified in 2.8.4, Part H of the Rules is the same as that specified for rotating machines in H2.4.15-2(1) to (7); however, the term “rotating machines” is to be read as “controlgears for motors”. In addition, the sample checklist given in H2.4.15-2(7) is to be in accordance with Table H2.8.4-1.

3 High voltage tests are to be in accordance with H2.5.10-3 to -5 as far as practicable.

Table H2.8.4-1 has been added as follows.

**Table H2.8.4-1 Checklist for Starters**

CHECKLIST for omission of temperature rise tests			
Nippon Kaiji Kyokai _____ Branch Office		Date: _____	
Representative starters:		Manufacturer name: _____	
Factory		Representative starters test date: _____	
Item <input type="checkbox"/> Starters <input type="checkbox"/> A.C. motor <input type="checkbox"/> D.C. motor <input type="checkbox"/> Controlgear  Test result list no.: _____  Drawing no.: _____	Capacity: _____ [kW] Rated voltage: _____ [V] Control circuit voltage: _____ [V] Main circuit load current: _____ [A] Motor starting system: Direct input / Star-delta / Voltage drop  External dimensions: _____ x _____ x _____ [mm] Opening area: _____ [m <sup>2</sup> ] Main circuit-breakers: Type _____ Rating _____ (Manufacturer: _____) Electromagnetic contactors: Type _____ Rating _____ (Manufacturer: _____) In-board mounting devices (Transformers, relays, etc.) total power consumption: _____ [W]		
The items for omission of temperature rise tests, etc. in 2.8.4-1, Part H of the Rules [compared to representative starters]			
( Ship builder: _____ Hull number: _____ ) ( Intended use: _____ Serial number(s): _____ )		(Check if applicable) Identical      Almost identical	
1	Capacity: _____ [kW] Rated voltage: _____ [V] (Control circuit voltage: _____ [V]) Degree of protection: _____ Motor starting system: Direct input / Star-delta / Voltage drop	<input type="checkbox"/>	
2	Main circuit load current: _____ [A]	<input type="checkbox"/>	<input type="checkbox"/>
3	Main circuit-breakers (or electromagnetic contactor) type and rating (manufactures)	<input type="checkbox"/>	
4	Cooling vent opening arear: _____ [m <sup>2</sup> ]	<input type="checkbox"/>	
5	Containers (boards, boxes, etc.) external dimensions, internal volume and ventilation method	<input type="checkbox"/>	<input type="checkbox"/>
6	Main circuit conductor dimensions, layout, connections and terminal structure	<input type="checkbox"/>	<input type="checkbox"/>
7	In-board mounting devices (Transformers, relays, resistors, etc.) arrangement Total power consumption: _____ [W]	<input type="checkbox"/>	<input type="checkbox"/>
8	Rectifiers [selenium, semiconductors, other: _____] and rating Reactors type and rating	<input type="checkbox"/>	
9	The use of subcontracted products is managed by incoming inspection standards Key working standards, equipment, and operator skills with respect to the production method remain the same or have been improved. The facilities, procedures and criteria for testing and inspection are under sufficient management.	<input type="checkbox"/>	<input type="checkbox"/>
As stated above, we certify that the _____, which are tested in this time, is of the same type, manufactured at the same factory and by the same production method as the representative starters mentioned above.			
Testing and Inspection Director: _____			

## H2.9 Cables

Paragraph H2.9.15 has been amended as follows.

### H2.9.15 Penetrations of Bulkheads and Decks

1 In verifying the watertightness and gas-tightness at cable penetrations, the construction and characteristics of materials of the cables are to be considered. ~~Cable penetrations which are required to be watertight may be verified, for example, in accordance any of the following (1) to (3):~~

- ~~(1) Confirmation as to whether watertightness is assured by the construction method in accordance with standards such as *JIS*~~
- ~~(2) Watertight tests specified in 2.1.5, Part B of the Rules~~
- ~~(3) Approval in accordance with Chapter 1, Part 4 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use~~

2 Cable penetrations through A class bulkheads or decks are to be approved by the Society in accordance with the requirements given in Chapter 1, Part 4 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use. ~~However, in cases where cable glands are used which are to be covered with non-combustible compounds approved by the Society to at least a thickness of 25 mm or more, such penetrations may be accepted notwithstanding any of the requirements specified above. In such cases, except A-0 class divisions, thermal insulation material is to be additionally fitted according to the class of fire protection required by similar cases.~~

3 Compounds used in cable penetrations through B class bulkheads or decks are to be non-combustible compounds approved by the Society. In cases where compounds are used to fill sealing boxes or coamings, the length of the filled part is to be at least 50 mm or more.

4 Those compounds approved to be used at cable penetrations through A class bulkheads or decks under the requirements specified in -2 above may be regarded as non-combustible compound meetings the requirements given in -3 above.

5 Cable penetrations which are required to be watertight may be verified, for example, in accordance any of the following (1) to (3).

- (1) Confirmation as to whether watertightness is assured by a construction method in accordance with standards such as *JIS*.
- (2) The watertightness tests specified in 2.1.5, Part B of the Rules.
- (3) Approval in accordance with Chapter 1, Part 4 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

## H2.10 Transformers for Power and Lighting

### H2.10.4 Modification of the Limits of Temperature Rise

The wording “in those cases where deemed appropriate by the Society” in 2.10.4-2, Part H of the Rules means that limits of temperature rise may be modified as follows:

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

- (1) In cases where forced cooling is provided and the temperatures of cooling water at the inlets of air coolers are not higher than 32 °C, limits of temperature rise may be set 13 K higher than those limits specified in Table H2.156, Part H of the Rules.

Paragraph H2.10.6 has been added as follows.

### **H2.10.6 Shop Tests**

**1** The wording “transformers which are produced in a series of identical types” referred to in **2.10.6-1, Part H of the Rules** means those transformers which are the same in terms of rated capacity, voltage, current, dimension, method for cooling and thermal class, and which are produced at the same factory by the same production method.

**2** The procedures for omitting the temperature rise tests specified in **2.10.6-1, Part H of the Rules** are the same as those specified for rotating machines in **H2.4.15-2(1) to (7)**; however, the term “rotating machines” is to be read as “transformers”. In addition, the sample checklist given in **H2.4.15-2(5)** is to be in accordance with **Table H2.10.6-1**.

**3** Calculations for voltage regulation specified in **2.10.6-3, Part H of the Rules** may be performed using the following method.

$$\text{Voltage regulation (\%)} = q_r + \frac{q_x^2}{200}$$

$q_r$  : voltage drop (%) caused by register

$$\text{Single-phase: } q_r = \frac{P_{75}}{EI} \times 100 \text{ or } q_r = \frac{P_{115}}{EI} \times 100$$

$$\text{Three-phase: } q_r = \frac{P_{75}}{\sqrt{3}EI} \times 100 \text{ or } q_r = \frac{P_{115}}{\sqrt{3}EI} \times 100$$

$q_x$  : voltage drop (%) caused by reactance

$$q_x = \frac{E_x}{E} \times 100$$

$P_t$  : load loss (W) to rated capacity at  $t$  °C

$P_{75}$  : load loss (W) to rated capacity converted to 75 °C

$P_{115}$  : load loss (W) to rated capacity at 115 °C

$E_z$  : Impedance voltage (V), namely, the voltage at primary terminals when measuring  $P_t$

$E_x$  : Reactance voltage (V)

$$\text{Single-phase: } E_x = \sqrt{E_z^2 - \left(\frac{P_t}{I}\right)^2}$$

$$\text{Three-phase: } E_x = \sqrt{E_z^2 - \left(\frac{P_t}{\sqrt{3}I}\right)^2}$$

$E$  : Rated primary voltage (V)

$I$  : Rated primary current (A)

In the above equation,  $P_{75}$  applies to insulating materials of thermal classes A, E and B of insulating materials, while  $P_{115}$  applies to insulating materials of thermal classes F and H.

Table H2.10.6-1 has been added as follows.

**Table H2.10.6-1 Checklist for Transformers**

CHECKLIST for omission of temperature rise tests			
Nippon Kaiji Kyokai _____ Branch		Date: _____	
Representative transformer:		Name of manufacturer: _____	
Factory		Test date for representative transformer: _____	
Item	Total capacity: _____ [kVA] Total number of transformers: _____ ( _____ [phase(s)], _____ [kVA]) Voltage(primary / secondary): _____ / _____ [V] Current (primary / secondary): _____ / _____ [A] Thermal class: _____ Dimensions of housing: _____ × _____ × _____ [mm] (Total number of transformers: _____) Area of opening: _____ [m <sup>2</sup> ] No-load loss / No-load current: _____ [W] / _____ [A] (%) Load loss / Impedance voltage: _____ [W] / _____ [V] (%) Test result list no.: _____ Drawing no.: _____ Total weight: _____ [kg]		
The items for omission of temperature rise tests in <b>2.10.6-1, Part H of the Rules</b> [compared to representative transformer]			
( Ship builder: _____ Ship number: _____ How to use: _____ Product number _____ )			(Check if applicable)
		Identical	Almost identical
1	Total capacity: _____ [kVA] Total number of transformers: _____ ( _____ [phase(s)], _____ [kVA]) Voltage (primary / secondary): _____ / _____ [V] Current (primary / secondary): _____ / _____ [A] Thermal class: _____, Degree of protection: _____	<input type="checkbox"/>	
2	Cooling method: _____, Dimensions of housing: _____ × _____ × _____ [mm]	<input type="checkbox"/>	
3	Area of opening: _____ [m <sup>2</sup> ], Total weight: _____ [kg]	<input type="checkbox"/>	
4	Material for iron core, composition, production method and accuracy Sizes and species of conductors used for string Types and processing methods for insulating materials (impregnation method, drying method, etc.) Construction of terminals, processing methods for terminals of internal wiring	<input type="checkbox"/>	
5	Resistance measurements for each winding (primary / secondary): _____ / _____ [Ω] No-load loss / No-load current: _____ [W] / _____ [A] (%) Load loss / Impedance voltage: _____ [W] / _____ [V] (%)	<input type="checkbox"/>	<input type="checkbox"/>
6	The use of subcontracted products is managed by incoming inspection standards Key working standards, equipment, and operator skills with respect to the production method remain the same or have been improved. The facilities, procedures and criteria for testing and inspection are under sufficient management.	<input type="checkbox"/>	<input type="checkbox"/>
As stated above, we certify that the _____, which are tested in this time, is of the same type, manufactured at the same factory and by the same production method as the representative transformer mentioned above.			
Testing and Inspection Director: _____			

## EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2021.
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.

## H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

### H2.9 Cables

#### H2.9.15 Penetration of Bulkheads and Decks

Sub-paragraph -5 has been added as follows.

5 Penetrations which are approved as fire protection materials, watertight penetrations, or gas-tight penetrations in accordance with the Rules and Regulations of the Society are to be installed and maintained in accordance with the requirements of the relevant type approval certification.

#### EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2021.
2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships to 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.