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 2020 AMENDMENT NO.1
Guidance for the Survey and Construction of Steel Ships
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Rule No.47 / Notice No.26 30 June 2020
Resolved by Technical Committee on 22 January 2020

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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 H Electrical Installations

2020 AMENDMENT NO.1

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Rule No.47 30 June 2020
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-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, 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) Ship service generators (main, auxiliary and emergency)
(3) Main and emergency switchboards
(4) Motors for auxiliary machinery specified in **1.1.6-1(1)** to **1.1.6-1(3), Part D** (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) Power semiconductor converters of not less than 5 *kW* and their respective accessories that are used for supplying power to the electrical equipment specified in **(1)** to **(5)** above~~
(~~8~~7) 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 **1.1.6-1(4)** and **1.1.6-1(5), Part D** 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~~6)** are to be subjected to type tests for each type of products.
(1) Fuses
(2) Circuit breakers
(3) Electromagnetic contactors
(4) Explosion-protected electrical equipment
(5) Cables for power, lighting and internal communications
(6) Semiconductor converters for power of not less than 5 *kW* that are used for supplying power

to the electrical equipment specified in **-1(1)** to **(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

2.3 System Design - Protection

Paragraph 2.3.13 has been added as follows.

2.3.13 Harmonic Filters

1 Where harmonic filters are installed on the main busbars of electrical distribution systems, except when the harmonic filters are installed for single application frequency drives such as pump motors, the ship is to be fitted with facilities to continuously monitor the Total Harmonic Distortion (THD) values experienced by the main busbars as well as to alert the crew in cases where the value exceeds the upper limits given in **2.1.2-4**. The Total harmonic distortion (THD) value is to be recorded in the engine log book, but this reading may be logged electronically in cases where the engine room is provided with systems which automatically log such values.

2 The protection arrangements for harmonic filters specified in **-1** are to comply with the following requirements:

(1) Arrangements are to be provided to alert in the event of activation of the protection of a harmonic filter circuit.

(2) The protection of a harmonic filter circuit is to be arranged in conformity with the following requirements:

(a) A harmonic filter is to be arranged as a three-phase unit with individual protection provided for each phase. The activation of the protection arrangement for a single phase is to result in automatic disconnection of the entire filter.

(b) A current unbalance detection system independent of the overcurrent protection is to be provided to alert the crew in the case of current unbalance.

(3) Consideration is to be given to additional protection for individual capacitor elements, such as relief valves or overpressure disconnectors, in order to protect against damage from rupturing. This consideration is to take into account the type of capacitors used.

Section 2.12 has been amended as follows.

2.12 Semiconductor Converters for Power

2.12.1 General*

1 The requirements given in this **2.12** are to apply to semiconductor converters for power (hereinafter referred to as "converters") not less than 5 *kW*. ~~However, the requirement given in **2.12.4** is to apply to converters less than 5 *kW*, too.~~

2 Converters are to be in accordance with all applicable requirements given in this Part, and standards are, as far as practicable, to be deemed appropriate by the Society.

2.12.2 Construction and Location

1 ~~Semiconductor valve units, semiconductor stacks or semiconductor elements~~ Converters are to be arranged so that they can be ~~removed from equipment without dismantling the complete unit~~

repaired or replaced.

2 Effective means are to be provided in convertors to prevent any accumulation of moisture and condensation unless such convertors are located in air-conditioned spaces.

3 Transformers for converters are to be of two separate windings.

4 In case where semiconductor elements are connected in a series or in parallel, they are to be arranged so that voltages or currents for each element will become equal as far as practicable.

5 Converters are to be installed with effective cooling devices in order to maintain temperature rises of semiconductor elements or semiconductor stacks below allowable levels. In such cases, such equipment is to be installed in such a manner that coolant circulation is not impeded and that the temperature of the air at inlets to air-cooled semiconductor elements or semiconductor stacks does not exceed allowable values.

6 Converters are to be separated from resistors, steam pipes or other sources of radiant heat as far as practicable.

2.12.3 Protective Devices, etc.

1 In cases where forced cooling devices are provided, converters are to be arranged so that they can not remain loaded unless effective cooling is maintained.

2 In case where necessary, means are to be provided to guard against any transient over-voltage caused by switching and breaking of circuits and any *d.c.* voltage rise due to regenerative power.

~~**3** Protecting fuses for semiconductor elements are to be co-ordinated with characters of semiconductor elements as far as practicable.~~

43 Over voltages in those supply systems to which convertors are connected are to be limited by suitable ~~devices~~ means to prevent any damage.

~~**5**~~**4** Semiconductor elements and filter circuits are to be protected by fuses, etc. In addition, consideration is to be given to how the failure of converters may affect other equipment.

~~**2.12.4 Harmonic Filters**~~

~~**1** Where harmonic filters are installed on the main busbars of electrical distribution systems, except when the harmonic filters are installed for single application frequency drives such as pump motors, the ship is to be fitted with facilities to continuously monitor the Total Harmonic Distortion (THD) values experienced by the main busbars as well as to alert the crew in cases where the value exceeds the upper limits given in **2.1.2-4**. The Total harmonic distortion (THD) value is to be recorded in the engine log book, but this reading may be logged electronically in cases where the engine room is provided with systems which automatically log such values.~~

~~**2** The protection arrangements for harmonic filters specified in **-1** are to comply with the following requirements:~~

~~(1) Arrangements are to be provided to alert in the event of activation of the protection of a harmonic filter circuit.~~

~~(2) The protection of a harmonic filter circuit is to be arranged in conformity with the following requirements:~~

~~(a) A harmonic filter is to be arranged as a three-phase unit with individual protection provided for each phase. The activation of the protection arrangement for a single phase is to result in automatic disconnection of the entire filter.~~

~~(b) A current unbalance detection system independent of the overcurrent protection is to be provided to alert the crew in the case of current unbalance.~~

~~(3) Consideration is to be given to additional protection for individual capacitor elements, such as relief valves or overpressure disconnectors, in order to protect against damage from rupturing. This consideration is to take into account the type of capacitors used.~~

~~**2.12.5 Shop Tests***~~

~~**1** Converters and their accessories are to be tested in accordance with the requirements in this~~

~~**2.12.5**. However, those tests required by **-2** below may be omitted, subject to Society approval, for those products which are produced in a series of identical types from the second unit onward.~~

~~**2** — Temperature rise tests for converters and their accessories are to be carried out under normal working conditions, and temperature rise for the interiors of converters is not to exceed manufacturer specified values and 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 those 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.~~

~~**3** — Instruments, switching devices and protective devices fitted in converters are to be checked for normal operation under operating conditions.~~

~~**4** — Converters are to withstand high voltages by applying the following *a.c.* voltages for a period of 1 *minute* between semiconductor elements or live parts of accessories charged with main circuit potential and earths.~~

~~Testing voltage (V) = 1.5 EP_t + 1,000 (minimum 2,000 V)~~

~~EP_t : Maximum voltage values are to be impressed on the reverse side of convertor circuit arms~~

~~In cases where *d.c.* voltages are less than 100 V, minimum testing voltages may be 1,500 V. Semiconductor elements are to be short-circuited before such tests.~~

~~**5** — 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 **2.8.4-4**.~~

~~**6** — Immediately after such high voltage tests have been performed, insulation resistance between live parts of converters and their accessories and earths is not to be less than 1 $M\Omega$ when tested with *d.c.* voltages of at least 500 V.~~

Section 2.17 has been amended as follows.

2.17 High Voltage Electrical Installations

2.17.1 General

1 The requirements given in this **2.17** are to be applied to those high voltage electrical installations with system voltages above *a.c.* 1,000 V up to *a.c.* 15,000 V.

2 The high voltage electrical installations are to meet the requirements given in this **2.17** and also those in other applicable chapters of this Part.

2.17.2 Distribution*

1 The following distribution systems **(1)** or **(2)** are considered as standard~~.~~. Furthermore, the expressions "high-impedance" and "low-impedance" refer to the value of the earthing factor derived from the following formula. Earthing factors greater than or equal to 0.8 are considered to be "High-impedance". Those lower than 0.8 are considered to be "Low-impedance".

(1) Three-phase, three-wire, insulated systems

(2) Three-phase, three-wire, neutral earthed systems

(a) High-impedance earthing

(b) Low-impedance earthing

(c) Direct earthing

$$earthing\ \ factor = \frac{phase\ to\ earth\ voltage\ of\ \ the\ health\ \ phase\ when\ an\ earth\ \ fault\ occurs}{phase\ to\ \ phase\ voltage}$$

2 In the case of three-wire insulated systems, high voltage equipment is to be able to withstand any transient over-voltages which may arise from earth-faults.

3 ~~In the case of three-wire n~~Neutral earthed systems~~, high voltage equipment is to be able to withstand earth-fault currents. In cases where means are provided for limiting earth-fault currents, such means are not to influence selective tripping of fault circuits.~~ are to comply with the following:

(1) In case of earth fault, the current is not to be greater than full load current of the largest generator on the switchboard or relevant switchboard section and not less than three times the minimum current required to operate any device against earth fault.

(2) It is to be assured that at least one source neutral to ground connection is available whenever the system is in the energised mode.

(3) Electrical equipment in directly earthed neutral or other neutral earthed systems is to withstand the current due to a single phase fault against earth for the time necessary to trip the protection device.

(4) Means of disconnection are to be fitted in the neutral earthing connection of each generator so that the generator may be disconnected for maintenance and for insulation resistance measurement.

(5) In the subdivided busbar arrangement, connection of the neutral to the hull is to be provided for each section of the electrical distribution system.

(6) In low impedance neutral earthed systems or direct neutral earthed systems, provisions are to be made to automatically disconnect any faulty circuits. High impedance neutral earthed systems, in cases where outgoing feeders are not isolated in the case of earth faults, are to be capable of withstanding transitional over voltages caused by earth faults.

~~**4** In the case of three-wire neutral earthed systems, it is to be assured that at least one source neutral to ground connection is available whenever such systems are in energized modes.~~

~~**5**~~**4** All earthing resistors are to be connected to the hull. Earthing methods are to be considered in order to eliminate any possible interference with radio, radar and communication circuits.

2.17.3 Construction and Location*

1 High voltage electrical equipment is to be manufactured in accordance with standards deemed appropriate by the Society, whose ambient temperature may be subject to consideration by the Table **H1.1** when necessary, and to comply with the requirements in this **2.17.3**.

2 High voltage electrical equipment is to be protected so that the operators are not accidentally able to come in contact with the live parts of the equipment.

3 Where equipment is not contained in an enclosure but a room forms the enclosure of the equipment, the access doors are to be so interlocked that they cannot be opened until the supply is isolated and the equipment earthed down.

~~**3**~~**4** High voltage electrical equipment or entrances to key-locked spaces in which the equipment are installed are to be marked in an easily visible place so as to identify them as high voltage electrical installations.

~~**4**~~**5** High voltage electrical equipment ~~is to be of construction to facilitate leading of cables, preparation of cable ends, and connection of cables, and also to prevent any accidental contact between high and low voltage circuits.~~ is not to be installed in the same enclosure as low voltage equipment, unless segregation or other suitable measures are taken to ensure that access to low voltage equipment is obtained without danger.

~~**5**~~**6** In the case of rotating machines, transformers and reactors, effective means are to be provided to prevent the accumulation of moisture and condensation within such machines especially in cases where they are idle for appreciable periods.

~~**6** In cases where generators are run with neutrals interconnected, such generators are to be suitably designed to avoid any excessive circulating currents.~~

~~**7** In the case of generators used in three-wire neutral earthed systems, means to disconnect are to be fitted in neutral earthing connections of each generator so that the generator may be disconnected for maintenance and for insulation resistance measurements.~~

~~8~~7 To ensure safety of operation, a passageway that has a width of at least 1 *m* is to be arranged in front of each high voltage switchboard. Where access to the rear of a switchboard is needed for purposes of operation or maintenance, a passageway of sufficient width allowing such access is to be provided.

~~9~~8 For generators with cooling systems that use auxiliary power, interlocks are to be provided. These interlocks are to disconnect the generator for all other systems in either of the following cases:

(1) In cases where the auxiliary power fails.

(2) In cases where temperature detectors, which sound an alarm when the generator stator windings reach their maximum rated temperature, indicate a temperature of 110 % of the maximum rated temperature.

9 High voltage generator stator windings are to have all phase ends brought out for the installation of the differential protection.

10 Rotating machines are to be provided with temperature detectors in their stator windings to actuate visual and audible alarms in normally attended positions whenever temperatures exceed their permissible limits.

11 In cases where rotating machines are provided with water-air heat exchangers, they are to be double tube types. Visual and audible alarms in normally attended positions are to be given to monitor cooling water leakage.

~~**12 Higher voltage terminals are never to be combined with lower voltage terminals in the same box, unless measures are taken to ensure that access to lower voltage terminals can be obtained without danger.**~~

1~~3~~2 The degree of protection applying to enclosures of high voltage electrical equipment ~~are to be deemed appropriate by the Society.~~ is to be provided with a degree of protection appropriate to the location, as a minimum the requirements of *IEC* 60092-201. Particularly rotating machines, transformers, high voltage switchboards, high voltage control boards and converters are to comply with the following:

(1) The degree of protection for the enclosures of rotating machines is to be at least IP43 and the degrees of protection for the terminals of them are to be at least IP44. However, in the case of rotating machines installed in key locked spaces, the degrees of protection for their enclosures may be IP23.

(2) The degree of protection for the enclosures of transformers is to be at least IP43. However, in the case of transformers installed in key locked spaces, the degrees of protection for their enclosures may be IP23. And, in case where transformers are installed in switch boards, protection of such enclosures may be dispensed with.

(3) The degree of protection for the enclosures of high voltage switchboards, high voltage control boards and static convertors is to be at least IP42. However, in case of high voltage switchboards, high voltage control boards and static convertors installed in key-locked spaces, a degree of protection of IP32 may be acceptable.

1~~4~~3 High voltage switchboards and high voltage control boards are to be of an enclosed type and the high voltage sections are to be equipped with doors that are either locked by key or some other equivalent means.

1~~5~~4 Earthing conductors are to be provided for high voltage electrical equipment. These conductors are to be properly connected to the earthing system of the equipment and satisfy the following:

(1) be made of copper.

(2) the cross-section area is to be at least 35 mm^2.

(3) the current density does not exceed 150 A/mm^2 when an earth fault occurs.

1~~6~~5 High voltage switchboards are to comply with the requirements given in **2.5.3-1** and **2.5.3-2**

of this chapter regardless of whether power is being fed to the propulsion system. ~~In such cases, for neutral earthed systems, means of earthing are to be provided for each section.~~ If two separate high voltage switchboards are provided and interconnected by cables, circuit breakers are to be provided at each end of such cables.

1~~7~~6 Each high voltage circuit in high voltage switch boards and control boards is to be fitted with means of earthing and short-circuiting for safe maintenance work. An adequate number of portable earthing and short-circuiting devices may be used as an alternative method.

1~~8~~7 In high voltage switchboards and control boards, an adequate separation is to be provided between lower voltage circuits and higher voltage circuits, in order to prevent the operators from touching the live parts of higher voltage circuits accidentally.

1~~9~~8 Circuit-breakers are to be withdrawable types or their equivalent provided with means or arrangements for permitting safe maintenance while the busbars are live.

~~20~~19 Withdrawable circuit breakers and switches are to be provided with mechanical locking facilities at both in-service and withdrawn positions. For safe maintenance, withdrawable circuit breakers, switches and fixed disconnectors are to be capable of being locked by key or some other equivalent means.

2~~1~~0 Fixed contacts of withdrawable circuit breakers and switches are to be arranged so that live contacts are automatically covered at withdrawn positions by shutters. Shutters are to be clearly marked using colours or labels to indicate whether they are for incoming and outgoing circuits.

2~~2~~1 If electrical energy or physical energy is required for the operation of circuit breakers, switches and the like, a store supply of such energy is to be provided for at least two operations of all the components. If stored electrical energy sources are necessary for the tripping due to overload~~,~~ or short-circuit, ~~or~~and under-voltage, alarms which activate upon any discontinuity in release circuits and power supply failures are to be provided.

2~~3~~2 ~~The air clearances (phase-to-phase, pole-to-pole and phase-to-earth) of the non-insulated busbars of high voltage switchboards and control boards, and the air clearances of high voltage control equipment~~ 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 H2.16**. In **Table H2.16**, intermediate values may be accepted for nominal voltages provided that the next higher air clearance is observed. ~~When difficulty arises in meeting the above requirements, the measures deemed appropriate by the Society are to be adopted.~~ 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.

24~~3~~ ~~The air clearances of high voltage electrical equipment other than the equipment specified in -23 and the~~ eCreepage distances ~~of all high voltage electrical equipment are not to be less than the values deemed appropriate by the Society~~ between live parts and between live parts and earthed metal parts are to be in accordance with *IEC* 60092-503 for the nominal voltage of the system, the nature of the insulation material and the transient overvoltage developed by switch and fault conditions.

2~~5~~4 Control circuits are to be separated from main circuits by partitions insulated with flame-retardant material.

2~~6~~5 The secondary winding of current and voltage transformers for control circuits is to be earthed. In this case, the earthing conductor is to be of copper and have a minimum cross-section area of 4 mm^2.

2~~7~~6 For forced-ventilated transformers, the running condition of the ventilators and the temperature of the cooling air are to be monitored.

2~~8~~7 For transformers using a heat exchanger equipped with a closed circuit cooling method, the temperature sensors are to be provided so as to monitor the cooling air temperature. Transformers, particularly those employing a water forced-cooled system, are also to be provided with leakage

monitoring devices and fitted so that leakage-water and condensed moisture are kept away from the transformer windings.

2~~9~~8 High voltage switchboards and control boards are to be internal arc classified in accordance with *IEC* 62271-200. In cases where they are accessible by authorized personnel only, *Accessibility Type A* is sufficient. *Accessibility Type B* is required if they are accessible by non-authorized personnel.

~~30~~29 The installation and location of high voltage switchboards and control boards, including their clearance to the ceiling (deckhead), are to correspond with its internal arc classification and classified sides (front, lateral and rear).

30 When external source of supply is necessary for auxiliary circuits, at least two external sources of supply are to be provided and so arranged that a failure or loss of one source will not cause the loss of more than one generator set and/or set of essential services. Where necessary one source of supply is to be from the emergency source of electrical power for the start up from dead ship condition.

Table H2.16 Minimum Air Clearances

~~Rated voltage (*V*)~~	Non-insulated busbars (*mm*)	~~High voltage control equipment (*mm*)~~
~~above 1,000 and 3,600 or below~~	55	30
~~above 3,600 and 7,200 or below~~	~~90~~	60
~~above 7,200 and 12,000 or below~~	120	100
~~above 12,000~~	160	--

Nominal voltage (*V*)	Minimum air clearances (*mm*)
3,000 (3,300)	55
6,000 (6,600)	90
10,000 (11,000)	120
15,000	160

2.17.4 Protective Devices, etc.*

1 Fuses are not to be used for overload protection.

2 ~~In order to protect a generator from any internal malfunctions and from any electrical failures between the generator and its circuit breakers, differential protection relays are to be provided.~~ Protective devices, such as differential protection relays, are to be provided against phase-to-phase faults in the cables connecting the generators to the main switchboard and against interwinding faults within the generators. The protective devices are to trip the generator circuit breaker and to automatically de-excite the generator. In distribution systems with a neutral earthed, phase to earth faults are also to be treated as above.

~~**3** Excitation systems of generators are to be designed so that faulty generators can be de-excited automatically.~~

4~~3~~ In order to prevent any problems of over voltage, protective devices are to be provided for the temperature sensor circuits of the windings that are fitted to rotating machines.

5~~4~~ Circuit-breakers are generally to be used for short-circuit protection at primary sides of transformers.

6~~5~~ In cases where transformers are arranged in parallel, any tripping of those protective devices at their primary sides is to be automatically followed by the tripping of those switches connected at their secondary sides.

7~~6~~ Dry type transformers are to comply with *IEC* 60076-11, while liquid cooled transformers are to comply with *IEC* 60076. Oil immersed transformers are to be provided with the following alarms and safety devices.

(1) Alarms for low oil level and high oil temperature

(2) Stopping or load reducing devices for low oil level and high oil temperature
(3) Stopping devices for high gas pressure

~~8~~7 In cases where single consumers, such as bow thrusters or others, are supplied directly at higher voltages via step-up transformers, transformers may be protected at their lower-voltage sides.

~~9~~8 ~~Protective measures are to be taken to prevent any problems of short circuit in both the primary and secondary sides of voltage transformers used for control circuits. However, these protective measures may be omitted in cases where any power loss causes a critical condition in any related system.~~ Voltage transformers for control and instrumentation are to be provided with overload and short circuit protection on the secondary side.

~~10~~9 Low voltage circuits fed through step-down transformers from high voltage circuits are to be protected so that there is no chance of any overlapping between the high voltage and low voltage circuits. The protection may be achieved by any of the following means:

(1) direct earthing of the low voltage circuits;
(2) appropriate neutral voltage limiter; or
(3) earthed screen between the primary and secondary windings of transformers.

1~~1~~0 Devices capable of indicating any earth faults in systems by means of visual and audible alarms are to be provided.

~~12~~ ~~In low impedance neutral earthed systems or direct neutral earthed systems, provisions are to be made to automatically disconnect any faulty circuits. High impedance neutral earthed systems, in cases where outgoing feeders are not isolated in the case of earth faults, are to be capable of withstanding transitional over voltages caused by earth faults.~~

2.17.5 Cables

~~1~~ ~~High voltage cables are to have metallic sheaths or metallic armour. In cases where high voltage cables having neither metallic sheaths nor metallic armour are used, they are to be protected by metallic ducts or pipes or electrically conductive non-metallic ones complying with the requirements specified in **2.9.14-3(4)** throughout their entire length. These ducts or pipes are to be ensured of their electrical continuity with earthings.~~

~~2~~ ~~High voltage cables associated with different voltages are not to be run in the same ducts or pipes. These cables may be run on the same trays if they are fixed by individual clips and isolated from each other at distances of at least the air clearances of those non-insulated busbars (for the higher voltage cable) given in the **Table H2.16**.~~

~~3~~ ~~High voltage cables are to be installed as far apart as possible from lower voltage cables and such cables are be laid in places not liable to suffer from mechanical damage. These cables are not to be run on or in the same trays, ducts or pipes.~~

~~4~~ ~~In cases where practicable, high voltage cables are not to be run through accommodation spaces. In cases where it is necessary to run these accommodation spaces, they are to be installed for their entire length in enclosed cable pipes.~~

~~5~~ ~~The terminal ends of high voltage cables and the connecting parts for high voltage cables are to be made of materials that will not negatively impact the overall integrity of the cable as well as be sufficiently protected by insulation in order to prevent, as much as is practically possible, any electrical accidents.~~

~~6~~ ~~When the conductors inside of a terminal box are not insulated, sufficiently insulated shields are to be provided to ensure proper phase-to-phase and phase-to-earth separation.~~

1 High voltage cables are to be constructed in accordance with the *IEC* 60092-353 and *IEC* 60092-354 or other equivalent Standard.

2 In cases where practicable, high voltage cables are not to be run through accommodation spaces. In cases where it is necessary to run these though accommodation spaces, they are to be installed for their entire length in enclosed cable pipes.

3 The segregation of high voltage cables is to be as follows:

(1) High voltage cables are to be segregated from cables operating at different voltage ratings each other; in particular, they are not to be run in the same cable bunch, nor in the same ducts or pipes, or, in the same box.
(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 H2.16**. However, high voltage cables are not to be installed on the same cable tray for the low voltage cables.

4 High voltage cables are to have metallic sheaths or metallic armour. In cases where high voltage cables having neither metallic sheaths nor metallic armour are used, they are to be protected by metallic ducts or pipes or electrically conductive non-metallic ones complying with the requirements specified in **2.9.14-3(4)** throughout their entire length. These ducts or pipes are to be ensured of their electrical continuity with earthings.

5 Terminations of high voltage cables are to be as follows:
(1) Terminations in all conductors of high voltage cables are to be, as far as practicable, effectively covered with suitable insulating material.
(2) In terminal boxes, if conductors are not insulated, phases are to be separated from earth and from each other by substantial barriers of suitable insulating materials.
(3) High voltage cables of the radial field type, i.e. having a conductive layer to control the electric field within the insulation, are to have terminations which provide electric stress control.
(4) Terminations are to be of a type compatible with the insulation and jacket material of the cable and are to be provided with means to ground all metallic shielding components (i.e. tapes, wires etc.).

~~7~~**6** High voltage cables are to be appropriately marked or color-coded to ensure easy identification.

2.17.6 Testing*

1 High voltage electrical equipment and high voltage cables are to be tested in accordance with all applicable requirements of ~~**Part H of the Rules**~~ this Part. High voltage test, however, is also to comply with the following requirements in this **2.17.6**.

2 Internal arc fault tests on high voltage switchboards and control boards, in accordance with the standards deemed appropriate by the Society, are to be carried out at the place of manufacturer, etc. However, the subsequent testing of identical units of the same series may be omitted subject to the approval of the Society.

3 A power-frequency voltage test is to be carried out on any high voltage switchboards and high voltage control boards. The test procedure and voltages are to be according to the *IEC* 62271-200 section 7 / routine test.

4 In addition to the tests normally required for rotating machinery, a high frequency high voltage test in accordance with *IEC* 60034-15 is to be carried out on the individual coils in order to demonstrate a satisfactory withstand level of the inter-turn insulation to steep fronted switching surges.

~~3~~**5** The following high voltage tests on high voltage electrical equipment and cables are to be carried out at the place of manufacturer, etc.:
(1) Test voltages for high voltage switchboards and high voltage control boards of the following values.
Rated voltages above 1,000 *V* and 3,600 *V* or below: 10,000 *V*
Rated voltages above 3,600 *V* and 7,200 *V* or below: 20,000 *V*
Rated voltages above 7,200 *V* and 12,000 *V* or below: 28,000 *V*
Rated voltages above 12,000 *V*: 38,000 *V*
(2) Test voltages for high voltage transformers of the following values.

Maximum voltages above 1,000 *V* and 1,100 *V* or below: 3,000 *V*
Maximum voltages above 1,100 *V* and 3,600 *V* or below: 10,000 *V*
Maximum voltages above 3,600 *V* and 7,200 *V* or below: 20,000 *V*
Maximum voltages above 7,200 *V* and 12,000 *V* or below: 28,000 *V*
Maximum voltages above 12,000 *V*: 38,000 *V*

~~(3) At least five impulses are to be applied to the stator coils for high voltage rotating machines. The peak value of the test voltage is $\sqrt{6}$ *times* the rated voltage.~~

(~~4~~3) Test voltages for high voltage cables of the following values.
Rated voltages above 1,000 *V* and 3,600 *V* or below: 6,500 *V*
Rated voltages above 3,600 *V* and 7,200 *V* or below: 12,500 *V*
Rated voltages above 7,200 *V* and 12,000 *V* or below: 21,000 *V*
Rated voltages above 12,000 *V*: 30,500 *V*

~~4~~6 High voltage cables, after installation on board, are to be confirmed as having no abnormalities by testing them with the voltage in direct current (*d.c.*) equal to 4 *times* the rated voltage U_0 for a period of 15 *minutes*. However, in the case of cables with a rated voltage U_0/U above 1.8/3 *kV* (U_m=3.6 *kV*), alternative testing procedures specified in **(1)** or **(2)**, in lieu of that specified above, may be accepted ~~by the Society~~. Insulation resistance is to be measured before and after testing so as to confirm there are no abnormalities.

In such cases, U_0, U and U_m means as follows:

U_0 : The rated power-frequency voltage between the phase conductor and the ground or metallic screen for which the cable is designed

U : The rated power-frequency voltage between phase conductors for which the cable is designed

U_m: The maximum value of the "highest system voltage" for which the equipment may be used

(1) Testing the supply voltage in alternating current (*a.c.*) between the conductors and the shields for 5 *minutes*.

(2) Testing the supply voltage in alternating current (*a.c.*) for 24 *hours*.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2020.

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 1-2

Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

2.4 Rotating Machines

Paragraphs 2.4.1 and 2.4.2 have been amended as follows.

2.4.1 Prime Movers for Generators

Prime movers for generators are to be constructed in accordance with the requirements given in **Part D** ~~and, in addition, their governors are to be in accordance with the requirements given in **2.4.2**~~.

2.4.2 Characteristics of Governors

Characteristics of governors for prime movers driving generators are to comply with the requirements specified in **2.4.1-5, PartD**.

~~**1** The characteristics of governors on prime movers for main generators are that such governors be capable of maintaining speeds within the following limits:~~

~~(1) Momentary speed variations are, in principle, to be 10% or less of the maximum rated speed when the rated loads of generators are suddenly thrown off. However, in cases where it is difficult to meet the above requirements, the characteristics of such governors may be acceptable in the following cases.~~

~~(a) In cases where momentary variations are 10% or less of the rated speed when the maximum load on board is suddenly thrown off and the speed is returned to within 1% of the final steady speed in not more than 5 *seconds*, momentary variations in excess of 10% of rated speeds may be acceptable in cases where rated loads of such generators are suddenly thrown off.~~

~~(b) The momentary variations given in **(a)** above, in cases where rated loads of generator are suddenly thrown off are less than any adjusted values of the intervention of overspeed devices as required by **2.4.1-4, Part D**.~~

~~(2) Momentary speed variations are, in principle, to be 10% or less of the maximum rated speed when 50% of the rated loads of generators are suddenly thrown on followed by the remaining 50% of such loads suddenly being thrown on after an interval to restore the steady state. Speeds are to return to within 1% of final steady speeds in not more than 5 *seconds*. In cases where it is difficult to meet the above requirements or in cases where certain installations require different characteristics and the prime movers have mean effective pressures of 1.35 *MPa* or more, the following methods of throwing in steps may be acceptable:~~

~~Total throw-on loads at the 1st power stage (%) = $80/P_{me}$~~
~~Total throw-on loads at the 2nd power stage (%) = $135/P_{me}$~~
~~Total throw-on loads at the 3rd power stage (%) = $180/P_{me}$~~
~~Total throw-on loads at the 4th power stage (%) = $225/P_{me}$~~
~~Total throw-on loads at the 5th power stage (%) = $270/P_{me}$~~
~~Total throw-on loads at the 6th power stage (%) = 100~~
~~P_{me}: Declared power mean effective pressure (*MPa*)~~

~~However, in cases where the above throwing on methods apply, manufacturers or shipyards are requested to submit throw-on power calculation sheets to the Society for approval, and such sheets are to demonstrate that the throw-on loads and base loads at each step of the operation do not exceed those values determined by the formulae above under any of the **(a)** to **(d)** circumstances given below;~~

~~(a) at times of power restoration after blackout,~~

(b) at times of sequential starting,

(c) at times of starting with large start-up loads, or

(d) at times of instantaneous load transfers in cases where one set of generators fails (during parallel running).

(3) At all loads in ranges between no loads and rated loads, any permanent speed variations are to be within ± 5% of the maximum rated speed.

2 The characteristics of governors on prime movers driving emergency generators are that such governors be capable of maintaining speeds with the following limits:

(1) Momentary speed variations are not to exceed those values specified in **-1(1)** in cases where total emergency consumer loads are suddenly thrown off.

(2) Momentary speed variations are, in principle, not to exceed those values specified in **-1(2)** and speeds are to return to within 1% of final steady speeds in not more than 5 *seconds* in cases where total emergency consumer loads are suddenly thrown on. However, if it is difficult to meet the above requirements and in cases where the following **(a)** through **(c)** requirements are to be adopted, and a method of throwing-in-steps may be used.

(a) Total emergency consumer loads are to be thrown on within 45 *seconds* after blackout.

(b) Prime movers are to be designed so that the maximum step loads in emergency consumer loads are to be thrown on at one time.

(c) Documents, such as thrown power calculations, declaring the adoption of throwing-on in steps, are to be submitted.

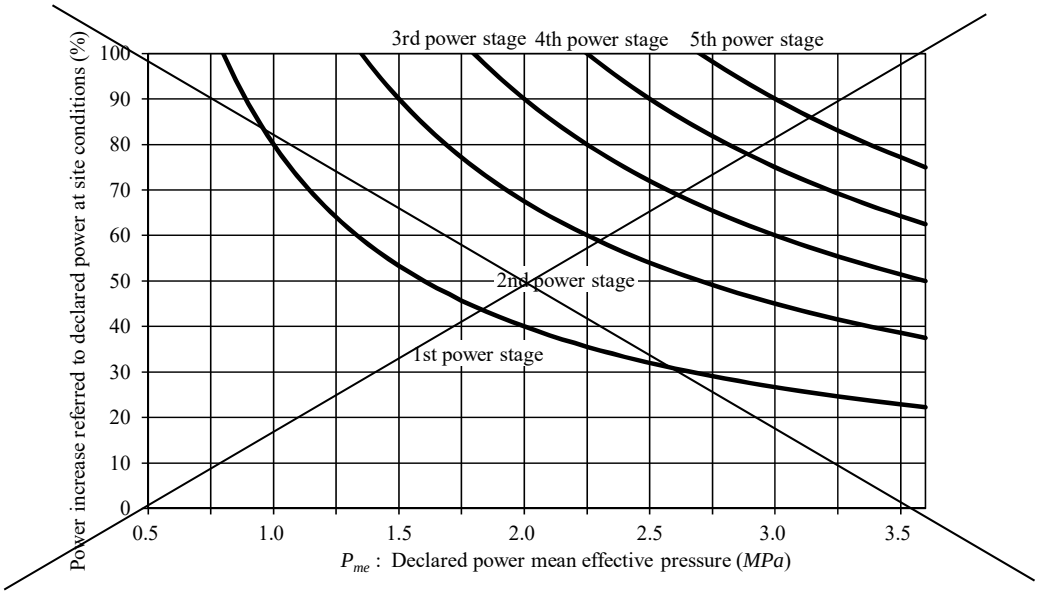
(3) At all loads in ranges between no loads and total emergency consumer loads, any permanent speed variations are not to exceed those values specified in **-1(3)**.

3 In the case of *a.c.* generating sets operating in parallel, the governor characteristics of prime movers are to be such that the load sharing specified in **2.4.14-4** and **-5** is ensured, and facilities are to be provided to adjust the governor sufficiently enough to permit adjustments of loads not exceeding 5 % of rated loads at normal frequencies.

4 In cases where turbine-driven *d.c.* generators are arranged to run in parallel with other generators, switches are to be fitted on each turbine emergency governor in order to open generator circuit breakers when emergency governors come into function.

Fig. H2.1 has been deleted.

~~Fig. H2.1 — Reference values for maximum possible sudden power increases as a function of brake mean effective pressure (P_{me}) at declared power (four-stroke diesel engines)~~



EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 June 2020.

2. Notwithstanding the amendments to the Rules, the current requirements apply to governors for which the application for approval is submitted to the Society before the effective date.

Amendment 1-3

Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

2.4 Rotating Machines

Paragraph 2.4.1 has been amended as follows.

2.4.1 Prime Movers ~~for~~ Driving Generators

Prime movers ~~for~~ driving generators are to be constructed in accordance with the requirements given in **Part D** and, in addition, their governors are to be in accordance with the requirements given in **2.4.2**.

2.4.11 Shafts of Rotating Machine*

Sub-paragraph -4(3) has been amended as follows.

4 The shafts of generators are to comply with the following requirements:

(1) The diameters of generator shafts, in the length from those sections in cases where rotors are fixed to the shaft ends of prime movers, are not to be less than those values obtained from the formula specified in **6.2.2, Part D**.

In such cases, the values H, N_0 and F_1 used in that formula mean as follows:

H : Output of rotating machines at maximum continuous rating (kW)

N_0 : Number of revolutions of rotating machine shaft at maximum continuous rating (rpm)

F_1: Factor given in **Table H2.3**

However, in cases where bearings are arranged on both sides of generators, the diameter of shafts around those couplings on prime movers may be reduced gradually to 0.93 times those diameters obtained from the aforementioned formula.

((2) is omitted.)

(3) In case where generators are driven by ~~diesel~~ reciprocating internal combustion engines, tortional vibrations of shafting~~s~~ are to comply with those relevant requirements given in **Chapter 8, Part D**.

Table H2.3 has been amended as follows.

Table H2.3 Values of F_1

Bearing arrangements of rotating machines	Generators driven by steam or gas turbines, as well as those generators driven by ~~diesel~~ reciprocating internal combustion engines through slip type couplings (Note)	Generator driven ~~diesel~~ by reciprocating internal combustion engines other than those mentioned in the left-hand column
In cases where bearings are arranged at both sides of rotating machines	110	115
In cases where no bearings are arranged at prime movers or load sides of rotating machines	120	125

Note: Slip type couplings in this case refer to hydraulic couplings, electro-magnetic couplings or their equivalent.

2.9 Cables

2.9.11 Precaution against Fire*

Sub-paragraph -5 has been amended as follows.

5 Interconnecting cables between generators and main switchboards are to be routed clear of fuel oil purifier spaces, above other ~~generator~~ engines driving generators and fuel oil purifiers except in any of the following **(1)** to **(3)**:
((1) to (3) are omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2020.
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 1-4

Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

2.4 Rotating Machines

2.4.14 *A.C.* Generators

Sub-paragraph -6 has been added as follows.

6 Rating plates which comply with the requirements in **1.3.10 of Part D** are to be installed on *A.C.* generating sets; in this context, "generating sets" means those systems which are composed of alternators, reciprocating internal combustion engines, couplings, etc.

EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

1. The effective date of the amendments is 1 July 2020.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to *A.C.* generating sets whose applications for approval are submitted to the Society before the effective date installed on 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

Chapter 3 DESIGN OF INSTALLATIONS

Section 3.5 has been amended as follows.

3.5 Steering Gear, Waterjet Propulsion Systems, Azimuth Thrusters, etc.

3.5.1 ~~General~~ Steering Gear
See **Chapter 15, Part D**.

3.5.2 Waterjet Propulsion Systems
See **Chapter 19, Part D**.

3.5.3 Azimuth Thrusters
See **Chapter 20, Part D**.

3.5.4 Selective Catalytic Reduction Systems and Associated Equipment
See **Chapter 21, Part D**.

3.5.5 Exhaust Gas Cleaning Systems and Associated Equipment
See **Chapter 22, Part D**.

3.5.6 Exhaust Gas Recirculation Systems and Associated Equipment
See **Chapter 23, Part D**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-5)

1. The effective date of the amendments is 1 July 2020.

2. Notwithstanding the amendments to the Rules, the current requirements apply to waterjet propulsion systems, azimuth thrusters, SCR systems, EGCS or EGR systems whose applications for approval are submitted to the Society before the effective date installed on ships for which the date of contract for construction is before the effective date.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part H Electrical Installations

2020 AMENDMENT NO.1

Notice No.26 30 June 2020

Resolved by Technical Committee on 22 January 2020

Notice No.26 30 June 2020
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

H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

H2.12 Semiconductor Converters for Power

Paragraph H2.12.5 has been deleted.

~~**H2.12.5 Shop Tests**~~
~~**1** Regarding the temperature rise tests for semiconductor element connections mentioned in **2.12.5-2, Part H of the Rules**, measurements of the temperature rise of individual element parts such as cooling fins, cases and coolant parts, etc. may be accepted. However, such temperature rise tests may be preformed on the aforementioned element parts only in cases where manufactures 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 **2.12.5-3, Part H 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.~~

Section H2.17 has been amended as follows.

H2.17 High Voltage Electrical Installation

~~**H2.17.2 Distribution**~~
~~The expressions "High-impedance" and "Low-impedance" in **2.17.2-1(2)(a)** and **(b), Part H of the Rules**, refer to the value of the earthing factor derived from the following formula. Earthing factors greater than or equal to 0.8 are considered to be "High-impedance". Those lower than 0.8 are considered to be "Low-impedance".~~

~~$$\text{earthing factor} = \frac{\text{phase to earth voltage}}{\text{phase to phase voltage}}$$~~

H2.17.3 Construction and Location

1 The wording "standards deemed appropriate by the Society" in **2.17.3-1, Part H of the Rules** means the current standards of the *International Electrotechnical Commission* (*IEC*) listed below or any equivalent thereto.

(1) Transformers
IEC 60076 *Power transformers*

(2) Switchboards and control boards
IEC 62271-1 *High-voltage switchgear and controlgear - Part 1: Common specifications*

IEC 62271-200 *High-voltage switchgear and controlgear - Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*
IEC 62271-201 *High-voltage switchgear and controlgear - Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

(3) High voltage circuit breakers
IEC 62271-100 *High-voltage switchgear and controlgear - Part 1: High-voltage alternating current circuit breakers*

(4) High voltage fuses
IEC 60282-1 *High-voltage fuses - Part 1: Current limiting fuses, - Part 2: Expulsion fuses*

(5) High voltage switches
IEC 62271-103 *High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV*

(6) High voltage *a.c.* contactors
IEC 62271-106 *High-voltage switchgear and controlgear - Part 106: Alternating current contactors, contactor-based controllers and motor-starters*

(7) Current transformers and voltage transformers
IEC 61869-1 *Instrument transformers - Part 1: General requirements*

~~**2** The wording "suitably designed to avoid any excessive circulating currents" in **2.17.3-6, Part H of the Rules** means that generators in which the third harmonic content of waveforms does not exceed 5 % may be considered adequate.~~

~~**3**~~**2** The phrase "sufficient width allowing such access" in **2.17.3-~~8~~7, Part H of the Rules** means, in principle, a width of at least 1 *m*. However, in cases where operation and maintenance can be properly preformed, the width of the passageway may be reduced as long as it is greater or equal to 0.5 *m*.

~~**4** The phrase "to be deemed appropriate by the Society" in **2.17.3-13, Part H of the Rules** means that, in addition to the requirements in **H2.1.3-4**, the following are also to be complied with:~~

~~(1) The degree of protection for the enclosures of rotating machines is to be at least IP43 and the degrees of protection for the terminals of them are to be at least IP44. However, in the case of rotating machines installed in key-locked spaces, the degrees of protection for their enclosures may be IP23.~~

~~(2) The degree of protection for the enclosures of transformers is to be at least IP43. However, in the case of transformers installed in key-locked spaces, the degrees of protection for their enclosures may be IP23. And, in case where transformers are installed in switch boards, protection of such enclosures may be dispensed with.~~

~~(3) The degree of protection for the enclosures of switchboards and control boards is to be at least IP42. However, in case of switchboards, control boards and their low voltage compartments installed in key-locked spaces, a degree of protection of IP32 may be acceptable.~~

~~**5** The clause "the measures deemed appropriate by the Society" in **2.17.3-23, Part H of the Rules** means that value for minimum air clearances may be reduced in cases where sufficient insulation performance has been confirmed by an impulse voltage test carried out according to paragraph 4.2 of *IEC* 62271-1.~~

~~**6** The clause "the values deemed appropriate by the Society" in **2.17.3-24, Part H of the Rules** refers to the values given in paragraph 4.5 of *IEC* 60092-503 (Ed.2).~~

3 In applying **2.17.3-22, Part H of the Rules**, refer to the values of the **Table H2.17.3-3** in cases where using intermediate values for minimum air clearances.

Table H2.17.3-3 Minimum Air Clearances

Nominal voltage (*V*)	Minimum air clearances (*mm*)
Exceeding 1,000 and 3,000 (3,300) or less	55
4,000	66.7
5,000	78.4
6,000 (6,600)	90
7,000	97.5
8,000	105
9,000	112.5
10,000 (11,000)	120
11,000	128
12,000	136
13,000	144
14,000	152
15,000	160

~~**H2.17.4 Protective Devices, etc.**~~

~~The phrase "be protected so that there is no chance of any overlapping between the high voltage and low voltage circuits" in **2.17.4-10**, **Part H of the Rules** refers to, but not confined, any of the following:~~

~~(1) A direct earthing of the low voltage circuits~~

~~(2) Installation of a neutral voltage limiter~~

~~(3) Installation of a grounded shield between the primary and secondary windings of a transformer~~

H2.17.6 Testing

~~**1**~~ The clause "the standards deemed appropriate by the Society" in **2.17.6-2, Part H of the Rules** refers to Appendix A of *IEC* 62271-200.

~~**2** The phrase "alternative testing procedures" in **2.17.6-4, Part H of the Rules** refers to either of the following:~~

~~(1) Testing the supply voltage in alternating current (*a.c.*) between the conductors and the shields for 5 *minutes*.~~

~~(2) Testing the supply voltage in alternating current (*a.c.*) for 24 *hours*.~~

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2020.

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 1-2

H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

H2.3 System Design - Protection

H2.3.5 Protection of Generators

Sub-paragraph -3 has been amended as follows.

3 Adjusting values of reverse power protection for the following are to be as specified as standard:
(1) ~~Turbine driven generators~~ Generators driven by turbines: 2 – 6 %
(2) ~~Diesel driven generators~~ Generators driven by reciprocating internal combustion engines: 6 – 15 %

H2.9 Cables

H2.9.15 Penetration of Bulkheads and Decks

Sub-paragraph -1 has been amended as follows.

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**

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2020.
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.