Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries

Object of Amendment

Rules for the Survey and Construction of Steel Ships Part H
Rules for High Speed Craft
Rules for the Survey and Construction of Inland Waterway Ships
Guidance for the Survey and Construction of Steel Ships Part H
Guidance for High Speed Craft
Guidance for the Survey and Construction of Inland Waterway Ships

Reason for Amendment

In recent years, computers have become increasingly used in control equipment installed on ships, and there is a growing trend to install Uninterruptible Power System (UPS) units to prevent data loss and damage to such computers due to power failure.

Although IACS Unified Requirement (UR) E21, which compiles requirements for UPS units, specifies requirements for their design, installation, and performance, its application is limited to UPS units used as alternative power supply or transitional power supply as defined in regulations 42 and 43 of SOLAS Chapter II-1. Therefore, IACS adopted IACS UR E21(Rev.2) in February 2024 to extend the UR's scope to UPS units used in computers for control equipment installed on ships and to specify some requirements in more detail.

In addition to above, the IACS discussed concerns regarding the adverse effects of temperature rise during normal operations of valve-regulated sealed type lead acid batteries used for starting emergency generators. As a result of this discussion, IACS adopted Recommendation (Rec.) No.179 in December 2023, to specify safety requirements for such batteries.

Accordingly, relevant requirements related to UPS units and valve-regulated sealed type lead acid batteries are amended in accordance with UR E21(Rev.2) and in reference to Rec.No.179 and other documents.

Additionally, references to international standards in Part H of the Rules for the Survey and Construction of Steel Ships are amended.

Outline of Amendment

(1) Amends the battery requirements specified in 2.11, Part H of the Rules for the Survey and Construction of Steel Ships so, those for valve-regulated sealed type lead acid batteries are separately specified from those for vented type batteries, and further clarifies which requirements are applicable to valve-regulated sealed type lead acid batteries.
(2) Clarifies requirements applicable to natural ventilation for battery compartments.
(3) Amends the scope of application of UPS requirements to include UPS units used for preventing power failure for control equipment.
(4) Aligns UPS requirements with the latest IEC standards.
(5) Specifies requirements for valve-regulated sealed type lead acid batteries used for

starting emergency generators.

(6) Amends references to international standards for semiconductor converters.

Effective Date and Application

(1) Annex 3.3.3(3), Part H of the Rules for the Survey and Construction of Steel Ships
This amendment applies to UPS units for which the application for approval is submitted to the Society on or after 1 July 2025 and UPS units installed in ships for which the date of contract for construction is on or after 1 July 2025.

(2) Amendments other than (1)
This amendment applies to vented type batteries, valve-regulated sealed type lead acid batteries and semiconductor converters installed in ships for which the date of contract for construction is on or after 1 July 2025.

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

ID:DD23-17

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS **Part H ELECTRICAL INSTALLATIONS** **Chapter 1 GENERAL** **1.1 General** **1.1.6 Drawings and Data*** The drawings and data to be submitted are as follows. In cases where the Society deems it to be necessary, the submission of drawings and data other than those specified below may be requested. ((1) is omitted.) (2) Data: ((a) to (f) are omitted.) (g) Lists of particulars for uninterruptible power system units subject to **Annex 3.3.3(3).** **1.1.8 Maintenance Records of Batteries*** **3** Where vented type batteries and valve-regulated sealed type lead acid batteries are used, it is to be ensured that the requirements specified in **2.11** are complied with. (Note) (1) A vented type battery is one in which the cells have a cover provided with an opening through which	**RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS** **Part H ELECTRICAL INSTALLATIONS** **Chapter 1 GENERAL** **1.1 General** **1.1.6 Drawings and Data*** The drawings and data to be submitted are as follows. In cases where the Society deems it to be necessary, the submission of drawings and data other than those specified below may be requested. ((1) is omitted.) (2) Data: ((a) to (f) are omitted.) (Newly added) **1.1.8 Maintenance Records of Batteries*** **3** Where vented type batteries replace valve-regulated sealed type batteries, it is to be ensured that the requirements specified in **2.11** are complied with. (Note) (1) A vented type battery is one in which the cells have a cover provided with an opening through which	In accordance with the amendment of Annex 3.3.3 (3), list of particulars for UPS units is added to the item of drawings and data. Unifying the description of “sealed type batteries” to “valve-regulated sealed type lead acid batteries”

Amended	Original	Remarks
products of electrolysis and evaporation are allowed to escape freely from the cells to atmosphere. (2) A valve-regulated sealed type lead acid battery is one in which cells are closed but have an arrangement (valve) which allows the escape of gas if the internal pressure exceeds a predetermined value. **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN** **2.11 Accumulator Batteries** **2.11.1 General*** **1** The requirements given in **2.11.2** apply to all permanently installed vented type batteries. The requirements specified in **2.11.3** apply to valve-regulated sealed type lead acid batteries. **2** Accumulator battery systems consisting of lithium-ion batteries with total capacities of 20 *kWh* or more and associated equipment are to be in accordance with **Annex 2.11.1-2**. **3** Any usage of types of batteries other than vented type	products of electrolysis and evaporation are allowed to escape freely from the cells to atmosphere. (2) A valve-regulated sealed type battery is one in which cells are closed but have an arrangement (valve) which allows the escape of gas if the internal pressure exceeds a predetermined value. **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN** **2.11 Accumulator Batteries** **2.11.1 General*** **1** The requirements given in this **2.11** apply to all permanently installed vented types of secondary batteries. However, the requirements specified in **2.11.5-4** are also applicable to valve-regulated sealed types of batteries. **2** Accumulator battery systems consisting of lithium-ion batteries with total capacities of 20 *kWh* or more and associated equipment are to be in accordance with **Annex 2.11.1-2**. **3** Any usage of types of secondary batteries other than	1 Clarifying the requirements which is applicable to vented type batteries and valve-regulated sealed type lead acid batteries. Thereafter, the description of "vented type of secondary battery" is changed to "vented type battery". (Aligning with 1.1.8-3, Part H of the Rules) 3 Clarifying that this

Amended	Original	Remarks
batteries, valve-regulated sealed type lead acid batteries and the batteries specified in **-2** above is required to be as deemed appropriate by the Society. **4** Accumulator batteries are to be able to suitably perform with respect to their intended service. **5** Where batteries are used for uninterruptible power system units subject to **Annex 3.3.3(3)**, such units are to comply with **Annex 3.3.3(3)**.	vented types of secondary batteries and the secondary batteries specified in **-2** above is required to be as deemed appropriate by the Society. **4** Accumulator batteries are to be able to suitably perform with respect to their intended service. (Newly added)	exemption also applies to valve-regulated sealed type lead acid batteries. Clarifying that UPS units with built-in batteries are also to comply with the Annex 3.3.3(3).
2.11.2 Vented Type Batteries*	**2.11.2 Construction**	2.11.2 specifies the requirements for vented type battery. In terms of content, the current requirements of the 2.11, Part H of the Rules are specified as they are. (except for (3)(f) and (4))
(1) Construction Cells of all batteries are to be constructed and secured so as to prevent any spilling of electrolytes due to ship motion as well as to prevent any emission of acid or alkaline spray.	Cells of all batteries are to be constructed and secured so as to prevent any spilling of electrolytes due to ship motion as well as to prevent any emission of acid or alkaline spray.	
(2) Location (a) (Omitted) (b) (Omitted) (c) (Omitted) (d) (Omitted)	**2.11.3 Location*** **1** (Omitted) **2** (Omitted) **3** (Omitted) **4** (Omitted)	
(3) Installation Procedures and Protection from	**2.11.4 Installation Procedures and Protection from Corrosion**	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
Corrosion (a) (Omitted) (b) (Omitted) (c) (Omitted) (d) (Omitted) (e) (Omitted) (f) Batteries are to be firmly secured to the ship by a method specified by the battery manufacturer so that they do not become unusable due to ship vibration or oscillation.	**1** (Omitted) **2** (Omitted) **3** (Omitted) **4** (Omitted) **5** (Omitted) (Newly added)	(f) Incorporate Chapter 4, 12(1) of "Guidelines for Large-capacity Storage Batteries" which is issued by NK. (Also applies to vented type.)
(4) Ventilation (a) (Omitted) (b) In cases where natural ventilation is employed, ventilation ducts are to be run directly from the top of battery compartments to the open air above, with no parts of the ducts at angles of more than 45° from vertical. If natural ventilation is impracticable, mechanical exhaust-ventilation is to be provided. (c) In cases where mechanical exhaust-ventilation is provided, electric motors for the ventilating fans are not to be placed inside any ducts. Ventilating fans are to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings.	**2.11.5 Ventilation*** **1** (Omitted) **2** In cases where natural ventilation is employed, ventilation ducts are to be run directly from the top of battery compartments to the open air above, with no parts of the ducts at angles of more than 45° from vertical. **3** If natural ventilation is impracticable, mechanical exhaust-ventilation is to be provided. Electric motors for the ventilating fans are not to be placed inside any ducts. Ventilating fans are to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings.	(b) to (d): The configuration of the rules was reviewed in order to clarify the treatment of natural ventilation and mechanical exhaust-ventilation.
(d) The ventilation arrangements for installation of vented type batteries which have charging power (outputs of charging facilities connected	**4** The ventilation arrangements for installation of vented type batteries which have charging power higher than 2 *kW* are to be such that the quantity of air expelled is at least	(d) The meaning of the "charging power" is clarified in accordance with specified in

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
to battery groups) higher than 2 kW are to be such that the quantity of air expelled is at least equal to: $Q = 110 \times I \times n\ (l/h)$ I: Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes n : Number of cells in series Q : Quantity of air expelled in litres/hour	equal to: $Q = 110 \times I \times n\ (l/h)$ I : Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes n : Number of cells in series Q : Quantity of air expelled in litres/hour	H2.11.3-2, Part H of the Guidance. In principle, this requirement applies, when ventilation is provided by mechanical exhaust-ventilation (See H2.11.2-2(3), Part H of the Guidance). For natural ventilation, see also H2.11.2-2(4), Part H of the Guidance.
(Deleted)	The ventilation rate for compartments containing valve-regulated sealed type batteries may be reduced to 25 % of that given above.	The requirements for valve-regulated sealed type lead acid batteries are deleted here because they are specified in 2.11.3.
(5) Electrical Equipment (a) (Omitted) (b) (Omitted) (c) (Omitted)	**2.11.6 Electrical Equipment*** **1** (Omitted) **2** (Omitted) **3** (Omitted)	
(6) Charging Facilities (a) (Omitted) (b) (Omitted)	**2.11.7 Charging Facilities** **1** (Omitted) **2** (Omitted)	
2.11.3 Valve-regulated Sealed Type Lead Acid Batteries*	**(Newly added)**	2.11.3 contains new requirements for valve-regulated sealed type lead acid batteries.
(1) Location (a) Large batteries are not , in principle, to be	(Newly added)	(a) 2.11.3-2, Part H of

Amended	Original	Remarks
installed on the deck. They may be installed in boxes on deck if adequately ventilated and provided with means to prevent any ingress of water.		the Rules applies mutatis mutandis.
(b) Engine starting batteries are to be located as close as practicable to those engines served. If such batteries cannot be accommodated in battery rooms, they are to be installed at places where adequate ventilation is ensured.		(b) 2.11.3-3, Part H of the Rules
(c) Batteries are not to be placed in living quarters.		(c) 2.11.3-4, Part H of the Rules
(2) Installation Procedures, etc.	(Newly added)	(a) 2.11.4-1, Part H of the Rules applies mutatis mutandis. (The requirement for replenishing of batteries is deleted.)
(a) Batteries are to be arranged to permit ready access for replacing, inspecting, testing and cleaning.		
(b) Batteries are to be firmly secured to the ship by a method specified by the battery manufacturer so that it does not become unusable because of vibration or oscillation of the ship.		(b) Incorporating 12(1), Chapter 4 of "Guidelines for Large-capacity Storage Batteries" which is issued by NK.
(c) In cases where several batteries are installed in the same compartment, sufficient space is to be provided between batteries to allow sufficient air circulation in order to prevent the temperature rise of the batteries.		(c) 3.3.2 of IACS Rec.179 applies mutatis mutandis. When several battery boxes containing batteries are installed, sufficient spacing is to be provided between the battery boxes.

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
(3) Ventilation (a) Battery compartments are to be adequately ventilated.	(Newly added)	(a) 2.11.5-1, Part H of the Rules applies mutatis mutandis. Since valve-regulated sealed type lead acid batteries may be placed in the engine room, it is technically difficult to install “independent ventilation systems”. Therefore, it is not applicable.
(b) Ventilation ducts are to be run from the battery compartments to the open air above. In such case, the inclination and other matters of the duct is to be taken into account during installation, and the air in the compartment is to be led to the outside. If natural ventilation is impracticable, mechanical exhaust-ventilation is to be provided.		(b) Since the possibility of the retention of the gas generated from valve-regulated sealed type lead acid batteries is less than that of the vented type, the inclination angle of the duct for natural ventilation of battery compartment can be flexibly corresponded.
(c) The ventilation arrangements for installation of valve-regulated sealed type lead acid batteries which have charging power (outputs of charging facilities connected to battery groups) higher than 2 kW are to be such that the quantity of air expelled is at least equal to 25 % of: $Q = 110 \times I \times n\ (l/h)$		(c) In principle, this requirement applies, when ventilation is provided by mechanical exhaust-ventilation (See H2.11.2-2(3), Part H of the Guidance). For natural ventilation,

Amended	Original	Remarks
I: Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes n : Number of cells in series Q : Quantity of air expelled in litres/hour		see also H2.11.2-2(4), Part H of the Guidance. Q for the compartment which is installed valve-regulated sealed type lead acid batteries is to be 25% or more of the Q at the compartment which is installed the vented type batteries.
(4) Charging Facilities	(Newly added)	
(a) Suitable charging facilities are to be provided. Battery charging facilities by means of *d.c.* generators and series resisters are to be provided with protection against any reversal of currents when charging voltages are at 20 % of line voltages or higher.		(a) 2.11.7-1, Part H of the Rules
(b) In the case of floating service or for any other conditions where loads are connected to batteries while they are charging, maximum battery voltages under any conditions of charging are not to exceed those safe values of any connected apparatus. Voltage regulators or other means of voltage control may be provided for this purpose.		(b) 2.11.7-2, Part H of the Rules
(c) For charging facilities of valve-regulated sealed type lead acid batteries used for starting batteries of emergency generators, when float charging is available, consideration is to be given to the temperature rise of the batteries during charging in accordance with manufacturer recommendations.		(c) 3.3.1 of IACS Rec.179 applies mutatis mutandis.

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
The effective date of the amendment is according to EFFECTIVE DATE AND APPLICATION (A)		

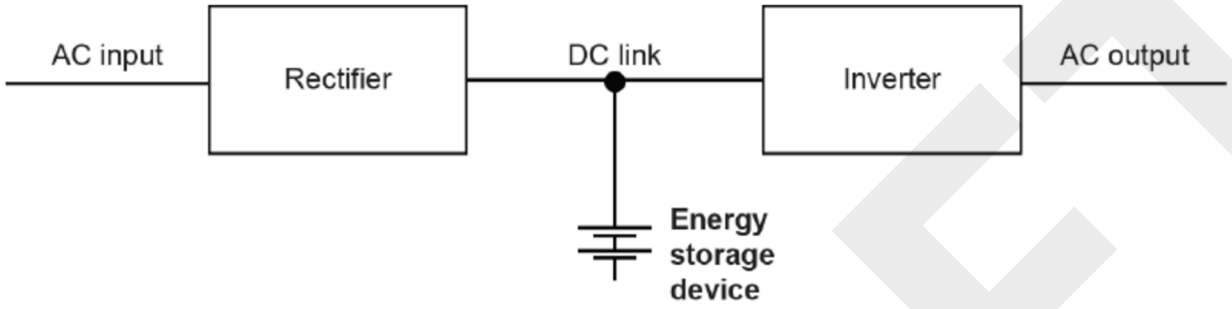
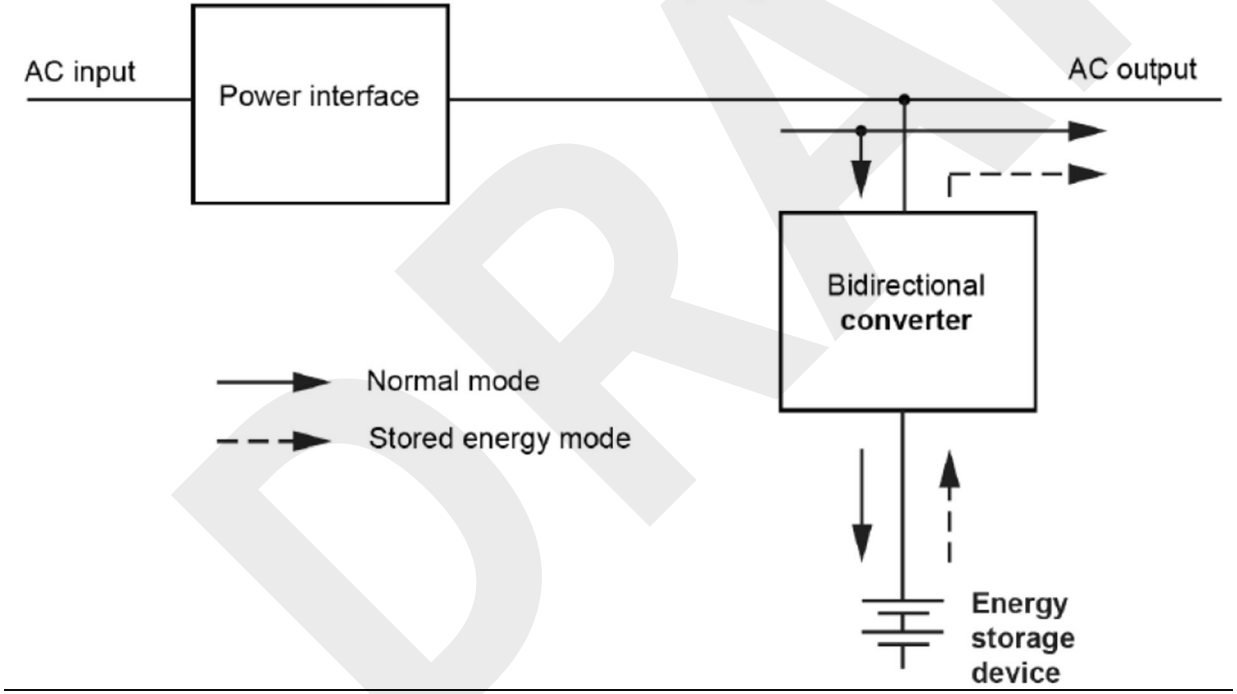
Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

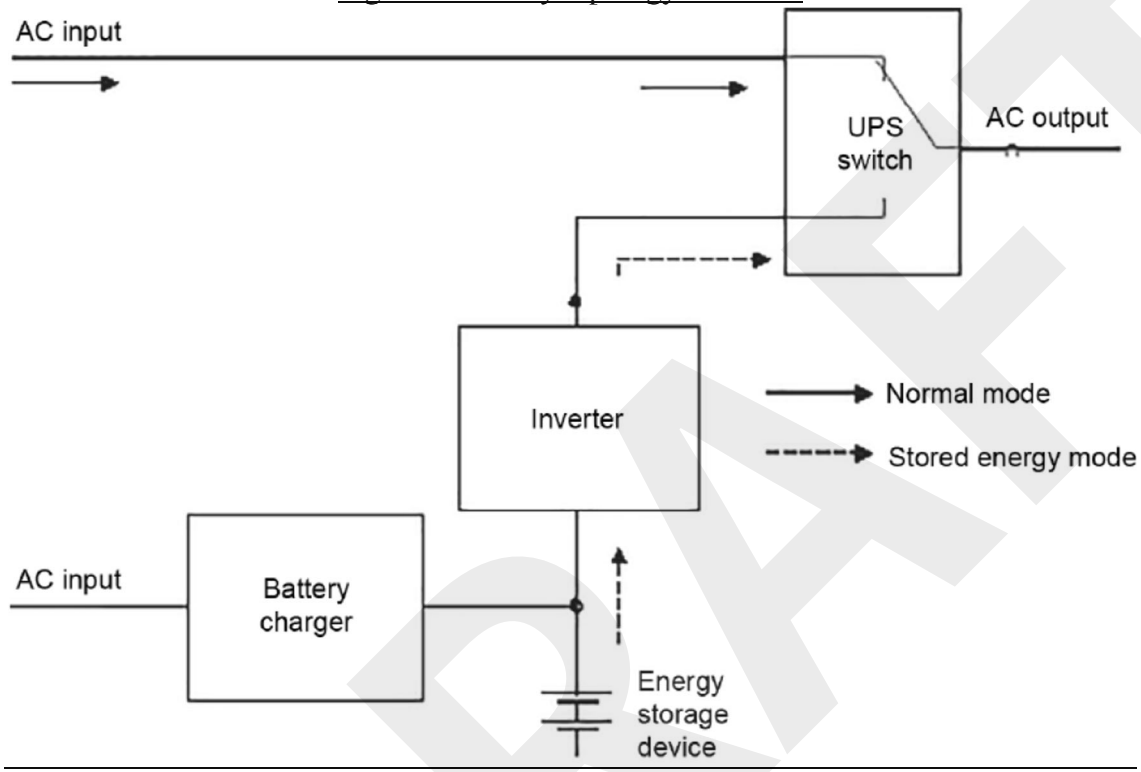
Amended	Original	Remarks
Annex 3.3.3(3) UNINTERRUPTIBLE POWER SYSTEM UNITS	**Annex 3.3.3(3) UNINTERRUPTIBLE POWER SYSTEM UNITS**	
1.1 General	**1.1 General**	
1.1.1 Application This annex applies when uninterruptible power system (hereinafter referred to as "UPS") units, as defined in *IEC* 62040-3:2021 as bellow, is installed. Any batteries and semiconductor converters combined with UPS units are to be in accordance with those requirements specified in **2.11** and **2.12, Part H** as practicable.	**1.1.1 Application** This annex to uninterruptible power system (hereinafter referred to as "UPS") units, as defined in *IEC* 62040-3:2011, apply when providing an alternative power supply or transitional power supply to the emergency sources of power specified in **3.3, Part H**. Any batteries and semiconductor converters combined with UPS units are to be in accordance with those requirements specified in **2.11** and **2.12, Part H** as practicable.	Incorporating 1.1 of UR E21(Rev.2).
(1) When installing UPS units as a continuous and uninterruptible power supply to prevent power failure of "those service necessary to provide normal operation conditions of propulsion and safety" as specified in **3.2.1-2, Part H**.	(Newly added)	
(2) When installing UPS units as a power supply specified in from **29.2.2-2** to **29.2.2-4, Part R**.	(Newly added)	
(3) When installing UPS units as an alternative power supply or transitional power supply to the emergency sources of power specified in **3.3, Part H**.	(Newly added)	
1.1.2 Definitions Definitions of the terms used in this annex are as follows:	**1.1.2 Definitions** Definitions of the terms used in this annex are as follows:	
(1) "UPS units" are sources of electrical power with semiconductor converters, switches and batteries, used for maintaining continuity of loads in cases of	(1) UPS means sources of electrical power with semiconductor converters, switches and batteries, used for maintaining continuity of loads in cases of	(1) to (7): Incorporating 2 of UR E21(Rev.2).

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
a.c. input power failure. (*IEC* 62040-3:2021)	input power failure.(*IEC* 62040-3:2011)	
(2) "Double conversion topology UPS units" are those units which comprise an *a.c.* to *d.c.* converter, generally a rectifier, and a *d.c.* to *a.c.* converter, generally an inverter. In normal mode of operation, the load is continuously supplied by the rectifier/inverter combination. When the *a.c.* input power is out of UPS pre-set tolerances, the UPS enters stored energy mode. This topology may be referred to as "on-line UPS". (*See* Annex B to *IEC* 62040-3:2021)	(4) On-line UPS units mean those systems which supply electrical power to loads via inverters without any power interruption.	(2) In addition to the incorporation of UR E21(Rev.2), a supplementary explanation is added with reference to B.2 of IEC 62040-3.
(3) "Line interactive topology UPS units" are those units which comprise bidirectional *a.c.* to *d.c.* power conversion, generally through a bidirectional converter and an *a.c.* power interface (*e.g.* power switches). In normal mode of operation, while the load is directly supplied with *a.c.* input power via the bidirectional converter, the storage device is charged through the bidirectional converter. When *a.c.* input power voltage is out of UPS pre-set tolerances, the UPS runs in stored energy mode. (*See* Annex B to *IEC* 62040-3:2021)	(3) Line interactive UPS units means those systems specified in **(2)** above which are attached to equipment which controls voltage vibrations.	(3) In addition to the incorporation of UR E21(Rev.2), a supplementary explanation is added with reference to B.3 of IEC 62040-3.
(4) "Standby topology UPS units" are those units which comprise a battery charger, a *d.c.* to *a.c.* converter, generally a unidirectional inverter and a UPS switch. In normal mode of operation, while the load is directly supplied with *a.c.* input power via the UPS switch, the storage device is charged through the battery charger. When the *a.c.* input power is out of UPS pre-set tolerances, the UPS operates in stored energy mode. This topology may be referred to as "off-line UPS". (*See* Annex B to *IEC* 62040-3:2021)	(2) Off-line UPS units mean those electrical power devices in which output loads are powered from bypass lines under normal operation and which are only transferred to inverters if such bypass supply falls or goes outside preset limits.	(4) In addition to the incorporation of UR E21(Rev.2), a supplementary explanation is added with reference to B.4 of IEC 62040-3.

Amended	Original	Remarks
(5) "Energy storage devices" are systems consisting of a single or multiple devices designed to provide power to the UPS inverter/converter. (*IEC* 62040-3:2021) (6) "*A.C.* input power failures" are variations in the *a.c.* input power which could cause the UPS to operate in stored energy mode. (*IEC* 62040-3:2021) (7) "Bidirectional converters" are those converters which have the functions of both a rectifier and an inverter, and which can reverse the flow of power from *a.c.* to *d.c.* and vice-versa. (*IEC* 62040-3:2021)		

Amended	Remarks
Fig. 1 Double conversion topology UPS unit  Fig. 2 Line interactive topology UPS unit  	Figs. 1 to 3: Incorporating the figures of UR E21(Rev.2).

Amended	Remarks
Fig. 3 Standby topology UPS unit 	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
1.2 Design	**1.2 Design**	
1.2.1 Construction	**1.2.1 Construction**	
1 UPS units are to be constructed in accordance with *IEC* 62040:2017+AMD1:2021+AMD2:2022, *IEC* 62040-2:2016, *IEC* 62040-3:2021, *IEC* 62040-4:2013 and/or *IEC* 62040-5-3:2016, as applicable, or acceptable and relevant national or international standards.	**1** UPS units are to be constructed in accordance with *IEC* 62040:2017, *IEC* 62040-2:2016, *IEC* 62040-3:2011, *IEC* 62040-4:2013 and/or *IEC* 62040-5-3:2016, as applicable, or acceptable and relevant national or international standards.	1 Incorporating 3.1 of UR E21(Rev.2).
2 The operation of UPS units is not to depend on any external services.	**2** The operation of UPS units is not to depend on any external services.	
3 The configuration and topology of UPS units are to be appropriate for the power supply requirements of the relevant connected loads (*See* **2.1.2-3, Part H**).	**3** The type of UPS unit (off-line, line-interactive, on-line) is to be appropriate for the power supply requirements of the relevant connected loads (*See* **2.1.2-3, Part H**).	3 Incorporating 3.3 of UR E21(Rev.2).
4 When external bypass is provided, a bypass transfer switch is to be arranged to protect the load against power disturbances or interruption arising from inrush or fault current. (*See* Annex C to *IEC* 62040-3:2021)	**4** UPS units are to have external bypass circuits.	4 Incorporating 3.4 of UR E21(Rev.2). Refer to Fig. C.1, Annex C of IEC 62040-3 for a single line diagram showing the relationship between the external bypass and the bypass transfer switch.
5 UPS units are to have self-monitoring functions, and audible and visual alarms are to be activated in continuously manned stations (e.g. navigation bridges and machinery control spaces) in the following cases:	**5** UPS units are to have self-monitoring functions, and audible and visual alarms are to be activated in those spaces where crew members are normally stationed (e.g. navigation bridges and machinery control spaces) in the following cases:	5 Incorporating 3.5 of UR E21(Rev.2).
(1) Power supply failures (abnormal voltage or frequency)	(1) Power supply failures (abnormal voltage or frequency)	
(2) Earth faults	(2) Earth faults	
(3) Operation of battery protective devices	(3) Operation of battery protective devices	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
(4) Discharge of batteries (5) Operation of bypass circuits in cases where an external bypass is provided (6) Any other fault and abnormal conditions of the UPS units, as applicable **1.2.2 Arrangements** **1** UPS units are to be suitably located for use in emergency situations. **2** In cases where UPS units utilising valve regulated sealed type lead acid batteries are provided with the ventilation arrangements in accordance with the requirements of *IEC* 62040-1:2017+AMD1:2021+AMD2:2022, *IEC* 62040-2:2016, *IEC* 62040-3:2011, *IEC* 62040-4:2013 and/or *IEC* 62040-5-3:2016, the Society may approve the location of such UPS units in the compartment where normal electrical equipment is located. However, a compartment where batteries connected to charging facilities which have charging power higher than 2 *kW* are placed and a mechanical exhaust-ventilation system is provided, the quantity of air expelled is not to be less than that specified in **2.11.3(3)(c), Part H**.	(4) Discharge of batteries (5) Operation of bypass circuits for on-line UPS units (Newly added) **1.2.2 Arrangements** **1** UPS units are to be suitably located for use in emergency situations. **2** In case where UPS units utilising valve regulated sealed batteries are provided with the ventilation arrangements in accordance with the requirements of *IEC* 62040-1:2017, *IEC* 62040-2:2016, *IEC* 62040-3:2011, *IEC* 62040-4:2013 and/or *IEC* 62040-5-3:2016, the Society may approve the location of such UPS units in the compartment where normal electrical equipment are located.	2 Incorporating 4 of UR E21(Rev.2). When mechanical exhaust-ventilation systems are installed in a compartment where batteries connected to charging facilities with charging outputs exceeding 2 kW are placed, the requirements specified in 2.11.3(3)(c), Part H of the Rules are also to be met. Natural ventilation is to be comply with reference standards, etc.
The effective date of the amendment is according to EFFECTIVE DATE AND APPLICATION (B)		

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
RULES FOR HIGH SPEED CRAFT **Part 10 ELECTRICAL INSTALLATIONS** **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN**	**RULES FOR HIGH SPEED CRAFT** **Part 10 ELECTRICAL INSTALLATIONS** **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN**	
2.8 Accumulator Batteries	**2.8 Accumulator Batteries**	The requirements are to be the same as those in Part H of the Rules for the Survey and Construction of Steel Ships, as amended above. Since the contents of 2.8 "Accumulator Batteries" in the Rules for High Speed Craft are identical to those in 2.11, Part H of the Rules for the Survey and Construction of Steel Ships, 2.8 of this Rules is deleted and replaced with a reference to 2.11, Part H of the Rules for the Survey and Construction of Steel Ships.
Accumulator batteries are to comply with the requirements in **2.11, Part H of the Rules for the Survey and**	(Newly added)	

Amended	Original	Remarks
Construction of Steel Ships.		
(Deleted)	**2.8.1 General***	
(Deleted)	**1** The requirements in this **2.8** apply to all permanently installed vented types of secondary batteries. However, the requirements specified in **2.8.5-4** are also applicable to valve-regulated sealed types of batteries.	
(Deleted)	**2** Accumulator battery systems consisting of lithium-ion batteries with total capacities of 20 *kWh* or more and associated equipment are to be in accordance with **Annex 2.11.1-2, Part H of the Rules for the Survey and Construction of Steel Ships.**	
(Deleted)	**3** Any usage of types of secondary batteries other than vented types of secondary batteries and the secondary batteries specified in **-2** above is to be required as deemed appropriate by the Society.	
(Deleted)	**4** Accumulator batteries are to be able to suitably perform with respect to their intended services.	
(Deleted)	**2.8.2 Construction**	
(Deleted)	Cells of all batteries are to be so constructed and secured as to prevent spilling of the electrolyte due to craft's motions and to prevent emission of acid or alkaline spray.	
(Deleted)	**2.8.3 Location***	
(Deleted)	**1** Alkaline batteries and lead acid batteries are not to be installed in the same compartment.	
(Deleted)	**2** Large batteries are to be installed in compartment assigned to them only. They may be installed in a box on deck if adequately ventilated and provided with means to prevent ingress of water.	
(Deleted)	**3** Engine starting batteries are to be located as close as practicable to the engine(s) served.	

Amended	Original	Remarks
(Deleted)	**4** Batteries are not to be placed in the living quarters.	
(Deleted)	**2.8.4 Installation Procedures and Protection of Corrosion**	
(Deleted)	**1** Batteries are to be arranged to permit ready access for replacing, inspection, testing, replenishing and cleaning.	
(Deleted)	**2** Cells or crates are to be placed on non-absorbent isolating supports. They are to be fitted to prevent any movement due to craft's motions.	
(Deleted)	**3** In case where acid is used as the electrolyte, a tray of acid resisting materials is to be provided below the cells unless the deck below is similarly protected.	
(Deleted)	**4** The interior of the battery compartment including the shelves is to be coated with corrosion-resistant paint.	
(Deleted)	**5** The interior of ventilating ducts and impellers of ventilating fans are to be coated with corrosion-resistant paint unless ducts and fans are made of corrosion-resistant material.	
(Deleted)	**2.8.5 Ventilation***	
(Deleted)	**1** Battery compartments are to be adequately ventilated by an independent ventilating system.	
(Deleted)	**2** In case where natural ventilation is employed, the ventilation ducts are to be run directly from the top of the battery compartment to the open air above, with no part of the ducts more than 45 degrees from the vertical.	
(Deleted)	**3** If natural ventilation is impracticable, mechanical exhaust-ventilation is to be provided. The electric motors for the ventilation fans are not to be placed inside the ducts. Ventilating fans are to be so constructed and to be of such a material as to render sparking impossible in the event of the impeller touching the fan casing.	

Amended	Original	Remarks
(Deleted)	**4** The ventilation arrangements for installation of vented type batteries which have charging power higher than 2 kW are to be such that the quantity of air expelled is at least equal to: $Q = 110 \times I \times n\ (l/h)$ I : Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes n : Number of cells in series Q : Quantity of air expelled in litres/hour The ventilation rate for compartments containing valve-regulated sealed type batteries may be reduced to 25 % of that given above.	
(Deleted)	**2.8.6 Electrical Installations***	
(Deleted)	**1** Switches, fuses and other electrical installations liable to cause an arc are not to be installed in battery compartments.	
(Deleted)	**2** Lighting fittings provided within battery compartments are to be suitable for use in explosive atmosphere classified into gas and vapour group IIC, temperature class T1 and construction suitable for use in Zone 1 as specified in *IEC* 60079, or equivalent thereto.	
(Deleted)	**3** Cables other than those for batteries and electrical installations specified in **-2** are, as a rule, not to be installed in battery compartments except where installation in other locations is impracticable.	
(Deleted)	**2.8.7 Charging Facilities**	
(Deleted)	**1** Suitable charging facilities are to be provided. Battery charging facilities by means of d.c. generator and	

Amended	Original	Remarks
(Deleted)	series resister are to be provided with protection against reversal of current when the charging voltage is 20 % of the line voltage or higher. **2** For floating service or for any other conditions where the load is connected to the battery while it is on charge, the maximum battery voltage under any conditions of charge is not to exceed the safe value of any connected apparatus. A voltage regulator or other means of voltage control may be provided for this purpose.	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS **Part 8 ELECTRICAL INSTALLATIONS** **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN** **2.11 Accumulator Batteries**	**RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS** **Part 8 ELECTRICAL INSTALLATIONS** **Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN** **2.11 Accumulator Batteries**	The requirements are to be the same as those in Part H of the Rules for the Survey and Construction of Steel Ships, as amended above. Since the contents of 2.11 “Accumulator Batteries” in the Rules for the Survey and Construction of Inland Waterway Ships are identical to those in 2.11, Part H of the Rules for the Survey and Construction of Steel Ships, 2.11 of this Rules is deleted and replaced with a reference to 2.11, Part H of the Rules for

Amended	Original	Remarks
		the Survey and Construction of Steel Ships.
Accumulator batteries are to comply with the requirements in **2.11, Part H of the Rules for the Survey and Construction of Steel Ships.**	(Newly added)	
(Deleted) (Deleted)	**2.11.1 General*** **1** The requirements given in this **2.11** apply to all permanently installed vented types of secondary batteries. However, the requirements specified in **2.11.5-4** are also applicable to valve-regulated sealed types of batteries.	
(Deleted)	**2** Accumulator battery systems consisting of lithium-ion batteries with total capacities of 20 *kWh* or more and associated equipment are to be in accordance with **Annex 2.11.1-2, Part H of the Rules for the Survey and Construction of Steel Ships.**	
(Deleted)	**3** Any usage of types of secondary batteries other than vented types of secondary batteries and the secondary batteries specified in **-2** above is required to be as deemed appropriate by the Society.	
(Deleted)	**4** Accumulator batteries are to be able to suitably perform with respect to their intended service.	
(Deleted) (Deleted)	**2.11.2 Construction** Cells of all batteries are to be constructed and secured so as to prevent any spilling of electrolytes due to ship motion as well as to prevent any emission of acid or alkaline spray.	
(Deleted) (Deleted)	**2.11.3 Location*** **1** Alkaline batteries and lead acid batteries are not to be installed in the same compartment.	

Amended	Original	Remarks
(Deleted)	**2** Large batteries are to be only installed in those compartments assigned to them. They may be installed in boxes on deck if adequately ventilated and provided with means to prevent any ingress of water.	
(Deleted)	**3** Engine starting batteries are to be located as close as practicable to those engines served. If such batteries cannot be accommodated in battery rooms, they are to be installed at places where adequate ventilation is ensured.	
(Deleted)	**4** Batteries are not to be placed in accommodation spaces.	
(Deleted)	**2.11.4 Installation Procedures and Protection from Corrosion**	
(Deleted)	**1** Batteries are to be arranged to permit ready access for replacing, inspecting, testing, replenishing and cleaning.	
(Deleted)	**2** Cells or crates are to be placed on non-absorbent isolating supports. They are to be fitted to prevent any movement due to ship motion.	
(Deleted)	**3** In cases where acid is used as the electrolyte, trays made out of acid resisting materials are to be provided below such cells unless those decks below are similarly protected.	
(Deleted)	**4** The interior of battery compartments including any shelves is to be coated with corrosion-resistant paint.	
(Deleted)	**5** The interior of ventilating ducts and impellers of ventilating fans are to be coated with corrosion-resistant paint unless such ducts and fans are made of corrosion-resisting material.	
(Deleted)	**2.11.5 Ventilation***	
(Deleted)	**1** Battery compartments are to be adequately ventilated by independent ventilation systems.	
(Deleted)	**2** In cases where natural ventilation is employed,	

Amended	Original	Remarks
	ventilation ducts are to be run directly from the top of battery compartments to the open air above, with no parts of the ducts at angles of more than 45 degrees from vertical.	
(Deleted)	**3** If natural ventilation is impracticable, mechanical exhaust-ventilation is to be provided. Electric motors for the ventilating fans are not to be placed inside any ducts. Ventilating fans are to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings.	
(Deleted)	**4** The ventilation arrangements for installation of vented type batteries which have charging power higher than 2 kW are to be such that the quantity of air expelled is at least equal to: $Q = 110 \times I \times n\ (l/h)$ I : Maximum current delivered by the charging equipment during gas formation, but not less than 25 % of the maximum obtainable charging current in amperes n : Number of cells in series Q : Quantity of air expelled in litres/hour The ventilation rate for compartments containing valve-regulated sealed type batteries may be reduced to 25 % of that given above.	
(Deleted)	**2.11.6 Electrical Installations***	
(Deleted)	**1** Switches, fuses and other electrical installations liable to cause arcs are not to be installed in battery compartments.	
(Deleted)	**2** Lighting fittings provided within battery compartments are to comply with the requirements given in **2.16** and to be suitable for use in explosive atmospheres classified into gas and vapour group *IIC*, temperature class *T*1 and construction suitable for use in Zone 1 as specified in	

Amended	Original	Remarks
	IEC 60079, or equivalent thereto.	
(Deleted)	**3** Cables other than those for batteries and electrical installations specified in **-2** above are, as a rule, not to be installed in battery compartments except in cases where installation in other locations is impracticable.	
(Deleted)	**2.11.7 Charging Facilities**	
(Deleted)	**1** Suitable charging facilities are to be provided. Battery charging facilities by means of d.c. generators and series resisters are to be provided with protection against any reversal of currents when charging voltages are at 20 % of line voltages or higher.	
(Deleted)	**2** In the case of floating service or for any other conditions where loads are connected to batteries while they are charging, maximum battery voltages under any conditions of charging are not to exceed those safe values of any connected apparatus. Voltage regulators or other means of voltage control may be provided for this purpose.	

Amended	Original	Remarks
GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS	**GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**	
Part H ELECTRICAL INSTALLATIONS	**Part H ELECTRICAL INSTALLATIONS**	
H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN	**H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN**	
H2.11 Accumulator Batteries	**H2.11 Accumulator Batteries**	
H2.11.2 Vented Type Batteries	**H2.11.3 Location**	Since the structure of Part H of the Rules is changed, the structure of the Guidance is made consistent with the Part H of the Rules.
1 In applying **2.11.2(2), Part H of the Rules,** installation location is to be as follows: (1) Accumulator batteries are not to be located in high temperature or low temperature areas, or any areas exposed to steam, water or oil vapours. (2) The term "large batteries" in **2.11.2(2)(b), Part H of the Rules** means those accumulator batteries connected to battery charging facilities with outputs more than 2 *kW*. Outputs of such battery charging facilities are to be the product of the rated currents of semiconductor converters and the nominal voltage of battery groups. Deck boxes may be naturally ventilated. Natural ventilation by means of ducts of	(Newly added) **1** Accumulator batteries are not to be located in high temperature or low temperature areas, or any areas exposed to steam, water or oil vapours. **2** The term "large batteries" in **2.11.3-2, Part H of the Rules** means those accumulator batteries connected to battery charging facilities with outputs of 2 *kW* or more. Outputs of such battery charging facilities are to be the product of the rated currents of semiconductor converters and the nominal voltage of battery groups. Deck boxes may be naturally ventilated. Natural ventilation by means of ducts of ample dimensions, terminating at least 1.25 *m* above in	2 Modifying the reference number resulting from a change the structure of Part H of the Rules. In accordance with the requirements of relevant IEC standards and UR

Amended	Original	Remarks
ample dimensions, terminating at least 1.25 *m* above in goose-necks, mushroom-heads or their equivalent will be sufficient. Holes for air inlets are to be provided on at least two opposite sides of these boxes.	goose-necks, mushroom-heads or their equivalent will be sufficient. Holes for air inlets are to be provided on at least two opposite sides of these boxes.	E18, the description of "2 kW or more" and "2 kW or less" in the classification of the capacity of charging facilities connected to storage batteries is corrected to "more than 2 kW" and "less than 2kw" respectively and unified. (The same shall apply hereinafter.)
(3) Accumulator batteries connected to battery charging facilities with capacities in the range of 0.2 to 2 *kW* are to be placed in battery boxes installed within battery compartments or on the upper deck or upward. In cases where such batteries are unable to be installed in such areas, the following requirements are to be complied with: (a) Batteries are to be placed in storage boxes or on shelves provided at adequate areas; (b) Batteries are to be placed in open states within machinery spaces; or, (c) Batteries are to be placed in compartments with good air ventilation.	**3** Accumulator batteries connected to battery charging facilities with capacities in the range of 0.2 to 2 *kW* are to be placed in battery boxes installed within battery compartments or on the upper deck or upward. In cases where such batteries are unable to be installed in such areas, the following requirements are to be complied with: (1) Batteries are to be placed in storage boxes or on shelves provided at adequate areas; (2) Batteries are to be placed in open states within machinery spaces; or, (3) Batteries are to be placed in compartments with good air ventilation.	
(4) Accumulator batteries connected to battery charging facilities with capacities less than 0.2 *kW* may be placed in open states at adequate areas or may be placed in battery boxes.	**4** Accumulator batteries connected to battery charging facilities with capacities of 0.2 *kW* or less may be placed in open states at adequate areas or may be placed in battery boxes.	
(Deleted)	**H2.11.5 Ventilation** (Newly added)	Since the structure of Part H of the Rules is changed, the structure of the Guidance is made consistent with the Part H of the Rules.
2 In applying **2.11.2(4), Part H of the Rules,** ventilation is to be as follows: (1) In cases where accumulator batteries are arranged in two tiers or more, all shelves are to have not less than 50 *mm* in space, front and back, for the circulation of air.	**1** In cases where accumulator batteries are arranged in two tiers or more, all shelves are to have not less than 50 *mm* in space, front and back, for the circulation of air.	
(Deleted)	**2** It is recommended that ventilation systems for those compartments containing accumulator batteries connected to battery charging facilities with outputs of 2 *kW* or more be	

Amended	Original	Remarks
	mechanical exhaust-ventilation types.	
(2) The ventilation fans which are "to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings" specified in **2.11.2(4)(c), Part H of the Rules** mean those ventilation fans complying with the requirements given in **R4.5.4-1(2)**. For the purpose of this requirement, protection screens of not more than 13 *mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.	**3** The ventilation fans which are "to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings" specified in **2.11.5-3, part H of the Rules** mean those ventilation fans complying with the requirements given in **R4.5.4-1(2)**. For the purpose of this requirement, protection screens of not more than 13 *mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.	(2) Modifying the reference number resulting from a change the structure of Part H of the Rules.
(3) In cases where mechanical exhaust-ventilation is provided, the requirements in **2.11.2(4)(d), Part H of the Rules** are, in principle, to be complied with.	(Newly added)	
(4) In **2.11.2(4)(d), Part H of the Rules**, the calculation of quantity of expelled air of natural ventilation for battery compartments may be replaced with the requirements for cross sectional areas of inlet and outlet openings specified in Annex CC.2 to *IEC* 62040-1:2017+AMD1:2021+AMD2:2022.	(Newly added)	(4) Since it is unrealistic to apply the same formula for calculating exhaust capacity to mechanical ventilation and natural ventilation, other appropriate formulas can be used for natural ventilation. Since IEC 62040-1 is referred to in Annex 3.3.3 (3) of Part H of IACS UR E21(Rev. 2), the formula specified in Annex CC.2 of IEC 62040-1 "Ventilation of UPS using lead-acid batteries" can be referred to for the details

Amended	Original	Remarks
		of natural ventilation in the battery compartment. In this case, the calculation method of Q is to be in accordance with this standard as well as with other appropriate provisions and standards.
(Deleted) **3** In applying **2.11.2(5), Part H of the Rules**, electrical equipment is to be as follows: Explosion-protected electrical equipment certified as Explosion Class *d*3 and Ignition Group *G*1 or higher as specified in the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, may be treated as equivalent to those grouped into Apparatus Group *II*C and Temperature Class *T*1 or higher as specified in *IEC* 60079.	**H2.11.6 Electrical Equipment** (Newly added) Explosion-protected electrical equipment certified as Explosion Class *d*3 and Ignition Group *G*1 or higher as specified in the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, may be treated as equivalent to those grouped into Apparatus Group *II*C and Temperature Class *T*1 or higher as specified in *IEC* 60079.	Since the structure of Part H of the Rules is changed, the structure of the Guidance is made consistent with the Part H of the Rules.
H2.11.3 Valve-regulated Sealed Type Lead Acid Batteries **1** In applying **2.11.3(1), Part H of the Rules**, installation location is to be as follows: (1) Accumulator batteries are not to be located in high temperature or low temperature areas, or any areas exposed to steam, water or oil vapours. (2) The term "large batteries" in **2.11.3(1)(a), Part H of the Rules** means those accumulator batteries	**(Newly added)** (Newly added)	(2) to (4): The same installation requirements apply to

Amended	Original	Remarks
connected to battery charging facilities with outputs more than 2 *kW*. Outputs of such battery charging facilities are to be the product of the rated currents of semiconductor converters and the nominal voltage of battery groups. Deck boxes may be naturally ventilated. Natural ventilation by means of ducts of ample dimensions, terminating at least 1.25 *m* above in goose-necks, mushroom-heads or their equivalent will be sufficient. Holes for air inlets are to be provided on at least two opposite sides of these boxes. (3) Accumulator batteries connected to battery charging facilities with capacities in the range of 0.2 to 2 *kW* are to be placed in battery boxes installed within battery compartments or on the upper deck or upward. In cases where such batteries are unable to be installed in such areas, the following requirements are to be complied with: (a) Batteries are to be placed in storage boxes or on shelves provided at adequate areas; (b) Batteries are to be placed in open states within machinery spaces; or, (c) Batteries are to be placed in compartments with good air ventilation. (4) Accumulator batteries connected to battery charging facilities with capacities less than 0.2 *kW* may be placed in open states at adequate areas or may be placed in battery boxes.		valve-regulated sealed type lead acid batteries as for vented type batteries.
2 In applying **2.11.3(3), Part H of the Rules,** ventilation is to be as follows: (1) In cases where accumulator batteries are arranged in two tiers or more, all shelves are to have not less	(Newly added)	

Amended	Original	Remarks
than 50 *mm* in space, front and back, for the circulation of air. (2) In cases where mechanical exhaust-ventilation is provided, the requirements in **2.11.3(3)(c), Part H of the Rules** are, in principle, to be complied with. (3) In **2.11.3(3)(c), Part H of the Rules**, the calculation of quantity of expelled air of natural ventilation for battery compartments may be replaced with the requirements for cross sectional areas of inlet and outlet openings specified in Annex CC.2 to *IEC* 62040-1:2017+AMD1:2021+AMD2:2022.		(3) Since it is unrealistic to apply the same formula for calculating exhaust capacity to mechanical ventilation and natural ventilation, other appropriate formulas can be used for natural ventilation. Since IEC 62040-1 is referred to in Annex 3.3.3 (3) of Part H of IACS UR E21(Rev. 2), the formula specified in Annex CC.2 of IEC 62040-1 "Ventilation of UPS using lead-acid batteries" can be refered for the details of natural ventilation in the battery compartment. In this case, the calculation method of Q is to be in accordance with this standard as well as with other appropriate provisions and standards.

Amended	Original	Remarks
(4) In **2.11.3(3)(c), Part H of the Rules**, in cases where several batteries are installed in the same compartment and are provided with completely independent charging faciliteies, the calculation of ventilation capacity may be carried out only for the batteries connected to the charging facilities with the highest output in the compartment, provided that immediate action can be taken in case of any abnormality in the batteries or charging facilities.		(4) Gas generation in valve-regulated sealed type lead acid batteries occurs mainly due to overcharging, and gas is often not generated during normal operation. Therefore, assuming a single charger failure, this requirement may be applied if measures such as immediately stopping charging when an abnormal condition is noticed can be taken.
H2.12 Semiconductor Converters for Power	**H2.12 Semiconductor Converters for Power**	
H2.12.1 General	**H2.12.1 General**	
The wording “standards are to be deemed appropriate by the Society” given in **2.12.1-2, Part H of the Rules** means the current versions of *IEC* 60146 and *IEC* 61800. Semiconductor converters for power, except for those used in electric propulsion systems, are to be designed and constructed in accordance with *IEC* 60092-304, taking into account their use on board.	The wording “standards are to be deemed appropriate by the Society” given in **2.12.1-2, Part H of the Rules** means the current versions of *IEC* 60146 and *IEC* 61800.	IEC 60146 and IEC 61800 are "land-based" standards for semiconductor converters for power. IEC 60092-304 specifies special requirements for semiconductor converters for marine use. This standard is added as a supplement to the requirements when applying the IEC 60146 and IEC 61800 land-based standards to

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
		ship equipment. It is applicable to semiconductor converters of 5 kW or more, excluding those used in electric propulsion systems. (See 2.12.1-1, Part H of the Rules.)

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
GUIDANCE FOR HIGH SPEED CRAFT	**GUIDANCE FOR HIGH SPEED CRAFT**	
Part 10 ELECTRICAL INSTALLATIONS	**Part 10 ELECTRICAL INSTALLATIONS**	
Chapter 2 ELECTRICAL INSTALLATION AND SYSTEM DESIGN	**Chapter 2 ELECTRICAL INSTALLATION AND SYSTEM DESIGN**	
(Deleted)	**2.8 Accumulator Batteries**	Since 2.8 of the Rules refers entirely to Part H, requirements of the Guidance for accumulator batteries are deleted.
(Deleted) (Deleted)	**2.8.1 General** **1** Accumulator batteries of an adequate discharge rate are to be selected according to their application.	
(Deleted)	**2** In the case where alkali batteries are used, the specification including the construction, performance, method of installation, etc., is to be submitted at each time to the Society for approval.	
(Deleted) (Deleted)	**2.8.3 Location** **1** Accumulator batteries are not to be located in high temperature or low temperature areas, or areas exposed to steam, water or oil vapour.	
(Deleted)	**2** The term “large batteries” in **2.8.3-2, Part 10 of the Rules** means the accumulator batteries connected to battery charging facilities with an output of 2 *kW* or more. Here, the	

Amended	Original	Remarks
	output of battery charging facilities is to be the product of rated current of the rectifier and nominal voltage of the battery group. Deck boxes may be naturally ventilated. Natural ventilation by means of a duct of ample dimensions, terminating at least 1.25 *m* above in a goose-neck, mushroom-head or the equivalent will be sufficient. Holes for air inlet are to be provided on at least two opposite sides of the box.	
(Deleted)	**3** Accumulator batteries connected to battery charging facilities with a capacity in a range from 0.2 to 2 *kW* are to be placed in a battery box installed within a battery compartment or on the upper deck or upward. In the case where they are unable to be installed in such areas, the following requirements are to be complied with: (1) To be placed in a storage box or on a shelf provided at an adequate area, (2) To be placed in an open state within the machinery space, or (3) To be placed in a compartment with good air ventilation.	
(Deleted)	**4** Accumulator batteries connected to battery charging facilities with a capacity of 0.2 *kW* or less may be placed in an open state at an adequate area or may be placed in a battery box.	
(Deleted)	**2.8.5 Ventilation**	
(Deleted)	**1** Where accumulator batteries are arranged in two tiers or more, all shelves are to have not less than 50 *mm* space, front and back, of circulation of air.	
(Deleted)	**2** The capacity of exhaust ventilation of a battery compartment is to be of the value obtained by the following formula or more:	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
	Exhaust capacity $Q = 100 \times I \times n$ (*litre/h*) I:maximum charging current at end (where no specific limitation is imposed, the charging current in 10 *hours* is to be regarded as the standard) n:number of batteries	
(Deleted)	**3** It is recommended that the ventilation system for a compartment containing accumulator batteries connected to battery charging facilities with an output of 2 *kW* or more be of the mechanical exhaust-ventilation.	
(Deleted)	**4** The ventilation fans which are of "such a material as to render sparking impossible" specified in **2.8.5-3, Part 10 of the Rules** mean those ventilation fans complying with the requirements of **R4.5.4-1(2) of the Guidance for the Survey and Construction of Steel Ships**. For the purpose of this requirement, protection screens of not more than 13*mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.	
(Deleted) (Deleted)	**2.8.6 Electrical Installations** Explosion-protected electrical equipment certified as Explosion Class *d*3 and Ignition Group *G*1 or higher as specified in the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, may be treated as equivalent to those grouped into Apparatus Group *IIC* and Temperature Class *T*1 or higher as specified in *IEC* 60079.	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS	**GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS**	
Part 8 ELECTRICAL INSTALLATIONS	**Part 8 ELECTRICAL INSTALLATIONS**	
Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN	**Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN**	
(Deleted)	**2.11 Accumulator Batteries**	Since 2.11 of the Rules refers entirely to Part H, requirements of the Guidance for accumulator batteries are deleted.
(Deleted) (Deleted)	**2.11.1 General** **1** Accumulator batteries of adequate discharge rates are to be selected according to their application.	
(Deleted)	**2** In cases where alkali batteries are installed, specifications including construction, performance, method of installation, etc. are to be submitted for Society approval at each time of installation.	
(Deleted) (Deleted)	**2.11.3 Location** **1** Accumulator batteries are not to be located in high temperature or low temperature areas, or any areas exposed to steam, water or oil vapours.	
(Deleted)	**2** The term “large batteries” in **2.11.3-2, Part 8 of the**	

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
	Rules means those accumulator batteries connected to battery charging facilities with outputs of 2 *kW* or more. Outputs of such battery charging facilities are to be the product of the rated currents of semiconductor converters and the nominal voltage of battery groups. Deck boxes may be naturally ventilated. Natural ventilation by means of ducts of ample dimensions, terminating at least 1.25 *m* above in goose-necks, mushroom-heads or their equivalent will be sufficient. Holes for air inlets are to be provided on at least two opposite sides of these boxes.	
(Deleted)	**3** Accumulator batteries connected to battery charging facilities with capacities in the range of 0.2 to 2 *kW* are to be placed in battery boxes installed within battery compartments or on the upper deck or upward. In cases where such batteries are unable to be installed in such areas, the following requirements are to be complied with: (1) Batteries are to be placed in storage boxes or on shelves provided at adequate areas; (2) Batteries are to be placed in open states within machinery spaces; or, (3) Batteries are to be placed in compartments with good air ventilation.	
(Deleted)	**4** Accumulator batteries connected to battery charging facilities with capacities of 0.2 *kW* or less may be placed in open states at adequate areas or may be placed in battery boxes.	
(Deleted)	**2.11.5 Ventilation**	
(Deleted)	**1** In cases where accumulator batteries are arranged in two tiers or more, all shelves are to have not less than 50 *mm* in space, front and back, for the circulation of air.	
(Deleted)	**2** It is recommended that ventilation systems for those	

Amended	Original	Remarks
	compartments containing accumulator batteries connected to battery charging facilities with outputs of 2 *kW* or more be mechanical exhaust-ventilation types. **3** The ventilation fans which "are to be constructed and to be made of such materials so as to render any sparking impossible in the event of impellers touching fan casings" specified in **2.11.5-3, Part 8** of the Rules mean those ventilation fans complying with the requirements given in **3.5.5-1(2), Part 9**. For the purpose of this requirement, protection screens of not more than 13 *mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.	
(Deleted)		
(Deleted) (Deleted)	**2.11.6 Electrical Installations** Explosion-protected electrical equipment certified as Explosion Class *d*3 and Ignition Group *G*1 or higher as specified in the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, may be treated as equivalent to those grouped into Apparatus Group *II*C and Temperature Class *T*1 or higher as specified in IEC 60079.	
2.12 Semiconductor Converters for Power	**2.12 Semiconductor Converters for Power**	
2.12.1 General The wording "standards are to be deemed appropriate by the Society" given in **2.12.1-2, Part 8 of the Rules** means the current versions of *IEC* 60146 and *IEC* 61800. Semiconductor converters for power, except for those used in electric propulsion systems, are to be designed and constructed in accordance with *IEC* 60092-304, taking into	**2.12.1 General** The wording "standards are to be deemed appropriate by the Society" given in **2.12.1-2, Part 8 of the Rules** means the current versions of *IEC* 60146 and *IEC* 61800.	In accordance with the amendment of H2.12.1, Part H of the Guidance for the Survey and Construction of Steel Ships, the relevant

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
account their use on board.		requirements of the Guidance for the Survey and Construction of Inland Waterway Ships are amended.
The effective date of the amendment is according to EFFECTIVE DATE AND APPLICATION (A)		

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks

EFFECTIVE DATE AND APPLICATION (A)

1. The effective date of the amendments is 1 July 2025.

2. Notwithstanding the amendments, the current requirements apply to equipment for marine use other than those installed in ships for which the date of contract for construction* is on or after 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.

EFFECTIVE DATE AND APPLICATION (B)

1. The effective date of the amendments is 1 July 2025.

2. Notwithstanding the amendments, the current requirements apply to UPS units other than those which fall under the following:

(1) UPS units for which the application for approval is submitted to the Society on or after the effective date.

(2) UPS units installed in ships for which the date of contract for construction* is on or after the effective date.

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

Amended-Original Requirements Comparison Table
(Uninterruptible Power System Units and Valve-regulated Sealed Type Lead Acid Batteries)

Amended	Original	Remarks
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.		