RULES CHANGE NOTICE No.2 October 2022

Part 1 Seagoing Ships

Volume IV

RULES FOR ELECTRICAL INSTALLATIONS

2022

Biro Klasifikasi Indonesia

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Foreword

This Rules Change Notice (RCN) No.2 gives new additions and amendments to the "Rules for Electrical Installations (Pt.1, Vol.IV), 2022 Consolidated Edition" along with the effective dates from which these changes are applicable.

Amendments to the preceding Edition are marked by strikethrough, red color, and expanded text. These new additions and amendments are to be read in conjunction with the requirements given in the 2022 Consolidated Edition of the Rules.

The summary of current amendments for each section including the implementation date are indicated in *Table 1 - Amendments Incorporates in This Notice*.

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Further queries or comments concerning this Rules are welcomed through communication to BKI Head Office.

Rules Changes Notice No. 2 – October 2022

Table 1 – Amendments Incorporates in This Notice

Unless otherwise stated in table 1, these amendment is to be implemented on ships contracted for construction on or after 1 July 2023.

Paragraph	Title/Subject	Status/Remark
Section 4 Installation Protection and Power Distribution		
4.G	Shore to Ship Connection	
4.G.1	Application	New requirement explaining the scope and application of shore to ship connection
4.G.2	Class notation	New requirement explaining the class notations assigned to ship with shore connection and their requirements
4.G.3	Document to be submitted	New requirement explaining required document for shore connection notations
4.G.4	General requirements	Renumbering
Section 7 Power Equipment		
A	Steering Gear	
7.A.6	Steering gear control system	
7.A.6.1	-	Adding scope of steering gear control system to include definition in Rules for Machinery Installation
7.A.6.12	Failure detection	Removing hydraulic locking from failure scenario that must be automatically detected
7.A.6.13	System response upon failure	Adding clause that mechanical failures is not mandatory to be responded without manual intervention
Annex A Additional Requirements for Low Voltage Shore Connection *The amendments are effective from 1 January 2023*		
Annex A	New annex explaining the additional requirements for low voltage shore connection	

Section 4 Installation Protection and Power Distribution

G. Shore to Ship Connection

1. Application

The requirements in this sub-section are applied to ship utilized with shore connection system intended to supply the ship with shore power only, enabling the ship's main power source to be shut down while in port.

The shore power voltage is divided into Low Voltage (LV) which is the system voltage is up to 1000 V and High Voltage (HV) with system voltage more than 1000 V.

Requirements in Annex A of the Rules are also be applied for specific type of class notation, see 2.

2. Class notation

Ships found to be in compliance with the requirements in this sub-section as well as requirements in Annex A will be assigned with additional notation **SP (LV)**.

Ship that has been equipped with shore connection system may be eligible with additional class notation **SP (Ready)**, provided that the requirements of this sub-section and sub-section A, D of Annex A are complied.

Table 4.1. Notation requirements

Section	SP (LV)	SP (Ready)
4.G	X	X
Annex A, A (General)	X	X
Annex A, B (Shore Installation)	X	
Annex A, C (Ship to Shore Connection and Interface)	X	
Annex A, D (Ship Installation)	X	X
Annex A, E (Testing and Trials)	X	

3. Document to be submitted

3.1 The following document are required:

Table 4.2. Documents to be Submitted

No.	Documents	Note
1	Overall One line diagram of the Shore Connection system	AP
2	General arrangement showing the location of the connection equipment, cabinets, routing of the cables, movable parts, openings and accesses	AP
3	Services to be supplied and electrical load analysis in shore supply condition	AP
4	Selectivity and coordination of the electrical protections	FI

Table 4.2. Documents to be Submitted *(continued)*

No.	Documents	Note
5	Diagrams of control, alarm, and safety systems	AP
6	Operating manuals describing the method of connection, the operating and the monitoring instructions (including the interlocking procedure of earth-switches, breakers)	FI
7	Operational and construction details of Connection Equipment, including any flexible or adjusting arrangements, including plugs and socket-outlets	FI
8	Environmental conditions having consequences on the shore connection (weather, tides, mooring arrangement)	FI
9	Details of type tests for Connection cables, plugs and socket-outlets	AP
10	Details of supplementary arrangements required to protect equipment from exposure to moisture, condensation or temperatures outside their rating	FI
11	Schedule of testing at manufacturers' works, initial surveys and trials.	AP, FI
Note: AP: for approval FI: for information		

3.2 When the approved arrangements are intended to be modified, details are to be submitted to BKI for examination.

4. General requirements

4.1 Terminal boxes for shore supply shall be linked to the ship's system by permanently laid cables.

4.2 A device for connecting a protective conductor or a potential equalizer has to be provided, if required.

4.3 Switching-on of the shore supply shall only be possible if the switches of the main generators have been shut-off. Short-term parallel operation of the ship's mains and the shore mains for load transfer is permissible.

4.4 The shore connection shall be switchable, and it shall be protected against short-circuit and overload.

The terminal box for shore connection shall be provided at least with short-circuit protection.

4.5 A voltage indicator shall be provided in the main switchboard.

4.6 Facilities shall be provided to compare the polarity (in the case of direct current) and the phase sequence (in the case of three-phase alternating current) of the shore supply with those of the ship's mains.

4.7 The following details shall be indicated on a plate fitted to the shore connection box: voltage system and rated voltage, and the frequency in the case of alternating current.

----------*end*----------

Section 7 Power Equipment

A. Steering Gear

6. Steering gear control systems

6.1 Ships with electrically operated steering gear controls shall have two independent steering gear control systems. Separated cables and wires shall be provided for these control systems. Where physical separation is not practicable, separation may be achieved by means of a fire-retardant plate.

A common steering wheel or a common tiller may be used.

Steering gear control system covers the equipment required to control the steering gear power actuating system as defined in Rules for Machinery Installations (Pt.1, Vol.III) Section 14.A Table 14.1

----------*end*----------

6.12 Failure detection

6.12.1 The most probable failures that may cause reduced or erroneous system performance shall be automatically detected and at least the following failure scenarios shall be considered:

1) Power supply failure
2) Earth fault on AC and DC circuits
3) Loop failures in closed loop systems, both command and feedback loops (normally short circuit, broken connections and earth faults)
4) Data communication errors
5) Programmable system failures (Hardware and software failures)

~~6) Hydraulic locking~~

6~~7)~~ Deviation between rudder order and feedback

7~~8)~~ Deviation alarm shall be initiated if the rudder's actual position does not reach the set point within acceptable time limits for the closed loop control systems (e.g. follow-up control and autopilot). Deviation alarm may be caused by mechanical, hydraulic or electrical failures.

~~***Notes:***~~

~~*" Hydraulic locking" includes all situations where two hydraulic systems (usually identical) oppose each other in such a way that it may lead to loss of steering. It can either be caused by pressure in the two hydraulic systems working against each other or by hydraulic "bypass" meaning that the systems puncture each other and cause pressure drop on both sides or make it impossible to build up pressure.*~~

6.12.2 All failures detected shall initiate audible and individual visual alarm on the navigation bridge.

6.13 System response upon failure

6.13.1 The failures (as defined but not limited to those in 6.12.1) likely to cause uncontrolled movements of rudder are to be clearly identified. In the event of detection of such failure, the rudder should stop in the current position without manual intervention. For systems and/or operational modes where midship position is considered to be the least critical condition, this may also be accepted. For mechanical failures such as sticking valves and failure of static components (pipes, cylinders), the system response without manual intervention is not mandatory, and the operator can follow instructions on the signboard in case of such failures, in accordance with Rules for Machinery Installations (Pt.1, Vol.III) Sec14.A Table 14.1.

Notes:

For hydraulic locking failure, refer also to Rules for Machinery Installations (Pt.1, Vol.III) Sec.14.A.3.9.5 and Sec.14.A.7

Annex A Additional Requirements for Low Voltage Shore Connection

A. General

1. Scope and application

1.1 The additional class notation **SP(LV)** is assigned in accordance with this Rules, to ships fitted with low voltage shore connection systems complying with the requirements of this Annex.

For the purpose of this Annex, the term "Shore Connection" means Low Voltage Shore Connection.

1.2 These requirements apply to the design, safety, reliability and availability of shipboard electrical and control engineering arrangements installed to permit operation of services by connection to an external Low Voltage electrical power supply in port. Low Voltage is a set of voltage levels whose upper limit is generally accepted to be 1000 V AC.

1.3 These requirements are applied as complement to other Rules in Part 1, Seagoing Ships as applicable.

1.4 If necessary, beside of the BKI's Construction Rules, National Regulations and/or requirements by the Owners or Authorities responsible for shore supply or distribution system are to be observed as well.

2. Other standards to be considered

Systems complying with the standards mentioned below can be accepted by BKI in case by case basis

2.1 National standards

Requirements of national standards (SNI) can also be considered

2.2 International Standards

The international standards below can also be considered:

- IEC/IEEE 80005-3 Utility connections in port - Part 3: Low Voltage Shore Connection (LVSC) Systems
- Relevant ISA standards regarding control systems

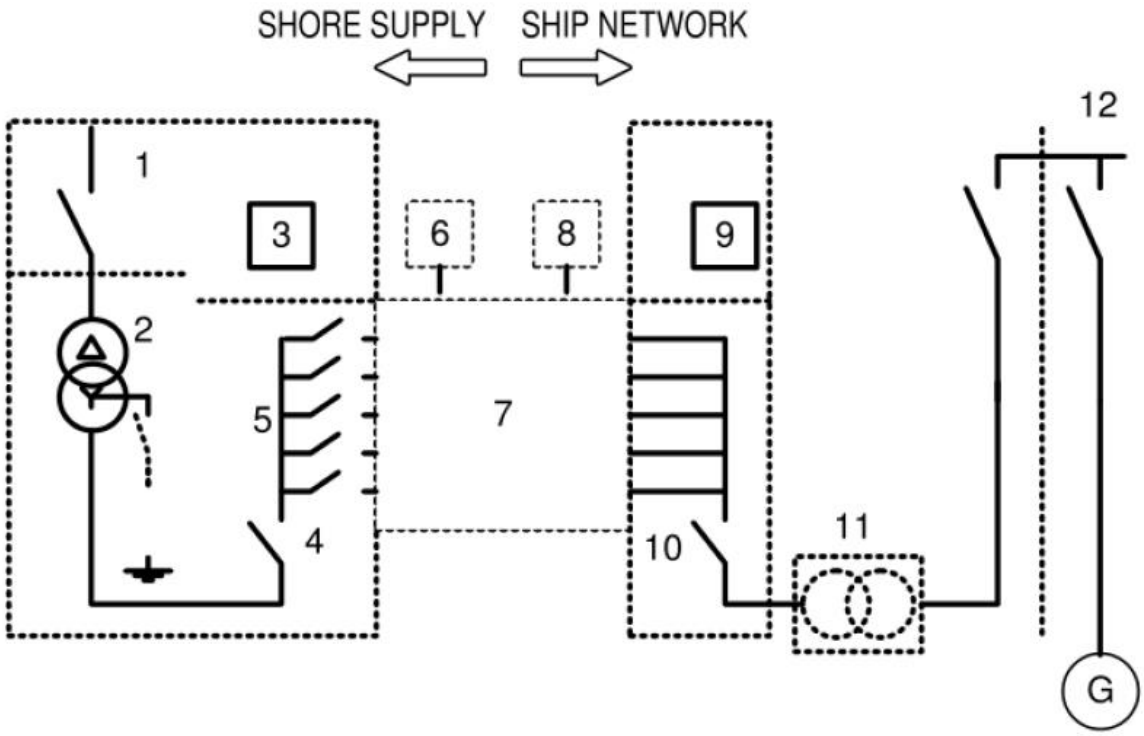
3. General requirements

3.1 System description

3.1.1 A typical shore connection system described in these requirements consists of the following hardware components, see Fig. A.1:

- Shore supply equipment
- Transformer
- Static/ rotating convertor, where applicable (for instance, when the shore and vessel have different frequencies)
- Cables and cables management equipment including plug and socket-outlet
- Shore connection switchboard
- On board transformer, where applicable (for instance when the vessel has a low voltage main switchboard)

– Ship receiving switchboard (in general, a section of the main switchboard).



Key

1. SHORE SUPPLY SYSTEM
2. SHORE-SIDE TRANSFORMER AND NEUTRAL GROUNDING RESISTOR OR/AND IT SYSTEM
3. SHORE-SIDE PROTECTION RELAYING
4. SHORE-SIDE CIRCUIT-BREAKER
5. SHORE-SIDE FEEDERS CIRCUIT-BREAKERS
6. CONTROL SHORE
7. SHORE-TO-SHIP CONNECTION AND INTERFACE EQUIPMENT
8. CONTROL SHIP
9. SHIP PROTECTION RELAYING
10. ON-BOARD SHORE CONNECTION SWITCHBOARD
11. ON – BOARD TRANSFORMER (WHERE APPLICABLE)
12. ON-BOARD RECEIVING SWITCHBOARD

Fig. A.1 Block diagram of a typical shore connection system

3.2 Design requirements

3.2.1 Each failure is to be identified by alarm at a manned control station on board.

3.2.2 Functions are to be designed on the fail safe principle.

3.2.3 Suitable warning notices are to be provided at locations along connection equipment routes including at connection locations.

3.2.4 Effective means are to be provided to prevent accumulation of moisture and condensation, even if equipment are idle for appreciable periods.

3.2.5 Connection to an external electrical power supply is not to adversely affect the availability of main, auxiliary or emergency machinery, including ship sources of electrical power to allow ship power to be restored.

3.2.6 Shore connection system is to be compatible with forces, moments and deflections resulting from the movement of the moored ship under normal operational circumstances.

3.3 Location and construction

3.3.1 LV equipment is to be installed in access controlled spaces.

3.3.2 Equipment shall be suitable for the environment conditions in the space(s) where it is expected to be operate. Ship equipment is to comply with the applicable requirements of IEC 60092-101.

3.3.3 The permanent or temporary installation of electrical equipment located in the combined hazardous area envelope of the ship and shore facilities is to be minimized.

3.3.4 If some of the equipment cannot be located in a non-hazardous area, then it is to be certified of a safe type. See also Section 1.K

3.3.5 Shore connection system is to be located outside of areas where it could be damaged by in-port activities or ship activities under normal operational circumstances.

3.4 Emergency shut down

3.4.1 Fail-safe, hard-wired circuits shall be used for emergency shut-down. This does not preclude emergency shut-down activation commands from non-safety programmable electronic equipment, e.g. programmable protection relays

3.4.2 The Emergency Shut-Down facilities are to be activated in the event of:

- overtension on the flexible cable (mechanical stress), see C.1.1.6
- loss of the emergency Shut-Down control circuit
- activation of any emergency-stop buttons
- activation of protection relays provided to detect faults on the LV connection cable or connectors
- withdrawal of power plugs from socket-outlets while LV connections are live (before the necessary degree of protection is no longer achieved or power connections are broken).

3.4.3 Activation of the emergency shut down shall instantaneously open all circuit breaker on shore and on-board ship

3.4.4 Emergency stops shall be provided at:

- Ship's manned station during Shore Connection system operation
- In the vicinity of socket outlet or other suitable connections
- Active cable management system control locations
- Shore connection switchboards.

3.4.5 Additional manual activation facilities may also be provided at other locations where it is considered necessary. The means of activation are to be visible and prominent, prevent inadvertent operation and require a manual action to reset.

3.4.6 An alarm indicating activation of the Emergency Shut-Down is to be provided at a Ship's manned station during Shore Connection system operation. The alarm shall indicate the cause of the activation.

3.4.7 Consequences of emergency shutdown activation on the ship installation are to be evaluated.

B. Shore Installation

1. Electrical system

1.1 Capacity

1.1.1 The rating of the supply system is to be adequate for the normal continuous electrical load of the vessel at quay. In particular, the external supplies are to be sufficiently rated to supply the following services:

- Essential services normally required in port
- Services required to ensure ready availability of non-operating main and auxiliary machinery
- Services required to prevent damage to cargo or stores.

1.1.2 If the propulsion machinery is intended to be used to maintain the vessel at quay in case of heavy weather, the whole shore supply system is to be sized accordingly.

1.1.3 The maximum electrical step load switched on or off is not to cause the power supply quality to exceed the parameters given in 1.2 or failure when connected to an external electrical power supply in accordance.

1.2 Quality of the shore power supply

1.2.1 The shore power supply system is to be documented.

1.2.2 Each ship is to be provided with a dedicated low voltage shore supply installation which is galvanically isolated from other connected ships and the shore power.

1.2.3 Ship electrical equipment is to be only connected to shore supplies that will be able to maintain the distribution system voltage and frequency characteristics within the limits specified in IEC 60092-101 and indicated in the tables below.

1.2.4 The voltage and frequency variations of the power supply shown in Table A.1 and Table A.2 are to be assumed.

Table A.1 Voltage and frequency variation in steady state condition

Quantity in operation	Parameter	Value
Voltage	Upper voltage limit, for no-load condition	+6% nominal rating
	Lower voltage limit, for rated load condition	-5% nominal rating
Frequency	Frequency variation	±5% nominal rating

Table A.2 Voltage and frequency variation in transient condition

Quantity in operation	Parameter	Value
Voltage	Voltage variation	+20%, -15%
Frequency	Frequency variation	±10%

1.2.5 It is assumed that the voltage harmonic distortion does not exceed the values given in Table A.3.

Table A.3 Voltage and frequency variation in transient condition

Parameter	Value
Individual voltage harmonic distortion	3%
Total voltage harmonic distortion	5%

2. Electrical protection

2.1 Earthing

2.1.1 The neutral point treatment on the shore supply must be able to adapt to various grounding philosophies.

2.1.2 The vessel's earth fault protection system is not to be impaired or disabled by the system earthing arrangement of the shore supply.

2.1.3 The vessel is not to be permitted to establish shore power connection with an earth fault present on either side.

2.2 Protection of circuit

2.2.1 The whole shore power installation is to be at least protected against overcurrent, short circuit and earth fault.

2.2.2 LV circuit-breaker on the secondary side of the transformer is to be arranged to open all insulated poles in the event of the following conditions:

- Overload
- Instantaneous overcurrent
- Overcurrent
- Undervoltage
- Overvoltage
- Reverse power
- Earth fault.

3. Shore connection converter equipment

3.1 General

3.1.1 Where provided, ship-converting equipment (transformers and/or semiconductor converters) for connecting HV-shore supplies to a ship electrical distribution system are to be constructed in accordance with IEC 60092-303, IEC 60076 for transformers and IEC 60146-1-series for semiconductor converters, as applicable.

3.1.2 The effect of harmonic distortion and power factor is to be considered in the assignment of a required power rating.

3.1.3 Requirements in Section 6 is to also be observed.

3.2 Degree of Protection

The protection of electrical equipment shall be in accordance with Section 1.K.2 as applicable.

C. Ship to Shore Connection and Interface

1. Cable management system

1.1 General

1.1.1 A cable management system (cable reels, crane, etc) enabling the connection of cables between the Shore connection switchboard and the ship receiving switchboard and suitable for the different places where the vessel intends to connect is to be provided.

1.1.2 Cable management system, cables are to be equipped with warning notices to highlight the presence of high voltage, moving parts, obstacles, risks of fall.

1.1.3 The cable management system is to be arranged to provide an adequate movement compensation (due to ship movement, tidal changes) and to maintain an optimum length of cable which avoids slack cable or exceeding of tension limits.

1.1.4 The cable management system is to ensure that the cable tension does not exceed the permitted design value.

1.1.5 The cable management system is to be equipped with a device (e.g. limit switches), independent of its control system, to monitor maximum cable tension and deployed cable length.

1.1.6 The detection of tension in the cable is to activate an alarm at a first stage and an emergency shutdown at a second stage.

1.1.7 Cable management system, cables are to be physical protected against heavy seas and mechanical damages.

1.1.8 Power connections with external electrical power supply arrangements may be made with either suitable connections or by using socket-outlets and plugs in accordance with 2.

1.1.9 Power, control and monitoring cables is to be at least of a flame-retardant type in accordance with the requirements given in IEC 60332-1-2. The outer sheath shall be oil resistant and resistant to sea air, seawater, solar radiation (UV) and no hygroscopic.

1.1.10 Power, control and monitoring may be based on a single cable or cables in bunch.

1.1.11 Arrangements is to be provided to stow the cable management system and associated cable when not in operation.

1.1.12 The break away capability of the vessel is to be demonstrated. The time necessary to disconnect the shore connection system is to be recorded.

1.1.13 Consequences of mooring breaks on the shore connection are to be considered. It shall not lead to critical damages on the installation.

2. Connection equipment

2.1 Plugs and socket-outlets

2.1.1 The plug and socket-outlet arrangement are to be fitted with a mechanical-securing device that locks the connection in engaged position.

2.1.2 The plugs and socket-outlets are to be designed so that an incorrect connection cannot be made.

2.1.3 Socket-outlets and inlets are to be interlocked with the earth switch so that plugs or connectors cannot be inserted or withdrawn without the earthing switch in closed position. The earthing contacts shall make contact before the power contacts do when inserting a plug.

2.1.4 Plugs are to be designed so that no strain is transmitted to the terminals, contacts and cables.

2.1.5 Connection plug and socket-outlets are to be designed according to international or national standards. Another standard will be considered on the case-by-case basis.

2.1.6 Type tests are to be carried out on power connection plug and socket-outlets to verify that the design is suitable for the intended application.

Type test reports are to be submitted.

2.1.7 LV plugs and socket-outlets are to be type tested in the following order:

7) Electrical tests:
   - partial discharge test: 10 pC at 10kV in accordance with IEC 60502-4
   - A.C. voltage test: 28 kV for 5 minutes in accordance with IEC 60502
   - short time and peak withstand current test in accordance with IEC 60309-5,
   - impulse withstand voltage test in accordance with IEC 60947-1
   - temperature rise test in accordance with IEC 60309-1 clause 22
8) Mechanical tests:
   - mechanical strength test IK10 in accordance with IEC 62262
   - normal operation test in accordance with IEC 60309-1 clause 21 (5000 cycles; for main contacts only off-load, for pilot contacts on-load)
   - degree of protection in accordance with IEC 60529
   - ageing of gasket and insulator in accordance with IEC 60309-1 clause 13
   - corrosion and resistance to rusting in accordance with IEC 60309-1 clause 28
   - environmental tests to demonstrate compliance with IEC 60092-101, Annex B and IEC 60721-3-6 for the ship environment following IEC TR 60721-4-6
   - pilot contact is to be tested according to IEC 60947-5-1. The degree of protection is to be at least IP20 when not plugged.

D. Ship Installation

1. General

1.1 Electrical installation

1.1.1 Permanently fixed cables are to be provided between the shore connection switchboard and the ship receiving switchboard connection point.

1.1.2 An earth connection is to be provided for connecting the hull to an earth appropriate for the external electrical power.

1.1.3 Arrangements are to be provided to check the insulation between Connection Equipment conductors and between the conductors and earth prior to the connection of an external power supply.

1.1.4 Means are to be provided for checking the phase sequence of the incoming supply in shore connection switchboard.

1.1.5 An indicator is to be provided at the Shore Connection switchboard, and at the main switchboard, in order to show when connections are energized.

1.1.6 The shore connection switchboard is to be located onboard the vessel in a dry space close to the connection point, for the reception and / or extension of the ship to shore connection cable. The degree of protection is to be in accordance with Section 1.K.2.

1.2 Protection

1.2.1 The shore connection switchboard is to be equipped with:

- Voltmeter, all three phases
- Short-circuit devices: tripping and alarm
- Overcurrent devices: tripping and alarm
- Earth-fault indicator: alarm
- Back-up of the protection system adequate for at least 30 minutes.

1.2.2 The ship receiving switchboard is to be equipped with the following protections and alarms:

- Short-circuit: tripping with alarm
- Overcurrent in two steps: alarm and tripping with alarm,
- Earth fault: alarm and tripping if required by the type of isolation system used
- Over / under voltage in two steps: alarm and tripping with alarm
- Over / under frequency in two steps: alarm and tripping with alarm
- Reverse power: tripping with alarm*
- Phase sequence protection with alarm and interlock.

Protection function marked with an asterisk (*), may be omitted when load transfer via blackout is chosen.

2. Control and monitoring

2.1 Instrumentation and communication

2.1.1 If the load transfer is carried out via parallel connection (see 2.2.3), the ship receiving switchboard is to be equipped with the following instrumentation:

- Two voltmeters
- Two frequency meters
- One ammeter with an ammeter switch to enable the current in each phase to be read or an ammeter in each phase
- Phase sequence indicator or lamps
- One synchronising device.

Note:

One voltmeter and one frequency meter shall be connected to the switchboard busbars, the other voltmeter and frequency meter shall be switched to enable the voltage and frequency of the connection to be measured.

2.1.1 If the load transfer is carried out via black out (see 2.2.2), the ship receiving switchboard is to be equipped with the following instrumentation:

- Two voltmeters

- Two frequency meters
- One ammeter with an ammeter switch to enable the current in each phase to be read, or an ammeter in each phase
- Phase sequence indicator or lamps.

2.1.3 Arrangements shall be provided to ensure that the shore connection circuit-breakers cannot be operated when:

- The pilot contact circuit is not established
- Emergency-stop facilities are activated
- Ship or shore control, alarm or safety system self-monitoring properties detect an error that would affect safe connection
- The data-communication link between shore and ship is not operational
- The voltage supply is not present
- Earth fault is detected.

2.1.4 The measuring point for all instrumentation related to the shore power is to be on the upstream side of the incoming circuit breaker that isolates the shore power from the vessels power system.

2.1.5 An independent means of voice communication e.g. two way radio is to be provided between the ship and the shore control locations.

2.2 Electrical load transfer

2.2.1 Load transfer between operation using ship sources of electrical power and an external electrical power supply is to be provided via black out or synchronization between the two sources.

2.2.2 In case of load transfer via black out, means are to be provided to ensure that the shore supply can only be connected to a dead switchboard.

2.2.3 Temporary parallel connection for load transfer, when provided, is to be in accordance with 2.2.4 to 2.2.8.

2.2.4 Means to automatically synchronize a ship source of electrical power with an external electrical power supply and connect them in parallel for load transfer are to be provided.

2.2.5 The load transfer is to be completed in a time as short as practicable without causing machinery or equipment failure or operation of protective devices. This time shall be used as the basis for defining the transfer time limit.

2.2.6 The transfer time limit is to be defined and made available to responsible personnel.

The transfer time limit may be adjustable to match with the ability of the external source of electrical power to accept and shed load.

2.2.7 When transferring of load between ship sources of electrical power and an external electrical power supply exceeds a defined Transfer Time Limit then, arrangements are to be such that:

- The transfer is aborted
- Load is removed from the ship sources of electrical power or external electrical power supply that was intended to take the load
- The connection Circuit-Breaker is opened.

2.2.8 An alarm is to be provided at a machinery control station that is attended when connected to an external electrical power supply when the transfer time limit is exceeded and is to indicate the return to previous operating conditions.

E. Testing and Trials

1. Initial tests

1.1 General

1.1.1 All systems components shall have passed type tests and routine tests according to the relevant IEC standards.

1.1.2 Electrical and control engineering equipment is to be surveyed at manufacturer's works and undergo survey and operational trials on board in accordance with the approved test schedules and applicable testing requirements in Section 20.

1.1.3 Tests shall be carried out to demonstrate that the electrical system, control, monitoring and alarm systems have been correctly installed and are in good working order before being put into service. Tests shall be based on actual condition and simulations avoided as far as is practicable.

1.1.4 Following tests shall be carried out after completion of the installation.

- Visual inspection
- Power frequency test
- Insulation resistance measurement
- Measurement of the earthing resistance
- Function test including correct settings of the protection devices
- Function test of the interlocking system
- Function test of the control equipment
- Load transfer (black out or synchronization, if applicable)
- Phase-sequence test
- Function test of the cable management system where applicable
- Integration test to demonstrate that the ship-side installations such as the power management system, integrated alarm, monitoring and control system work properly.

2. Additional tests and maintenance

2.1 General

2.1.1 An overall compatibility assessment is to be carried out to verify the possibility to connect the ship to the different shore supply.

2.1.2 A record of annual maintenance, repair, equipment modifications and the test results are to be available for the shore and ship side.