SECTION 1 GENERAL REQUIREMENTS

1 General

1.1 Application

1.1.1 The requirements of this Chapter apply to electrical installations on yachts assigned with service notation Yacht and Charter Yacht completed with the additional service features motor or sailing.

Where the word yachts is used in the subsequent chapter, it means yachts and charter yachts.

1.1.2 For yachts intended to carry more than 12 passengers, additional requirements specified in the Rules for Steel Ships Pt D, Ch 11, Sec 5 apply.

1.1.3 The Flag Administration may request application of National Rules and/or International Regulations. In such a case, it is the Owner, or the Shipyard or the Designer responsibility to comply with the therein Rules and Regulations.

1.1.4 In the present Chapter, length reference to 24 m means:

- for yacht: Hull length, L_h, as defined in EC Directive (EN ISO standard 8666:2002) reminded in Pt A, Ch 2, Sec 1, [2.2.1]
- for charter yacht: Length according to International Rules, L_{LL}, as defined in Pt A, Ch 2, Sec 1, [2.2.1].

1.2 References to other regulations and standards

1.2.1 The Society may refer to other regulations and standards when deemed necessary. These include the IEC publications, notably the IEC 60092 series.

1.2.2 When referred to by the Society, publications by the International Electrotechnical Commission (IEC) or other internationally recognised standards, are those currently in force at the date of agreement for ship classification.

2 Documentation to be submitted

2.1

2.1.1 The documents listed in Tab 1 are to be submitted.

The list of documents requested is to be intended as guidance for the complete set of information to be submitted, rather than an actual list of titles.

The Society reserves the right to request the submission of additional documents in the case of non-conventional design or if it is deemed necessary for the evaluation of the system, equipment or components.

Plans are to include all the data necessary for their interpretation, verification and approval.

Unless otherwise agreed with the Society, documents for approval are to be sent in triplicate if submitted by the Shipyard and in four copies if submitted by the equipment supplier.

Table 1 : Documents to be submitted

No	I/A **(1)**	Document
1	A	Single line diagram of electrical installation
2	A	General arrangement diagram of the yacht showing the location of electrical equipment (batteries, generators, switchboards, battery chargers, quay sockets, etc.)
3	I	Electrical power balances (AC and DC installations)
4	A	List of circuits including, for each supply and distribution circuit, data concerning the nominal current, the cable type and cross-section, nominal and setting values of the protective and control devices
5	A	List of main electrical equipments including type and manufacturer
6	A	Single line diagram and detailed diagram of the main switchboard
7	A **(2)**	Single line diagram and detailed diagram of the emergency switchboard
8	A **(2)**	Diagram of the supply, monitoring and control systems of the rudder propellers
9	A **(2)**	Detailed diagram of the navigation-light switchboard
10	A **(2)**	Diagram of the remote stop system (ventilation, fuel pump, fuel valves, etc.)
11	A **(3)**	Diagram of the general emergency alarm system and other intercommunication systems

(1) A: to be submitted for approval
I : to be submitted for information.
(2) for yachts equal or over 24 m in length
(3) for yachts of 500 gross tonnage and above

Documents requested for information are to be sent in duplicate.

In any case, the Society reserves the right to require additional copies when deemed necessary.

3 Definitions

3.1 General

3.1.1 Unless otherwise stated, the terms used in this Chapter have the definitions laid down by the IEC standards.

The definitions given in the following requirements also apply.

3.2 Essential services

3.2.1 Services essential for the navigation, steering or manoeuvring of the yacht, or the safety of human life.

3.2.2 For yachts whose length is less than 24 meters, essential services may include but are not limited to following services:

- Starting equipment of main propulsion engines
- Steering gear
- Bilge pumps
- Necessary lighting
- Navigation lights
- Navigational equipment
- Equipment necessary for the control of the sails (for sailing yachts).

3.2.3 For yachts whose length is equal or greater than 24 metres, essential services may in addition to those listed in [3.2.2] include but are not limited to following additional services:

- Fuel supply pumps, lubricating oil pumps and cooling water pumps for main and auxiliary engines
- Electric generator and associated power sources the above equipments
- Windlasses
- Fire detection and alarm system
- Fire extinguishing systems
- Ventilation fans for engine rooms
- Starting air compressor
- Emergency battery charger
- Internal safety communication equipment.

3.3 Low-voltage systems

3.3.1 Alternating current systems with rated voltages greater than 50 V r.m.s. up to 1000 V r.m.s. inclusive and direct current systems with a maximum instantaneous value of the voltage under rated operating conditions greater than 50 V up to 1500 V inclusive.

3.4 Safety voltage

3.4.1 A voltage which does not exceed 50 V a.c. r.m.s between conductors, or between any conductor and earth, in a circuit isolated from the supply by means such as a safety isolating transformer, or convertor with separate windings.

A voltage which does not exceed 50 V d.c. between conductors, or between any conductor and earth, in a circuit which is isolated from higher voltage circuits.

Note 1: Consideration should be given to the reduction of the limit of 50 V under certain conditions, such as wet surroundings or exposure to heavy seas or where direct contact with live parts is involved.

Note 2: The voltage limit should not be exceeded either at full load or at no-load, but it is assumed, for the purpose of this definition, that any transformer or convertor is operated at its rated supply voltage.

3.5 DC systems of distribution

3.5.1 Two-wire d.c. system

A d.c. system comprising two conductors only, between which the load is connected.

3.6 AC systems of distribution

3.6.1 Single-phase two-wire a.c. system

A single-phase a.c. system comprising two conductors only, between which the load is connected.

3.6.2 Single-phase three-wire a.c. system

A single-phase a.c. system comprising two conductors and a neutral wire, the supply being taken from the two outer conductors or from the neutral wire and either outer conductor, the neutral wire carrying only the difference current.

3.6.3 Three-phase three-wire system

A system comprising three conductors connected to a three-phase supply.

3.6.4 Three-phase four-wire system

A system comprising four conductors of which three are connected to a three-phase supply and the fourth to a neutral point in the source of supply.

3.7 Hull return system

3.7.1 A system in which insulated conductors are provided for connection to one pole or phase of the supply, the hull of the yacht or other permanently earthed structure being used for effecting connections to the other pole or phase.

3.8 yacht's earth/ground

3.8.1 Connected to the general mass of the hull of the yacht in such a manner as will ensure at all times an immediate discharge of electrical energy without danger.

Note 1: A conductor is said to be "solidely earthed" when it is electrically connected to the hull without a fuselink, switch, circuit breaker, resistor, or impedance, in the earth connection.

Note 2: In the USA, "grounded" is used instead of "earthed".

3.9 Main source of electrical power

3.9.1 A source intended to supply electrical power to the main switchboard for distribution to all services necessary for maintaining the yacht in normal operational and habitable condition.

3.10 Main switchboard

3.10.1 A switchboard which is directly supplied by the main source of electrical power and is intended to distribute electrical energy to the yacht's services.

3.11 Emergency source of electrical power

3.11.1 A source of electrical power, intended to supply the emergency switchboard in the event of failure of the supply from the main source of electrical power.

3.12 Emergency condition

3.12.1 A condition under which any services needed for normal operational and habitable conditions are not in working order due to failure of the main source of electrical power.

3.13 Emergency switchboard

3.13.1 A switchboard which in the event of failure of the main electrical power supply system is directly supplied by the emergency source of electrical power and is intended to distribute electrical energy to the emergency services.

3.14 Distribution board

3.14.1 A switchgear and controlgear assembly arranged for the distribution of electrical energy to final circuits.

3.15 Engine negative terminal

3.15.1 Terminal on the engine to which the negative cable of a battery system is connected.

3.16 Final circuit

3.16.1 Portion of a wiring system extending beyond the final overcurrent protection device for that circuit.

3.17 Overcurrent protection device

3.17.1 Device, such a fuse or circuit breaker, designed to interrupt the circuit when the current exceeds a predetermined value for a predetermined time.

3.18 Circuit breaker

3.18.1 Mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions, and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions, such as those of overload or short-circuit.

3.19 Residual (differential) current device RCD)/Ground Fault Circuit Interrupter (GFCI)

3.19.1 Electromechanical switching device, or association of devices, designed to make, carry and break currents under normal service conditions and to cause the opening of contacts when the residual current attains a given value under specified conditions. RCD are recognized as reducing the risk of injury to people from electric shock.

3.20 Fuse

3.20.1 Overcurrent protection device that, by fusing of one or more of its specifically designed and proportioned components, opens a circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time.

3.21 Protective conductor

3.21.1 Conductor, not normally carrying current, used for some measure of protection against electric shock by electrically connecting any of the exposed and extraneous conductive parts of electrical equipment of a yacht with non-metallic hull to the yacht's main earth.

In the case of a yacht with metallic hull, exposed and extraneous conductive parts may be bonded to the yacht's hull by permanent and reliable metal to metal joints of negligible impedance.

3.22 Bond

3.22.1 The connection of non-current carrying parts to ensure continuity of electrical connection, or to equalize the potential between parts comprising, for example, the armour or lead sheath of adjacent length of cable, the bulkhead, etc. For example bulkhead and cables in a radio-receiving room.

3.23 Neutral conductor

3.23.1 Conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy.

3.24 Sheath

3.24.1 A uniform and continuous tubular covering of metallic or non-metallic material, generally extruded.

3.25 Batteries

3.25.1 Vented battery

Vented batteries are those in which the electrolyte can be replaced and freely releases gas during periods of charge and overcharge.

3.25.2 Valve regulated battery

The cells are closed but have a valve which allows the escape of gas if the internal pressure exceeds a predetermined value.

3.25.3 Sealed battery

Cells remain closed and do not release or take in gas or liquid when operated within the limits specified by the manufacturer. The cells may be equipped with a safety device to prevent dangerously high internal pressure.

3.26 Cable trunking

3.26.1 System of enclosures comprising a base with a removable cover intended for the complete surrounding of insulated conductors, cables or cords and for the accommodation of other electrical equipment.

3.27 Accessible

3.27.1 Capable of being reached for inspection, removal or maintenance without removal of the permanent structure of the yacht.

3.28 Readily accessible

3.28.1 Capable of being reached quickly and safely for effective use without the use of tools.

3.29 Captive-spade terminal

3.29.1 Conductor terminal component which is maintained in connection to the screw or stud even when the threaded terminal fastener is loose.

3.30 Generator

3.30.1 A device which creates d.c. or a.c. (alternator) power for distribution to the electrical system onboard a yacht.

3.31 Certified safe-type equipment

3.31.1 Certified safe-type equipment is electrical equipment of a type for which a national or other appropriate authority has carried out the type verifications and tests necessary to certify the safety of the equipment with regard to explosion hazard when used in an explosive gas atmosphere.

4 Environmental conditions

4.1 General

4.1.1 The electrical components of installations are to be suitable for expected environmental and operational conditions and are to sustain anticipated overloads and transient current induced by motor start-up without damage, tripping or overheating. In particular, the conditions shown in the tables in this Article are to be taken into account.

4.2 Ambient air and cooling water temperatures

4.2.1 Electrical equipment is to be designed to operate satisfactorily with the nominal ambient air temperatures indicated in Tab 2 and a primary cooling sea water temperature of 32°C maximum.

4.3 Inclination

4.3.1 Electrical equipment is to be designed to continue to operate satisfactorily with the yacht at the inclinations angles from normal specified in Ch 1, Sec 1, Tab 1.

4.3.2 For sailing yachts a maximum heel angle of 45° on either tack is to be considered.

5 Quality of power supply

5.1 General

5.1.1 Electrical components are to be so designed and manufactured that they are capable of operating satisfactorily under the variations of voltage, frequency and harmonic distortion of the power supply specified from [5.2] to [5.4].

5.2 A.c. distribution systems

5.2.1 A.c. system is to be designed to operate within the voltage and frequency variations shown inTab 3.

5.3 D.c. distribution systems

5.3.1 The nominal d.c. voltage tolerance at the battery terminals over which all d.c. equipment is to operate is +/- 10%.

The yacht's essential services are to remain functional to the minimum voltage at the battery terminals.

Note 1: When battery chargers / battery combination are used as DC power systems, adequate measures are to be taken to keep the voltage within the specified limits during charging, quick charging and discharging of the battery.

5.4 Harmonic distortions

5.4.1 For components intended for systems without substantially static converter loads and supplied by synchronous generators, it is assumed that the total voltage harmonic distortion does not exceed 5%, and the single harmonic does not exceed 3% of the nominal voltage.

6 Electromagnetic susceptibility

6.1

6.1.1 Electrical equipment for yachts whose length is greater than 24 meters is to conform to IEC60533 and IEC60945.

Table 2 : Ambient air temperature

Location	Temperature range °C	
Enclosed spaces	0	+ 45
Exposed decks	– 25	+ 45

Table 3 : Voltage and frequency variations of power supply in a.c.

Parameter	Variations	
	Continuous	Transient
Voltage	+ 6% – 10%	± 20% (recovery time: 1,5 s)
Frequency	± 5%	± 10% (recovery time: 5 s)
Note 1: For alternating current components supplied by emergency generating sets, different variations may be considered.		