

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 211

Electrical cabin Construction and equipment
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1. Scope

The purpose of this specification is to define the minimum requirements for design, fabrication, testing, sea fastening, packing and transportation of a fully equipped standalone electrical cabin for off-shore or on-shore installation.

The above requirements include installation, connection and testing of all equipment inside the cabin.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Should there be any technical difficulties or any conflict between this specification and the standards listed hereafter, Cabin Supplier shall request clarification.

Design and engineering shall conform as a minimum to the following in order of preference:

- Applicable laws and regulations of the country in which the system will be operated. In cases where no "local" regulations exist, then French laws and regulations shall be used.
- Company Particular Specifications and data sheet (if any)
- Company General Specifications
- Applicable International Electrotechnical Commission (IEC) publications
- Applicable CENELEC Standards
- Applicable recognised standards and codes (e.g. UTE-NFC, BSI, VDE, etc.) where IEC publications have not yet been issued.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
IEC 60331-21	Tests for electric cables under fire conditions. Circuit integrity - Part 21: Procedures and requirements-Cables of rated voltage up to and including 0.6/1.0 kV
IEC 60364 (All parts)	Electrical installations of buildings - All parts

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Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 354	External protection of onshore structures and equipment by painting
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 131	High voltage switchgear and controlgear
GS EP ELE 135	Low voltage switchgear assembly
GS EP ELE 137	Distribution boards
GS EP ELE 141	Power transformers
GS EP ELE 151	DC Uninterruptible Power Systems (UPS)
GS EP ELE 152	AC Uninterruptible Power Systems (UPS)
GS EP ELE 161	Electrical cables
GS EP HVA 100	HVAC Basis of design
GS EP HVA 202	Air Handling Unit(s) (AHU)
GS EP HVA 211	Electrical heaters
GS EP HVA 212	Fire Damper(s) Pneumatically Actuated
GS EP HVA 213	Fire Damper(s) Electrically Actuated
GS EP HVA 801	Terminology, definitions, abbreviations
GS EP HVA 802	Documents to be supplied for Basic Engineering and Detailed Engineering
GS EP INS 107	Design and installation of instrumentation links
GS EP SAF 221	Safety rules for buildings
GS EP SAF 311	Rules for the selection of fire-fighting systems
GS EP SAF 312	Fire and Gas detection systems
GS EP SAF 331	Carbon dioxide fixed fire extinguishing systems
GS EP SAF 337	Passive Fire Protection: Basis of design
GS EP STR 104	Design and fabrication of technical cubicles for offshore oil installations

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3. Environmental conditions

The cabin shall be designed in accordance with the data given in the “Environmental conditions particular specification”.

4. Cabin, technical characteristics

4.1 Cabin, construction requirements

4.1.1 General

Cabins installed in hazardous area, in dusty atmosphere or in case of sand wind shall be pressurised (50 Pa).

Unless otherwise specified, walls, roof and floor of the electrical cabin shall be constructed from steel plates and shall have coating and cladding arrangements to provide a passive fire protection.

Cabin shall be air conditioned to control temperature and humidity conditions. In case of HVAC failure, electrical equipment shall be able to operate as long as room temperature does not exceed 40°C.

Large cabin shall be designed in separate modules to be assembled on site.

Design shall be such as the fully equipped cabin / Module shall be, unless otherwise specified in the project documentation, lifted and transported in one piece safely to its final destination, under compliance to local regulations pertaining to such transport.

4.1.2 Structural works

4.1.2.1 Steel works

Structural steel material shall be defined as per specification [GS EP STR 104](#).

4.1.2.2 Lifting

The cabin shall be designed to withstand all shipping and erection loads in addition to normal dead and live loads in accordance with § 4.2.1 and § 6.3 of [GS EP STR 104](#).

4.1.3 Architectural works

4.1.3.1 Cabin dimensions

Refer to “Project Cabin general arrangement document”.

Internal cabin dimensions shall take into account identified future expansion, if any or at least 20% of free surface area for potential switchgear extension.

4.1.3.2 Walls

Wall insulation shall be designed in accordance with [GS EP HVA 100](#).

Walls shall be designed to support “wall mounted” equipment up to 50 kg.

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Unless otherwise specified in project particular specification, external painting shall be carried out with system "P16" of **GS EP COR 350** for offshore or coastal installation.

With regards to inland onshore installation, painting shall be certified for a corrosive atmosphere of class "C4" or "C5" depending on environmental conditions as per **GS EP COR 354**.

Indoor surface finishes shall be non reflective.

4.1.3.3 Doors

Door insulation shall be designed in accordance with **GS EP HVA 100**. Doors shall be equipped with lock, anti-panic bars, rubber cushions and automatic closing system.

Adequate warning signs related to electrical hazards and a notice summarising the first aid methods must be posted on the doors.

A minimum of two doors shall be provided, one for staff access and one for emergency exit.

The minimum clear width door opening shall be as follows:

- Doors for staff access: 2100 mm * 900 mm
- Double door for material access: 2500 mm * 1400 mm.

Door for material access shall be suitable to handle the largest piece of equipment.

Unless otherwise stated, the doors shall be located such as any distance to exit, does not exceed 7 meters.

4.1.3.4 Internal partitioning

Particular requirements (e.g. noise, fire...) shall be taken into account to define the partitioning material.

4.1.3.5 Floor and raised floor

4.1.3.5.1 Floor

In battery room, the surface shall be electrolyte resistant.

4.1.3.5.2 Raised floor

A minimum 600 mm raised floor shall be provided and shall be compatible with the bending radius of the largest cross-section of cables.

Raised floor shall be designed in accordance with **GS EP STR 104**.

4.1.3.6 Ceiling

Minimum clearance distance above switchgears shall be 500 mm (access for maintenance purpose) and shall also be compatible with the requirements of switchgear Manufacturers (arc resistance).

4.1.3.7 Roof

Roof shall be constructed with a slope for drainage.

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4.1.4 Piping works - supports and location

All piping shall be supported, guided and anchored. All supports shall be designed as dismantling type.

Piping routing above electrical equipment or behind the inner walls is prohibited.

4.2 Pressurization - Heating, ventilation and air conditioning system

4.2.1 Design criteria

HVAC design shall be upon requirements of Company Specification **GS EP HVA 100** and **GS EP HVA 801**.

4.2.2 HVAC equipment design criteria

Pressurization and air conditioning systems shall be sized in compliance with **GS EP HVA 100** and **GS EP HVA 202**.

4.2.3 HVAC operation

HVAC system shall operate automatically and shall be capable of maintaining the required conditions.

An "Automatic / Manual" switch shall be provided. In manual position, unit may be controlled at request for testing purposes.

Fan and HVAC units, shall be redundant with automatic change over.

Electrical heaters shall be designed as per **GS EP HVA 211** requirements and shall be stopped in case of loss of airflow.

After electrical power shutdown, HVAC system shall automatically restart.

In battery rooms, appropriate dilution ventilation system shall be provided and all electrical equipment shall be ATEX certified category 2G.

4.2.4 Fire and gas damper operation

Fire dampers shall be designed as per **GS EP HVA 212** or **GS EP HVA 213** depending of the project particular specification.

The fire and gas system will have the capability to shutdown the complete HVAC system and to close the fire and gas dampers.

To ensure fire extinguishing, all fire and gas dampers of the technical room shall be automatically closed before CO₂ injection.

In case of gas detection at fresh air inlet, inlet and exhaust dampers shall be closed and pressurization shall be stopped.

4.2.5 HVAC control system

HVAC system shall be controlled from a programmable logic controller (PLC) interlocked with the main fire and gas detection system.

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It shall have the following operating functions:

- Normal starting sequence of each HVAC unit
- Room pressurization and ventilation
- Maintain temperature and humidity
- Fan, pump and compressor operation
- Shut-off damper operation
- Emergency operation (shutdown and HVAC restarting)
- Air filters condition
- All alarms, faults and equipment status
- Changeover to stand-by equipment.

The automatic control system shall be designed, so that upon failure of any unit, automatic changeover to the stand-by unit is made.

4.3 Fire detection and protection system

The system shall consist of:

4.3.1 Fire detection

Automatic detection shall be carried out by a minimum of two smoke detectors located on the ceiling and two others inside the raised floor, to make two separate loops.

Smoke detector spacing shall be according to [GS EP SAF 312](#).

Detection logic shall be done according to “Causes and Effects Matrix” document.

4.3.2 Fire-extinguishing system

If an active fire-fighting system is necessary to protect the installation, the type(s) of this active fire-fighting system(s) and its location shall be as per [GS EP SAF 311](#).

As per [GS EP SAF 331](#), fixed CO₂ extinguishing system is recommended for isolated technical rooms.

Electrical cables for the fire extinguishing system shall be of fire resisting type in accordance with [IEC 60331-21](#) and [GS EP ELE 161](#).

4.4 Gas detection system

When required, gas detection system shall be designed as per [GS EP SAF 312](#).

4.5 Passive Fire Protection (PFP)

This chapter deals only with fire outside cabins.

P.F.P shall be in compliance with [GS EP SAF 221](#) and [GS EP SAF 337](#).

Depending on the Project “Safety Concept” document, the required P.F.P level shall be defined in a particular specification.

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4.6 Electrical equipment

4.6.1 Main electrical equipment

Main electrical equipment installed in the cabin shall be as per Project Particular specifications and Company General Specifications **GS EP ELE 131**, **GS EP ELE 135**, **GS EP ELE 137**, **GS EP ELE 141**, **GS EP ELE 151**, **GS EP ELE 152** requirements.

Selection of electrical equipments for hazardous area shall be done in accordance with **GS EP ELE 079**.

4.6.2 Lighting circuits and socket outlets

4.6.2.1 Indoor lighting

It shall consist of:

- Category 2G (if required) self-contained battery back-up (2x36 W) fluorescent luminaires (autonomy: 3 h), supplied from the 230 V lighting panel and controlled by switches located at the doors of the cabin.

The minimum illumination level to be maintained in normal operation shall be 300 Lux at 0.85 m above the floor level.

- Escape lighting ("Exit" luminaire) above each door, Category 2G (if required), self-contained battery powered and permanently charged (autonomy 1h30 minimum).
- Category 2G portable lighting, suitable for use in hazardous area. Battery powered with the rechargeable device supplied from a 230 V socket (autonomy: 4 h minimum).

4.6.2.2 Outdoor lighting

It shall consist of:

- Category 2G (if required), fluorescent type self-contained luminaire with minimum 3 h autonomy and installed above the main door access.
- Control of lighting shall be made by switch.
- Power supply shall be from 230 V normal or essential lighting panel (if any).
- Minimum illumination level shall be maintained at 150 Lux.

4.6.2.3 Socket outlets

Sockets "2 poles 16 A + earth" - 230 V next to the main switchgears and panels shall be provided.

Upon request, clearly identified sockets shall be powered from 230 V panel from UPS.

Category 2G (if required), "3 poles 63 A + earth / 400 VAC / IP55 IK08" socket with plug shall be installed on cabin structure, outside and preferably near the main door access.

Sockets that are not powered from a UPS, shall be fitted with 30 mA earth leakage protection.

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4.6.3 Cables

- Cables (power and control circuits) for electrical apparatus (transformers, switchboards, motors panels, lighting, etc.) shall be in accordance with the Company specification **GS EP ELE 161**.
- Interface cables between PCS and electrical panels can be of instrumentation type.
- Cables for the HVAC system (control) shall be in accordance with the particular project specification "Instrumentation cables".

4.6.4 Safety equipment

Safety devices shall be grouped together on a rack fixed to the wall close to the main door access and shall include as a minimum:

- One pair of gloves (in a box)
- Safety anti-flash glasses
- One isolating stool and rubber mat
- One isolating pole
- One voltage detector
- "First aid" resuscitation instructions and warning plates
- Eye - wash.

4.7 Telephone and public address

4.7.1 Telephone

One telephone outlet and one telephone set shall be provided and shall be Category 2G if required.

4.7.2 Public address

The public address shall be defined in the Project Particular Specification.

4.8 Earthing system

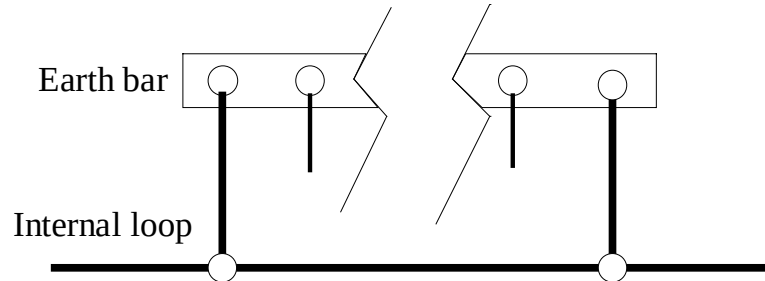
4.8.1 General

Unless otherwise specified in particular specification, one earth loop made of 95 mm² bare copper conductor shall be provided internal to the cabin.

Instrument and electrical protective earthing shall be connected to this loop through copper earth bars.

Earthing loop shall be connected at both ends of each earth bar as shown hereunder.

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When earth bars are installed under false floor, marking shall be provided above floor to indicate location.

Supporting jacks (one out of four) shall be interconnected to each other and to the earth loop.

Two external earthing studs located at two opposite sides of the cabin, shall be provided for connection of the internal loop to the general grid.

4.8.2 Protective earth (PE)

Any metallic parts, electrical equipment that is not class II rated or powered by a system operating at a voltage other than the safety extra low voltage, shall be connected to the equipotential bonding system by its own earthing conductor.

In TNS systems, the protective conductor shall be included in the multi core power supply cable and it may be separate from the power supply cable in other cases.

Earthing conductors shall be copper made and PVC insulated (coloured green/yellow) with suitable size according to section 543.1.1 of [IEC 60364.5.54](#).

Metal ducting (cable tray, conduit, etc.) shall be connected to the protective earth system at both ends (minimum conductor size is 4 mm²). Full continuity shall be ensured. The use of metal ducting as earthing conductor is strictly prohibited.

4.8.3 Instrument earthing

Refer to [GS EP INS 107](#).

4.9 Lightning protection

Cabin structure shall withstand the direct lightning strike (kA) as specified in environmental conditions.

Lightning protection of the cabin shall be part of a specific study carried out by third-party.

Implementation of the relevant recommendations shall be done during cabin construction.

In case of high keraunic level, only metallic cabin shall be provided. GRP cabin is prohibited.

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5. Installation and connections

5.1 Equipment installation

Equipment above 50 kg and not floor mounted shall be fixed on steel supports and welded to the cabin structure. Supports shall be sandblasted and painted in the same way as the rest of the cabin steelwork.

5.2 Cables and cabling

5.2.1 General

Cables interconnecting the equipment within the cabin shall be of non-armoured type.

Cables under the raised floor shall be laid on cable trays or cable ladders.

5.2.2 Segregation

Minimum distances for parallel routings between LV power cables and electronic signal wiring shall be 600 mm.

For cable crossings (at right angle), minimum distance shall be 200 mm.

HV cables shall have direct access to the cubicles.

5.2.3 Cable trays and cable fixation

Internal cable trays shall be hot dip galvanised perforated steel plate.

External cable trays shall be:

- Offshore and coastal area: glass reinforced polyester (GRP), or aluminium 5754 or stainless steel 316L
- Onshore: hot dip galvanised steel.

Fixation of external cable trays shall be achieved by standard steel supports having a minimum thickness of 5 mm. These supports shall be welded to the structure, sandblasted and painted same as the structure.

Cable trays shall be sized with 20% spare capacity.

Protective covers shall be provided wherever mechanical damage is likely to occur.

Changes in direction and crossing shall be done without interrupting the continuity of cable trays, and taking into account the minimum cable bending radii.

Elbows, tees, etc., shall be supplied in form of pre-fabricated components of the same material as the cable tray.

HV Cables shall be laid in a single layer. Two layers will be acceptable for LV power cables.

Fixation of cables on cable trays shall be done as follows:

- Every 30 cm for vertical routings
- Every 1 m for horizontal routings, plus fixation points at direction changes

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- At a distance of 20/30 cm of each connecting point
- In general, where lack of fixation may cause cable deterioration.

Individual cables or group of 2 maximum may be placed in ducts, of same grade as the cable tray or in tubes, reinforced, fire resistant and mounted with open bends.

Individual cables shall be clamped every 30 cm.

When cables are directly exposed to direct sunlight they shall be protected by sunshades.

5.2.4 Cable penetrations

- They shall be modular transit systems.
- They shall be provided and sized to accommodate all the cables entering the cabin.
- 20% spare capacity shall be provided.
- They shall be of the same fire rating as the wall.
- They shall be mounted on the wall under the raised floor level.

5.2.5 Cables marking

Cables marking shall be achieved by means of stainless steel tags, embossed or graved.

Tags shall be clamped to each cable, at both ends and at both side of cable penetrations.

Control wires and power conductors shall be tagged.

5.2.6 Cable glands

Cable glands are not required to enter into floor mounted switchboard.

When required cables terminated into enclosures shall use mechanical compression type cable glands.

Aluminium alloy cable glands are prohibited.

For offshore installations, either Nickel plated Brass or stainless steel 316 (metallic enclosures or armoured cables), or polyamide (Polyester enclosures and non armoured cables) shall be used.

For onshore installations, brass cable glands shall be used.

In case of GRP boxes, metallic cable glands shall be used for armoured cable connection, with suitable accessories for earthing and bonding. For non armoured cable connection, polyamide type cable glands may be used.

Spare and unused entries shall be properly plugged.

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5.2.7 Cable connections

- Lugs and terminations shall be crimped.
- Cable armours and shields shall be connected to relevant switchboard, cabinet, panel, etc., earth bar or terminal.

6. Engineering documents

The engineering services shall issue the following deliverables as a minimum:

Note: See particular specification for additional required documents.

6.1 Structure documents

- Structural calculations taking all type of loads into account
- Welding specification and procedures
- Cabin structural detailed drawings
- Cabin architectural detailed drawings and specifications, showing:
 - Internal partitions
 - Access doors
 - False floor supporting structures
 - Equipment supporting frames
- Cabin weight follow-up report
- Cabin loading/unloading/slides/spreader frame, calculation
- Cabin certificates (passive fire protection, etc.)
- Equipment layout drawings in cabin with dimensions and weights
- Drawings showing penetrations inside the cabin (cables, pipe, HVAC, ducts).

6.2 Pressurization and HVAC documents as per **GS EP HVA 802**

- P&ID's & D&ID's
- Instrument list
- Pressurization and HVAC calculation notes
- Functional analysis and logic diagrams
- Specifications and data sheets
- HVAC detailed drawings
- Trouble shooting diagrams.

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6.3 Fire & gas protection system documents

- Fire protection calculation note
- Fire & gas detectors layout
- Piping and nozzles layout
- CO₂ bottles system layout and arrangement.

6.4 Electrical documents

6.4.1 Studies

- Single line diagram
- Electrical Consumer list and load balance
- Relay coordination study
- Cable sizing calculation note and charts
- Battery sizing calculation note.

6.4.2 Detailed drawings, specifications and documents

- Cabin layout
- Equipment dimensions, lay out and arrangement
- Equipment data sheets
- Equipment Schematics and wiring diagrams
- Cabin interconnection wiring diagram
- Cabin cable schedule
- Cabin earthing and lightning detailed drawings
- Cabin lighting circuit detailed drawings
- Cabin cable penetration Schedule/arrangement.

6.4.3 Final documentation

Cabin Supplier shall establish a final dossier including:

- As-built drawings
- FAT reports
- Operating and maintenance manuals
- Sub-supplier documentation (including type test certificates, ATEX certificates)
- Manufacturer's drawings

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- Electrical Equipment obsolescence Dossier
- Spare part lists.

The cabin Supplier dossier shall be delivered at the same time as the cabin.

7. Factory Acceptance Tests (FAT)

7.1 Acceptance tests

Cabin Supplier shall perform acceptance tests in the presence of Company, or his representative.

The factory acceptance tests shall include, but shall not be limited to the following:

- Visual inspection of equipment and installation for the checking of mechanical integrity and painting
- Inspection of equipment and installation for the checking of compliance with specifications, data sheets and drawings
- Inspection of earthing circuit (continuity and connections)
- Checking of lighting circuits and illumination level
- HVAC functional tests:
 - Conformity with specifications and drawings
 - Functional tests.
- Fire system functional tests:
 - Conformity with specifications and drawings
 - Functional tests (without CO₂ release).
- HV and LV cables:
 - Insulation and continuity tests.
- HV and main LV switchboard tests:
 - Dielectric tests
 - Protection relay settings, tests and calibrations (secondary current injection)
 - Functional tests (closing, tripping and signalling circuits).
- Secondary LV switchboards and panels tests:
 - Conformity with specifications and drawings
 - Functional tests (relaying and signalling circuits).
- AC and DC UPS functional tests (including battery autonomy if possible).

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8. Sea fastening

Cabin Supplier shall carry out sea fastening of equipment installed in the cabin or directly associated with the cabin (roof mounted equipment).

Sea fastening shall be achieved in compliance with instructions given by equipment manufacturers. Equipment shall be secured to withstand movements and accelerations during handling and transportation.

Withdrawable and removable equipment shall be shipped in sea worthy packed cases. This is also applicable to equipment that must be shipped separately (batteries, HVAC units, etc.).

Sea fastening procedure shall be submitted to Company for approval.

Sufficient quantities of desiccant shall be placed in electrical switchboards, panels, etc., prior to sea transportation.