

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 321

Navigational Aids System

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1. Scope

This specification defines the minimum technical requirements for the design, manufacture, operation and testing of Marine Navigational Aids and aviation obstruction lights system for Company installations located either onshore or offshore.

It shall mainly consist of:

- Marine navigation lights
- Fog-horns
- Aviation obstruction lights
- Helideck beacons.

This specification does not deal with the specific requirements for the offshore platform sea transportation.

2. Reference documents

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

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

- Applicable laws, rules and regulations of the country in which the system will be operated
- International rules, codes and regulations
- Company Particular Specifications (if any)
- Company General Specifications
- Applicable CENELEC Standards
- Applicable International Electro-technical Commission (IEC) standards
- Applicable recognised standards and codes (e.g. UTE, 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
Civil Aviation Authority (Safety Regulation Group)	CAP 437: Offshore Helicopter Landing Areas - Guidance on Standards
IALA report	The definition and method of calculation of the nominal range of a fog horn
IALA report	Recommendations for calculation of the effective intensity of a rhythmic light

Reference	Title
IEC 60068	Environmental testing
IEC 60079 (All Parts)	Explosive atmospheres - All Parts
IEC 60331-21	Tests for electric cables under fire conditions. Circuit integrity - Part 21: Procedures and requirements-Cables of rated voltage up to 0.6/1.0 kV
IEC 60332-3-22	Tests on electric and optical fibre cables under fire conditions - Part 3-22: Tests for vertical flame spread of vertically-mounted bunched wires or cables-Category A
IEC 60529	Degrees of protection provided by enclosures
IEC 61000 (All Parts)	Electromagnetic compatibility - All Parts
IEC 61204	Low-voltage power supply devices, d.c. output - Performance characteristics
International Association of Light house Authorities (I.A.L.A.)	Recommendations on the marking of offshore structures, May 1998
International Civil aviation Organisation (I.C.A.O.)	Annex 14 Volume II: Heliports
UK Department of Transport (D.O.T.)	Standard marking schedule for offshore installations Only to be used for North Sea locations or if specified in the Project particular specification

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 ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 161	Electrical cables
GS EP ELE 261	Solar Power System
GS EP LSO 115	Helideck specifications
GS EP STR 002	Crane for fixed offshore installations
GS EP TEL 410	Installation rules

3. Specification deviations

The Supplier shall advise the Company of any deviations made in respect of this Specification or the documents referred to herein at the time of tendering. Should this Specification conflict

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with requirements of the listed standards the Supplier shall request clarification from the Company.

4. Electrical conditions

Unless otherwise specified in project particular specification, equipment shall be able to operate at rated power with normal supply variations as following:

- Voltage: $\pm 10\%$
- Frequency: $\pm 5\%$.

5. EMI/EMC

Equipment that is sensitive to interference shall be designed in such a way that interference caused by EMI shall have no effects on its reliability and pre-defined specifications.

All equipment shall meet the requirements of [IEC 61000](#) (all parts) and CENELEC regarding Electro-Magnetic Compatibility (EMC).

Supplier will indicate in his offer the maximum acceptable THD and voltage dip by the navigational aids system.

6. Equipment environmental conditions

6.1 Outdoor installed

- Equipment which shall work in case of gas detection must be suitable for zone 1 area classification
- Minimum IP 66 enclosure (as per [IEC 60529](#))
- Equipped with ISO Cable entries
- Cable glands for offshore installations shall be made of marine bronze
- All equipment shall be fully tropicalized according to [IEC 60068\(2-10\)](#): climatic tests
- Enclosure shall be cast iron or cast bronze or fibre glass reinforced resin and resist to marine spray and corrosion. Enclosures of corrosion resistant, copper free aluminium, which have proven to be suitable for the specified environmental conditions, are acceptable
- Electrical terminals shall be insulated clamp type and labelled according to function
- Spare circuit holes, if any shall be plugged with suitably certified plugs
- Bolted earth connections shall be made with corrosion proof materials with spring washers and/or have lock nuts fitted.

6.2 Indoor installed

Indoor equipment shall be generally installed inside an air-conditioned technical room, with an average ambient air temperature of 25°C but shall be able to operate on unusual condition such as specified in the Project data sheet.

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Equipment which is associated with power supply and control of those parts of the system which shall be maintained for 96 hours shall be certified for zone 1 hazardous areas, gas group IIB, temperature class T3, as per CENELEC 50014.

For other equipment the minimum degree of protection of enclosure shall be IP 31.

7. Marine navigational aids - Offshore

7.1 General

The marine navigational aids system shall comprise visual and audible aids, which shall provide 360 degree of protection for the offshore platforms.

This system shall be permanently energised and able to stay in operation during 96 hours even in case of total platform shutdown. The operating mode shall be fully automatic.

To perform this function different type of system can be used. Each installation shall be individually assessed to permit selection of the most suitable system type between:

7.1.1 Centralised battery system

Batteries are located in a central location and supply each remote lamps/horn. In this case the power supply shall be sized for the complete field including any identified future platforms.

7.1.2 Distributed battery system

Batteries are integrated into each lamp/horn.

7.1.3 Solar panel system

This system, in conjunction with batteries, can be used for small platforms like wellhead platforms where no electrical power is available. Choice of system depends on climatic conditions in accordance to the Company specification [GS EP ELE 261](#).

7.2 Reliability

Reliability of equipment to perform continuously is essential. Prototype or unproven equipment not having a well-established operating record will not be considered.

Supplier shall state in his bid the availability, reliability and Mean Time Between Failure (MTBF) data for similar units in service.

7.3 Installation conditions

In case of centralised battery system, Control panel, foghorn, lanterns and DC supply shall be connected by fire resisting cables conforming to [IEC 60331-21](#) and Company specification [GS EP ELE 161](#).

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7.4 Marine lights

7.4.1 Main marine lights

Main marine lights shall be:

- Equipped with flashing white lights of which the intensity shall be 12000 candelas, giving a range of 15 nautical miles, or 1400 candelas in any direction as per [IALA](#) recommendations.
- Installed in such a way that at least one light has to be visible upon approaching the structure from any direction (generally located on the corners of the complex)
- Equipped with 3000 hours lamps life duration for 12000 candelas type light
- Equipped with six-lamp changer (6 x 1000 hours) 6000 hours duration life for 1400 candelas light type. Lamp changer comes in operation automatically upon failure of the main light and sends one alarm signal to the control panel, if any, or to the platform control system
- Photocell controlled and automatically switched on from 15 minutes before the sunset until sunrise and any time when the meteorological visibility in any direction is two nautical miles or less. Manual override switch located at the navigation aids control panel shall be provided
- Synchronised with each other and emit the Morse letter "U" every 15 seconds
- Placed not less than 6m and not more than 30 m above Mean High Water Springs
- Protected against bird soiling
- The use of LED is allowed when technology is available.

7.4.2 Secondary lights

If 12000 candelas main lights are used, secondary lights are required, and shall be:

- Equipped with white lights of which the intensity shall not be less than 1200 candelas giving a range of 10 nautical miles
- Equipped with six-lamp changer (6 x 1000 hours) 6000 hours duration life
- Coming in operation automatically on failure of the main lights and sending one alarm signal to the control room
- Synchronised with each other and emit the Morse letter "U" every 15 seconds
- Protected against bird soiling.

7.4.3 Subsidiary lights

When required by local regulation, subsidiary lights shall be installed to mark the horizontal extremities of the structure or vessel, except those extremities which have been already marked by white lights, and bridge, if any.

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Subsidiary lights shall:

- Comply with the local regulation
- Equipped with red lights of which the intensity shall not be less than 15 candelas
- Be photocell controlled with a manual override located at the navigation aids control panel
- Be equipped with six-lamp changer (6 x 1000 hours) 6000 hours duration life
- Be protected against bird soiling.

7.4.4 Photocell

An external photocell suitable for zone 1 shall be used.

Two schemes can be used:

- One common photocell for the lights navigation aids system connected to the central control panel
- One photocell per flashing navigation light.

7.5 Fog horns

Any platform shall carry one or more foghorns providing omnidirectional sound signal.

If the Supplier is not able to confirm whether one foghorn is sufficient to guarantee omnidirectional sound radiation, due to the overall dimensions of the complex it will be recommended to use two foghorns.

In that case, the Supplier shall state which precautions, are to be taken to reduce "on board" noise from emitter to an acceptable minimum sound pressure level (use of sound baffle for example).

In any case foghorn shall be equipped with marking underline risk of sound pressure.

Foghorns shall be:

- In case of manned platform, automatically and manually actuated when the visibility is two nautical miles or less. Manual actuation can be done from radio room, control room or electrical room
- In case of unmanned platform, automatically started by remote order or fog detector
- Switched on by manual override located at the navigation aids control panel
- Protected against bird soiling
- Synchronised, if more of one are used, and emit the Morse letter "U" every 30 seconds
- Provided with an emitter producing an audio beam with a frequency sound between 500 and 900 Hz, and with a range of two nautical miles in all directions in clear weather conditions
- If required by particular Project specification or by local regulation, equipped with a secondary system with a range of 0.5 nautical mile in case of main foghorn failure. In case

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of main fog horn failure, a remote alarm signal shall be sent to the navigation aids control panel, if any, and to the platform control system.

7.6 Marine navigation aids control panel (if any)

It shall include DC UPS system having a minimum of 96 hours autonomy and U code systems to supply lights and foghorn.

7.6.1 Modes of operation

During normal operation, the battery will be “floating” on line with the battery charger maintaining the battery in the fully charged condition, at the same time supplying the loads.

Battery charger shall be in accordance with the equipment definition contained in the data sheet if any.

7.6.2 Electrical utilities

7.6.2.1 Electrical service conditions

The charger shall be fed from three phase AC supplies (400 V essential switchboard) with insulated earth (IT configuration), unless otherwise specified, with insulation monitoring by low frequency current injection and protected by ELCB.

7.6.3 Construction requirements

Control panel shall be of free-standing type unless other specified.

7.6.3.1 Internal wiring

Internal wiring shall be:

- PVC insulated 1000 V grade, at least flame retardant as per [IEC 60332-3-22](#), stranded copper conductors, and be 2.5 mm² minimum
- Flat ribbon type for electronic wiring
- Fitted at both ends with compression type lugs or crimp sleeves and ferrules for identification
- Identified by numbered and/or lettered ferrules, of insulating material and located adjacent to the terminals. Wrap-around adhesive type markers shall not be used
- Securely held in position (either loomed or run in conduit/trunking).

Cabling between components shall be continuous. Cable splicing is forbidden.

Wiring connections for external connections shall be brought out to individual terminals on a readily accessible terminal block.

Partitions shall be placed between terminals of different voltage.

7.6.3.2 Cable termination

External cable terminating facilities and terminals shall be suitable for the specified cable type and conductor size. All external cables shall be connected on terminal blocks, and the number

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of conductors connected to each terminal shall not exceed two for internal cabling and one for external cabling.

Cable supporting and clamping systems shall be provided by the Supplier to avoid undue strain on the cable terminations and suitable for the size and the number of conductors.

Power and control external cabling shall be separated: power and control terminals shall be fully segregated. Protection covers shall be split in order to provide independent access to power and control terminals.

7.6.3.3 Marking

Equipment shall be labelled to indicate all control, alarm and monitoring functions and equipment number. Labels and fixing screws (or rivets) shall be of stainless steel (glue is prohibited).

Equipment and terminal blocks inside enclosures shall also be identified. Permanent nameplates shall be provided identifying each switch, breaker, indicating light, relay and terminal.

Nameplates shall be of laminated engraved plastic with black letters on a white background unless otherwise specified.

7.6.3.4 Distribution circuits

The panel shall be located as close as possible to the batteries and shall contain a three pole incoming switch.

If marine lights and fog horn must be started even in case of gas presence, one Ex"d" panel with the facility to start them manually shall be provided.

A two-pole circuit breaker with overcurrent protection plus a tripping fault contact shall protect each outgoing circuit.

All circuit breaker shall be sized for the specific circuit requirements and shall be fully selective with other devices in the circuit.

DC distribution shall be unearthed except where specified otherwise. A ground fault detector relay providing local and remote alarm shall be installed.

7.6.3.5 Control and monitoring

Local control and monitoring shall be given on the front of the panel and shall include as a minimum:

- Two LED's DC system normal and fault
- Two LED's for Light failure and foghorn failure
- Alarm reset push button
- On/off charger switch
- A buzzer providing audible alarm
- For maintenance purpose, one remote/off/on switch on control panel for marine lantern and foghorn lockable in remote position.

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Alarms and faults (the same as in local) shall be provided on terminals for remote information.
Terminals shall be provided for foghorn remote control.

7.6.3.6 Earthing

An earthing busbar shall be provided along the full length of the equipment frame with provision for earth connections at each end.

All metallic non-current carrying parts of the equipment shall be bonded together and connected to the earth busbar. All doors shall be bonded to the main frame by means of a flexible copper connection arranged so that it cannot be trapped as the door is opened or closed.

7.6.4 DC system

7.6.4.1 Battery charger operation

Chargers shall have two modes of operation: "charge" and "float" as a minimum.

The silicon-controlled rectifiers shall be protected from over temperature by thermal switches, which will de-energise the charger and initiate an alarm.

A loss of control caused by a failure shall block the rectifier bridge.

The charger shall be capable of limiting the output current at its rated value and of limiting the battery charging current to the safe value corresponding to the mode of operation.

The chargers shall be designed not to disturb the AC supply differential protection.

Return to "charge" mode or "float" mode shall be automatic after a pre-set period.

Facilities shall be provided to inhibit "charge" mode in case of failure of the room ventilation system.

Charge mode shall be automatically initiated upon restoration of AC power after an outage.

An adjustable timer started when the battery reaches the second stage of charge shall automatically reset the charger to the float mode to prevent the battery from being overcharged.

Float voltage shall be adjusted automatically depending on the battery temperature monitored by a probe.

7.6.4.2 Minimum features to be provided

Charger shall be equipped with:

- AC supply three pole ON/OFF switch
- RC networks for power semi-conductors
- High speed fuses for power semi-conductors
- Output voltage monitoring relay providing:
 1. High DC voltage alarm tripping the charger
 2. Low DC voltage alarm
- High battery current monitoring providing alarm and trip of the charger.

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Control and monitoring shall be provided by a microprocessor-based controller with as minimum the following visible indications:

- Status of operating modes
- Alarms and faults.

7.7 Battery and batteries installation

7.7.1 Battery type

The batteries shall be of sealed gas recombination type nickel cadmium for “centralised battery system”.

This type of cell shall have a gas recombination rate equal to or greater than 95% in floating mode.

End of discharge voltage shall not be lower than 1 V per cell at 20°C.

In case of “distributed battery system”, preferred battery type is sealed lead acid.

7.7.2 Battery construction

The battery cells shall be assembled in flame retardant heat resistant, shock-absorbing containers with covers attached to form a permanent leak-proof seal. Covers shall be also sealed against electrolyte leakage and shall be fitted with spray-proof vent plugs.

The two polarities shall be insulated from ground unless otherwise specified.

7.7.3 Batteries installation

The maximum voltage drop in main power cables between batteries and main equipment cubicles shall limited to 1% unless otherwise specified.

Warning labels shall be fitted in prominent positions advising care to be taken when gaining access to live equipment.

Battery access shall be lockable.

7.7.3.1 Batteries always used in safe area

Battery enclosure shall be completely assembled and wired in free standing sheet steel cabinet or box suitable for indoor operation. The equipment shall be arranged such that internal access can be made without shutting down.

In case of cabinet, it shall be cleaned, primed and painted with a minimum of two coats of electrolyte resistant paint.

Enclosure shall have at least IP 21 protection (as per [IEC 60529](#)) and shall be designed to be lifted by use of removable eyebolts.

Battery shall be provided with a circuit breaker equipped with undervoltage trip coil.

7.7.3.2 Batteries in presence of gas atmosphere (zone 1)

In this case an Ex”e” batteries box with Ex”e” batteries inside following [IEC 60079-7](#) shall be required.

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Battery shall be provided with an Ex'd' circuit breaker box. This circuit breaker shall be equipped with undervoltage trip coil.

7.7.4 Battery terminals

All cell terminals shall have adequate current carrying capacity. Cell terminal posts shall be equipped with connector bolts. Cell terminal posts, bolts and associated hardware shall be of electrolyte-resisting material and protected by insulating screens to prevent risk of contact with live parts.

7.7.5 Battery capacity

A load curve versus time shall be provided by Engineer to allow definition of battery rating. Also minimum voltage at the end of discharge shall be defined.

The Supplier shall give a calculation note justifying the type and reference of the battery selected and the number of elements.

8. Aviation obstruction lights

8.1 Obstacle marking and lighting

Telecommunications towers, masts, antennae supports, crane and flare shall be treated as obstructions in accordance with [ICAO annex 14](#).

Marking for day and night shall be achieved in accordance with this document.

The lay out of these lights shall enable omnidirectional signalling and be visible from the top.

These lights shall be Ex"e" type (unless otherwise specified) and shall be equipped with long life type lamp. The aviation obstruction lights shall be a part of the safety lighting system.

Provisions shall be taken for a lowering system (relamping purpose).

8.1.1 Crane beacon requirements

Crane obstruction lighting shall be preferably fed from the 230 V AC UPS network.

These lights shall comply with the [GS EP STR 002](#), and shall be usually supplied by the crane Manufacturer and located on the frame and boom.

8.1.2 Flare beacon requirements

Flare beacons shall be designed to withstand high temperatures. This specific requirement shall be studied during detail engineering studies.

Floodlights can be installed at the bottom of the flare and directed at flare nozzle.

8.1.3 Telecom masts and tower beacons

These beacons shall comply with the [GS EP TEL 410](#), and shall be usually supplied as telecom equipment part.

Beacons should be fed from the 230 V AC UPS network.

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9. Helideck requirements

Refer to the Standards for Offshore Helicopter Landing Areas ([CAP 437](#)) and Total [GS EP LSO 115](#).

10. Accessories

A complete set of tools required for handle, erect, monitor, test and maintain the equipment shall be provided.

A tin of finish paint shall be provided to permit final "touch up" following installation.

11. Painting

The surface treatment shall be suitable for the site environmental conditions. The Supplier shall submit his coating system for protection against external corrosion for Company approval.

For offshore application, the proposed coating system must be suitable for category of corrosion C5-M minimum as per [ISO 12944-2](#), and shall provide a warranty of 5 years - with a rusting degree Ri = 2.

Colour shall be Manufacturer's standard, unless otherwise specified in the project particular specification.

12. Testing and inspection

12.1 General

The Supplier shall submit a detailed proposed testing schedule to the Company prior to commencement of testing.

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

12.2 Acceptance tests

The Supplier shall perform all necessary tests to establish that the equipment is in satisfactory working condition will operate as intended and conforms to the purchase order and the requirements of this specification.

Company shall have access to inspect the works at any time.

The following witnessed tests shall be carried out on the equipment:

- Insulation resistance
- Functional check of all control and tripping devices and circuitry, to prove correct operation of all equipment and its ability to meet specific requirements
- Wiring continuity check
- Check on earthing facilities
- Operational tests on the complete system.

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Other tests may be carried out in accordance with details to be agreed between the Supplier and Company at the pre-award meeting.

12.3 Reports and acceptance certificate

With regard to witnessed tests the Supplier shall prepare a full report on the tests and their results noting any discrepancies observed by the Company's inspectors and, shall provide the Acceptance Certificates for each item of equipment tested.

The reports shall be included in the contractual technical documentation of which they form an integral part.

13. Documentation

As a minimum and unless otherwise defined in a project particular specification, the following drawings and documentation shall be supplied in a timely manner according to the specified schedule:

- Overall arrangements
- Completed Data sheet (if any)
- Power consumption and battery sizing calculation notes
- Arrangement details of auxiliary equipment
- Layout of connection boxes and control panels
- Wiring and termination diagrams
- Schematic diagrams
- Equipment technical details
- Operation and maintenance manuals
- Detail drawings of all interface points
- FAT report
- Type examination certificates delivered by the CENELEC or other recognised notified bodies.

The SI system shall be used for all dimensions on drawings. All text on data sheets, drawings, test certificates and instruction manuals shall be in the English language, unless otherwise specified.

The Supplier shall furnish information for installation, maintenance and record purposes. Each piece of equipment shall be clearly marked with the Company's complete purchase order number, item and equipment number.

Supplier shall furnish with each equipment, in a sealed waterproof packet attached inside the unit, a copy of wiring and connection diagram, installation, operation and maintenance manuals.

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14. Other references

Following documents are applicable:

- External documents: [IEC 61204](#), [International Association of Light house Authorities \(I.A.L.A.\)](#), [UK Department of Transport \(D.O.T.\)](#)
- Total General Specifications: [GS EP ELE 079](#).