



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 081

Lighting

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1. Scope

The purpose of this specification is to define the main lighting criteria in order to specify:

- The Company lighting installations
- The minimum requirements for manufacturing/inspection/testing of luminaires and associated accessories.

This specification shall cover:

- Onshore installations
- Offshore platforms
- Floating Units (FPSO, FSO, FPS, FSU, FPU, etc.)
- Company offices and buildings.

In hazardous areas, the luminaire type shall be selected in accordance with the Company general specification **GS EP ELE 079**.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Design, construction and inspection shall conform as a minimum requirement to the current edition of 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, the French laws and regulations shall be used
- Company Particular Specifications and data sheet (if any)
- Company General Specifications
- Applicable International Organisation of Standardisation (ISO) Standards
- Applicable International Electro-technical Commission (IEC) Standards
- Applicable CENELEC Standards
- Applicable International Commission on Illumination (CIE) Technical Reports.

Standards

Reference	Title
IEC 60050-845	International Electro-technical Vocabulary (IEV) - Chapter 845: Lighting
IEC 60064	Tungsten filament lamps for domestic and similar general lighting purposes – Performance requirements
IEC 60081	Double-capped fluorescent lamps – Performance specification
IEC 60155	Glow-starters for fluorescent lamps
IEC 60400	Lampholders for tubular fluorescent lamps and starterholders



Reference	Title
IEC 60432 (All parts)	Incandescent lamps- Safety requirements- All parts.
IEC 60529	Degrees of protection provided by enclosures (IP code)
IEC 60598 (All parts)	Luminaires – All parts
IEC 60662	High pressure sodium vapour lamps- Performance specifications
IEC 60921	Ballasts for tubular fluorescent lamps - Performance requirements
IEC 60923	Auxiliaries for lamps - Ballast for discharge lamps (excluding tubular fluorescent lamps) - Performance requirements
IEC 60927	Auxiliaries for lamps - Starting devices (other than glow starters) - Performance requirements
IEC 60929	ACand/or DC- supplied electronic supplied electronic control gear for tubular fluorescent lamps - Performance requirements
IEC 60968	Self-ballasted lamps for general lighting services - Safety requirements
IEC 60969	Self-ballasted lamps for general lighting services - Performance requirements
IEC 61000-3-2	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current inferior or equal 16 A per phase)
IEC 61167	Metal halide lamps – Performance specifications
IEC 61231	International lamp coding system (ILCOS)
IEC 61347 (All parts)	Lamp control-gear – All parts
IEC 61547	Equipment for general lighting purposes - EMC immunity requirements
IEC 62035	Discharging lamps (excluding fluorescent lamps) - Safety specification
ISO 3864 (All parts)	Safety colours and safety signs – All parts
EN 1838	Lighting applications - Emergency lighting
EN 12464 (Parts 1; 2)	Light and lighting - Lighting of work places - Parts 1; 2
EN 13032 (All parts)	Light and lighting - Measurement and presentation of photometric data of lamps and luminaires – All parts



Professional Documents

Reference	Title
CIE 97	Maintenance of indoor electric lighting system
CIE 129	Guide for lighting exterior work areas

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP MED 062	Hygiene in bases and living quarters

3. Definitions

General light and lighting terms are defined in the following standards:

- [IEC 60050-845](#): International Electro-technical Vocabulary (IEV) - Chapter 845: Lighting.

4. Lighting criteria requirements

The lighting system must be designed and implemented according to the following criteria:

- Ambient temperature
- Environmental conditions such as exposure to chemicals or to saltwater
- Type of location: outdoor, indoor, hazardous and safe areas

- Classification of equipment
- Compliance with applicable standards and local regulation if any
- Satisfactory lighting levels
- Use: intermittent versus constant on
- Colour rendering
- Accessibility: Ease of maintenance and replacement of luminaires
- Power consumption
- Appearance.

The lighting system is split into three systems:

- Normal lighting fed by the main network
- Emergency lighting fed by a back up source (Diesel generator) in case of main network failure
- Escape/safety lighting: part of selected luminaires of the above emergency lighting, which illuminate escape routes, emergency exits and ladders and panels used for re-starting operation.

4.1 General requirements for outdoor normal lighting

4.1.1 Illumination levels

The surrounding area is defined at 3 m.

Location	Maintained illuminance E _m (lux) note 4		Uniformity factor U note 3	GR _L note 5	CRI note 6
	Task area	Surrounding area			
A - Outdoor lighting					
General Process and utility areas	50	NA	0.4	45	20
Process and utility areas					
Compressors, pumps, collectors, exchangers, separators, generator areas	100	50	0.5	45	40
Sampling points and other working points	200	50	0.5	45	40
Ladders and stairs	100	50	0.4	45	40
Furnace	50	50	0.4	50	40
Instruments	200	50	0.5	45	40
Local control panels	200	50	0.5	45	40

Location	Maintained illuminance E_m (lux) note 4		Uniformity factor U note 3	GR _L note 5	CRI note 6
	Task area	Surrounding area			
Onshore storage area					
• General area	10	NA	0.4	50	20
• Tank ladders, access and gauge areas	10	10	0.4	50	20
Loading area (truck, boat)					
• General area	50	NA	0.4	50	20
• Loading point	200	50	0.5	45	40
Port					
General area	20	NA	0.25	55	20
Handling areas	50	20	0.25	55	20
Loading station	100	50	0.4	45	40
Special areas					
Boat landing	100	50	0.4	45	40
Life boats / muster areas	200 Note 8	50	0.4	50	40
Helideck	100	20	0.4	45	40
Street lighting					
Road	10	10	0.4	45	20
Fences	10	10	0.4	50	20
Security fence and junction points (note 1)	50	20	0.4	50	20
Car park	20	20	0.4	45	20
Walking areas	10	10	0.4	45	20

Note 1: Unless otherwise specified by local regulations.

Note 3: U is the ratio between the minimum illuminance and the average illuminance

Note 4: E_m is the minimum average value to be maintained between two scheduled maintenance operations.

Note 5: Glare rating limit

Note 6: Minimum color rendering indices

Note 8: This lighting shall be battery back up (UPS supply as example)

These values are in accordance with the recommendations made in [EN 12464-2](#)

4.1.2 Normal luminaires for outdoor

Consideration shall be given to the use of floodlighting, especially around the perimeter of storage and wide areas. Care shall be taken to ensure that this does not result in shadows, especially at operating locations

High pressure discharge luminaires in hazardous areas shall have type of protection Ex'd'.

Luminaires for instrument and control panels lighting shall be preferably of the fluorescent type, bracket mounted.

In order to allow the relamping without power disconnection, an isolating switch shall be included within the Ex"e" fitting.

For standardization reasons the same type of Ex'd' or Ex'e' luminaires should be used in all plant areas, whether classified Zone 1, Zone 2.

4.2 General requirements for indoor normal lighting

4.2.1 Illumination levels

The surrounding area is defined at 0.5 m

B - Indoor lighting				
Living quarters	Average illuminance on task area(lux)	Average illuminance on surrounding area(lux)	UGR _L note 5	CRI note 6
Gymnasium	300	200	22	80
Bedrooms	100	100	22	80
Lounges, bars and restaurants, TV lounges (note 2)	200	200	22	80
Kitchens	500	300	22	80
Waste installations: Note 7	150	150	22	80
Laundry rooms	300	200	22	80
Air locks	100	100	22	80
Offices - Meeting rooms (note 2)	500	300	19	80
Lockers rooms - Showers – toilets/ Bathrooms	200	200	25	80
First aid rooms: Note 7	500	300	19	80
Prayer rooms (note 2)	300	200	19	80
Stairs	150	150	25	40
Electrical & technical rooms	300	300	22	80
Instrumentation rooms	500	300	22	80
Control rooms (note 2)	500	300	16	80
Stores	300	200	25	60
Laboratories	500	300	19	80
Workshops	300	200	25	60

B - Indoor lighting				
Living quarters	Average illuminance on task area(lux)	Average illuminance on surrounding area(lux)	UGR _L note 5	CRI note 6
Administrative buildings				
Office	500	300	19	80
Gate house	500	300	19	80
Corridors	100	100	28	40
Fire station	200	200	25	60

Note 2: Dimmer controlled.

Note 4: Em is the minimum average value to be maintained between two scheduled maintenance operations.

Note 5: Glare rating limit

Note 6: Minimum color rendering indices

Note 7: For more details on lighting in medical areas see [GS EP MED 062](#)

These values are in accordance with the recommendations made in [EN 12464-1](#)

4.2.2 Normal luminaires for indoor

Luminaires for normal lighting in room that are classified non-hazardous areas shall be fluorescent bi-pin, switch-start, and industrial type.

Non-industrial luminaires may be used in control rooms, offices, living quarters area.

4.2.3 Additional luminaires

When required, portable hand lamp shall be provided by Contractor but not considered for illuminance calculation.

4.2.4 CCR lighting

If no external windows are installed in the Central Control Room, the lack of natural sunlight could be compensating with an artificial lighting scheme.

The colour temperature of the lamps could be improved upon to meet the levels equivalent to 'natural sunlight' which is 6000 Kelvin, and provide the full spectrum of light.

4.2.5 Shower lighting in cabins

Isolation Class III luminaires shall be provided.

4.3 General requirements for emergency lighting

The emergency lighting shall be implemented as a minimum according to percentages in the table below:

AREAS	% of the complete lighting system
Outdoor	30 %
Living quarters	
• bedrooms	20%
• lounges, bars and restaurants, TV lounges	20%
• kitchens/ laundry / lockers	20%
• escape route	100%
• offices	20%
Electrical rooms	100 %
Instrumentation rooms	100 %
Control rooms	100%
Stores	30%
Laboratories	30%
Workshops	30%

4.4 General requirements for emergency escape /safety lighting

The emergency escape / safety lighting systems shall be:

- Suitable for use in zone 1 hazardous area Supplied by dedicated Ni-Cd battery with autonomy of 90 minutes providing no delay to illuminate upon loss of normal or back up sources
- In accordance with the [IEC 60598-2-22](#)
- No delay to illuminate
- With fluorescent lamps except for arctic conditions.

The number and the location of escape / safety lighting points shall be such as:

The maximum distance between an escaping person and an escape/safety lighting point or between an escaping person and an "EXIT" sign or any other sign (refer to [ISO 3864](#)) used to materialize the exit route is 15 meters

4.4.1 Escape lighting

The escape lighting is a part of emergency lighting provided to ensure that an escape route can be effectively identified and used

The locations of escape lighting are ([EN 1838](#)):

- Mounting at least at 2 m above the floor
- At all exit door intended to be used in an emergency
- Along escape route in order to indicate unambiguously the route of escape

- Near stairs so that each flight of stairs receives direct light
- Near any other change in level
- At each change of direction
- At each intersection of corridors
- Outside and near to each final exit
- Near each first aid post
- Near each piece of fire fighting equipment and call point.

Maintained illuminance (E_m) of escape route shall be as:

- 10 lux average, with a minimum of 1 lux at any point when lighting supply disappear: (Uniformity factor ≥ 0.1)
- 6 lux average, with a minimum of 0.6 lux at any point when lighting supply has disappeared for 60 minutes
- Illuminance ratio ≤ 40 (ratio between the maximum illuminance and the minimum illuminance)
- Minimum colour rendering indices (R_a) shall be 40
- Minimum luminescence of EXIT signs (or any other signs used to materialize the exit route) shall be 60 lumens.

4.4.2 Safety lighting

The safety lighting is a part of emergency lighting provided to ensure the safety of people involve in a potentially hazardous process. This lighting system could also be used for restarting operation.

The locations of safety lighting shall include the following:

- Inside technical rooms an appropriate number of safety lighting points shall be installed to provide 90 min / 150 lux illumination of panels/switchboards used for re-starting operation
- Control rooms
- In the process area where people could be trapped in case of main lighting shut down

5. Lighting illumination Calculation notes

Purpose of this lighting calculation note is to correctly estimate the number of lighting fixtures required in each area for providing lux level as specified

Contractor shall prove by calculation notes that the E_m , U , UGR_L / GR_L and R_a meet the required limit values.

Illumination shall be designed and measured in accordance with a lighting grid system.



5.1 Illumination grid

The illumination grid system shall be established for the studied work plane ([EN 12464](#)). It shall indicate the points where the calculated and measured lighting criteria are applied. It is composed of identical square cells.

The cell size is defined by:

$$p = 0.2 \times 5^{\log d}$$

Where d is the longest dimension (m) of the studied area (task or surrounding area).

p shall be 10 m at the maximum

5.2 Maintenance factor

In order to determine the maintained illumination, maintenance factor shall be specified:

The Maintenance Factor shall be ([CIE 97](#)):

- 0,7 for outdoor
- 0.8 for indoor.

Higher Maintenance Factor may be considered if justified by calculation note, subject to Company approval.

5.3 Lighting calculation cases

Lighting calculation shall be done for following two cases in all the areas

- (i) Considering all lighting ON i.e. area lighting & escape route lighting
- (ii) Escape / Safety lighting exclusively.(in that case, only one tube shall be considered on).

6. Lamp type

Lamp types required on Company installations shall be limited to:

- For outdoor locations: high pressure sodium and fluorescent lamps
- For indoor locations: Except living quarters: fluorescent lamps
- Living quarters: tungsten, metal halide and fluorescent lamps
- Incandescent lamps shall be limited to portable lighting or to decorative purpose
- Led could be used as far as the lux requirement are reached.

Unless otherwise specified lamp color could be:

- Cool color shall in general be used for outdoor and working area illumination
- Warm color could be used for restroom area (bedroom, .etc.)
- The "color appearance" of lamps for the office and control rooms shall be cool (above 5300 K).



The chosen tubes for fluorescent lamps will have the following characteristics:

- Electric power 36 W (1,20 m), 18 W(0.6m) or exceptionally 58 W (1, 50 m)
- Color temperature:
 - 4300 - 4700 for outdoor lighting (white great or white industrialist), standard tubes the most used in the industry
 - 4100 K (Cool-white fluorescents) for office lighting
- Tubes T26 (26 mm)
- Luminaire will be equipped with 2 tubes
- Instantaneous start ballast.

7. Installation

Adjacent luminaires shall as far as practical not be supplied from the same circuit.

Unless otherwise specified, core marking shall not be applied for lighting fixture.

Final number and location of lighting, in order to meet the company requirement, will be checked during construction phases.

Following completion of the lighting installation, a lighting survey shall be conducted to measure lighting levels to verify design at commissioning stage.

Luminaires on structures shall be located so that maintenance and lamp changing can be done without the use of ladders or scaffolding. Where a luminaire mounted from an elevated walkway or platform does not overhang it, the lamp post shall be arranged to swivel for maintenance purposes.

Where no structure is available to support luminaires, fixed lighting poles of adequate length with high pressure discharge floodlighting shall be used to supplement the fluorescent luminaires

In tall buildings or area, maintenance and lamp-changing by means of the cradle platform shall be possible.

8. Minimum Contractor document requirements

As a minimum Contractor shall supply the following documents:

- Project lighting general layout
- Detailed normal, emergency and escape / safety lighting arrangement drawings per work plane location
- Project lighting work plane location calculation notes for the cases as indicated in clause 5
- Project lighting material take-off document (this document shall included as a minimum the following information):

Each luminaire shall be specified as follows:

- a) Protection mode (GS EP ELE 079)
- b) Lamp type

- c) Number of lamps
- d) Luminous flux distribution: Wide Angle or Narrow Angle
- e) Electrical apparatus isolation: class I, class II or class III ([IEC 60598-1](#))
- f) Fixing systems: adjustable, portable, pendant, rise and fall pendant or recessed
- g) Maintenance factor: LMF and RSMF

Each type of lamp shall be specified as follows:

- a) Lamp type
 - b) Radiant power or radiant flux (in W)
 - c) Correlated colour temperature (TCP)
 - d) Lamp burning hours
 - e) Maintenance factor: LLMF and LSF
- Type test certificates
 - Project measurement lighting reports per work plane location.
 - Clear instructions and procedures for cleaning, relamping, maintaining and testing luminaires in the field

9. Other references

Following documents are applicable:

- Standards: [IEC 60064](#), [IEC 60081](#), [IEC 60155](#), [IEC 60400](#), [IEC 60432](#), [IEC 60529](#), [IEC 60662](#), [IEC 60921](#), [IEC 60923](#), [IEC 60927](#), [IEC 60929](#), [IEC 60968](#), [IEC 60969](#), [IEC 61000-3-2](#), [IEC 61167](#), [IEC 61231](#), [IEC 61547](#), [IEC 62035](#), [EN 13032](#)
- Professional document [CIE 129](#).