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	Technical Specification For Lighting System And Socket	
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Technical Specification For Lighting System And Socket

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Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE

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1.0 GENERAL

1.1 SCOPE

This specification covers minimum design requirement characteristics which suppliers should observe for the luminaries and lighting fixtures and small power outlets.

1.2 DOCUMENT PRIORITY

In case of conflict between documents, the order of precedence shall be:

- This Specification,
- Drawings and other technical documents.
- I.E.C. standards.
- Other standard and codes when I.E.C. publications have not yet been issued.

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

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Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature:

Max. Temperature:	+40 deg. C (Recorded)
	+50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded)
	-10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

1.6 Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2
20 - 100 m:	2.4

Rainfall

Yearly 120 mm (average)

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Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the “Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999” (“Iranian Regulations 2800”) and “Minimum Design Loads for Building and Structures” (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

1.7 Conditions of Operation

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, 365 days/year operation.

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2.0 STANDARDS AND CODES

The design of the electrical system for buildings and the electrical components shall comply with the latest edition of the following standards and codes:

IEC 60309	Receptacles for industrial purpose
IEC 60529	Classification of degree of protection provided by enclosures
IEC 60598	Luminaires
IEC 60884	Plugs and socket-outlets for household and similar purposes
IEC 60906	IEC system of plugs and socket-outlets for household and similar purposes
IEC 60906-1	Plugs and socket-outlets 16 A 250 V AC

In the case of conflicts, interference or discrepancies between the listed codes, standards and specifications the company will decide on the procedure to be utilized.

3.0 LIGHTING CALCULATION CRITERIA

The problem of the Architect / Lighting Designer at the functional level is to determine how many lights and where to place them to get the correct level of illumination for a given activity.

The lux (symbol: lx) is the SI unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is used in photometry as a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface. It is analogous to the radiometric unit watts per square metre, but with the power at each wavelength weighted according to the luminosity function, a standardized model of human visual brightness perception.

One lux is equal to one lumen per square meter. In other words:

- LUX = Level of Illumination. OR $LUX (lx) = Lumens / Sq.M.$
- Lux level = total light output (lumens) / area (square meters)

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- Total Light Output = lumens per fixture * number of fixtures
- Number of Fixtures = (Lux level * area) / lumens per fixtures

Every Lamp has certain Lumens. It will be mentioned in the manufacturer data for light fitting to get the lumens per fixture.

3.1 UTILIZATION FACTOR: (UF)

This may be due different reasons viz., Room Reflectance's, Dimensions etc. the utilization factor (UF) is a Direct ratio. This is the proportion of the downward luminous flux that reaches the work area directly without reflection. It depends on the shape of the room. The Direct ratio has a low value with a tall narrow room (small RI) and a high value for a wide room (large RI).

The light distribution from the luminaries. Luminaries that emit light through a larger solid angle will generally have a smaller direct ratio than luminaries that emit light in a narrower beam. There exist data sheets of UF for rooms of different shapes and luminaries of a common type. Catalogues of luminaries often provide data sheets of UF for rooms. Normally we take 0.8 as the Utilization Factor.

3.2 MAINTENANCE FACTOR (MF)

It is also known as LLF OR Light Loss Factor. This may be due different reasons viz., Time, Temperature, Cleanliness etc., the maintenance factor gives an estimate of how lighting conditions will deteriorate through use. Some factors are:

- Dust and dirt inside luminaries surfaces.
- Aging of light bulbs emitting less light.
- Cleaning of room surfaces, e.g. ceiling. Normally the Maintenance Factor will be taken as below table

Location	MF
Industrial areas:	0.6
Non-industrial areas (outdoor):	0.7
Non-industrial areas (indoor):	0.8

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3.3 ELECTRICAL FORMULAS:

Demand for Power (kW) = System Input Wattage (W) ÷ 1,000

Energy Consumption (kWh) = System Input Wattage (kW) x Hours of Operation/Year

Hours of Operation / Year = Operating Hours / Day x Operating Days / Week x Operating Weeks / Year

Lighting System Efficacy (Lumens per Watt or LPW) = System Lumen Output ÷ Input Wattage Unit

Power Density (W/ Sq.M.) = Total System Input

3.4 REQUIRED ILLUMINATION LEVELS

The required illumination levels, measured at the working plane or 1 m above the floor level in a horizontal plane, are shown in the table below. These values shall be used as a basis for the design of new installations.

Electrical rooms, transformer rooms	250lux
Battery rooms, diesel generator rooms (if any)	200lux
Control rooms, pulpits, computer rooms	400-500lux
Tunnels, basements, cellars	50-100lux

Control of the illumination level should be possible by switching-off rows/groups of luminaries.

4.0 EMERGENCY & SAFETY LIGHTINGS

An emergency lighting system shall be provided and shall be by external emergency supply during power failure, for min 30 % of total lighting in building and area except for control room substation and laboratory to be min.50 %. In addition, safety lighting fixtures shall be provided for critical escape points to assure safe personnel exit from substation, control room and strategic points of process area. Safety Lights

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shall be LED type with built-in battery. Charger / inverter and automatic switching system.

Emergency lighting and Safety lighting shall be installed in the substation & control room, other building and other places according to process & Operation requirement.

The location and arrangement of the emergency fixtures shall be suitable to prevent the dangerous of a power failure.

Emergency lighting level shall reach at least 30% of the normal illumination level and other places according to process & Operation requirement. For emergency socket shall be considered for process & Operation requirement.

20% of emergency lighting fixtures will be provided as safety lighting with battery backup. These lighting fixtures will be equipped with internal emergency source (built-in battery), suitable to maintain the lighting for at least 30 minutes.

5.0 LIGHTING FIXTURES

For Outdoor lighting system, Water proof industrial type LED lighting fixture shall be designed. The outdoor lighting will be designed with astronomical type.

The plant lighting shall be designed in such a way that in daytime the lighting outdoors should be switched on by means of a switch overriding the appropriate photoelectric relay contact. Moreover, the lighting distribution board shall be provided with an override switch for maintenance purposes.

For electrical rooms which the lights are operated continuously, switching is done using the panel board circuit breakers or wall mounted push button may also be used.

General requirements of overall lighting fixtures are as follows:

Wiring shall be designed for maximum voltage drop of 2 percent.

LED fittings for indoor application shall have through wiring and completely equipped and wired. Connection to gear tray shall be by plug-in connector.

Wiring inside light fittings shall have a minimum cross section of 0.75mm². A cross section of at least 1.5mm² shall be used for through wiring.

The term “luminaries” shall mean a lighting fixture complete with lamp, related control gears (capacitor, igniters, chocks, etc.) and other accessories.

Capacitors of 0.5 micro farads and above shall be provided with a means of prompt discharge on disconnection of the supply.

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Induction and high reactance transformers are to be installed as close as practicable to the associated discharge lamp.

The electrical insulation grade of all light and ordinary power materials shall be min. 500V, DC, 1min. after the application of the voltage.

All LED tubes shall be 47W, 1150mm in length, 38mm in diameter or 24W, 600mm in length and have bi-pin lamp contacts, unless otherwise stated. LED tubes shall be of day light type.

The degree of protection of enclosure for indoor application shall be min. IP20 and for weatherproof version shall be min. IP54, if not otherwise specified.

Luminaries shall be fitted with an earthing screw.

All metallic parts of luminaries shall be electrically connected together.

Luminaries shall have cable entries compatible with their specified class of enclosure.

Enclosures shall be of metal or flame retardant insulating materials.

The materials chosen for the luminaries shall be able to withstand without damage or aging or alteration in their structural or physical properties for the severe local climatic condition.

Minimum types of enclosure against foreign bodies and water shall be in accordance with IEC 60529 "Degree of protection provided by enclosure (IP code) 2nd Edition".

Lighting and ordinary power materials shall be designed and constructed for either recess, flush or surface mountings as required.

Cable glands shall be provided for all cable entries of luminaries. For enclosures with degree of protection up to IP23, glands shall be of thermoplastic type for indoors only. Non magnetic, compression type cable glands shall be provided, from corrosion-proof metal material, complete with PVC shroud (for outdoor type).

All cable entries shall be threaded and plugged. Threads shall be in accordance with ISO metric.

All equipment with conductive (metal) body shall be provided with internal earthing terminal.

In steel structure buildings such as workshop, the lighting fixtures shall be with 140W, or 200W, 230V LED lamps, complete with ballast, aluminum reflector and grounding terminal. Degree of protection shall be IP54.

All lighting fixtures and their conduits shall be suitable for the area classification in which they are to be installed.

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The Variety of luminaries shall be kept to a minimum.

LED lighting fixtures with 24/47W LED lamps may be used in houses toilets and similar places in different buildings.

A suitable lighting fixture shall be provided above the entrance door of each building. The switch for this lamp shall be installed by the side of the door.

Lighting fixture for public services, laundry and kitchen shall have LED lamp and their degree of protection shall be IP42.

Control gear shall be suitable for operation at 230V, 50Hz, power factor compensated to at least 0.9. The ballast shall be of a type specially adapted for the particular make of lamp selected. The lamp shall be able to start with at least plus or minus ten percent of the voltage value and continue in normal operation with dips attaining 20 percent for four seconds.

Each luminaries shall be permanently marked with the maximum permissible wattage of the lamp to be fitted.

Each luminaries optical or unit shall be protected by a heat and high impact resistant glass protector and shall be dust and watertight and suitable for area of installation. The protector shall be smooth to reduce a minimum dirt accumulation with a coefficient of transmission of the order of 88 percent or better.

Lighting Fixture shall be equipped with chain holder.

6.0 LIGHTING DISTRIBUTION

The lighting circuits from distribution board to local main junction boxes will be 3-phase with 5- wires (3-phase + neutral + earth).

The lighting circuits from main junction boxes to lighting fixtures shall be single-phase with 3- wires (1-phase + neutral + earth).

The load distribution of lighting circuits shall be balanced over the 3 phases, as much as possible. Lighting installations shall be designed to avoid stroboscopic effects. The lighting fixtures in hazardous area shall be designed according to the related hazardous area classification drawings, if any.

7.0 FLOOD LIGHT

The degree of protection for outdoor installation flood light in this plant is considered as IP54.

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Floodlights should be wide beam with symmetrical pattern of light.

Floodlights should be suitable for 140 & 200Watt LED lamps.

Floodlights should be equipped with built-in ignition & control gear.

Floodlights should have wiring with heat resistance flex with silicon insulation and exterior connection box. Ignition unit shall be incorporated in the junction box.

The housing for flood lights shall be stainless steel and anodized aluminum reflector

The painting finish of all parts of the floodlight shall be powder coated and stove enameled white to 70-80 μm .

Other characteristics of the floodlights shall be in accordance with section 4 of this specification as required.

In areas such as football yard the floodlights shall be mounted on tower with 30m height or less which made of steel pipe.

8.0 STREET LIGHTING

Street lighting luminaries for 140W or 200W LED lamp equipped on 9m height (at least) Lighting Poles.

Body of pressed aluminum sheet, which is chromated electrostatically and stove enameled.

Reflector of anodized 99.9% pure aluminum and bowl of clear glass.

Suitable for pole mounting, on 42-60mm diameter steel pipe angled at 5° to horizontal.

Degree of protection by enclosure at least IP54.

Luminaries shall have a suitable terminal block to allow connection of the internal wiring and incoming supply cable into which standard cross-linked polyethylene cable could be connected.

Lighting poles shall be made of hot dip galvanized steel pipe and suitable to accommodate the LED discharge lamps with accessories & flood lights fitting, type of poles indicated in lighting detail installations drawings.

Bulkhead lighting fitting equipped with bracket shall be suitable for outdoor installation.

The height of pole for street lighting shall be 8m for 140W lamp and 10m for 200W.

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Lighting poles shall be equipped with cutout fuse with use of armored cables, three phase, neutral & ground wire and suitable for circular conductor up to 25mm².

Lighting poles shall be supplied with either two-sealed neoprene grommets or a glanded brass bonding plate for Cu/XLPE/SWA/PVC cables, complete with earthing terminal.

9.0 TYPE OF INDOOR LUMINAIRES

9.1 LED LUMINAIRES

Surface luminaires with white louvers – 47W LED – IP42. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Recess luminaires with white louvers – 37W LED – IP42. Sheet steel, white, stove-enameled, with surrounding rim. 6mm high, and knockouts at each end for wiring inside the luminaires, heat resistant, single conductor cables should be used. With heat resisting wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaires with white louvers – 47W LED – IP42. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Recess luminaires with white louvers – 37W LED – IP42. Sheet steel, white, stove-enameled, with surrounding rim. 6mm high, and knockouts at each end for wiring inside the luminaires, heat resistant, single conductor cables should be used. With heat resisting wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaires with Plexiglas opal diffusers – 47W LED - IP42. Trapezium – shaped front and side sections in sheet steel, joined together flush by corner pieces die-cast in zinc alloy, stove-enameled, white with knock-outs at each end for through-wiring with heat-resistant wiring ready for connection and complete with low-less

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inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Recess luminaires with Plexiglas opal diffusers – 37W LED - IP42. Sheet steel, white, stove enameled. With knockouts at each end for through wiring inside the luminaires. Using heat resistant, single conductor cables. Wires shall be sealed and mechanically protected by grommet or by gland. With heat resisting wiring, ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaires with white louvers – 47W LED – IP54. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Wall luminaires with Plexiglas diffusers – 10W LED – IP54 for mounting above the mirror. Sheet steel, white, stove-enameled. With heat-resistant wiring ready for connection and complete with conventional inductive ballast with 2-pole terminal block and earth connection for wire up to 2.5mm².

9.2 INDUSTRIAL LUMINAIRES

High-bay reflector units, with 140W LED lamp and IP54. Deep-drawn top member of sheet steel with aluminum colored, heat-resistant enamel finish.

Cable entry through suspension opening. Applicable for workshop. Suitable for mounting height over 6m.

Plastics or cast-metal bulkhead units.

With basket guard and globe. Housing of brown or gray molded plastics, with two compression type glands applicable for outdoors and equipment rooms.

9.3 SAFETY LIGHTING UNITS

Safety lighting and exit signs are complete with self-contained batteries and fully automatic in operation. It shall operate on 230V AC single phase 50Hz system and upon failure of the normal power system LED lamp shall be battery backed up.

The unit shall be capable of operating in the emergency mode for a minimum 30 minutes at not less than 87.5% of normal battery voltage.

The unit shall operate on failure of the normal power supply.

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The units shall be equipped with the fully automatic charger to maintain the battery fully charged all the times with a test switch to indicate operating status of the unit & batteries.

Units can be provided With 2 LED lamps 8 watt, plastics or cast-metal bulkhead units.

10.0 LAMPS

10.1 LED LAMPS

ALL LAMPS ARE LED TYPE.

Type	:	LED					
Wattage	:	24	37	47	140	200	Watt
Flux intensity	:	2400	4500	4500	18000	2400	Lumen
Average Life	:	2000	2000	2000	2000		Hours

10.2 EXIT SIGN LAMPS

Type	:	LED
Wattage	:	2 x 8 W
Battery	:	Ni-Cd

11.0 LIGHTING SWITCHES

- All lighting switches shall be designed and constructed for minimum 10A at 230V AC.
- Lighting switches shall be suitable for supply of discharge and LED lamps at the rated current and at the site conditions.

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- For outdoor and industrial areas the switches shall be weather-proof, IP54 with body of corrosion-proof, cast metal and threaded conduit entry, these switches shall be suitable for surface mounting. Earth terminals shall be provided.
- For indoor areas, the switches shall be of molded insulating material, with threaded conduit entry. The switches shall be suitable for surface or flush mounting (with box) as specified in list of equipment and materials.
- In all buildings the lighting switches shall be mounted in height of 1200mm and from 300mm of wall edge.

12.0 ASTRONOMICAL RELAY CLOCK (TIMER) FOR OUTDOOR LIGHTING

- Programmable for different zones.
- Calculate Dusk/Dawn for each day with an offset (before or after dusk/dawn)
- Battery Back-up for 5 years
- Up to 15 Amp load
- At least 2 relay outputs

13.0 POWER OUTLETS

13.1 General

Socket outlets should be provided the facilities required for operation, maintenance and inspection during normal operation and plant overhaul in all areas. Full temporary facilities must be made available.

Socket voltage levels shall be:

- 230 VAC for general purposes such as portable equipment
- 400 VAC for welding

Socket outlets and their associated plugs operating at different voltage levels shall not be interchangeable.

13.2 230 VAC Sockets

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230 VAC socket outlets shall be minimum 16A, 3 wire, 3 pole and single phase interlocked type. In general, the third pole of each receptacle shall be solidly and permanently connected to the plant earthing system.

In general, no more than six 230 VAC sockets shall be supplied by one circuit.

The minimum size of conductor for small power socket branch circuit shall be 4 mm².

230 VAC outlets shall be fed from a normal lighting distribution board, and comprising earth leakage circuit breakers.

The number of outlets shall be calculated on the basis that the plant areas can be reached with a 15 meters extension cord.

13.3 Power Socket Boxes

Some Power Socket Box (with two 16A, 230VAC, 50Hz, 1Ph+N+E and one 32A, 400VAC, 50Hz, 3Ph+N+E Socket outlets) with IP54 shall be considered for maintenance purpose of conveyors, fed by Local Lighting panel. Circuits from Local Lighting panel to Power Socket Box shall be three- phase, with 5wires (3-phase +Neutral+ earth).

The maximum distance to access to nearest socket box shall be 30m, so the distance between two adjacent socket boxes, shall be maximum 60m.

14.0 JUNCTION BOXES

Unless otherwise specified, the junction boxes shall be of metallic construction, hot dipped galvanized, stainless steel or aluminum die-cast, with an ingress protection IP 55 for outdoor and IP 42 for indoor at least. They shall be adequately sized to accommodate the incoming cables.

Separate clamp type terminals shall be provided for each conductor. Bunching of conductors under the terminal is not acceptable.

All unused entries shall be fitted with approved stopping plugs.

Junction boxes shall be provided with label detailing function and circuit reference. Junction boxes shall be provided with internal and external brass each terminal (min M8, max M10).

15.0 PACKING

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The lighting fixtures, flood lights & accessories shall be packed ready for service with all wiring terminals links, label, foundation bolt (if applicable) and earth connector and all other necessary devices assembled and tested.

16.0 MANUFACTURER'S RESPONSIBILITY AND GUARANTEES

The supplier is to take full responsibility for the complete equipment. All components shall be guaranteed for first class material and workmanship throughout and shall be guaranteed to perform satisfactorily in accordance with service conditions as specified.

Any exception or deviations shall be listed separately for company approval.

17.0 VENDOR DOCUMENTS

The supplier shall provide following technical documents such as:

- Overall dimension, weight and installation instructions for all types of lighting equipment.
- Related brochures and catalogue.