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Technical Specification for Lighting & Power Sockets

03	02/04/2024	Issued For Final				
02	01/20/2024	Issued For Final				
01	11/29/2023	Issued For Approval				
00	09/07/2023	Issued For Review				
Rev.	Date	Description	Prepared By	Checked By	Approved By	Authorized By

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1. General

1.1.Introduction

The plant will be referred to as “phase 3” in the rest of the report.

“Nominal” and “Design” capacity of the project is equal to 2340 dtph and 2700 dtph fresh ore feed conditions respectively. The plant is “Designed” to accommodate the “Maximum” conditions.

1.2.Definitions of terms

Throughout this document the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires:

- **“CLIENT” &/OR OWNER**
- **“BUYER &/OR PURCHASER”**
- **“BUYER REPRESENTATIVE”**
- **“SUPPLIER &/OR CONTRACTOR &/OR VENDOR”** means the firm or company which the contract will be made with.
- **“SUB-SUPPLIER”** means any person or company (other than the supplier) named in the contract for any part of the works.
- **“WORKS”** means all obligations of the Contractor described in the "scope of works" of this document.
- **“PLANT”**
- **“APPROVE”** means approval in writing letter confirmed by buyer.

1.3.Document Priority

In the event of conflict, actual or implied, among documents relating to an enquiry or order, following order of precedence shall govern, unless agreed in writing by Buyer.

1. Material Requisition

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2. Data sheet
3. Drawings
4. specification
5. Design Criteria
6. Code and standards
7. In any case the vendor shall inform purchaser and obtain clarification before proceeding with any work.

The Vendor shall notify the Buyer of any apparent conflict between this specification, the Codes and Standards and any other specification noted herein. Resolution and/or interpretation of precedence shall be obtained from the Buyer in writing before proceeding with the design/manufacture.

Alternatives proposed by the Supplier will receive careful consideration if they improve performance and reliability.

2. Site Condition and Utilities

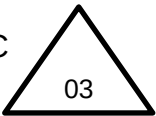
2.1.General Site Location

2-1-1 Site Location:

- Elevation: about 2500 meters above sea level.

2-1-2- Temperature:

- Max. (Summer): 35 °C
- **Design Max (indoor and outdoor) 40 °C**
- Min. (Winter): -25 °C
- **Design Min.(outdoor) -25 °C**



2-1-3- Relative Humidity:

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- Humidity: 30 % @ 33°C
- Max.: 70 %
- Min.: 23 %

For specific indoor area (above open sumps and flotation cells and above thickeners) due to special condition (water evaporation and water spraying) relative humidity shall be considered 100 %.

2-1-4- Wind Condition:

- Max. Wind Velocity already recorded: 100 Km/h
- Prevailing Wind Direction:
- Winter: Between South and South West
- Summer: Between North and North East
- Stormy days per annum: 10

2-1-5- Rainfall:

- Average: 500 mm/a
- Design: 500 mm/a
- Rainfall Intensity: 76 mm/h

2-1-6- Snowfall:

- Average: 100 mm/a (as water)
- Design Intensity: 150 mm/a (as water)
- Frost Line: 1200 mm below grade

2.2.Site description

2-2-1- Lithology:

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The Site lithology consists of colluviums or slope wash overlying a deep volcanic weathering profile.

The Site lithology is summarized in below table:

Unit	Description	Top of Unit (m)	Approx. thickness (m)
1	Colluvium/ Slope wash	Surface	1-3
2	Residual Solids	3	5-10
3	Volcanic Rocks	10	>10

2-2-2- Seismicity:

SITE is classified as a high hazard zone and the above standard shall be considered during design of all foundation, structures and buildings.

3.OBJECTIVE & SCOPE

This specification covers the minimum technical requirements, design, procurement, manufacture, quality control, testing, inspection, spare parts engineering and transportation of Technical Specification for Lighting & Power Sockets to the site location.

It is basically a performance-type specification and covers only those general aspects that are considered minimum quality and performance requirements by the purchaser. More detailed and specific data are contained in the drawings, data sheets and other documents that form the tender.

Standard design and models from bidders manufacturing program will be accepted in case they meet the requirements of this specification and serve the intended purpose. If a substantial improvement of any or all of the specified requirements expressed or implied herein is available from bidder, and this improved design offers economic

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advantages to purchaser, this should be proposed as an alternative together with basic proposal that conforms to this specification.

All equipment described in this specification are intended for continuous duty at the specified ratings under specified service conditions.

Compliance of the manufacturer with the provisions of this specification does not relieve him of the responsibility of furnishing Technical Specification Lighting & Power Sockets and accessories of proper design electrically and mechanically suited to meet the operating guarantees at the specified service conditions.

4.Standard & Codes

The equipment covered by this Specification, including all components and auxiliaries shall be designed, manufactured and tested in accordance with the latest IEC Standards wherever they may apply, and in particular: unless otherwise specified, the design, equipment, materials, installation, inspection and testing shall be conformed to the requirements of the latest edition of the followings:

IEC 60061	Lamp caps and holders together with gougues for control of interchangeability and safety
IEC 60064	Tungsten filament lamps for domestic and similar general lighting purposes
IEC 60081	Double-capped fluorescent lamps - Performance specifications
IEC 60083	Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC
IEC 60127	Cartridge fuse links for miniature fuses
IEC 60155	Glow-starter for fluorescent lamps
IEC 60188	High pressure mercury vapor lamps
IEC 60192	Low-pressure sodium vapor lamps
IEC 60291	Fuse definitions

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IEC 60269	Low Voltage Fuses
IEC 60309	Plugs, Socket-outlets and couplers for industrial purposes
IEC 60357	Tungsten halogen lamps
IEC 60364	Electric installation of buildings
IEC 60400	Lamp-holders for tubular fluorescent lamps and starter-holders
IEC 60432	Incandescent lamps
IEC 60446	Identification of Insulated Wires and Bare Conductors By Colors
IEC 60449	Voltage bands for electrical installation of buildings
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
IEC 60598	Luminaries
IEC 60630	Maximum lamp outlines for incandescent lamps
IEC 60662	High pressure sodium vapor lamps
IEC 60669	Switches for household and similar fixed electrical installations
IEC 60838	Miscellaneous lamp-holders
IEC 60884	Plugs and socket-outlets for household and similar purposes
IEC 60901	Single-capped fluorescent lamps - Performance specifications
IEC 60921	Ballast for tubular fluorescent lamps
IEC 60974	Arc-welding equipment - Part 12: Coupling devices for welding cables (supersedes IEC 60501)
IEC 61195	Double-capped fluorescent lamps - Safety specifications
IEC 61199	Single-capped fluorescent lamps - Safety specifications
IEC 61549	Miscellaneous lamps
IEC 62722-1	Luminaire performance - Part 1: General requirements
IEC 62722-2-1	Luminaire performance - Part 2-1: Particular requirements for LED luminaires

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Note: Electrical equipment shall be designed, manufactured, erected, and installed according to the latest editions of the IEC (International Electro technical Commission) standards.

Minimum requirement for installation shall be follow local codes and norms. In lack of them normal European industrial practice is followed. Other standards that can use in reference, but shall be equivalent with IEC standard, are as below:

BS-IEEE-ANSI-VDE -DIN -ISO -NEMA-NFPA-NACE-API-ISA-NACE

5.NETWOEK SYSTEM

Power Supply and Distribution System:

- Nominal voltage level: 0.4KV/230VAC
- Nominal Frequency: 50Hz
- Voltage fluctuation: ±10%
- Frequency fluctuation: ±5%
- Control voltage: 230VAC from UPS
- Power distribution system: TNS (3PH+N+PE)
- Short circuit level: Will be finalized during detail design

6.GENERALCONSTROCTION

6.1.LIGHTING FIXTURE

6.1.1.General Requiremets

Area lighting circuits shall be designed for automatic switching via photoelectric relays. Lighting methods and materials shall be suitable for the area classification in which they are installed.

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Luminaries shall be so designed that the heat generated is efficiently dissipated. Fittings, reactors, capacitors and other auxiliaries are not to be mounted on surface, which are subject to high temperatures.

All areas including but not limited to: Paved and unpaved roads, conveyor walkways, tunnels, process and non process areas shall have suitable lighting.

It should be noted that Procurement and Construction activities of this equipment must be done based on approved engineering document. All equipment shall be supplied based on approved TBE documents.

Contractor should be assured about using last revision of all documents.

6.1.2.WIRING

Branch circuits from outdoor lighting panels to the lighting fittings shall be done by suitable cable. Wiring inside light fittings shall have a minimum cross section of 0.75 mm².

Branch circuit from indoor lighting panels to indoor lighting fixture is junction box will be considered in the lighting feeder. A cross section of at least 2.5 mm² shall be used. PVC insulated three core cables shall be used for lighting purpose.

Lighting circuits shall generally be 230 V, single phase, 50 Hz supplied from either 400/230 V three phase or 230 V single phase panel boards, with separate neutral & earthing system (TN-S system). Branch circuit protection shall be provided by miniature circuit breakers (MCB's).

Note: Just in a wet and high-risk area such as a boiler room; RCBO shall be considered for all lighting and socket feeders. In this area, RCBO (with 30mA as its sensitivity) will be used instead of MCB.

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6.1.3.Electrical Requirements

Each luminaire shall be permanently marked with the maximum permissible wattage of the lamp to be fitted. Inductors are to be installed as close as practicable to the associated discharge lamp. Luminaries shall have a suitable terminal block to allow connection of the internal wiring and incoming supply cable. Spare branch circuit breakers shall be provided on the basis of 20% of circuits installed initially.

In this regard, 20% installed spare feeder (as per type and size of exist feeder) shall be considered inside all lighting/socket panel.

Also, 20% space shall be considered in all lighting panel for future install of extra feeders.

4-Pole (three phase + N) circuit breaker shall be considered for all incoming of lighting panels.

6.1.4.Mechanical Construction

The following construction should be considered. Luminaries shall be of sufficiently robust construction compatible with the site condition and installation i.e. indoor or outdoor.

Luminaries shall be fitted with an earthing screw. Luminaries shall have cable entries compatible with their specified class of enclosure.

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 conditions in addition to the heat emitted by the lamp.

Minimum ingress protection of enclosure against foreign bodies and water shall be in accordance with I.E.C. publication 60529. Requirement for degree of protection for various types of luminaries will be indicated in MRs and drawings.

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Gaskets to provide sealing of exterior and proof type luminaries must be capable of withstanding temperature and corrosive atmosphere and shall be manufactured either from neoprene or silicon rubber.

Each luminaire optical compartment or unit shall be protected by a heat and high impact resistant glass protector and shall be suitable for area of installation. The protector shall be smooth to reduce to a minimum dirt accumulation.

The exposed metallic parts of the luminaires shall be factory finished, stove enameled with a suitable corrosion resisting paint capable of resisting the heat emitted by the lamp during continuous operation, even if necessary under full sunlight conditions.

The mirror reflectors shall be of high purity, glazed and anodized aluminum type or a white lacquered reflector type, rigidly fixed to the body and easily replaceable. The walkways and platform lighting shall be suitable for either stanchion mounting or mounting on structural steel members. Lighting poles shall be made of hot-dip galvanized steel pipe and suitable to accommodate the lighting fitting, type of poles indicated in lighting system installations drawings.

Lamp fitting in structures shall be located that maintenance and lamp changing can be affected without the use of ladders or other equipment.

6.1.5.Control Gear for Discharge and Fluorescent Lamp Luminaries

Control gear shall be of the removable type & for operation at 230VAC, Single phase, 50 Hz, 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 rated voltage and continue in normal operation.

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6.1.6.Type of Lamps

For offices, canteen, clinic, control rooms, substation, and same building LED/SMD lighting and lamp shall be considered.

For all industrial and process area flood lights or industrial lamps with high pressure sodium vapor lamps shall be considered.

In critical condition, with client approval below lighting could be used for industrial production and process area.

“High pressure 400 & 250 & 125 watt sodium lamps would be used for Industrial areas and streets while 400 & 250 & 125 watt metal halide lamps shall be used for workshops and process area. Please note, in any case power factor shall be less than 0.9 and voltage transition/fraction shall be removed.”

6.1.7.Ballasts

High efficiency, high power factor electronic ballasts shall be utilized. Light fixtures shall have a power factor of at least 90%.

6.2.FLUORESCENT LIGHTING FITTINGS

Finishing all parts of fluorescent lighting fitting should have powder coated and stove enameled white.

Diffusers of fluorescent lighting fitting should be made of a clear material. Heat resistant wire should be considered for interior wiring of fluorescent lighting fittings. Florescent lamp shall be compensate with electronic ballast and for high pressure metal halide ferromagnetic ballast with capacitor shall be considered.

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6.3.Exit Lights

Exit light (for staircases, corridors) shall be completely self-contained and fully automatic in operation. They shall operate on 230 VAC single-phase 50 Hz system and upon failure of the normal power system, low voltage lamps shall be battery powered. The units shall be capable of operating in the emergency mode for a minimum of 120 minutes.

The units have two modes of operation: “Normally On” and “Normally Off” With main power present, the unit will be ON for mode 1 and OFF for mode 2. In case of power failure, for both modes, the unit will remain/become on. The units shall be equipped with fully automatic charger to maintain the battery fully charged at all times. The lamps shall light the face of the sign and provide down light. The units shall contain the necessary equipment to extend lamp life. All batteries shall be long life, completely sealed, rechargeable nickel cadmium type.

6.4.Emergency Lighting

All places shall be equipped with emergency lighting. These locations including but not limited to: Control rooms, electrical rooms, automation marshalling rooms, main operating floors, staircases, corridors, etc.

If the power supply of the area and its Normal Lighting Panel is not connected to the emergency power supply, another emergency lighting panel should be considered for this area.

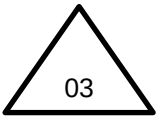
This emergency lighting panel shall be supplied from the MCCs in the other areas which their normal power supply is fed from the emergency power supply.

Generally, 20% of total lighting fixtures in All places shall be supplied form the emergency lighting panel. For all critical places, such as staircases, corridors, exit light shall be considered.

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6.5.SAFETY LIGHTING

In all areas and building, 10% safety lighting shall be considered, this includes using battery backed fixture with 120min endurance.



In order to light the inside of closed metal spaces such as sag mill, ball mill and flotation cells, it is necessary to provide 24V power supply. Therefore, in the socket boxes near the mentioned equipment, a 24V power converter should be included and the corresponding socket should be provided.

6.6.Lighting Level of Intensity

Maintenance factor for different areas shall be considered as below:

- All process area and production line: 0.6
- Workshop: 0.65
- Substation room and warehouse: 0.7
- Offices , control room and administrative areas , canteen, clinic, and same building: 0.75
- Outdoor area (street, road,...): 0.6

Lighting level calculation shall be done with latest dialux software.

Lighting around the buildings needs to be considered.

Uniformity factor for each areas shall be considered as below:

- All Process Area: 0.6
- All Office and admin area, canteen, guard house, clinic and same building: 0.7
- Substation and electrical room: 0.7
- Control room: 0.7

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- Street and road: 0.5

The illumination levels shall be generally in accordance with API-RP-540 and/or other internationally approved standards. Minimum illumination levels on process areas shall be:

Location	Illumination level (Average)	unit
control rooms	400	lux
electric and instrumentation rooms (substation, HVAC room, local electrical room)	300	lux
Lime & Molybden Area	150	lux
Street and Road	10	lux
Office, canteen, guard	300	lux
house, same building	150	lux
stairways and walkway of conveyer	30	Lux
Production area (Concentrator saloon, pebble crusher, transfer tower, apron feeder, primary crusher, tunnel of stockpile and sacrificial belt)	150	Lux
Outdoor area	20	lux

Above mentioned illumination value, shall be considered as minimum value. So, average illumination shall be much more than above mentioned table.

6.7. Lighting CIRCUIT DESIGN

In an area, the lighting fixtures shall be arranged in different phases such that even in case one lighting panel goes faulty complete lighting is not affected. In case of room, the lighting shall be arranged from two phases.

The circuit loading on each circuit shall be restricted to 80% of the MCB rating.

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The voltage drop from LDB and any fixture shall not exceed 3%. In case of outdoor, the same shall be 5%.

Normal and emergency Lighting and small power systems shall be supplied through isolating transformers.

The MCB shall be on inrush current and type B for lighting system and type C for socket outlet system respectively.

All of final circuit shall be protected by RCD

The RCD shall be chosen in adequate rating current and 30(mA) leakage current in order to protection people against electrical shock.

6.8.Socket Outlets

In general, welding sockets shall be provided only in process area. Sockets shall be supplied based on reaching any point within the unit where welding will be performed.

The sockets shall be 400V AC, 5 poles, weatherproof industrial type, completed with probe plug. Convenience outdoor socket outlets shall be 230V AC, weatherproof industrial type, completed with probe plug.

63 A or 32A outlets shall be installed in Power outlet panels for welding and normal 16 A socket outlets for other purpose.

The following features should be considered for the socket outlet.

No. of Poles:

- 3 (including earth outlet for single phase wiring)
- 5 (including earth outlet for 3-phase wiring)

Degree of Protection:

IP55 for concentrator saloon and lime-milk plant

IP42 for indoor installation

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IP65 for heavy pollution areas (pebble crusher, primary crusher, apron feeder, tunnel, transfer tower , outdoor area)

Circuit Breakers shall include earth leakage protection and surge protection for sensitive electronic equipment.

In office areas and wherever there is a computer, and shall providing UPS power for 30% of critical consumers .

In office areas, normal, emergency and UPS socket, plus telephone and LAN system (recessed, shunt or duct)

6.9.Accessories

6.9.1.Switches-On-Off

Branch circuit breakers shall not be used as light switches. Contactors and push buttons or impulse relay should control lighting for large indoor work areas.

Wherever concealed conduits are used, the switches shall be flush mounting type.

Wherever exposed conduits are used, the switches shall be surface mounted, industrial type.

The switches shall be in accordance with IEC or equivalent standard recommendations and suitable for the area classification in which they are installed.

Two-way switches shall be used for corridors or large halls with two entry/exit points.

control-eyes shall be used for official stairway lighting switching.

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Switches in general, shall be installed at 1200 mm above finished floor level, unless otherwise specified.

Switches, receptacles etc., situated near doors shall have a distance of approximately 100mm from doorframe to the edge of the first unit.

The switches installed outside the buildings shall be weatherproof type at least IP55 and shall accommodate with weather condition.

- Switches used for indoor shall meet following requirement:
Rating of Contacts: 10A
- Switch Type: One pole switch, two-pole switch, two-way switch & cross switch Earthing Connection: Earth terminal screw
- Degree of Protection: IP55 for outdoor installation IP42 for indoor installation.
- each fixture shall be had dedicate JB .

6.9.2.Astronomical clock / Photocell Units for outdoor Lighting

Photocell units shall be designed and constructed for min. 5 A, 230 V, 50 HZ.

Astronomical clock units shall be of the type not sensitive for operation under lighting or lightly clouded skies.

Astronomical clock units shall be fail-safe operation type that is the load circuit remains energized in the event of electronic circuit failure.

The sensitivity without adjustable mask shall be 10 to 30 foot-candles, and with adjustable mask 10 to 250 foot-candles.

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6.9.3.Junction Boxes

Junction boxes used for lighting system shall meet following requirement:

No. of terminals:	As required with spares
Degree of Protection:	IP65 for heavy pollution areas IP55 for outdoor or wet Area installation IP42 for indoor installation (safe area)
Earthing Connection:	Earth terminal screw
Material	Aluminum die cast (For outdoor area), For Indoor Area (not in Process area) Plastic Material can be used.

6.10.Wires and Cables

0.6/1KV PVC insulated multi-core cables shall be used for all lighting and socket circuit's purpose (NYY) and conduits or high dip galvanized tube shall be utilized.

All conductors of cables and wires shall be stranded copper.

- The minimum wire size for 1-phase receptacles shall be 2.5 mm².
- The minimum wire size for 3 phase receptacles shall be 4 mm².

The following color code shall be used for wires and cables; (L1) red; (L2) yellow; (L3) blue; (N) black – and shall be indicated on the drawings. Green/Yellow for grounding conductor.

Note: Minimum wire size for lighting circuits in buildings shall be 2.5 mm².

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6.11.Outdoor Installation Requirements

Regarding the outdoor installation, the following requirement should be observed for all type of accessories, (Switches, sockets):

Type of Installations: Surface mounted

Degree of Protection: IP 54 or IP 55

6.12.Drawing & Documents

Documents, drawings, catalogues, etc., shall be in English and in metric unit. Generally the drafting symbols shall be in accordance with IEC 60617.

Detail drawings with specification of material to be used and bill of material, completed with sections and details, etc. should be given.

7.QUALITY CONTROL, INSPECTION AND TESTING

The contractor shall have a comprehensive quality control procedure. Inspection and testing shall be based on the related standards.

Vendor shall submit a QC plan prepared based on the related standards and the template QC plan shall be sent to the buyer for approval, it shall be included at least the following items:

-Quality control procedure

-Type test(s)

-Routine tests

Approved QC plan will be the base of quality control, inspection and testing. The supplier shall issue the buyer the QCTM (including QC plan and approved Inspection and testing report) eventually.

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Important Notes: The QC plan does not relieve the contractor of his duties of quality control, inspection and testing of the equipment complete with all accessories necessary for proper operation.

8. TAGGING, MARKING, PACKING AND DELIVERY

For tagging, marking and packing procedure, the contractor shall submit a packing instruction to the buyer for approval. Approved packing instruction will be the base tagging, marking, packing and delivery. A copy of packing list and supply list will accompany each package.

The lighting fixtures, Socket outlet, 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. Materials shall be designed to withstand transportation by truck for long distances over rough roads. The contractor is responsible for proper and safe transport and delivery of the equipment to site.

9.SPARE PARTS AND SPECIAL TOOLS

The contractor shall provide all special tools that may be necessary to enable equipment to be erected, commissioned and maintained. These tools will become the property of the buyer.

The vendor shall provide spare parts for the following categories:

-Commissioning spare parts:

For the commissioning of the equipment, the vendor shall provide a complete set of spare parts, which in his opinion and experience are necessary during this period. These spares shall be in addition to those spare parts as below bought by

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buyer for the running of the equipment after commissioning.

-Operation spare parts:

These are spares, which the vendor recommends shall be held in stock in order to maintain the equipment in operation after setting to work. These spares will not be available for use by the vendor during commissioning of the plants.

All necessary spare parts for commissioning period shall be provided by seller.

All spare parts for utilization period shall be provided by seller according to contracts annexes.

10.Guarantees

The supplier shall replace any damaged equipment resulting from poor workmanship and/or faulty design. The supplier shall also replace any equipment failed under the following conditions:

- Failure under startup and commissioning tests performed according to IEC recommendations.
- Satisfactory and trouble-free operation of equipment under specified conditions generally shall be guaranteed for a period of 12 months from starting to operation.

The supplier shall guarantee to support any spare parts for a period of 10 years.