TECHNICAL SPECIFICATION
1.0 SPECIFICATION OF FLAMEPROOF DISTRIBUTION BOARD, FIXTURES, POWER DISTRIBUTION SYSTEM INCLUDING CABLE LYING & TERMINATION.

1.0.1 Scope

The following Specification flameproof Distribution board, flameproof illumination fixtures, flameproof exhaust fans, flameproof switch with cable termination box, flameproof switch sockets and plugs for the proposed Project.

1.0.2 General Information

The intent of this specification is to define the requirements of Utility Boards, Power Distribution Board, Light Distribution Board, Lighting fixtures and control gears, plug sockets, DP switch, Exhaust fans, junction boxes, FRLS cable, cable glands, lugs, motors etc suitable for installation.

All electrical components forming part of electrical distribution system requires to be manufactured & tested as per is 2148. The scope of supply of items under this contract.

1.0.3 Code and Standards:

The Flameproof fixtures shall conform to the requirement of the latest revisions of the following Codes & Standards.

- IS 2206/1984 Part I : Specification for FLP electric lighting fittings – Wellglass & Bulkhead
- IS 2206 / 1976 Part II : Specification for FLP electric lighting fittings – using glass tubes
- IS 4012 / 1967 : Dust proof electric light fittings
- IS 4013 / 1967 : Dust tight electric light fittings
- IS 4821 / 1968 : Specification for cable glands and cable sealing boxes for use in mines
- IS 6539 / 1972 : Intrinsically safe magneto telephones for use in hazardous atmospheres
- IS 6789 / 1972 : Bolted flameproof cable couplers & adaptors
- IS 8224 / 1976 : Specification for lighting fittings for Division 2 areas
- IS 8945 / 1987 : Specification for electrical measuring instruments for explosive gas atmospheres
- IS 9099 / 1980 Part II : Performance testing of powered industrial trucks working in hazardous areas (battery operated)
Wherever Indian Standards are not available, the transformer shall conform to relevant International Standard.

1.0.4 Design Criteria

1) Layout of illumination fixtures, exhaust fans, and switches shall be as per drawing

2) The Distribution Board, light fixtures, Plug socket, DP switch, Cable and junction boxes along with accessories, shall be certified conforming to applicable standards by a competent authority like CMRS Dhanbad/CCE(PESO) Nagpur-India or equivalent from the country of origin.

3) All light fixtures and junction boxes along with accessories shall have weatherproof enclosures (IP-55/NEMA-4 or equivalent) and suitable for the hazard in which they are installed. The temperature class shall be T3 as per IEC, unless otherwise specified. The body of the DB/fixture/junction box shall be cast metal and shall be free from frictional sparking hazard.

4) All fixtures shall be provided with sheet steel vitreous enameled or approved type reflector. All light fixtures except flood light fixtures shall be provided with steel wire protective cage having mesh dimensions of 50 mm x 50 mm. The glass used shall be clear and toughened type suitable for use under conditions involving exceptional risk of mechanical damage.

The light fixtures shall have glass sealed into retaining ring, which, in turn, shall be secured to the body. The fixtures shall be suitable for mounting on poles/ceilings/columns. Suitable fastening devices such as Clamps/brackets etc required for installation shall also be supplied. All hardware such as nuts, bolts, washers etc. shall be cadmium plated. All the fixtures shall be provided with an internal earthing terminal.

Special tools, if required, shall also be provided. All the fixture nameplates shall bear the stamp of certifying agency.

5) The junction boxes, wherever required, shall be flame proof and shall be provided with cable termination accessories for copper / Aluminium cables. All terminals for cable connection shall be anti-loosening type.

An earthing terminal shall be provided inside the junction box. Sufficient space for accommodating specified numbers of cables and easy access to their terminals for termination purposes shall be provided. Four lugs shall be provided for mounting of junction box on wall/steel structure.
6) Flame proof, double compression type, nickel/chromium plated brass cable glands shall be provided for all flame proof equipment. The lugs provided shall be tinned copper crimping type.

7) All equipment shall be painted as per general specification.

8) Testing and inspection of light fixtures and Junction boxes shall included but not necessarily be limited to the following:
   a) A visual inspection shall be made to ensure that the finishing and workmanship are up to the mark.

   b) Company reserves the right to witness the final testing and inspection. Prior intimation of at least 7 days shall be given to enable the Company to depute its representative to witness the test.

9) Erection / installation of distribution board, fitting, cabling and jointing / termination shall be in accordance with the Standards stipulated for flameproof characteristics. The contractor shall arrange all the necessary T&P required for the installation, testing and commissioning of electrical system

10) All the FLP light fixture are non-integral type.

1.0.5 Guarantee

The goods under the scope of the supply shall be guaranteed for their compliance with IS 2148 as applicable.

1.0.6 Certification

All the, boards, light fixtures and junction boxes offered or those with similar design & construction features, manufactured by same vendor shall have been type tested by CCE Nagpur or his authorized representative or a Competent Authority like CMRS Dhanbad or equivalent.
1.2 SPECIFICATION FOR LIGHT FITTINGS AND ACCESSORIES

1.2.1 Scope

The scope under this section covers the following selection, testing at works, inspection and delivery at site of following light fittings and their associated accessories.

1.2.2 Standards

The light fittings and their associated accessories such as lamps/tubes, reflector, housings, ballasts etc. shall comply with the latest applicable standards and codes.

Where no Standards are available, the supply items shall be backed by test results, shall be good quality and workmanship & any supply items which are brought out by the Contractor shall be procured from the approved manufacturers acceptable to the Employer.

1.2.3 General Requirements

i. Fittings shall be designed for continuous trouble free operation under atmospheric conditions as specified without reduction in lamp life or without deterioration of materials and internal wiring. Outdoor fittings shall be weather-proof and rain-proof type.

ii The fittings shall be designed so as to facilitate easy maintenance, including cleaning, replacement of lamps / starters etc.

iii Connections between different components shall be made in such a way that they will not work loose by small vibration.

iv For each type of lighting fitting the Contractor shall supply the utilization factor to indicate the proportion of the light emitted by the bare lamps which falls on the working plane.

v All fittings shall be supplied complete with lamps suitable for operation on a supply voltage and the variation in supply voltage.

vi. The fittings and accessories shall be designed to have low temperature rise. The temperature rise above the ambient temperature shall be as indicated in the relevant standards.

vii All mercury vapor, metal halide lamp and sodium vapor lamp fittings shall be complete with accessories like lamps, ballasts, power factor improvement capacitors, starters wherever applicable, etc. These shall be mounted as far as possible in the fitting assembly only. If these cannot be accommodated inside, then a separate metal enclosed box shall be included to accommodate the accessories and in addition with a fuse and a terminal block suitable for loop-in, loop-out connections. Outdoor type fittings shall be provided with outdoor type weather proof box.

viii All fluorescent lamp fillings shall be complete with all accessories like ballasts, power factor improvement capacitors, lamps, starters and capacitors for correction of stroboscopic effect.

ix Each fitting shall have a terminal block suitable for loop-in, loop-out and T4 connection
by 250/440V, 1 core, PVC insulated Cu conductor cable upto 4 sq.mm, in size unless otherwise specified. In hazardous areas, the termination at the fittings shall be suitable for 1100 V, PVC, armoured cables of sizes specified and terminals shall be of stud or clamp type. The internal wiring should be completed by the MANUFACTURER by means of stranded copper wire and terminated on the terminal block.

x The mounting facility and conduit knock-outs for the fixtures shall be as specified.

xi All hardware used in the luminaries shall be suitably plated or anodized and passivated for use in chemical industrial and power plants.

1.2.4 Earthing

1) Each light fitting shall be provided with an earthing terminal suitable for connection to the earthing conductor.

2) All metal or metal-enclosed parts of the housing shall be bonded to the earthing terminal so as to ensure satisfactory earth continuity throughout the fixture.

1.2.5 Painting/Finish

1) All surfaces of the fittings shall be thoroughly cleaned and de-greased. The fittings shall be free from scale, sharp edges and burns.

2) The housing shall be stove-enameled/epoxy stove-enameled/vitreous enameled powder-coated of anodized as indicated under various types of fitting.

3) The finish of the fitting shall be such that no bright spots are produced either by direct light source or by reflection.

1.2.6 LIGHT FITTINGS:

A) Industrial Type Fittings

i. These fittings shall be suitable for use with incandescent/fluorescent/mercury vapor/sodium/Metal halide lamps as per requirements and generally as described below.

ii The angle or cut-off for fittings with filament lamp shall not exceed 70° C and that for fittings with fluorescent tubes shall not exceed °.

iii The luminous output of each reflector shall not be less than:

   a. 60 % in case of vitreous enameled reflectors with incandescent and mercury vapour lamps.

   b. 80 % in case of anodized aluminium reflectors with lamps as in (a) above

   c. 75 % in case of fluorescent lamps irrespective of the type of reflector used

iv The distribution of light shall be such that at least 80% of the total luminous flux from the
fitting shall be in the lower hemi-sphere.

v Fluorescent lamps to be mounted in the false ceiling shall be installed so as to form a continuous luminous ceiling, shall have an inside reflector of non fluorescent power occupying 2/3 of inner surface of the tube so that the lamp radiates light mainly in the direction determined by the position of the reflective material.

B) Bulkhead and Well glass Type

i. Bulkhead, weather-proof type fittings for use in corridors, staircase landings covered porches and low ceiling factories, shall be suitable for direct fixing to wall ceiling and to accommodate upto 150 watts incandescent lamp. The fitting shall be provided with housing of cast aluminium alloy with stove enamelled finish, prismatic heat resistant glass cover hinged on to the housing and fixed by screws. Neoprene gaskets shall be provided to make the fitting weather-proof. For mechanic protection to glass cover, a protective wire-guard of 3 mm galvanized wire with stove enamelled finish paint shall be provided.

ii Well glass, weather-proof type fittings for use in building exteriors and common walls, shall be suitable for conduit mounting and to accommodate upto 200 wail incandescent lamps or 125 W HPMV lamp. The fitting shall be provided with stove enamelled cast aluminium housing with top conduit entry, heat resistant clear glass cover unit hinged to the housing and fixed by screws. The fittings shall be provided with neoprene gaskets and wire guards as started in above item.

C) High Bay / Low Bay Type

The fittings shall be suitable for mounting to the roof structure and for this purpose suitable hook for suspension shall be provided. The fitting shall be suitable for up 400 watts mercury vapour/metal halide lamp. If mercury vapour lamp or metal halide is provided, the fitting shall be provided with an integral housing for the control gear complete with ballast, capacitor, fuse-gear and internal wing.

The integral housing shall be designed for efficient cooling of the unit. The canopy and housing shall be of cast aluminium, stove-enameled and the reflector shall anodized aluminium sheet, mirror polished.

1.2.7 ACCESSORIES FOR LIGHT FITTINGS:

Fluorescent tube lamps, fitting and accessories shall comply with following standard.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>IS 1596 :1976</td>
<td>Capacitor for use in tubular fluorescent, high pressure mercury and low pressure sodium vapour discharge lamp circuit.</td>
</tr>
<tr>
<td>IS 1777 :1978</td>
<td>Industrial luminaries with metal reflectors</td>
</tr>
<tr>
<td>IS 2215 :1983</td>
<td>Starters for fluorescent lamps</td>
</tr>
<tr>
<td>IS 2418 (Part 1 to 4) :1977</td>
<td>Tubular fluorescent lamps for general lighting services</td>
</tr>
</tbody>
</table>
1.2.7.1 Reflectors

1) The reflectors shall be made of CRCA sheet steel/ aluminum / silvered glass/chromium plated sheet copper as indicated for the above-mentioned fittings unless otherwise specified.

2) The thickness of steel / aluminum shall comply with relevant Standards specified. Reflectors made of steel, shall have stove-enameded/Vitreous-enameded/Epoxy-coating finish. Aluminum used for reflectors, shall be anodized / epoxy stove-enameded/mirror polished. The finish for the reflector shall be indicated above mentioned fitting.

3) Aluminium paint on the reflectors of flameproof fittings is prohibited.

4) Reflectors shall be free from scratches or blisters and shall have a smooth and glossy surface having an optimum light reflecting co-efficient such as to ensure the overall light output specified by the MANUFACTURER.

5) Reflectors shall be readily removable from the housing for cleaning and maintenance without disturbing the lamps and without the use of tools, they shall be securely fixed to the housing by means of positive fastening device of captive type.

1.2.7.2 Lamp/Starter Holders

1) Lamp Holders shall comply with relevant Standards. They shall have low contact resistance, shall be resistant to wear and shall be suitable for operation at the specified temperature without deterioration in insulation value. They shall hold the lamps in position under normal condition of shock and vibration met within normal installation and use.

2) Lamp Holder for the fluorescent lamps shall be of the spring loaded bi-pin rotor type. Live parts of the lamp holder shall not be exposed during insertion or removal of the lamp or after lamp has been taken out. The lamp holder contacts shall provide adequate pressure on the lamp cap pings when in working position.

3) Starter holders for fluorescent lamps shall conform to the relevant Standards. All material used in the construction of the holder shall be suitable for tropical use.

4) The Starter Holder shall be so designed that they are mechanically robust and free from any operational difficulties. They shall be capable of withstanding the shocks met within normal transit, installation and use.

1.2.7.3 Ballasts

1) The ballasts shall be designed, manufactured and supplied in accordance with the relevant Standards. The ballasts shall be designed to have a long service life and low power loss.

2) The electronic ballasts shall be fully enclosed in an aluminum housing shall include a divided wiring compartment to separate the power leads from the control leads. All leads
3) The electronic ballast shall be multi voltage capable and operate from a voltage range of 180 – 305V at 50Hz.

4) Ballasts shall be mounted using self locking, anti-vibration fixings and shall to remove without demounting the fittings. They shall be in dusting combustible enclosures.

5) The ballasts shall be of the inductive, heavy duty type, filled with then insulating, moisture repellant polyester compound filled under pressure or Ballasts shall be provided with tapings to set the voltage within specified. End connections and taps shall be brought out in a suitable block, rigidly fixed to the ballast enclosure. The ballast wiring shall bed wire. They shall be free from hum. Ballasts which produce humming be. replaced free of cost by the VENDOR.

6) Separate ballast for each lamp shall be provided in case of multi lamp fittings.

Lamps

1) The fluorescent lamps shall be “Cool Day Light” type unless otherwise specified and shall be provided with features to avoid blackening of lamp ends. The fluorescent lamps shall have a high lumen output of 3250 lumens. The lamp shall have triple coil electrode with an anode ring and a tri-band Phosphor coating.

2) The lamps shall be capable of withstanding small vibrations and the connections at lead in wires and filaments/electrodes, shall not break under such circumstances.

3) Lamps/Tubes shall conform to relevant Standards and shall be suitable for supply voltage and frequency specified.

Starter

1) Starters shall have bimetal electrodes and high mechanical strength. Starters shall be replaceable without disturbing the reflector or lamps and without the use of any tool. Starters shall have brass contacts and radio interference capacitor.

2) The starters shall generally conform to the relevant Standards.

Capacitors

i. The capacitors shall have a constant value of capacitance and shall be connected across the supply of individual lamp circuits

ii The capacitors shall be suitable for operation at supply voltage and shall have a value of capacitance so as to correct the power factor of its corresponding lamp circuit to the extent of 0.95 lag or better.

iii The capacitors shall be hermetically seated preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.
1.2.7.7 Spare Parts

i. Unit prices of the items shall be quoted together with catalogue numbers.

ii. The unit prices shall not however be limited to the above items. The VENDOR may recommend additional spare items and quote the unit prices of the respective items.

1.2.7.8 Tests and Test Reports

i. Type tests, acceptance tests and routine tests for the lighting fittings and covered by this specification shall be carried out as per the relevant standards for the respective fittings and their accessories.

ii. The MANUFACTURER's type and routine test certificates shall be submitted for tests conducted as per relevant standards for the fittings and accessories. The BIDDER shall submit with his proposal copies of available test certificates of the fittings offered.

### APPROVED MAKE OF MATERIAL

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Materials</th>
<th>Manufacturer/Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Light Fittings(Industrial / Commercial)</td>
<td>Philips /Bajaj/Crompton</td>
</tr>
<tr>
<td>2)</td>
<td>Flameproof /Increased Safety Switchgear &amp; lighting fixtures</td>
<td>Flameproof Equipments P Ltd/ Sudhir Switchgear/CEAG/Baliga</td>
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