

Illumination Package (Package-2 in PY55416) for RINL ESP- ReVamp Vizag Project

Approved Makes, GST payment term, Freight scope and Delivery period

A. Approved Vendor: End customer has specified approved makes which are available in the technical spec PY 55416, only those approved makes/vendors will be qualified for price bid opening. Any bidder may write to sunil.kmr@bhel.in for clarification. All known sources will receive an email notification for submitting quotation.

B. GST Payment Term: The GST amount of the vendor invoices (after dispatches for payment) will be paid by BHEL to vendor only after it is available to BHEL for taking GST credit in GST portal.

C. SCOPE: Bidder shall quote prices including basic price, Packing forwarding, Freight and GST in enquiry in GeM portal. Transit insurance are in scope of BHEL.

D. Delivery Period: The calculation of Delivery period mentioned in the Bidding document is from GeM contract date up to material receipt at site.

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TECHNICAL SPECIFICATION FOR ILLUMINATION ITEMS PACKAGE

PROJECT :	REVAMPING OF ESP FOR UNIT-2,3,4&5 (4X330 TPH)
OWNER :	RASHTRIYA ISPAT NIGAM LTD, VISAKHAPATNAM STEEL PLANT
OWNER CONSULTANT:	M.N.DASTUR & COMPANY (P) LTD, CONSULTING ENGINEERS, KOLKATA

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Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
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- A. SCOPE:** This specification covers the design, manufacture, assembly, testing at manufacturer's works, packing and delivery to site of all items included in Illumination Package of Power Plants for efficient and trouble free installation and operation.

B. CODES & STANDARDS:

1.0 The different items covered under this specification shall be designed, assembled and tested in accordance with the standards of the Standards Institution, Institution of Electrical Engineers and Manufacturer,s Association of the country where they manufactured. The equipment and component parts shall conform to the relevant standards published by the Bureau of Indian Standards and comply with the latest applicable Indian Standards as listed below:

IS	Standard Description
IS 5	Colours for ready mixed paints and enamels
IS 1777	Industrial luminaire with metal reflectors
IS 1913	General and safety requirements for luminaires
IS 3287	Industrial lighting fittings with plastic reflectors
IS 3528	Waterproof electric lighting fittings
IS 4012	Specification for dust proof electric lighting fittings
IS 4013	Dust tight electric lighting fittings
IS 5077	Decorative lighting outfits
IS3854	Switch for domestic and similar purpose
IS-1248	Direct acting indicating analogue measuring instruments and their accessories.
IS/IEC 60898	Electrical Accessories - circuit breaker for over protection for house hold and similar
IS-12640	Residual current operated circuit breakers.
IS/IEC 60947	LV Switchgear and Control Gear
IS/IEC 60079-0	Electrical apparatus for explosive gas atmospheres (General requirement).
IS/IEC 60079-1	Electrical apparatus for explosive gas atmospheres (Equipment protection by flame proof enclosure "d")
IS/IEC 60079-7	Electrical apparatus for explosive gas atmospheres (Equipment protection by increased safety "e")
IS/IEC 60529	Degree of protection provided by enclosures (IP Code).
IS 694	PVC insulated cables for working voltages up to and including 1100V
IS 9537	Conduits for electrical installation
IS 2713	Specification for tubular steel poles for overhead power lines
IS 1161	Steel tubes for structural purposes – Specification
IS 8309	Compression type tubular terminal ends for Al conductors of insulated cables
IS 2678	Dimensions and tolerances for wrought Al and Al alloy drawn round tube
IS 1293	Plugs and socket outlets of rated voltage up to and including 250V and rated current up to and including 16A
IS 8623	Specification for Low-Voltage Switchgear and Control gear Assemblies
IS 1554	PVC insulated (heavy duty) electric cables
IS 8828	Electrical Accessories - Circuit Breakers for Over Current Protection for Household and Similar Installations
IS 2629	Recommended practice for hot-dip galvanizing of iron and steel
IS 3043	Code of practice for earthing

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IS 12640	Residual Current Operated Circuit-Breakers for Household and Similar Uses
IS 4759	Hot-dip zinc coatings on structural steel and other allied products
IS 9968	Elastomer insulated cables: Part-1 For working voltages up to and including 1100V

2.0 The code & standard to be followed for LED luminaires

Code	Standard Description
16101:2012	General lighting. LEDs and LED Modules Terms & definitions
16102(Part 1):2012	Self-ballasted LED lamps for General Lighting Services. Part-1 Safety Requirements.
16102(Part 2):2012	Self-ballasted LED lamps for General Lighting Services. Part-2 Performance Requirements.
16103(Part 1):2012	LED modules for General lighting Safety Requirements.
IEC 61347-2-13	Lamp Controlgear-Part2-13: Particular Requirement for DC and AC supplied electronic control gear for LED models.
16104:2012	DC or AC supplied Electronic Control Gear for LED Modules – Performance requirements.
16105:2012	Method of measurement of lumen maintenance of solid state Light (LED) sources.
16106:2012	Method of Electrical and photometric Measurement of solid state Lighting (LED) Products.
16107:2012	Luminaire Performance
16108:2012	Photo biological safety of lamps and lamp system.
IS 513	Cold rolled low carbon steel sheets and strips.
IS 12063	Classification of degree of protection provided by enclosure.
IS 14700(Part3/Sec.2)	Electromagnetic compatibility (EMC) – Limits for Harmonic current emission – THD < 15% (equipment input current < 16A per phase).
IS 9000(Part 6)	Environment testing: Test Z - AD: composite temperature/humidity cyclic test.
IS 4905, IEC 60598	Method of random sampling Ingress protection, luminaire performance and safety.
IEC 61000-3-2	Total Harmonic Distortion
IEC 61000-4-5	Surge protection
IES-LM 80 along with TM 21/IS16105	Lumen depreciation and rated life of LED Chip.
IES-LM 79/IS 16106	Luminaire optics and color parameter and electric parameter.

C. INSTRUCTIONS TO BIDDER

- Bidders are advised to contact BHEL for essential technical queries/clarification in writing within one week of issue of enquiry. It is Bidder's responsibility to thoroughly understand the technical and other documentation related requirements of this specification before submitting the offer. Offers with incomplete information will not be considered for evaluation and are likely to be rejected outright without any further communication with the Bidder.

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- Unsolicited requests from bidders for alterations to their already submitted offers will not be entertained. These would not be taken cognizance, and offers will be evaluated without taking into account such requests/correspondence.
- Bidders are advised to comply with the specification in total, unless the requirement is not feasible due to technical constraint. Bidder to intimate such constraint in writing in Deviation format (Annexure-V) and shall propose feasible deviations. In case feasible deviations are proposed by Bidder and subsequently withdrawn, no commercial implications can be claimed by the bidder. If any deviation is accepted by BHEL during technical evaluation then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
- Bidder shall submit duly filled, stamped & signed deviation schedule as per attached format (Annexure-V) along with technical offer. If there are no deviations from the specifications, bidder still has to submit the Deviation schedule by writing “NO Deviations” in this format. If the “Deviation format” is not submitted along with the offer, or submitted without sign & stamp, the bidder’s offer is likely to be rejected without any further interaction with the bidder.
- Bidders are advised to quote model and brand of all standard make items, manufactured by reputed makers or vendors from sub vendor list (Annexure-IV). Offer shall include supporting Catalogue/published literature (Duly highlighting the appropriate variant). In case of discrepancy between Bidder’s offer and published documents, details furnished in published documents/catalogues will be taken into consideration for technical evaluation.
- In the event of any conflicts between these specification, related standards, data sheets, codes, etc. vendor shall refer the matter to BHEL for clarification and only after obtaining the clarification, vendor shall proceed with the manufacture of the items in question.
- Bidder shall be responsible for providing all items specified at Illumination BOM, attached as Annexure-II. Incomplete Offer for illumination items listed in BOM will not be considered for evaluation and offer will likely be rejected without any communication.
- All materials shall be as per sub vendor list attached as Annexure-IV. Any deviation in this regard will not be acceptable. Any item or accessories which are not covered in the sub vendor list shall be of reputed make of proven track record and manufactured in accordance with various national and international standards.
- Bidder to submit duly signed & stamped un-priced price schedule filled in writing “Quoted” against each item as per attached format (Annexure-III) along with technical offer as a token of his concurrence that all items were quoted along with unit prices. **If not submitted in this format or any field is left blank, the offer will be liable for rejection.** For discrepancies, if any, in the bid with respect to Quantity, Rates & Totals, etc., BHEL discretion shall be applicable.
- Vendor shall fill up prices of various items and submit to BHEL in separate sealed cover as part of commercial offer. The commercial bid shall be submitted as per commercial terms and conditions.
- The quantities given in Illumination BOM (Annexure-II) may vary to the extent of +/-10% as per various finalized illumination layouts based on Customer approval. Same shall be informed to

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bidder at any time during execution of package. For addition/reduction of quantity, unit rates shall be considered.

12. Bidder to submit duly stamped and signed "Bidder Check list" as per prescribed format (Annexure-VI) as confirmation for compliance to various technical and documentation requirements associated with the offer. Bidder to fill in writing "Yes" in the indicated column against each row of table mentioned in the Checklist. **Technical offer submitted without filled in Check list will not be considered for evaluation.** Also if any row of submitted check list is left blank or not confirmed or the check list is submitted without bidder's sign and stamp, the offer will be rejected without any communication.
13. In case of any discrepancy between Illumination BOM (Annexure-II) and Technical specification as per clause D below, Illumination BOM (Annexure-II) is to be followed.

D. TECHNICAL SPECIFICATIONS:

SITE CONDITIONS: For Site conditions of Project Refer Annexure-II (Illumination BOM). Bidder shall supply all materials suitable for satisfactory working in the mentioned site condition:

I. SAFE AREA LIGHTING PANELS:

- 1.1. Lighting panels shall conform to IS-8623, IS-60947, IS-8828 and IS-12640 and shall have IP-54 (min.) protection for indoor and IP55 (min.) for outdoor type panel as per IS2147.
- 1.2. Lighting panels shall be totally enclosed, wall mounted, dust and vermin proof sheet steel design having gasketed hinged front door with suitable locking device.
- 1.3. Panel shall be fabricated from CRCA sheet steel of minimum 2 mm thick (14 SWG). Outdoor type panels shall be provided with external GI/FRP canopy of 2 mm to protect from heavy tropical rains from top and both sides. These shall be suitable for wall/column mounting with external fixing lugs. All hardware provided shall be of galvanized.
- 1.4. Incomer and outgoing isolating devices shall be as specified in the illumination BOM (Annexure-II). All MCCBs/MCBs/RCCBs should be mounted on a bracket covered with Bakelite cover plate with only opening for dollies. Dollies of MCCBs/MCBs/RCCBs should be accessible only after opening the outer door. Barrier plate shall be hinged/bolted with fixing screws. Size of Panel compartment shall be sufficient to accommodate all MCCBs/MCBs/RCCBs/TBs/Cable glands etc. along with their internal wiring in orderly manner.
- 1.5. For single phase and neutral (SPN) Lighting panel, incoming and outgoing MCBs shall be located in the same compartment but incoming MCB shall be separated from outgoing MCB's din rail supporting arrangement. For three phase and neutral (TPN) distribution board, TPN incoming isolating device shall be located in a separate compartment with provision of door interlocking facility
- 1.6. MCBs shall be designed as per IS:8828/IEC:898 and shall be provided with quick break-trip free mechanism and direct acting thermal overload and short circuit trip elements. MCBs shall be suitable for breaking capacity of 9kA (min.) at 0.8 PF and RCCBs shall be provided with tripping due to earth leakage with a sensitivity of 100mA.
- 1.7. Panel shall be provided with indicating ON/OFF lamp with cluster LED.

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- 1.8. Panel with Timer controlled contactor operated incoming shall be provided with Power Contactor, 0-24Hrs synchronous timer/Time switch (L&T type TSQ-100-T or equivalent), Auto / manual selector switch, start/stop push button switch, ON/OFF lamps and fuse block/MCB for control circuit as indicated in the annexure-1. Contactor rating shall be equal to incomer MCCBs/MCBs and 2 set of NO+NC auxiliary contacts of suitably rated and wired for holding the contactor in energised condition whenever switched ON. Time switch shall be suitable for continuous operation and shall have internal back up cell for clock mechanism.
- 1.9. Panel with provision of 240V & 24V outgoing circuit shall be provided with additionally 240/24V transformer, 24V bus-bar section as indicated in the annexure-I. Transformer provided in the panel shall be Single phase, two winding, dry, air cooled and synthetic resin vacuum impregnated type of 200VA. Core shall be made of high quality low loss silicon steel laminations insulated with materials having high inter lamination insulation resistance Winding shall be electrolytic grade copper with class 'F' insulation (temperature rise limited to class 'B'). Tappings of +2.5% and +5% shall be provided on HV side. Rating & terminal marking plate shall be provided in Transformer.
- 1.10. For AC Lighting panel with contactor (if specified in the Illumination BOM), Contactor shall be used for remote controlling of incomer supply in addition to MCCBs/MCBs & RCCB as per detail below.
- Contactor Coil rating:- 230V AC, heavy duty rated for continuous operation.
 - No. of Contacts & Rating:- DP/TPN Contactor with double break silver tipped contacts with 2 set of NO+NC auxiliary contacts of suitably rated and wired for holding the contactor in energies condition whenever switched ON.
 - Controlling of Contactor:- Contactor will be switched ON/OFF through push button type ON/OFF Switch. Provision for ON/OFF the contactor from two remote locations shall be provided. Refer Annexure-I for internal control wiring details. Suitable number of control terminal blocks shall be provided in addition to power terminal blocks for termination of control cabling / wire.
- 1.11. For AC lighting panels, High conductivity Cu. bus bar with colour coded for R, Y, B & N buses shall be provided. Neutral bus bar shall be colour coded with black band. Bus bar size shall be selected to limit bus bar temperature rise to 40°C above of ambient temperature of 45°C as measured by thermometer. However, Minimum size of the bus bar shall be 25x3 mm. Spacing between the bus bars shall be as per IS for the applied voltage to prevent flash over. Bus bar support shall be non-hygroscopic, insulating, self-extinguishing and fire retardant material of adequate mechanical strength. Bus bar support shall be capable of withstanding the effects of available short-circuit current without any damage.
- 1.12. Two numbers external earthing studs/earthing bolts complete with two plain, one spring/lock washer, and a nut on opposite side of the panels shall be provided. GI Earth Bus of suitable size with terminal/studs shall be provided at bottom part of the panel along the length of panel and shall be connected to the external earthing studs/bolts.
- 1.13. Panel name plate shall be provided at top of the panel but these shall be preferably Rear engraved Perspex with white letters on black background. Minimum information to be included in the name plate shall be as per clause E.III. Incoming and each outgoing unit shall be identified with inscription plate or engraved levels. Proper danger plate shall be provided for each panel.

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- 1.14. For MCBs rated over 30A, cables of outgoing shall be terminated to terminal cables blocks.
- 1.15. Undrilled detachable gland plates with proper gasket shall be provided at top and bottom for indoor type panel and only at bottom for outdoor type panel for taking out incoming and outgoing circuit cables.
- 1.16. Sufficient space shall be provided between gland plate and bottom of terminal block for easy termination of cables.
- 1.17. The number of outgoing feeders is to be considered as mentioned in Annexure-II.
- 1.18. All internal wiring shall be done with 1.1kV PVC insulated, stranded Cu flexible wires of suitable rating. All wires shall be neatly bunched and tied with PVC tape and Buttons & clamped to enclosure at regular interval of their routing. All wires shall be ferruled and terminated by using sleeved lugs.
- 1.19. A Circuit diagram indicating incomer details and outgoing details viz. Circuit number, circuit rating etc. shall be pasted inside the panel. In addition, a laminated copy of diagram shall be provided inside the panel in a suitably designed pocket.
- 1.20. Double compression Nickel-plated Brass Cable gland shall be supplied for both incoming and outgoing cables for Outdoor type panels and for only incoming cables for Indoor type panels. The quantities shall be equivalent to the number of outgoing and incoming feeder as mentioned in the illumination BOM (annexure-II). Glands should be supplied with PVC gland hoods.
- 1.21. Crimp type heavy duty tinned Copper lugs of appropriate sizes suitable for TBs shall be provided for all incoming and outgoing cables. Blanking plug/Rubber Grommet of suitable size shall be supplied for 20% (min) outgoing cable entries to seal the unused entries. Nuts & bolts of suitable size shall be supplied with each panel for mounting of panel.
- 1.22. Sizes of cable glands, Terminal blocks, Lugs & Blanking plugs are project specific, will be decided during detail engineering at drawing approval stage.
- 1.23. All electrical components except indicating lamps shall be mounted on suitable brackets to match with inner door.
- 1.24. Lighting panels should be supplied complete with installed sub components and necessary internal wiring. All loose items like Cable Glands, Blanking plugs, Lugs for incoming/outgoing cables and mounting hardware etc. shall be supplied along with panels for fitting at site.
- 1.25. Makes of major components shall be as follows if not otherwise specified in sub vendor list:-
 - (i) MCBs: MDS, Havell's, Indo-Asian, Legrand, ABB, Schneider.
 - (ii) Fuses: L & T, GE, Indo-Asian, Seimens.
 - (iii) Cable gland: Baliga, Commet, Flexipro, FCG
 - (iv) Terminal Block: Elmax, Connectwell
- 1.26. Panel enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification. Paint shade of the finished product shall be RAL 7032.
- 1.27. All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

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II. SAFE AREA FIXTURES AND LAMPS:

- 1.1 All fixtures, lamps and accessories shall be designed for continuous operation for its life under atmospheric conditions existing at site and without exceeding permissible temperature rise as specified in the applicable standards.
- 1.2 LED fixtures shall be manufactured and tested in conformity with code & standard as specified at clause-2.0 of 'B' above.
- 1.3 Unless specified otherwise, operating voltage is 240VAC $\pm$ 10% 1-phase 50Hz $\pm$ 5%. All fixtures shall be suitable for operation on available power supply.
- 1.4 All Lighting fixtures shall be complete with lamp(s), lamp holder(s), LED chip assembly/Driver, terminal blocks, clamps, locking arrangements, fixing brackets etc.
- 1.5 Driver circuit/Control gears shall be provided as applicable / specified. The fixtures shall be fully wired up to terminal block.
- 1.6 Fixtures should be provided with earthing terminals. All metal or metal enclosed parts of the housing and accessories shall be bonded and connected to earthing terminal.
- 1.7 The lighting fixtures shall be designed for minimum glare. The finish of the fixtures shall be such that no bright spot are produced either by direct source or by reflection.
- 1.8 All Well glass, street lighting, Flood lighting fixtures, Bulkhead & down lighter shall be weather proof with IP-65 (min) protection.
- 1.9 LED luminaires body shall such designed that heat sink/ heat dissipating housing shall be mounted outside the overall luminaire fixture housing, and shall be suitably clearing the driver circuit. Outdoor type LED luminaires, the exposed heat sink shall be suitably designed to avoid dust/foreign particles accumulation on the same.
- 1.10 LED luminaires housing/body shall be pressure die cast aluminum or extruded aluminum or CRCA as specified along with finished powder coating. Design shall be such that there is no water stagnation anywhere.
- 1.11 LED type of fixtures shall meet the following technical requirements:-
 - a) All fixtures shall be complete with lamps.
 - b) The LED Luminaire efficacy shall not be less than 100Lm/W.
 - c) LED lamp shall have wide beam angle suitable for uniform light distribution.
 - d) LED lamp shall be provided with highly translucent diffuser with advance optical system with high internal reflectivity material of excellent and smooth output for glare free light and no visibility of LED to eyes.
 - e) Heat Sink/Heat dissipation arrangement shall be provided in the luminaires.
 - f) Life of LED lamp including driver shall be minimum 35,000 burning hours.
 - g) All fixture shall be high power factor (Min. 0.9) type.
 - h) The LED light fixtures should be tested for luminous lux level as per IES-LM-79. Type test certificates shall be furnished in compliance to same.
 - i) The LED's used in the lighting fixtures should be tested for the service life as per IES-LM-80. Type test certificates shall be furnished in compliance to same.
 - j) LED modules and drivers shall be compatible to each other.
 - k) Make of fixtures shall be embossed on the body of the lighting fixtures.
 - l) LED fixture along with driver etc. shall be enclosed in single enclosure. Driver etc. shall not be fixed in separate enclosure.
 - m) LED drivers shall at least have following Control and protection: Surge protection.

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n) LED chipset and driver shall be of reputed make.

- 1.12 Fixture catalogue details/name plate as per E-I of this spec. shall be provided for easy identification.
- 1.13 All metal surfaces shall undergo manufacturer's standard cleaning/painting cycle. After preparation of under surface, equipment shall be painted with two coats of epoxy based final paint shade. All unpainted steel parts shall be suitably treated to prevent rust formation.
- 1.14 All hardware provided shall be galvanised.
- 1.15 Cable entries of fixtures shall be suitable for 3-Runs of 2.5 Sq.mm. flexible wires. For Well-glass and High bay fixtures cable entry should be from side only. Suitable connector/coupler made of either cast aluminum or galvanized shall be provided for connecting Flexible GI conduit. One no. Aluminum/brass blanking plug shall be supplied for fixture in case fixture is supplied with 2 Nos. cable entries.
- 1.16 Fixtures shall be supplied with all accessories like Crimp type heavy duty tinned Copper lugs, mounting Nuts & Bolts, Coupler/connector, Blanking plug, Pole reducer & "C" bracket for well Glass fixture etc.
- 1.17 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked. Following test reports to be submitted for LED Chip/ LED Luminaires:
 - a) LM 80/IS:16105 report
 - b) LM79/IS:16106 report
- 1.18 Details of LED Chipset and driver catalog shall be furnished during detailed engineering.
- 1.19 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-
 - a) Cable gland: Baliga, Comet, Flexpro, FCG

III. SAFE AREA WEATHER PROOF JUNCTION BOXES:

- 1.1 Enclosure of rectangular JB's shall be of material Cast Aluminum, Thermoplastic or FRP material with IP65 protection (min.)
- 1.2 Size of the JB shall be project specific as indicated in Annexure-II (Illumination BOM). The internal and external surface shall have smooth finish, completely free from dents, defects and blowholes. All screws / hinges if applicable shall be stainless steel and all hardware provided shall be of galvanized.
- 1.3 JB shall have cable entries from bottom only to protect from heavy tropical rains. Necessary detachable gland plate/knockout shall be provided for the same.
- 1.4 Terminal blocks of Cu. shall be provided in the JB, rating & qty. shall be as indicated in the Annexure-II (illumination BOQ). There should be sufficient space between bottom of Terminal Block and Top of Cable gland for easy termination of wires. Required no. of suitable Crimp type heavy duty tinned Copper lugs shall be supplied in loose for cable termination.
- 1.5 4 Nos of cable entries shall be provided in the Junction boxes. Entry sizes shall be project specific as indicated in the illumination BOM. 2 Nos of WP double compression Nickel plated Brass Cable gland shall be provided with PVC shroud of required sizes and 2 Nos of Cast Al/GI Coupler/connector for connecting flexible GI conduit shall be provided in loose.

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- 1.6 One PVC/Aluminum blanking plug for each type of cable entry shall be provided. In addition, all the entries should be plugged with PVC plugs before dispatch, if applicable.
- 1.7 JB enclosure shall have neoprene gasket.
- 1.8 JB should be suitable for Wall/Column mounting and mounting lugs shall be provided in the enclosure. Necessary mounting hardware shall be provided in loose.
- 1.9 JBs shall be provided with internal and external earthing studs (2 nos. internal and 2 nos. external) with washers.
- 1.10 Junction box enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification, if applicable. Paint shade of the finished product shall be 632 as per IS 5 (shall be finalized during detail engineering) if not otherwise specified.
- 1.11 Inscription plate / nameplate as per E.II of this spec. with caution note shall be provided on front cover.
- 1.12 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.
- 1.13 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-
 - (i) Cable gland: Baliga, Comet, Flexpro, FCG, Prompt

IV. GI/PVC CONDUIT BRANCHING ROUND JB.

- 1.1 Round JB shall be of GI /PVC as specified in the illumination BOM (Annexure-II) and shall have smooth finish, completely free from dents, defects and blowholes. JB shall be suitable for fitting to 20mm GI/PVC conduit.
- 1.2 JB should have conduit entries in all the four sides suitable for 20mm GI/PVC conduit.
- 1.3 JB should be supplied with flat cover screwed to the JB and shall have PVC blanking in all the entries before dispatch. Round JB with TB, should have 3 nos. terminal block suitable for 6 sq.mm (min) wire within it.
- 1.4 GI Round JB should be compatible with spring loaded ball socket such that when used for mounting of LED batten type fixture through 20mm down conduit, the combination should be able to sustain the conduit & Fixture load.
- 1.5 Make of JB shall be from reputed vendor with proven record of accomplishment unless otherwise specified in Sub-vendor list.
- 1.6 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

V. GI FLEXIBLE CONDUIT AND ACCESSORIES:

- 1.1 GI Flexible conduits shall be of liquid tight galvanized heavy-duty interlocked type conform to IS3480 with PVC jacket extruded over the pipe.
- 1.2 Diameter of conduit is specified in annexure-II (Illumination BOM).
- 1.3 Flexible conduit connector/coupler shall be of either cast aluminum or galvanized and shall be suitable for connecting the conduit to rigid conduit or fixtures/Junction boxes.
- 1.4 Make of conduit shall be from reputed vendor with proven track record.

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- 1.5 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

VI. FLEXIBLE WIRES:

- 1.1 Flexible wires shall be single core, unsheathed, PVC insulated suitable for voltage grade 1.1kV as per IS:694.
- 1.2 The conductor shall be stranded Copper conductor. The cross-sectional area of conductor and colour of insulation shall be as indicated in Annexure-II.
- 1.3 The standard length of bundle shall be 90m + 5%.
- 1.4 Internal resistance and insulation thickness of the wire should be as per IS694.
- 1.5 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

VII. FLUSH/SURFACE MOUNTED SWITCHBOARD (FSB/SSB):

- 1.1 All switchboards shall be of modular construction with piano type switches mounted on it. Switches shall be mounted on front cover made of Polypropylene sheet. Color of the front cover and switches shall be milky white.
- 1.2 For flush mounted switchboard, Front cover is arranged such that only cover with switch will be visible after installation of switchboard.
- 1.3 Modular boxes for flush mounted switchboard shall be made of GI sheet having minimum thickness of 1.2 mm. The box shall be galvanized /nickel-plated after fabrication. Switch boxes shall be provided with earthing screw and washer for body earthing. Material for surface boxes shall be plastic or other improved material as per reputed vendors manufacturing standard.
- 1.4 Front cover plate shall be fixed by stainless screws & cup washers.
- 1.5 Make of Front cover and modular box shall be same as that of switches.
- 1.6 Conduit knockouts shall be provided on each switchboard suitable for 20mm diameter conduit entry.
- 1.7 No. of switches on the switchboard shall be as specified in the Illumination BOM.
- 1.8 Switch boxes shall be provided with earthing screw and washer for body earthing.
- 1.9 Makes of switchboard & switches shall be of reputed make like MDS, Roma, Legrand, Anchor, Havells, Cona Electrical Solutions, ABB, Schneider, other reputed vendors if not otherwise specified in the sub-vendor list.
- 1.10 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

VIII. 6/16A, 240V, 2-POLE, 3-PIN COMMERCIAL TYPE SWITCH SOCKET:

- 1.1 Receptacles box shall be heavy duty, complete with individual 6/16A Socket & piano type switch.
- 1.2 All socket boxes shall be of modular construction with socket & the controlling ON/OFF switch mounted on front cover made of Polypropylene sheet of the same enclosure box. However, these

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shall be separate units to facilitate replacement by part. Color of the front cover and switches shall be milky white.

- 1.3 For flush mounted socket box, Front cover is arranged such that only cover with switch will be visible after installation of switchboard.
- 1.4 Modular boxes for flush mounted socket box shall be made of M.S sheet having minimum thickness of 1.2 mm. The box shall be galvanized /nickel-plated after fabrication. Socket boxes shall be provided with earthing screw and washer for body earthing. Material for surface mounted socket boxes shall be plastic or other improved material as per reputed vendors manufacturing standard.
- 1.5 Front cover plate shall be fixed by Stainless steel screws & cup washers. Inscription plate shall be provided on front cover plate indicating the voltage rating for the switch socket outlet.
- 1.6 Make of Front cover and modular box shall be same as that of switches and receptacle.
- 1.7 Conduit knockouts shall be provided on each switchboard suitable for 20mm diameter conduit entry.
- 1.8 Switch boxes shall be provided with earthing screw and washer for body earthing.
- 1.9 Makes of socket box & switches shall be of reputed make like MDS, Roma, Legrand, Anchor, Havells, Cona Electrical Solutions, ABB, Schneider, other reputed vendors if not specified in the sub-vendor list.
- 1.10 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

IX. 16A, 240V, 2-POLE, 3-PIN, INDUSTRIAL WEATHERPROOF METAL CLAD PLUG SOCKET :

- 1.1 Receptacles shall be of metal clad gasketed construction, dust and vermin proof conform to IS 1293. Dimension of receptacle shall be conform to IEC standards 60309-2. Receptacles shall be heavy duty, complete with individual socket (3pin, 240V 1-ph) & 25A DP RCCB for O/C, S/C & E/F (30mA).
- 1.2 Receptacles enclosure shall be of polycarbonate material (2mm thick). Outdoor type receptacle shall have weatherproof protection with IP65(min) and shall be provided with external Polycarbonate/FRP canopy (2mm thick) to protect from heavy tropical rain.
- 1.3 Receptacle enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification, if applicable. Paint shade of the finished product shall be 632 as per IS 5 (shall be finalized during detail engineering) if not otherwise specified.
- 1.4 Receptacles shall be suitable for wall / column mounting. Necessary mounting nuts & bolts shall be supplied along with receptacles.
- 1.5 Front cover shall be provided with neoprene gasket and shall be screwed to the fabricated box by screws & cup washers. This box shall have knockout/gland plate at the bottom for incoming and outgoing cables.
- 1.6 Inscription plate shall be provided on front cover plate indicating the voltage rating for the switch socket outlet.
- 1.7 Receptacle box shall be provided with internal and external earthing screws with washer and nuts for grounding.

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- 1.8 Receptacle shall be supplied with suitable heavy-duty plug. The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on the socket.
- 1.9 Terminal block suitable for 6 sq. mm wire or rated for 30A shall be supplied with Crimp type heavy duty tinned Copper lugs for 6 sq.mm Al cable for all outgoing and incoming cables with loop in and loop out facility.
- 1.10 All internal power wiring shall be done with 660V grade PVC insulated Cu wires of 4 sq.mm Cu. wire.
- 1.11 Each outlet shall be provided with a cap connected with chain to close the outlet when not in service.
- 1.12 Each socket shall have two cable entries for looping facility and supplied with two numbers of suitable weatherproof double compression Nickel-plated Brass Cable gland with PVC shroud, Heavy duty tinned copper lugs and one number-sealing plug to seal the unused cable entry.
- 1.13 The sizes of cable entries & Cable glands shall be project specific as indicated in the illumination BOM or will be decided during drawing approval stage.
- 1.14 Inscription plate/Name plate shall be provided indicating voltage rating of the socket as per clause E-V. of this spec.
- 1.15 Receptacle box shall be of reputed make with proven track records and make of major components shall be as follows if not otherwise specified in the sub vendor list:
 - (i) MCBs: MDS, Havell's, Indo-Asian, Legrand, ABB, Schneider.
 - (ii) Cable glands: Comet, Baliga, FCG Flameproof Control Gears, Flameproof Equipments, Flexpro, Prompt.
 - (iii) Terminal block: Elmax, Connectwell .
- 1.16 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

X. 6A, 24V, 2POLE, 3 PIN WEATHER PROOF INDUSTRIAL METAL CLAD PLUG & SOCKET

- 1.1 Receptacles shall be of metal clad gasketed construction, dust and vermin proof conform to IS 1293. Dimension of receptacle shall be conform to IEC standards 60309-2. Receptacles shall be heavy duty, complete with individual socket (3pin, 24V 1ph) & 6A DP RCCB for O/C, S/C & E/F (30mA).
- 1.2 24V socket outlet shall be so designed that it will be easily identifiable and inadvertent insertion of 240V plug can be prevented.
- 1.3 Receptacles enclosure shall be of polycarbonate material (2mm thick). Outdoor type receptacle shall have weatherproof protection with IP Class IP 65(min.) and shall be provided with external polycarbonate/FRP canopy (2mm thick) to protect from heavy tropical rain.
- 1.4 Receptacle enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification, if applicable. Paint shade of the finished product shall be 632 as per IS 5 (shall be finalized during detail engineering) if not otherwise specified.
- 1.5 Receptacles shall be suitable for wall / column mounting. Necessary mounting nuts & bolts shall be supplied along with receptacles. Front cover shall be provided with neoprene gasket and shall

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be screwed to the fabricated box by screws & cup washers. This box shall have knockout/gland plate at the bottom for incoming and outgoing cables.

- 1.6 Inscription plate shall be provided on front cover plate indicating the voltage rating for the switch socket outlet.
- 1.7 Receptacle box shall be provided with internal and external earthing screws with washer and nuts for grounding.
- 1.8 Receptacle shall be supplied with suitable heavy-duty plug. The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on the socket.
- 1.9 Terminal block suitable for 6 sq. mm wire or rated for 10A shall be supplied with Crimp type heavy duty tinned Copper lugs for 6 sq.mm Al cable for all outgoing and incoming cables with loop in and loop out facility.
- 1.10 All internal power wiring shall be done with 660V grade PVC insulated Cu wires of 4 sq.mm cu. wire.
- 1.11 Each outlet shall be provided with a cap connected with chain to close the outlet when not in service.
- 1.12 Each socket shall have two cable entries for looping facility and supplied with two numbers of suitable weatherproof double compression Nickel-plated Brass Cable gland with PVC shroud, Heavy duty tinned copper lugs and one number-sealing plug to seal the unused cable entry.
- 1.13 The sizes of cable entries & Cable glands shall be project specific as indicated in the illumination BOM or will be decided during drawing approval stage.
- 1.14 Inscription plate/Name plate shall be provided indicating voltage rating of the socket as per clause E-V. of this spec.
- 1.15 Receptacle box shall be of reputed make with proven track records and make of major components shall be as follows if not otherwise specified in the sub vendor list:
 - a) MCBs: MDS, Havell's, Indo-Asian, Legrand, ABB, Schneider.
 - b) Cable glands: Comet, Baliga, FCG Flameproof Control Gears, Flameproof Equipments, Flexpro, Prompt.
 - c) Terminal block: Elmax, Connectwell .
- 1.16 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

XI. 24V, 10W LED HAND LAMP

- 1.1 The metal casing of the hand lamp shall be of corrosion resistant alloy LM6. Suitable handle for carrying hand lamp on a stand type guard suspension hook shall be provided.
- 1.2 The enclosures of hand lamp shall be of Cast light Metal Alloy with modular construction. The enclosure shall be provided with gasket made of non-inflammable and self-extinguishing material.
- 1.3 All hardware provided shall be of galvanized.
- 1.4 All non-current carrying metallic parts of the panel shall be inherently bonded together.

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- 1.5 The well glass provided shall be clear, suitable for use under conditions involving exceptional risk of mechanical damage. Mechanical strength of well glass shall satisfy requirement of IS 2206 (for Type – A glass).
- 1.6 Hand lamp shall be provided with a galvanized steel wire protective cage.
- 1.7 Hand lamp unit shall be supplied with 10W LED lamp suitable for 24V, 50Hz supply and necessary suitable lamp holder shall be provided.
- 1.8 Each hand lamp shall supplied with 25m length of 3Cx1.5sq.mm Cu conductor, PVC insulated, metal braided flexible, duly terminated in the hand lamp through DC Brass cable gland at one end and to the 24V plug at the other end.

XII. 63A, 415V, 3-PHASE, 5-PIN WELDING RECEPTACLE WITH PLUG (SAFE AREA):

- 1.1 Receptacles shall be dust proof / vermin proof metal clad gasketed construction suitable for outdoor application with IP 65 protection and shall be provided with external polycarbonate canopy (2mm thick) to protect from tropical rain. Dimension of receptacle shall be conform to IEC standards 60309-2.
- 1.2 Receptacles enclosure shall be of Cast Aluminum / Thermoplastic material (2mm thick). Front cover shall be provided with neoprene gasket and shall be screwed to the fabricated box by Stainless steel screws & cup washers. This box shall have outlets at the bottom for incoming and outgoing cables.
- 1.3 Receptacle enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification, if applicable. Paint shade of the finished product shall be 632 as per IS 5 (shall be finalized during detail engineering) if not otherwise specified.
- 1.4 Sufficient space shall be provided between gland plate/knock out and bottom of terminal block for easy termination of cables.
- 1.5 Receptacle shall be provided with 5-pin (3P+1N+1E) socket & Plug non-reversible type.
- 1.6 The socket outlet shall be provided with isolating MCCB with service breaking capacity (ICS) of at least 75% of ultimate short circuit breaking capacity (ICU) as per IEC 60957-2.
- 1.7 Socket outlet and plug shall have porcelain base of 63A rating conform to IEC standards 60309-2.
- 1.8 Receptacles shall be suitable for wall / column mounting. All mounting hardware shall be supplied along with receptacles.
- 1.9 Receptacle box shall be provided with internal & external earthing stud with washer & nuts welded on the surface for grounding.
- 1.10 The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on the socket.
- 1.11 Terminal blocks suitable for incoming/Outgoing cable along with Crimp type heavy duty tinned Copper lugs shall be provided. Sufficient Nos. of TBs shall be provided. Maximum two wires are permitted to terminate at one terminal. If required additional terminal with shorting link shall be provided.
- 1.12 All internal power wiring shall be done with suitably sized Cu. wire of 660V grade PVC insulated.

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- 1.13 Each outlet shall be provided with either a spring loaded hinged cover or a cap connected metallic chain to close the outlet when not in service.
- 1.14 Each socket shall have two cable entries of 4C x 50 sq. mm. Al. FRLS with looping facility. Two numbers of weatherproof Double compression nickel-plated Brass cable glands with PVC hood and one number-sealing plug to seal the unused cable entry shall be supplied with each receptacle.
- 1.15 The sizes of cable entries, cable glands, lugs shall be project specific as indicated in the illumination BOM or will be decided during drawing approval stage.
- 1.16 All hardware like Nuts & Bolts, screw, washer etc. used in the receptacle shall be galvanized.
- 1.17 Inscription plate / name plate shall be provided indicating tag no. of receptacle and voltage rating as per clause E-V of this spec.
- 1.18 Makes of major components shall be as follows if not otherwise specified in the sub vendor list:
 - (i) MCBs: MDS, Havell's, Indo-Asian, Legrand, ABB, Schneider.
 - (ii) Cable glands: Comet, Baliga, FCG Flameproof Control Gears, Flameproof Equipments, Flexpro, Prompt.
 - (iii) Terminal block: Elemax, Connectwell
- 1.19 Receptacle Boxes shall be supplied complete in all respect with all internal accessories like Socket, Switch, TBs etc. Other accessories like mounting nuts & bolts, Cable Glands, Lugs, blanking plug shall be supplied in loose.
- 1.20 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

XIII. PUSH BUTTON STATION.

- 1.1 Push button type switch box unit is intended for controlling supply to lighting panel contactor so that controlled illumination can be achieved from the entry/exit point.
- 1.2 Each unit shall be consist of two nos. push button type switch of different coloured. i.e. one for switch ON (Red) and another for switch OFF (Green). All push buttons shall be of sturdy design of 22.5mm dia. and suitable for controlling 1-phase 230V supply to Contactor coil. The component shall be conform to IS:13947 for their mechanical and electrical design features.
- 1.3 Each push button shall be provided with minimum 2 NO & 2 NC contacts. The contacts shall be designed such as to provide enhanced contact reliability. Suitable numbers of terminal blocks shall be provided if necessary, for connecting external control cable/wire. All NO and NC contacts of the push buttons shall be wired to the terminal blocks.
- 1.4 The push button unit shall be housed in dust proof/ vermin proof, thermoplastic/ FRP (2mm thick) epoxy painted having gasketted, screwed front cover plate in such a way that only button colored switches with shroud are protruded outside. The push button unit shall be provided with external thermoplastic/ FRP canopy (2mm thick) to protect from tropical rain.
- 1.5 The unit shall have fixing lugs suitable for wall or column mounting and minimum two nos. cable/conduit knock out at bottom.
- 1.6 Inscription plate/ nameplate shall be provided as per E.IV of this spec.
- 1.7 Earthing screws with washers shall be provided.

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- 1.8 Push button station enclosure shall be treated and painted following painting method as mentioned in the **Clause –F** of this specification, if applicable. Paint shade of the finished product shall be 631 as per IS 5 (shall be finalized during detail engineering) if not otherwise specified.
- 1.9 All necessary test certificates from qualified agency in support of the technical requirement should be produced during approval of drawings and inspection or whenever asked.

XIV. 2.5M LIGHTING POLES:

- 1.1 Lighting pole shall be of medium grade GI pipe of 40NB. Construction and other required accessories shall be as per drawing (Annexure-I) attached with this document.
- 1.2 The lighting poles shall have fixing base plate for mounting of pole as per drawing (Annexure-I).
- 1.3 The poles shall have swan neck made of medium grade 40NB GI pipe with radius of 250mm as shown in the drawings (Annexure-I).
- 1.4 All poles should have required size holes at indicated location as shown in the drawing (Annexure-I) for routing of cable to the fixture.
- 1.5 All the accessories like reducer, coupler, bend pipe, U-bolt etc. as indicated in the drawing (Annexure-I) should be supplied with poles.
- 1.6 All hardware shall be of galvanized.

XV. GI /PVC RIGID CONDUIT AND ACCESSORIES:

1.0 CONDUIT

- 1.1 Minimum wall thickness of all conduits (GI/PVC) shall be 16 SWG.
- 1.2 GI Conduits shall be heavy gauge steel, hot-dip galvanized, furnished in standard length of 3m threaded at both ends conform to IS 9537. Galvanisation of Conduits shall be as per IS-4736 and IS-2629.
- 1.3 Conduits shall be straight and free from blister, sharp edge, burrs and other defects. The ends of all conduits shall be reamed and covered with capped bushing.
- 1.4 PVC conduits shall be straight and free from blisters, sharp edge, burrs and other defects and conform to IS 9537.
- 1.5 Make of conduit & conduit accessories should be from reputed vendor of proven track record.

2.0 CONDUIT COUPLER AND BEND

- 2.1 Couplers and Bend shall be of same material as conduit for which it will be used and shall conform to IS 3837 and IS 2667. They shall have internal threading suitable to join one conduit with another conduit.

3.0 SADDLE AND SADDLE BAR

- 3.1 Saddles and saddle bars shall be provided of size as mentioned in the project specific data sheet to suit the conduit.
- 3.2 Saddles shall be of 2mm thick GI and saddle bars shall be of GI with 3mm thickness and required length and width.

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- 3.3 All hardware including saddle bar mounting screw and saddle mounting end screws, for saddles and saddle bars shall be provided along with each saddle and saddle bar. All hardware shall be galvanized.
- 3.4 PVC Rawl Plug suitable for saddle bar mounting screw shall be provided along with each set of saddle and saddle bar.

XVI. MISCELLANEOUS ITEMS:

1.0 S- Hooks:

- 1.1 Hooks shall be of stainless steel with sizes as per details mentioned in the Annexure-II (illumination BOM).
- 1.2 Hook for medium bay/high bay fixture shall be suitable for fixture mounting eyebolt supplied with High bay/Medium bay fixture and so designed to withstand fixture load.
- 1.3 Hook for recessed mounted fixture shall be suitable for fixture mounting hole provided with 2x2 recess mounted LED fixture and so designed to withstand fixture load.

2.0 Anchor fastener:

- 2.1 Anchor fasteners size shall be as per project specific requirement. Design and technical requirement shall be as per standard design conforming to IS and shall be of reputed make.

3.0 120 /150 deg bend pipe:

- 3.1 1200mm length, GI pipe (Outer Diameter suitable for Street light fixture) with 120/150 degree bend at 600mm shall be supplied. Pipe shall be heavy gauge steel, hot-dip galvanized suitable for street lighting fixture supplied in the project. For details refer annexure-1.
- 3.2 The pipe shall have smooth finish and free from dents/defects and blow holes etc.
- 3.3 One end of the pipe shall be provided with nipple suitable for 3C x 2.5sqmm cable (50/19mm nipple).
- 3.4 Each bend shall be supplied with 2 Nos of suitable GI mounting clamp and its GI hardware like anchor fastener/nut and bolt etc for wall mounting.

4.0 STEEL CHAIN:

- 4.1 Steel chain shall be chromium plated and should have sufficient strength to withstand Fixture load of recess mounted LED fixture.

5.0 CHECK NUTS

- 5.1 Check nuts shall be GI with 6 mm thickness and should be suitable for 20mm down conduit.

6.0 CABLE CLAMP

- 6.1 Cable clamps shall be provided of size as mentioned in the project specific data sheet to suit the armoured cable.
- 6.2 Cable clamp shall be of 2mm thick GI and saddle bars shall be of GI with 6mm thickness and required length and width.
- 6.3 All hardware including saddle bar mounting screw and saddle mounting end screws, for saddles and saddle bars shall be provided along with each saddle and saddle bar. All hardware shall be galvanized.

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- 6.4 PVC Rawl Plug suitable for saddle bar mounting screw shall be provided along with each set of saddle and saddle bar.

E. MARKING AND IDENTIFICATION:

- I. Fixture :** Each fixture and CG box shall have marking with details like manufacturer name, Model no., applicable voltage and lamp wattage, applicable classified area (IP Class & Hazardous area classification with Certificate No. & Date with name of certifying agency, if applicable) etc.

- II. Junction Box/Marshalling Box Name Plate:** Each junction box/Marshalling Box shall have name plate fixed firmly on the front cover with details as per manufacturer standard. However minimum following details shall be provided in the name plate:

- Manufacturer's name & Model No.
- Material code
- Enclosure classification for flame proof JB (Certificate No. & Date with name of certifying agency)

- III. Lighting Panel Name Plate:** Each lighting panel shall have anodized Al name plate fixed firmly on the front cover by stainless steel screws. The following details shall be engraved / punched with appropriate letter size (not less than 3 mm):

- Manufacturer's name & Model No.
- Complete Description of panel/ Module with mention of applicable classified area (i.e. Indoor/ Outdoor /Hazardous Classification etc.)
- Voltage rating & Applicable IP class
- Enclosure classification for flame proof Panel (Certificate No. & Date with name of certifying agency)
- Tag no. - Tag nos. shall be furnished during detail engineering.

- IV. MCB Box/Push Button Station:-** Each MCB/Push Button Station shall have a name plate with details as per manufacturer standard. However minimum following details shall be provided in the name plate.

- Manufacturer's name & Model No.
- Description of MCB Box/Push button station

- V. Power Socket Name Plate:** Each 1ph/3ph socket shall have a name plate with details as per manufacturer standard. However minimum following details shall be provided in the name plate.

- Manufacturer's name & Model No.
- Complete Description of socket with mention of applicable classified area (i.e. Indoor/ Outdoor /Hazardous Classification etc.).
- No. of phase & Voltage rating (i.e. 1ph or 3 ph, 24V/230V/415V)
- Enclosure classification for flame proof socket (Certificate No. & Date with name of certifying agency)

F. PAINTING

- 1.1 All equipment with metallic enclosure i.e. Switch Board ,Lighting Panel, Socket, Junction boxes etc shall be painted following the method mentioned below:

The surface preparation shall be pickling or white blast cleaning to Sa 2½. The clean surface shall be given a phosphate coating consisting of a thin layer of zinc, iron or

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manganese phosphate deposited either by immersion or powder spray. The coating weight shall not be lower than 5 gm per sq m; the coating shall be tested, when required, by a continuous salt spray as per ASTM B 117. The phosphate coated surface shall have one coat of baking primer of zinc phosphate - butylated melamine - alkyd resin based and two coats of finish paint of amino-alkyd resin stove enamel as specified in below table. All unpainted steel parts shall be suitably treated to prevent rust formation.

Surface Quality	No. of Coats	DFT per Coat in micron	Paint System	Total DFT in micron
Pickling or Sa2.5 Phosphate treatment	1 Primer	25	Zinc phosphate - butyrate melamine - alkyd resin baking primer	75
	1 Intermediate		Aminoalkyd resin putty	
	2 Primer	25	Aminoalkyd resin baking enamel paint	

- 1.2 Other items shall be painted by manufacturer's standard cleaning/painting cycle.. All unpainted steel parts shall be suitably treated to prevent rust formation.
- 1.3 Equipment finish shall be free from imperfections like pinholes, orange peels, runoff paint etc.

G. PACKING INSTRUCTION

I. PACKING:

- a) Vendor is advised to include packing details in the datasheet of the item and obtain approval of the same from BHEL. All item must be packed as per approved datasheet and include the packing detail in the packing slip. Any item for which datasheet are not submitted for approval, vendor to submit packing detail for the same before dispatch.
- b) All items shall be packed in very good quality packing, the packing shall be such that the items should not be damaged during loading, unloading and transportation.
- c) The equipment may be stored outdoors for long periods before installation. The packing should be suitable for outdoor storage areas with heavy rains / high ambient temperature/ coastal area unless otherwise agreed.
- d) Primary packing of fragile items like lighting panels, fixtures, Junction boxes, CG boxes, switchboards, receptacles etc. shall be done individually with bubble polythene sheet. Secondary packing shall be done in Ply box/Cartoon box with cushioning materials to sustain above mentioned at point "c".
- e) Miscellaneous hardware items like clamps, glands, hooks, fasteners, steel chains, couplers, pole accessories(reducer/nipple/U bolt/) etc. shall be packed in sealed gunny bags wrapped in polythene materials. Separate bag must be used for each type of item.
- f) Packing of conduits, pipes, Metsec channels shall be done with hessian bitumen coated polythene Kraft paper.
- g) Standard packing shall be adopted for poles & Lamps as per OEM recommendation to avoid any damage.
- h) Pole accessories may be packed separately in sealed Gunny bags wrapped in polythene materials. However separate bag must be used for each type of pole accessories.

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- i) Mandatory spares items as listed at PART-B, C, D, E, F, G & H of illumination BOM (Annexure-II) **shall be packed and dispatched separately** using the packing methods specified above.
- j) It is vendor's responsibility to see that all the item along with its accessories are supplied. Query if any is received from site regarding discrepancy of illumination package, shall be clarified by the vendor immediately.
- k) Vendor shall visit to site in to resolve issue related to illumination package, if any as and when informed by BHEL.

II. MARKING OF PACKING

- a) All Packing which will be loaded in a consignment (Cartoon Box/Ply box/Gunny bags/Conduit bundle/ Poles etc.) shall assign a Identification number with PO number as prefix and tag no as suffix (i.e. PO NOXXXXX /01, 02...etc.). The Identification number shall be marked with indelible paint on top and minimum two sides of such packing.
- b) Vendor shall allot Identification number serially for packing dispatched from various locations depending upon no. of such packing in consistence with main package. Allotted Identification number shall be marked in each packing of the consignment following the above mentioned method. Vendor to ensure that no packing is dispatched without Identification number.
- c) Vendor shall securely attach Packing slip in a rain proof transparent enclosure to each packing to be dispatched in a consignment. Packing slip must contain Identification number of the packing, LR No. & date as header and PO sl. no., Item description and qty. packed within the packing in a table form.
- d) Pallets / crates / cases shall have skid bottoms for handling. Special notations such as 'Fragile', 'This side up', 'Weight', 'Owner's particulars', etc. shall be clearly marked on the package.
- e) Additionally, each Packet of Mandatory Spare Items shall be clearly marked with "MANDATORY SPARE ITEM" on top and minimum two sides.

III. PACKING SLIP

- a) Detailed packing list shall be prepared by the vendor and submitted to BHEL for review. Item shall be dispatched only after clearance from BHEL.
- b) Separate packing slip shall be prepared for each consignment dispatched as per attached format (Annexure-IX). Each Packing slip shall have Project Name, consignment No. with date & PO NO. as header. PO sl. no., item description, type of packing (i.e. Carton Box/Ply box/Gunny bags), Identification Nos. of packing, Quantity of item per package, Total quantity of item & No. of packing used for an item shall be listed in a row. Accessories of an item which has been packed in another package, can be listed in subsequent rows of packing slip using mentioned method.
- c) Separate rows of packing slip shall be used for listing each item being dispatched in a consignment.
- d) Separate packing slip with details mentioned above shall be provided for each Package of Mandatory spares items. **IN NO CASE, MAIN PACKAGE ITEMS AND MANDATORY SPARE ITEMS SHALL BE COMBINED IN ONE PACKING LIST.**
- e) Items like poles, GI pipes etc., which are being dispatched in loose as per standard packing, shall be listed in packing slip reflecting total quantity dispatched in a consignment. However accessories for the same which are dispatched in package shall be listed in packing slip using above mentioned method at "b".

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- f) In the consignment receipt, total no. of Carton Box/Ply box/Gunny Bags/ pipe & conduit bundle /poles etc. shall be clearly written and acknowledgement of the same shall be obtained from site and submitted to BHEL for review and records.

H. INSPECTION, TESTING & QUALITY ASSURANCE:

I. GENERAL: Quality assurance shall follow the requirements of BHEL Quality Assurance documents as applicable. Detail instruction pertaining to inspection, Quality Assurance Plan, inspection / testing procedure is enclosed as Annexure-VII.

II. INSPECTION INSTRUCTION (For Inspector & Vendor)

- a) Following document must be referred during inspection
 - (i) Illumination Spec. for general requirement of material.
 - (ii) Datasheet of item duly approved as Code-1, stamped and signed by design engineer for specific detail like dimension, paint shade, accessories detail, BOQ and any comment which are marked on the datasheet. In case any contradiction is observed between Spec. and approved datasheet, only technical specification of approved datasheet shall be referred.
 - (iii) Inspection checklist as per format at Annexure-VIII.
 - (iv) Other quality documents as listed in QAP.
- b) Inspector shall fill the respective field of inspection check list attached at Annexure-VIII and sign against each inspection check point listed in the Format. The signed copy of format shall be submitted to BHEL for review.
- c) If any anomaly is observed during inspection w.r.t. Spec./Approved datasheet/Inspection check list regarding quality, quantity or accessories, same shall be immediately brought to the notice of BHEL in writing. Such material shall not be approved without consent of BHEL.
- d) Inspection of any item will not be termed as completed until satisfactory report from Inspector is submitted to BHEL.
- e) Items which are to be dispatched in parts, Inspector shall inspect each and every sub item and satisfy himself for suitability of the same during assembly. Vendor shall demonstrate the assembling of such item.
- f) Some item may require functional test, Inspector is advised to witness the test at manufacturer's work before clearing the material.
- g) Inspector shall inspect the packing of material w.r.t. method mentioned in approved datasheet and Packing instruction indicated in this specification.
- h) Inspector is advised to check that correct quantity of material along with its associate accessories is packed with correct packing material.
- i) Inspector shall also check that marking of packing enclosure is done in line with procedure mentioned at "Marking of Packing" in this specification.

I. DOCUMENTATION:

Documentation shall be in three steps, during offer submission as response to BHEL Enquiry stage, drawing approval stage and during delivery of items stage (As built). All the documents shall be preferably in A3/A4 size. The documentation aesthetics shall be in line with international standards. Document shall have title block, Name of the item, Document/Drg. Number, revision

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no, page no. etc, additionally PO. Sl. No, PO No. and Project name shall be included in the “AS built” drawing and drawing submitted during approval. Document/drawing without title block and incomplete information will not be acceptable. Bidder shall be responsible for creating, making and arranging complete documentation as per BHEL requirements at all stages. Vendor shall visit BHEL office within one week of PO/LOI to collect the project specific information for incorporating the same in the drawing/document.

a) During Technical offer submission: Two copies of following

- (i) Filled up Bidder checklist as per annexure-VI.
- (ii) Un-priced price schedule as per clause C- 10 and annexure-III.
- (iii) Deviation list as per deviation format (Annexure-V).

b) During Drawing approval after PO Placement: Three copies of following

- (i) Data sheet, GA drawings and single line diagrams of all items in the PO as applicable.
- (ii) BIS & Type test certificates of all items as applicable.
- (iii) CMRI or equivalent test house certificates as applicable.
- (iv) Quality plan of individual item including all requirements as per annexure-VII.

NOTE:-The drawings, data sheets, single line diagrams as applicable shall be furnished within 15 days of LoI/ PO for BHEL/End customer’s approval. BHEL/End customer shall provide comments/ approval within 15 days of receipt of drawings. Vendor shall incorporate comments, if any and submit revised drawings within 7 days. ***Vendor is responsible for completion of approval cycle and minimizing number of revisions.***

c) Alongwith material, final documentation:

- (i) Packing slip: Along with material 2 copies, BHEL project site – 3 copies, BHEL design office- 3 copies.
- (ii) Inspection report - BHEL project site – 3 copies, BHEL design office- 3 copies.
- (iii) Test certificates- BHEL project site – 3 copies, BHEL design office- 3 copies.
- (iv) Warrantee certificates of equipment if any- BHEL project site – 3 copies, BHEL design office- 3 copies.
- (v) Operation & Maintenance manual of equipment, if any- BHEL project site – 3 copies, BHEL design office- 3 copies.
- (vi) Photocopies of BHEL Approved equipment Datasheet/Drawing - Along with material 2 copies, BHEL project site – 3 copies, BHEL design office- 2 copies.

Vendor shall submit all other documents as per commercial terms and condition separately.

J. PRICE SCHEDULE:

- 1.1 The items to be supplied as a part of illumination package along with their quantities are listed in the Annexure-II (Illumination BOQ) which is project specific.
- 1.2 Vendor shall quote unit prices and total prices in the format indicated in Annexure-III (Price schedule). The evaluation shall be done on the basis of the overall package price.
- 1.3 The quantities given in Illumination BOM (Annexure-II) may vary to the extent of +/-10% as per various finalized illumination layouts based on Customer approval. Same shall be informed to

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bidder at any time during execution of package. For addition/reduction of quantity, unit rates shall be considered.

1.4 BHEL reserves the right to cancel an item if not required for the project.

K. BHEL MATERIAL CODES:

Variant No.	Description	Material Code
00	Illumination package for RINL ESP Revamp	PY9755416005

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ANNEXURE – I

(TYPICAL ENGINEERING DRAWING OF MAJOR ILLUMINATION ITEMS)



PRODUCT STANDARD
PROJECT ENGINEERING
HYDERABAD

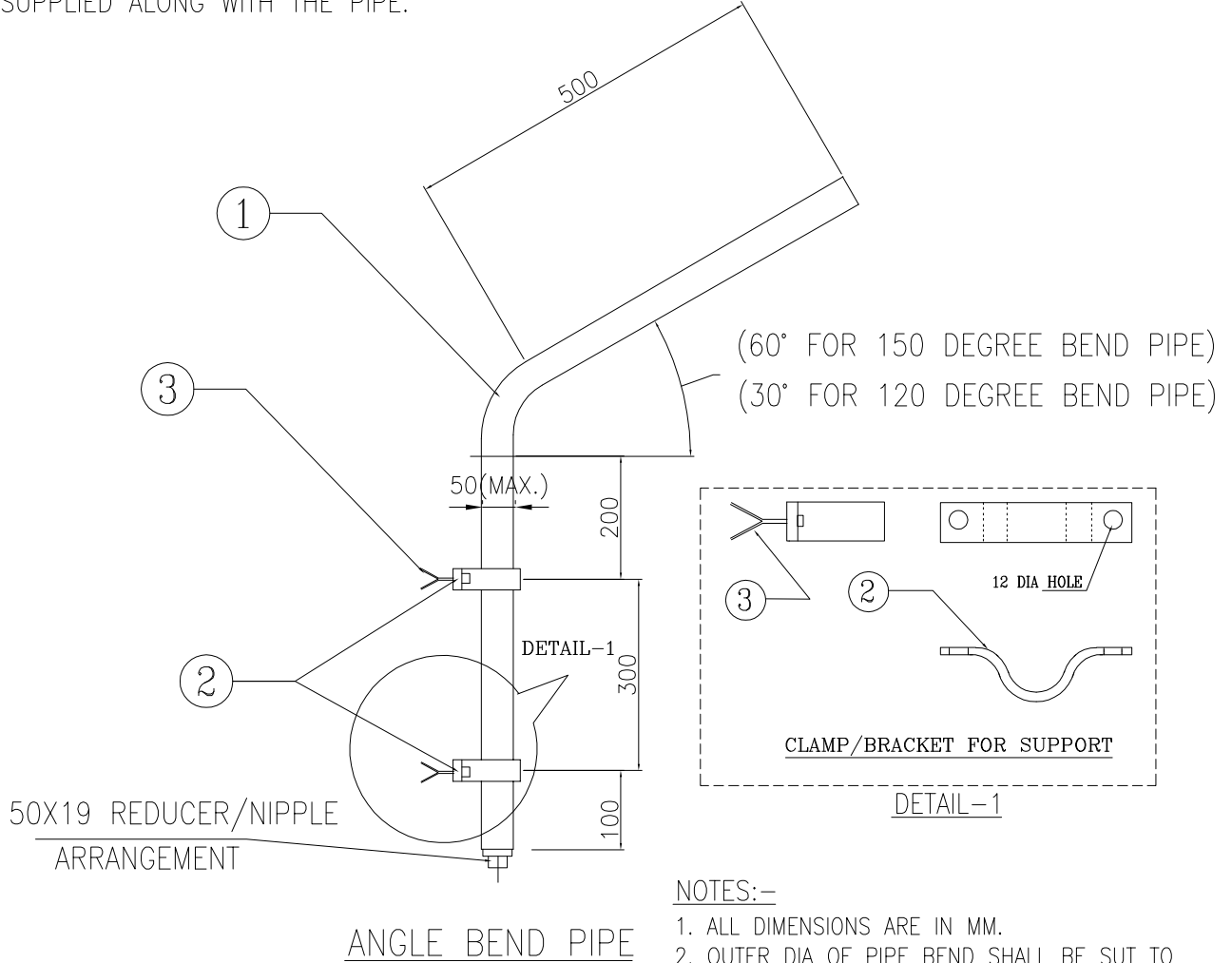
ANNEXURE-1 TO
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TITLE: ANGLE BEND PIPE

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THIS DRAWING INDICATES ARRANGEMENT OF ANGLE BEND PIPE. IT ALSO COVERS THE BOQ TO BE SUPPLIED ALONG WITH THE PIPE.



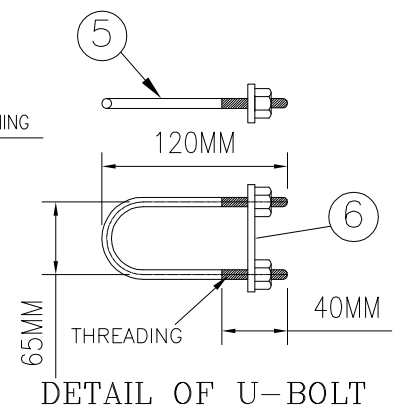
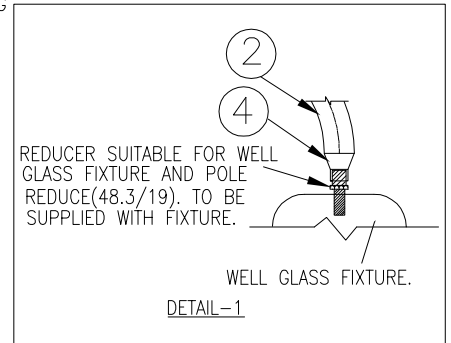
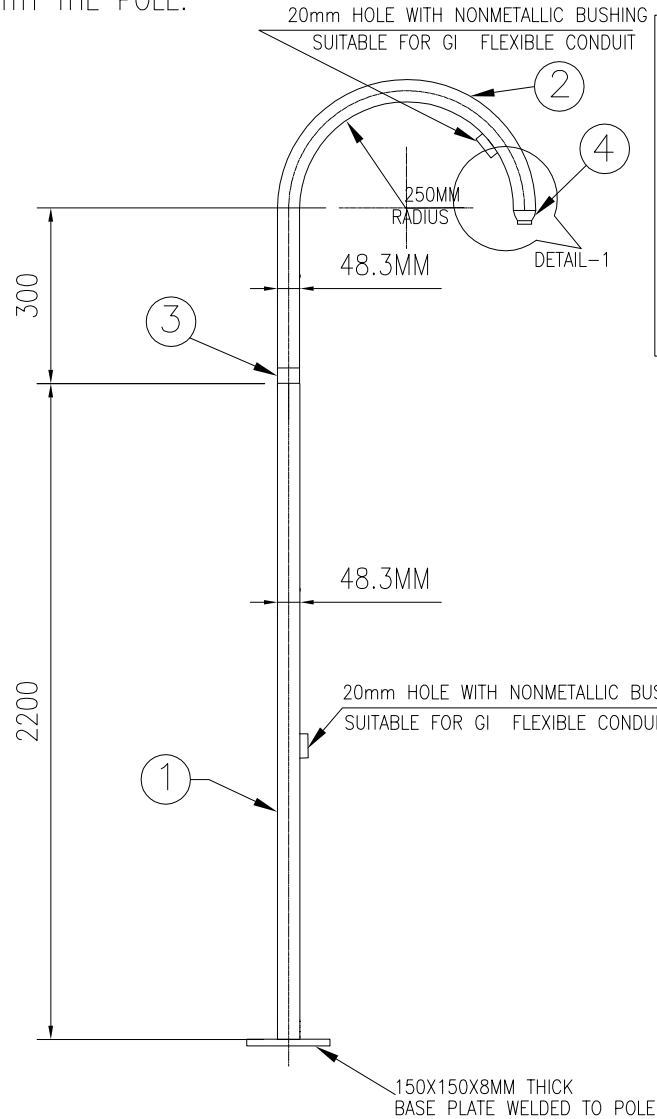
SUPPLY BOQ.

SL. NO.	ITEM DESCRIPTION	UNIT	QTY.
01	GI ANGLE BEND PIPE OF 50MM MAX. OUTER DIA SUIT TO LED STREET LIGHTING FIXTURE (CLASS MEDIUM) WITH NIPPLE ARRANGEMENT AT ONE END AS PER DETAILS.	NO.	01
02	GI CLAMP WITH BASE	NO.	2
03	M10X68MM LONG GI ANCHORING FASTNER/ NUT-BOLT	NO.	04

TITLE- 2.5M POLE

Page 03 OF 07

THIS DRAWING INDICATES TECHNICAL DETAIL OF 2.5 MTR. POLE. IT ALSO COVERS THE BOQ TO BE SUPPLIED ALONG WITH THE POLE.



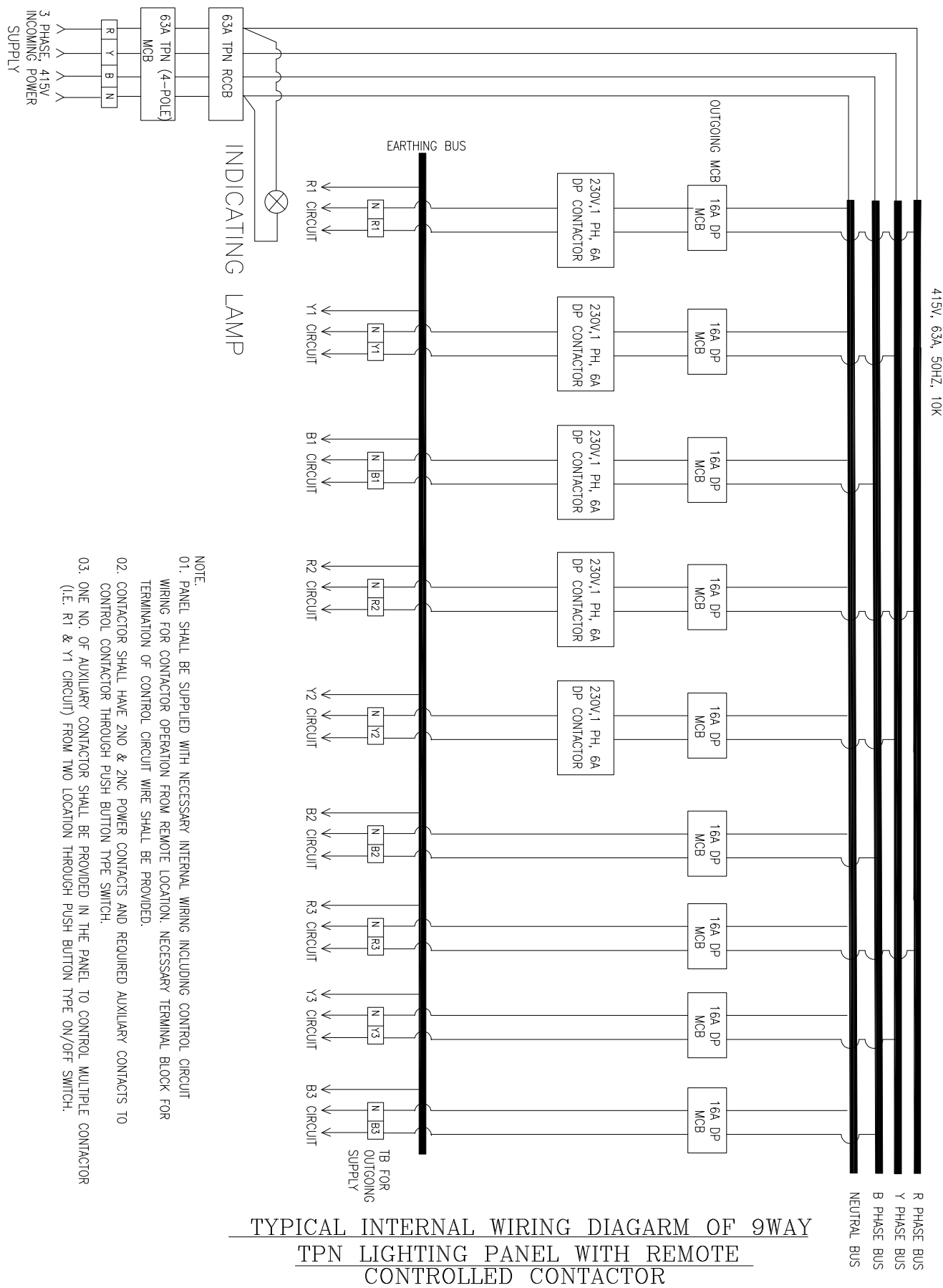
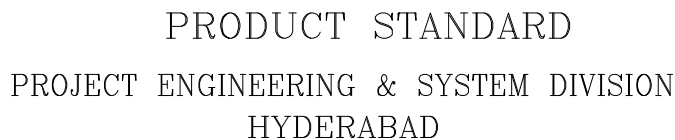
NOTE:-

1. ALL DIMENSIONS ARE IN MM.

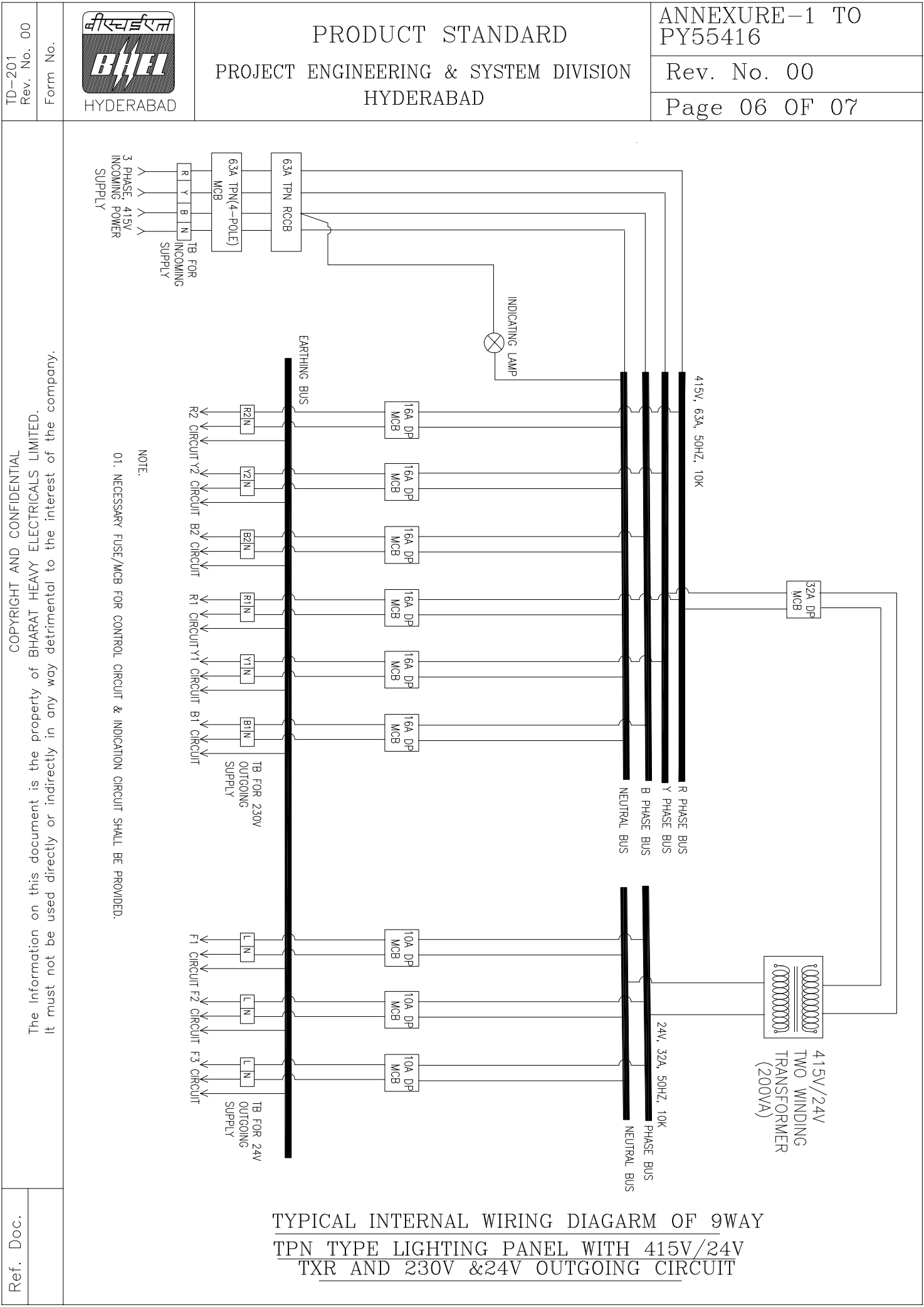
2.5M POLE

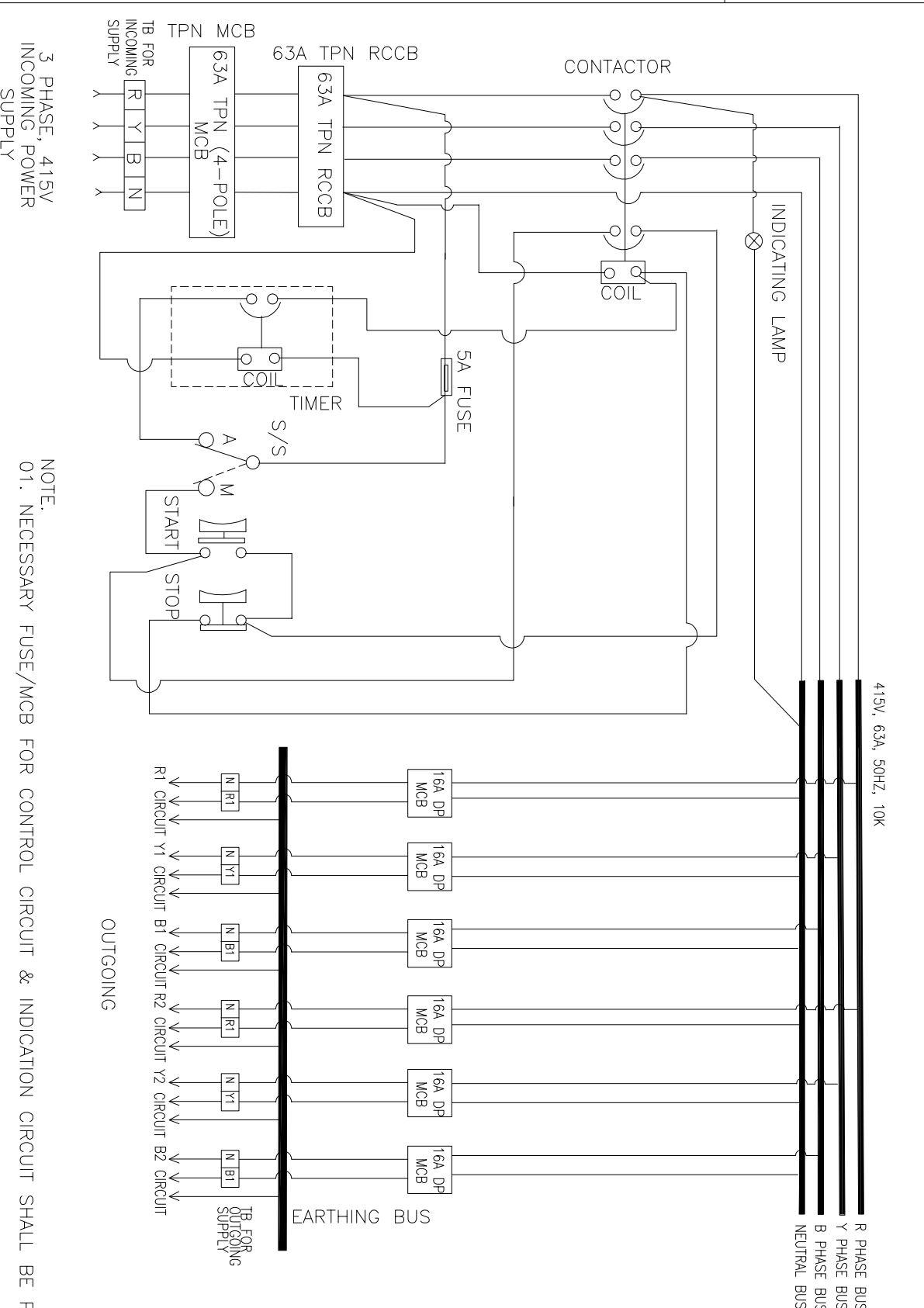
SUPPLY OF B.O.Q

SL. NO.	ITEM DESCRIPTION	UNIT	QTY.
01	40NB GI PIPE (CLASS MEDIUM) WITH THREADING FOR , COUPLER, LENGTH 2.2 Mtrs.	NO.	01
02	40NB G.I. PIPE (CLASS MEDIUM) WITH ONE END SWAN NECK 250mm RADIUS 180° BEND & BOTH END THREADED. MAXIMUM LENGTH 1.2 Mtrs.	NO.	01
03	G.I. COUPLER SUITABLE FOR 40NB PIPE	NO.	01
04	G.I. REDUCER 48.3X19MM SUITABLE FOR SWAN NECK	NO.	01
05	Ø10mm 'U' BOLT WITH BOTH ENDS THREADED, SUITABLE NUTS, 2 NOS. PLAIN AND 1 No. SPRING WASHER	SET	01
06	50x6x150mm LONG G.I. FLAT WITH 2Nos. Ø12mm HOLES	NO.	01
07	NON METALLIC BUSHING	NO.	02



TYPICAL INTERNAL WIRING DIAGARM OF 6WAY
SPN LIGHTING PANEL WITH REMOTE
CONTROLLED CONTACTOR



TD-201 Rev. No. 00	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING HYDERABAD	ANNEXURE-1 TO PY55416 Rev. No. 00
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TITLE: WIRING DIAGRAM OF 6WAY AC PANEL WITH TIMER & CONTACTOR		Page 07 OF 07 	

NOTE.
01. NECESSARY FUSE/MCB FOR CONTROL CIRCUIT & INDICATION CIRCUIT SHALL BE PROVIDED.

TYPICAL WIRING DIAGRAM OF AC LIGHTING PANEL WITH
TIMER CONTROLLED CONTACTOR



PROJECT ENGINEERING & SYSTEMS DIVISION
(Technical Specification For Illumination Items Package)

Std. / Doc. Number

**Annexure-II to
PY55416**

Rev. No. 00

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ANNEXURE – II
(ILLUMINATION BOM)

Project:- RINL REVAMPING OF ESP		ILLUMINATION BOQ	REV00
		Annexure-II to PY55416	Date:- 05.10.2020
SITE CONDITION			
1. Ambient temperature :- 50.0 Degree Celsius			
2. Relative humidity :- 88%			
3. Area of classification :- Non Hazardous			
4. Seismic data :- As per IS 1893 latest issue			
5. Site Location:- Vizag, Andrapradesh			
LIST OF ITEMS FOR ILLUMINATION PACKAGE			
SL NO.	DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)	UNIT	QTY.
A	ILLUMINATION ITEMS PACKAGE-1		
A.1	LED Batten of 40W with Aluminium extruded body & diffuser, complete with integrated driver/convertor, heatsink and shall be supplied with suitable Mounting hardware, Cu. lugs. Fixture shall have minimum 4400 system lumen output. Fixture shall be suitable for surface / suspension mounting through 20mm down conduit and necessary hardware/clamp shall be provided for mounting. (Equivalent of Bajaj make BCLAB SP 44L LED CW)	Nos	225
A.2	600x 600mm Recess mounted decorative LED fixture (36-40W Approx, 230V AC) with IP65 protection & opal diffuser. Fixture shall have total system lumen output of 3600 lumen (min.) and shall be complete with integrated driver, heatsink and shall be supplied with Mounting hardware, Cu. lugs. (Equivalent of Bajaj make BPRF 36W WH SL LED)	Nos	140
A.3	LED Medium bay fixture (80W approx, 230V AC) with IP65 protection & with minimum 8000 lumen total system lumen output. Fixture shall have integrated driver, heatsink. Fixture shall be suitable for Ceiling/Purlin mounted and shall be supplied with Mounting hardware, Cast Aluminium/Galvanised connector/coupler for flexible conduit, Cu. lugs. (Equivalent of Bajaj make TENTO nxt B 88L WH MB)	Nos	180
A.4	LED Well glass fixture (45W approx, 230V AC) of cast aluminum body with Opal diffuser & total system lumen output of 4500 lumen (min.). Fixture shall have integrated driver, heatsink. Fixture shall be suitable for Column/Ceiling and pole mounted and shall be supplied with Mounting hardware, Pole reducer /stud, Cu. lugs, Cast Aluminium/Galvanised connector/coupler for flexible conduit. (Equivalent of Bajaj make BIWDN 45L WH PC SD).	Nos	550
A.5	LED street lighting fixture (60W approx, 230V AC) of Die- Cast aluminium body with minimum 6000 lumen total system lumen output. Fixture shall have integrated driver, heatsink and shall be supplied with Mounting hardware, Cu. lugs. (Equivalent of Bajaj ENXT P 72L WH CR PC SD)	Nos	75
B	ILLUMINATION ITEMS PACKAGE-2		
B.1	2.5 meter, GI lighting pole with all accessories as per drg. in Annexure - 1.	Nos	50
B.2	1200mm long 150 deg bend GI pipe with 2 nos suitable clamp with base, reducer/nipple etc as per drg. in Annexure - 1.	Nos	75
B.3	3000mm long, 20mm GI conduit	Nos	2200
B.4	GI Conduit bend suitable for 20mm GI conduit	Nos	1700
B.5	GI Conduit inspection bend suitable for 20mm GI conduit	Nos	700
B.6	GI conduit coupler suitable for 20mm GI conduit	Nos	3000
B.7	Saddle with saddle bar suitable for 20mm dia conduit. Each saddle shall be supplied with 2nos suitable screws for fixing the clamp/saddle to saddle bar and 1 No of 1.5" deep screw along with PVC rawl plug for saddle bar.	Nos	7500
B.8	GI Conduit branching JB with PVC end plugs suitable for 20mm GI conduit	Mtrs	950
B.9	20mm Outer Dia GI Flexible conduit	Nos	3000
B.10	Connector/coupler of Cast Aluminum/galvanised with check nut suitable for connecting GI flexible conduit to GI round Junction box supplied in this project.	Nos	500
B.11	3000mm long 20mm PVC conduit	Nos	75
B.12	PVC Conduit bend suitable for 20mm PVC Conduit	Nos	75

B.13	PVC Conduit coupler suitable for 20mm PVC Conduit	Nos	150
B.14	PVC Conduit branching JB with PVC end plugs for 20mm PVC conduit	Nos	75
B.15	3000mm long 50NB GI conduit	Nos	10
B.16	3000mm long 50NB PVC conduit	Nos	10
B.17	GI check nuts suitable for 20mm conduit	Nos	1500
B.18	Chromium Plated Steel chain	Mtrs	1600
B.19	GI Spring loaded ball socket suitable for conduit branching round JB and round JB with TB.	Nos	450
B.20	Rubber grommet 20mm	Nos	4000
B.21	Stainless steel S hook suitable for fixing recessed mounted fixture.	Nos	500
B.22	Rawl Plug 1.5" with suitable stainless steel screw.	Nos	20000
B.23	6mm dia x 35mm long Galvanised anchor bolt with nuts and washers - Bolt type	Nos	550
B.24	6mm dia x 35mm long Galvanised anchor bolt with nuts and washers - Hook/Half ring type	Nos	600
B.25	10mm dia 68mm long Galvanised anchor bolt with nuts and washers - Bolt type	Nos	150
B.26	GI Cable clamps with base and hardware (Suitable for 3C X 6sqmm Armoured Cable	Nos	16000
B.27	GI Cable clamps with base and hardware (Suitable for 4C X 50sqmm Armoured Cable	Nos	1000
B.28	GI conduit Branching Round JB suitable for 20mm GI conduit with 3nos.terminal block suitable for 4sqmm wire and with PVC end plugs .	Nos	350
B.29	FSB-3 Flush mounted switchboard with 3 nos 5A piano type switches (modular type).Switch board shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	18
B.30	FSB-2 flush mounted switchboard with 2 nos 6A piano type switches. Switch board shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	10
B.31	SSB-3 Surface mounted switchboard with 3 nos 5A piano type switches (modular type).Switch board shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	5
B.32	SSB-2 Surface mounted switchboard with 2 nos 6A piano type switches. Switch board shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	60
B.33	6/16A, 230V, flush mounted decorative type switch socket outlet (modular type) with 16A piano type switch. Socket outlet shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	21
B.34	6/16A, 230V, Surface mounted decorative type switch socket outlet (modular type) with 16A piano type switch. Socket outlet shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	30
B.35	6A, 24V, Surface mounted decorative type switch socket outlet (modular type) with 6A piano type switch. Socket outlet shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	21
B.36	6A, 24V, flush mounted decorative type switch socket outlet (modular type) with 6A piano type switch. Socket outlet shall have necessary conduit entries suitable for 20 sqmm GI/PVC Conduit.	Nos	9
B.37	10W LED hand lamp with handle, protective cage, fixing hook and connected 25M, 3Cx1.5sqmm Cu. PVC metal braided cable and suitable plug for 24V socket.	Nos	15
B.38	16A, 230V,1-ph, Surface/Column mounted industrial weather proof metal clad switch socket outlet (outdoor type, IP65) of polycarbonate with canopy & 25A RCCB. Socket outlet shall have necessary cable knock out/gland plate and supplied with suitable WP DC brass Cable gland, mounting hardware, cu. lugs, Al/brass blanking plug.	Nos	55
B.39	6A, 24V,1 ph, Surface/Column mounted industrial weather proof metal clad switch socket outlet (outdoor type, IP65) of polycarbonate with canopy & 6A RCCB. Socket outlet shall have necessary cable knock out/gland plate and supplied with suitable WP DC brass Cable gland, mounting hardware, cu. lugs, Al/brass blanking plug.	Nos	40

C ILLUMINATION ITEMS PACKAGE-3

C.1	4-way 200x150x100mm rectangular weatherproof JB (IP65) of Cast Aluminium/ Thermoplastic/ FRP. JB shall have Cable entries, two nos. suitable for 3Cx6 sq.mm. armoured cable and two nos suitable for 20mm flexible conduit with connector/coupler. JB shall have Terminal block 6 nos. suitable for 6 sq.mm Cu cable. JB shall be supplied with 2nos. WP DC brass cable gland, 2nos. Cast Aluminium/Galvanised connector for flexible conduit, mounting hardware, suitable Cu. lugs, blanking plug 1 no. for each type of cable entry.	Nos	600
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C.2	63A, 415V, 3 ph, Surface/Column mounted welding receptacle (indoor type, IP65) of cast aluminum/ thermoplastic with 63A MCCB. Receptacle outlet shall have necessary cable knock out/gland plate and supplied with suitable WP DC brass Cable gland, mounting hardware, cu. lugs, Al./brass blanking plug.	Nos	10
C.3	63A, 415V, 3 ph, Surface/Column mounted welding receptacle (Outdoor type, IP65) of cast aluminum/ thermoplastic with canopy & 63A MCCB. Receptacle outlet shall have necessary cable knock out/gland plate and supplied with suitable WP DC brass Cable gland, mounting hardware, cu. lugs, Al./brass blanking plug.	Nos	17
C.4	ON-OFF Push button switch box with IP65 Thermoplastic/ Cast Aluminium/FRP housing with canopy, 2 Nos push button (one red and other green). Each push button switch shall have 2 nos. NO and 2nos. NC contacts. Switch box shall have 2 nos. conduit entry suitable 20mm conduit and shall be supplied with Cu. lugs and mounting hardware.	Nos	20

D ILLUMINATION ITEMS PACKAGE-4

D.1	6-way AC, SPN type Indoor Lighting Panel with 32A DP MCB & 32A DP RCCB as incomer and 6 nos. 16A DP MCB as outgoing.	Nos	3
D.2	9-way AC TPN type Indoor Lighting Panel with 63A TPN MCB & 63A TPN RCCB as incomer and 9nos 16A DP MCB as outgoing.	Nos	3
D.3	6-way TPN type AC Indoor Lighting Panel with 415V/24V transformer. Panel shall have 63A TPN MCB & 63A TPN RCCB as incomer and 4nos outgoing of 16A, 230V DP MCB fed from 415/240V bus section and 2nos outgoing of 10A, 24V, DP MCB fed from 24V bus section.	Nos	9
D.4	9-way AC TPN Type Indoor Lighting Panel with remote controlled contactor. Panel shall have 63A TPN MCB & 63A TPN RCCB as incomer & 4 nos 16A DP MCB and 5 nos DP contactor controlled of 16A DP MCB as outgoing (Refer Annexure-1).	Nos	6
D.5	6-way AC SPN Type Indoor Lighting Panel with remote controlled contactor. Panel shall have 32A DP MCB & 32A DP RCCB as incomer & 2 nos 16A DP MCB and 4 Nos DP contactor controlled nos of 16A DP MCB as outgoing (Refer Annexure-1).	Nos	6
D.6	18way AC TPN Type outdoor Lighting Panel with timer controlled contactor. Panel shall have 63A TPN MCB, 63A TPN RCCB & 63A TP contactor as incomer and 18nos 16A DP MCB as outgoing. Panel shall also have necessary time switch, selector switch, ON/OFF push switch for contactor. (Refer Annexure-1).	Nos	4
D.7	9-way AC TPN Type outdoor Lighting Panel with 415V/24V Transformer. Panel shall have 63A TPN MCB & 63A TPN RCCB as incomer and 6nos outgoing of 16A, 230V DP MCB fed from 415/240V bus section and 3nos outgoing of 10A, 24V, DP MCB fed from 24V bus section. (Refer Annexure-1).	Nos	4
D.8	6-way SPN Type AC outdoor Lighting Panel with timer controlled contactor. Panel shall have 32A DP MCB, 32A DP RCCB & 32A DP contactor as incomer and 6nos 16A DP MCB as outgoing. Panel shall also have necessary time switch, selector switch, ON/OFF push switch for contactor.	Nos	4

E ILLUMINATION ITEMS PACKAGE-5

E.1	1Cx1.5sq.mm. 1.1kV FRLS PVC insulated Cu flexible wire (Segregation of total quantity into Red, Yellow, Blue, Black & Green colour shall be informed during detailed engineering).	Mtrs	18000
E.2	1Cx2.5sq.mm. 1.1kV FRLS PVC insulated Cu flexible wire (Segregation of total quantity into Red, Yellow, Blue, Black & Green colour shall be informed during detailed engineering).	Mtrs	9990

NOTE:

1.) The quantities given in Illumination BOM (Annexure-II) may vary to the extent of +/-10% as per various finalized illumination layouts based on Customer approval. Same shall be informed to bidder at any time during execution of package. For addition/reduction of quantity, unit rates shall be considered.