

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 1 of 31	

TECHNICAL SPECIFICATION FOR ILLUMINATION ITEMS PACKAGE

PROJECT :	1 X 120MW GAS BASED CAPTIVE POWER PLANT AT TATA KALINGANAGAR
OWNER :	M/s TATA STEEL LIMITED
OWNER CONSULTANT:	M/S FICHTNER CONSULTING ENGINEERS (INDIA) PVT LTD

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PROJECT ENGINEERING & SYSTEMS DIVISION

(Technical Specification For Illumination Items Package)

Std. / Doc. Number

PY55340

Rev. No.

01

Sheet 2 of 31

CONTENT		
SL. NO.	Description	Page No.
A	Scope	3
B	Codes & Standard	3
C	Instructions To Bidder	5
D	Technical Specifications	6
E	Marking And Identification	25
F	Painting	26
G	Packing Instruction	26
H	Inspection, Testing & Quality Assurance	28
I	Documentation	29
J	Price Format	30
K	BHEL Material Codes	30

LIST OF ANNEXURES - ILLUMINATION ITEMS PACKAGE			
SL. NO.	ANNEXURE	DESCRIPTION	NO. OF SHEET
1	Annexure-I	Typical Engineering drawings of major illumination items	03
2	Annexure-II	Illumination Package BOM	03
3	Annexure-III	Unpriced price schedule	04
4	Annexure-IV	Sub vendor list	04
5	Annexure-V	Deviation format	02
6	Annexure-VI	Check list for offer submission by bidder	02
7	Annexure-VII	Quality system, Inspection & Testing requirements of package	11
8	Annexure-VIII	Inspection check list format	07
9	Annexure-IX	Typical Packing slip Format	02
10	Annexure-X	Guidelines for Preparation of Quality Assurance Plan	04

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 3 of 31	

- 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 and supervision of installation as specified, for efficient and trouble free installation and operation.

B. CODES & STANDARDS:

1.0 The different items covered under this specification shall comply with the latest applicable Indian Standards as listed below:

IS	Standard Description
IS 5, RAL:840-HR, RAL:841-GL	Colours for ready mixed paints and enamels
NLC PART-1 TO PART- 13	National Lighting Code for lighting in different areas
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 encloser "d")
IS/IEC 60079-7	Electrical apparatus for explosive gas atmospheres (Equipment protection by increased safety "e")
IS2148, IS 2206	Flame proof fittings
IS/IEC 60529	Degree of protection provided by enclosures (IP Code).
IS 694	PVC insulated unsheathed 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, IS 13947	Receptacle unit, Socket outlet
IEC:60947	General requirement of Switchgear
IS 8623	Specification for Low-Voltage Switchgear and Controlgear Assemblies

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 4 of 31	

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
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
IEC:62504, IS:16101	General lighting. LEDs and LED Modules Terms & definitions
IEC:62560, IS:16102(Part 1)	Self ballasted LED lamps for General Lighting Services. Part-1 Safety Requirements.
IS:16102(Part 2)	Self ballasted LED lamps for General Lighting Services. Part-2 Performance Requirements.
IEC:62031, IS:16103(Part 1)	LED modules for General lighting, Safety Requirements.
IEC:62717, IS:16103(Part 2)	LED modules for General lighting, Performance Requirements.
IEC 61347-2-13	Lamp Controlgear-Part2-13: Particular Requirement for DC and AC supplied electronic control gear for LED models.
IEC: 62384, IS:16104	DC or AC supplied Electronic Control Gear for LED Modules – Performance requirements.
North American Std LM80, IS:16105	Method of measurement of lumen maintenance of solid state Light (LED) sources.
North American Std LM79, IS:16106	Method of Electrical and photometric Measurement of solid state Lighting (LED) Products.
IEC:34D/950/NP, IS:16107 Part-1	LED luminaires for general lighting purpose , Part-1 safety requirement
IEC:34D/977/DC, IS:16107 Part-2	LED luminaires for general lighting purpose , Part-2 Performance requirement
IEC:62471, IS:16108	Photobiological safety of LED and LED System
IS 513	Cold rolled low carbon steel sheets and strips.
IS 12063	Classification of degree of protection provided by enclosure.
IEC:61000-3-2	Electromagnetic compatibility (EMC) – Limits for Harmonic current emission
IEC:61000-3-3	EMC Compliance for limits on voltage changes, voltage fluctuations and flicker.
IEC:61547	Immunity requirement
IS 9000(Part 6)	Environment testing: Test Z - AD: composite temperature/humidity cyclic test.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 5 of 31	

IS 4905, IEC 60598	Method of random sampling Ingress protection, luminaire performance and safety.
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.
- 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

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 6 of 31	

be of reputed make of proven track record and manufactured in accordance with various national and international standards.

9. 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.
10. 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.
11. 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 the time of technical scrutiny. For addition/reduction of quantity, unit rate quoted in the present offer 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 Check list. **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.
1. 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 conditions.

I. SAFE AREA LIGHTING PANELS:

- 1.1 Lighting panels shall conform to IS 8623, IS 60947, IS 8828, IS 694 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 industrial, metal enclosed, double door type, fabricated from CRCA sheet steel of minimum 2mm thickness with dust and vermin proof. Outdoor type panels shall be provided with external 14 SWG FRP/GI canopy to protect from heavy tropical rains from top and both sides. These shall be suitable for wall/column mounting. All hardware provided shall be Zinc passivated.
- 1.3 Panels shall have cable entry from Bottom only.
- 1.4 The boards shall have welded back and sides and gasketed hinged door at the front with door handle and suitable locking devices.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 7 of 31	

- 1.5 MCCB shall be provided with operating handle. Access of operating handle shall be from the front of panel without opening the door.
- 1.6 All MCBs/RCCBs should be mounted on a bracket covered with Bakelite cover plate with only opening for dollies. Dollies of MCBs/RCCBs should be accessible only after opening the outer door. Barrier plate shall be hinged / bolted with fixing screws. Sizes of each compartment shall be sufficient to accommodate all MCBs/RCCBs/RCBOs/TBs/Cable gland
- 1.7 s etc. along with their internal wiring in orderly manner.
- 1.8 Panels shall be factory wired and assembled.
- 1.9 Two numbers 6mm external earthing studs complete with two plain, one spring/lock washer, and a nut on opposite side of the panels shall be provided. Earth Bus of 25x6 (min.) Al. shall be provided with terminal studs along the length at TB compartment for internal earthing & terminating all earth wires of outgoing circuits.
- 1.10 Caution note and panel nameplate shall be provided as per manufacturer standard 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. A separate transparent acrylic or equivalent caution name plate” LIVE TERMINALS” in red letters on white background shall be provided above main terminals. Arrangement for keeping ‘tabular form circuit card’ on the inside of outer compartment door shall be provided.
- 1.11 Terminal blocks suitable for connection of incoming and outgoing circuit cables shall be provided. Terminal blocks shall be stud/clamp type suitable for incoming and outgoing cables. 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 Sufficient space shall be provided (150 to 200mm) between gland plate and bottom of terminal block for easy termination of cables.
- 1.13 Lighting panels shall have High conductivity Aluminum alloy bus bars suitable for continuous current rating of the incomer circuit breaker. Sizes of bus bars shall be so selected that with the passage of rated current, the temperature rise over 40 Deg C ambient does not exceed 45 Deg C as measured by thermometer. Minimum size of the bus bar shall be 25x3mm. Busbars shall be sleeved properly.
- 1.14 Short circuit level of the panel shall be 10kA/1sec. Spacing between the bus bars shall be as per IS for the applied voltage to prevent flash over. Bus bars shall be properly supported with High quality non-hygroscopic, insulating, self-extinguishing and fire retardant insulating material of adequate mechanical strength. Bus bar support shall be capable of withstanding the effects of available short-circuit current without any damage. The bus bars shall also be properly spaced to facilitate mounting of MCBs and taking connections to individual units.
- 1.15 Rating of MCCBs/MCBs/RCCBs/RCBOs for incomer and outgoing shall be as per Illumination BOM.
- 1.16 The number of outgoing feeders is to be considered as mentioned in Annexure-II.
- 1.17 All internal wiring shall be done with 1.1kV PVC insulated, 16 sq.mm stranded Cu flexible wires. All wires shall be neatly bunched 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.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 8 of 31	

- 1.18 All component installed in the panels shall have labels; also outgoing and incoming circuits at terminal blocks shall have labels. 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.
- 1.19 The outgoing miniature circuit-breakers shall be heat resistant plastic moulded type generally designed, manufactured and tested as per IS 8828 : 1993. Unless specified otherwise all MCBs shall be provided with quick break-trip free mechanism and direct acting thermal overload and short-circuit trip elements. The short circuit breaking capacity of the MCBs shall not be less than 9kA at 0.8 power factor.
- 1.20 WP double compression type Nickel plated Brass (ET) Cable gland with back-nut shall be provided for incoming and outgoing cable for panels. The quantities shall be equivalent to the number of outgoing and incoming feeder as mentioned in the illumination BOM (annexure-II). Glands for outdoor type panels should be supplied with PVC gland hoods. Incoming and outgoing cable entries shall be from bottom by means of removable undrilled gland plates.
- 1.21 Crimp type heavy duty tinned Copper lugs of appropriate sizes suitable for cable sizes 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 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 All metal surfaces shall be cleaned free of rust, given a coat of red-oxide primer and finished with two coats of epoxy based paint. Paint shade shall be 631 of IS:5 for indoor panel and 632 of IS:5 for outdoor panel (shall be decided during detail engineering at drawing approval stage). All unpainted steel parts shall be suitably treated to prevent rust formation.
- 1.26 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-
- (i) MCBs: MDS, GE India, Standard, Siemens, L&T, Schneider-Telemecanique, ABB.
 - (ii) Fuses: L & T, GE, Indo-Asian, Siemens.
 - (iii) Cable gland: Electromag, CCI, Dowells, Braco, Comet, Baliga, Metal Craft Industries Rajkot
 - (iv) Terminal Block: ELMEX, WAGO, PHOENIX, Schneider Telemecanique, Connectwell
 - (v) Cable Lug: Phoenix, Dowells, Hex, Connectwell
 - (vi) Push Buttons: Siemens, L&T, BCH, Schneider-Telemecanique
 - (vii) MCCB: GE India, ABB, L&T, Siemens, Schneider-Telemecanique
 - (viii) Power contactor: SIEMENS, L&T, Schneider, ABB
 - (ix) Timer: Siemens, BCH, L&T, Schneider Telemecanique, Alstom
- 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.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 9 of 31	

II. HAZARDOUS AREA LIGHTING PANELS:

- 1.0 Certification:** The equipment shall be certified by testing authorities like CIMFR/BASEEFA or equivalent as applicable for the service and the area of installation and shall be approved by CCOE/PESO. All indigenous flameproof equipment Ex(d) shall be under BIS license & shall have marking as required by statutory authorities.
- 2.0 Technical Particulars:**
- 2.1 The Lighting panel shall be suitable for installation and satisfactory operation in classified hazardous locations in tropical, humid and corrosive atmosphere as prevalent in refineries, petrochemical and fertilizer plants.
 - 2.2 The lighting panel shall be designed to operate under site conditions as specified in the illumination BOM, if not specifically mentioned therein, a design ambient temperature of 40 Degree centigrade and an altitude not exceeding 1000m above mean sea level shall be considered.
 - 2.3 Lighting panels shall have IP55 degree of protection (min.) and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA&IIB or IIC). The lighting panels shall be flameproof type Ex (d) with temperature class T3 (min.).
 - 2.4 The enclosure 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.
 - 2.5 Outdoor type panels shall be provided with external 14SWG FRP canopy to protect from heavy tropical rains from top and both sides. These shall be suitable for wall/column mounting with external fixing lugs. Hole provided in the lugs shall be oblong type. All hardware provided like nuts, bolts, washer etc. shall be stainless steel (SS304) or zinc passivated.
 - 2.6 Two numbers 6mm external earthing studs complete with two plain and one spring/lock washer, lugs and a nut on opposite side of the panels shall be provided for termination of 10mm dia GI wire rope.
 - 2.7 All non current carrying metallic parts of the panel shall be inherently bonded together.
 - 2.8 All the accessories and loose items supplied with panel shall be suitable for applicable classified area.
 - 2.9 Terminal blocks suitable for connection of incoming and outgoing circuit cables shall be provided. Terminal blocks shall be stud/clamp type suitable for incoming and outgoing cables. 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.
 - 2.10 Sufficient space shall be provided (100mm) between gland plate and bottom of terminal block for easy termination of cables.
 - 2.11 For AC lighting panels, High conductivity Al bar with colour coded for R, Y, B & N buses shall be provided. Neutral bus bar shall be colour coded with black band.. Minimum size of the bus bar shall be 25x6mm, however size shall be selected to limit bus bar temperature rise to 45°. Spacing between the bus bars shall be as per IS for the applied voltage to prevent flash over.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 10 of 31	

Short circuit level of the MCBs shall be 9kA. 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.

- 2.12 For AC lighting panels, rating of MCBs/RCCBs/RCBOs for incomer and outgoing shall be as per Illumination BOM. However if not specified, incomer shall be provided with 32A, 230V, DP MCB & 32A DP RCCB with sensitivity of 30mA. Outgoing feeders shall be provided with 20A, DP MCBs. All MCBs Shall be suitable for breaking capacity of 9kA(min.) at 240V AC and RCCBs shall be provided with tripping due to earth leakage.
- 2.13 The ELCB/RCCB shall be hand reset type, one no. door mounted reset push button shall be provided.
- 2.14 The operating knobs (ON/OFF/RESET) shall be provided with suitable rack and pinion arrangement or cam type operating mechanism for operating smoothly from outside.
- 2.15 The number of outgoing feeders is to be considered as mentioned in Annexure-II.
- 2.16 All internal wiring shall be done with FR type, 1.1kV PVC insulated, 16sq.mm stranded Cu flexible wires. All wires should be neatly bunched & clamped to enclosure at regular interval of their routing. All wires shall be ferruled and terminated by sleeved lugs.
- 2.17 All component installed in the panels shall have levels, also outgoing and incoming circuits at terminal blocks shall have levels. Wires of internal wiring shall be identifiable with numbered ferrules and shall carry same number at both ends of wire piece. Circuit diagram provided for internal wiring shall be in conformity with the levels of components and wiring.
- 2.18 Flameproof double compression Nickel plated Brass Cable gland shall be provided for incoming and outgoing cables. The quantities shall be equivalent to the number of outgoing and incoming feeder as mentioned in the illumination BOM (annexure-II). Glands for panels should be supplied with PVC gland hoods.
- 2.19 All panels shall be provided with NPT cable entries suitable for cable glands. Cable entry sizes shall be as per Illumination BOM (Annexure-II).
- 2.20 Crimp type heavy duty tinned Copper lugs of appropriate sizes suitable for TBs shall be provided for all incoming and outgoing cables. Flame proof nickel plated Brass Blanking plug of suitable size shall be supplied for 50% (min) outgoing cable entries to seal the unused entries. Stainless steel (SS304) nuts & bolts of suitable size shall be supplied with each panel for mounting of panel.
- 2.21 Sizes of cable glands, Terminal blocks, Lugs & Blanking plugs are project specific, will be decided during detail engineering at drawing approval stage.
- 2.22 All electrical components shall be mounted on suitable brackets to match with inner door.
- 2.23 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.
- 2.24 All metal surfaces shall be cleaned free of rust, given a coat of red-oxide primer and finished with two coats of epoxy based paint. Colour shade of final paint shall be 632 of IS:5 or RAL7035

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 11 of 31	

for Gas group IIA & IIB and Light Yellow 355 of IS:5 for Gas group IIC. All unpainted steel parts shall be suitably treated to prevent rust formation.

2.25 Warning inscription: "Isolate power supply elsewhere before opening" is to be provided on the nameplate or the warning inscription is to be embossed on the enclosure. Name plate shall be engraved type and permanently fixed on the equipment. Name plate /warning plate shall be of nickel plated brass or stainless steel.

2.26 Additionally following details are to be embossed on the nameplate:

- (i) Details of testing agency (CIMFR or equivalent)
- (ii) Test certificate no. with date
- (iii) Statutory approval no. with date and agency like PESO/CCOE etc.
- (iv) BIS License no. and date
- (v) Applicable gas group etc.

2.27 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 glands (Flame proof type): Baliga, Flameproof equipment, Prompt, FCG
- (iv) Terminal Block: Elmax, Connectwell

III. 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% for AC fixture and 220V DC for DC fixture. 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. DC fixture shall have driver compatible with DC voltage mentioned in the specification.
- 1.6 The fixtures shall be fully wired up to terminal block.
- 1.7 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.
- 1.8 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.
- 1.9 All outdoor type fixture i.e. Well glass/street light/Flood light etc., shall be weather proof with IP-55 (min) protection.
- 1.10 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

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 12 of 31	

circuit. Outdoor type LED luminaires, the exposed heat sink shall be suitably designed to avoid dust/foreign particles accumulation on the same.

1.11 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.

1.12 LED type of fixtures shall meet the following technical requirements:-

- i) All fixtures shall be complete with lamps.
- ii) The LED Luminaire efficacy shall not be less than 100Lm/W.
- iii) Minimum view angle of LED shall not be less than 120 degree.
- iv) LED lamp shall be provided with toughened glass and shall have thickness of sufficient strength and high efficiency prismatic diffuser under the LED chamber to protect the LED and luminaire.
- v) Suitable reflector/ lenses may also be provided to increase illumination uniformity and distribution of LED.
- vi) Adequate Heat Sink with proper thermal management shall be provided.
- vii) LED Fixture shall be design to have lumen maintenance at least 70% at the end of 100,000 hours at design temperature 35 degree centigrade. LED will be made ON 10hours per day.
- viii) LED luminaire shall be free of glare.
- ix) Power factor of complete fittings shall be more than 0.95 at full load 240VAC and THD shall be <8%.
- x) 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.
- xi) 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.
- xii) LED modules and drivers shall be compatible to each other.
- xiii) Make of fixtures shall be embossed on the body of the lighting fixtures.
- xiv) LED fixture along with driver etc. shall be enclosed in single enclosure. Driver etc. shall not be fixed in separate enclosure.
- xv) The luminaire should be an inbuilt surge protection of not less than 4KV to prevent damage to the driver in case of sudden voltage surge.
- xvi) LED luminaire shall consist of LED modules, driver, heat sink for thermal management, fixture & optic assembly.
- xvii) It shall be possible to replace or upgrade burnt out LED modules within LED luminaire without replacing the whole luminaire. Such LED modules for replacement shall be easily available.
- xviii) LED drivers shall incorporate devices to handle power quality issues like power factor correction and, filter for harmonic distortion.
- xix) The LED lighting & control gear should comply with the relevant electromagnetic compatibility standards such as IEC 61000-3-2 for limits on harmonic current emissions, IEC 61000-3-3 for limits on voltage changes, voltage fluctuations and flicker and IEC 61547 for immunity requirements.

1.13 Fixture catalogue details/name plate as per E-I of this spec. shall be provided for easy identification.

1.14 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. Paint shade of AC fixtures shall be 632 of IS: 5 or RAL7032. However, exact paint

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 13 of 31	

shade will be informed during detailed engineering. All unpainted steel parts shall be suitably treated to prevent rust formation.

- 1.15 Two nos. cable entries shall be provided for well glass fixtures suitable for looping of circuit cable (i.e. 3Cx2.5sq.mm Cu cable). All hardware provided shall be zinc passivated.
- 1.16 Cable entries of fixtures shall be suitable for 3Cx2.5sq.mm Cu cable. For Well-glass fixture cable entry should be from side only. WP double compression Nickel plated Brass cable glands with PVC shroud suitable for specified area classification shall be provided for all cable entries. One no. blanking plug shall be supplied for fixture with 2 nos. cable entries.
- 1.17 Fixtures shall be supplied with all accessories like Crimp type heavy duty tinned Copper lugs, Nuts & Bolts, cable glands, Blanking plug, Pole reducer & “C” bracket for well Glass fixture etc.
- 1.18 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
- 1.19 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-
 - a) Cable gland: Baliga, Comet, Flexpro, FCG

IV. HAZARDOUS AREA FIXTURES AND LAMPS:

- 1.0 Certification:** The equipment shall be certified by testing authorities like CIMFR/ /BASEEFA/ or equivalent as applicable for the service and the area of installation and shall be approved by CCOE/PESO. All indigenous flameproof equipment Ex (d) shall be under BIS license & shall have marking as required by statutory authorities.
- 2.0 Technical Particulars:**
 - 2.1 Fixtures and lamps shall have IP65 degree of protection and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA & IIB). The light fittings shall be flameproof type Ex (d) with temperature rise limited to applicable classified area or T3 (min.).
 - 2.2 The enclosures of fixtures shall be of Cast light metal alloy and free from frictional sparking hazard. All hardware provided shall be zinc passivated.
 - 2.3 The enclosure shall be provided with gasket made of non-inflammable and self-extinguishing material.
 - 2.4 All fixtures shall be provided with 2 Nos of NPT cable entries suitable for flameproof double compression Nickel plated brass cable glands with PVC Hood. 1 No. FLP nickel plated Brass blanking plug shall be supplied in loose for fixture with 2nos. cable entries
 - 2.5 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. Colour shade of final paint shall be 632 of IS:5 or RAL7035 for Gas group IIA & IIB and Light Yellow 355 of IS:5 for Gas group IIC. However, exact paint shade will be informed during detailed engineering. All unpainted steel parts shall be suitably treated to prevent rust formation.
 - 2.6 Additionally following details are to be embossed on the nameplate of light fittings:

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 14 of 31	

a. Details of testing agency (CIMFR or equivalent)

b. Test certificate no. with date

c. Statutory approval no. with date and agency like PESO, DGMS etc.

d. BIS License no. and date

e. Applicable gas group etc.

2.7 In addition to above, all technical particulars specified for safe area fixtures and lamps (II above) will be applicable.

2.8 Fixtures shall be supplied with all accessories like Crimp type heavy duty tinned Copper lugs, Nuts & Bolts, FLP DC Brass cable glands for all cable entries with PVC hood, 1no. FLP Brass blanking plug for fixture with 2 nos. cable entries, Pole reducer & “C” bracket for well Glass fixture etc.

2.9 Make of cable glands suitable for the specified area classification shall be as per the makes given under “Hazardous Area Lighting Panels” (I above) if not otherwise specified in sub vendor list.

V. SAFE AREA WEATHER PROOF JUNCTION BOXES:

1.1 The junction boxes shall have IP55 (Min.) degree of protection.

1.2 Enclosure of rectangular JB's shall be made of 1.2 to 2mm thick CRCA sheet steel, dust and vermin proof and shall be complete with removable cover plate with gasket, two earthing terminal with nuts & bolts.

1.3 The JB boxes shall be hot dip galvanized /painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint with shade of RAL 7032/ RAL7037 for indoor/outdoor JB (shall be decided during drawing approval stage), if not otherwise specified. All unpainted steel parts shall be suitably treated to prevent rust formation.

1.4 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 and hardware provided shall be zinc passivated.

1.5 JB shall have cable entries from bottom only to protect from heavy tropical rains.

1.6 Terminal blocks shall be made of copper alloy and shall be of box clamp type. Rating and qty. of TB as indicated in the illumination BOM (i.e. annexure-II) shall be provided. 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.

1.7 The no. of entries required and their sizes shall be project specific as indicated in the illumination BOM. WP double compression Nickel plated Brass Cable gland shall be provided with PVC shroud of required sizes and nos. equal to cable entries shall be supplied in loose.

1.8 One blanking plug for each type of cable entry shall be provided. In addition, all the entries should be plugged with PVC plugs before dispatch.

1.9 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.

1.10 JB's shall be provided with earthing studs (2 nos. internal and 2 nos. external) with washers.

1.11 Inscription plate / nameplate as per E.II of this spec. with caution note shall be provided on front cover.

1.12 on note shall be provided on front cover.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 15 of 31	

1.13 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.

1.14 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-

- (i) Cable gland: Baliga, Comet, Flexpro, FCG, Prompt
- (ii) Terminal Block: Elmax, Wago, phonix, Connectwell

VI. HAZARDOUS AREA JUNCTION BOXES:

1.0 Certification: The equipment shall be certified by testing authorities like CIMFR/ERTL/BASEEFA or equivalent as applicable for the service and the area of installation and shall be approved by PESO. All indigenous flameproof equipment Ex (d) shall be under BIS license & shall have marking as required by statutory authorities.

2.0 Technical Particulars:

2.1 The hazardous area junction boxes shall have IP65 degree of protection and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA&IIB). The JB shall be flameproof type Ex (d) with temperature rise limited to applicable classified area or T3 (min.).

2.2 Enclosure of JB's shall be of cast light alloy with adequate thickness and free from frictional sparking hazard.

2.3 The internal and external surface shall have smooth finish, completely free from dents, defects and blowholes. All screws / hinges and hardware provided shall be of stainless steel (SS304).

2.4 Gasket made of non-inflammable and self-extinguishing material shall be provided.

2.5 Size of the JB shall be project specific as indicated in annexure-II (Illumination BOM).

2.6 JB shall have cable entries from bottom only to protect from heavy tropical rains.

2.7 Terminal blocks shall be made of copper alloy and shall be of box clamp type. Rating and qty. of TB as indicated in the illumination BOM(annexure-II) shall be provided. 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.

2.8 All JB's shall be provided with NPT cable entries suitable for flameproof double compression Nickel-plated brass cable glands with PVC Hood. The no. of entries required and their sizes shall be project specific as indicated in the illumination BOM.

2.9 One FLP Brass blanking plug for each type of cable entry shall be provided. In addition, Mounting nuts & bolts shall be supplied with each JB.

2.10 All metal surfaces shall undergo manufacturer's standard cleaning/painting cycle. After preparation of under surface, equipment shall be painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint. Colour shade of final paint shall be 632 of IS:5 or RAL7035 for IIA&IIB, Light Yellow 355 of IS:5 for IIC. However, exact paint shade will be informed during detailed engineering. All unpainted steel parts shall be suitably treated to prevent rust formation.

2.11 Warning inscription: "Isolate power supply elsewhere before opening" is to be provided on the nameplate or the warning inscription is to be embossed on the enclosure.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 16 of 31	

2.12 Additionally following details are to be embossed on the nameplate:

- Details of testing agency (CIMFR or equivalent)
- Test certificate no. with date
- Statutory approval no. with date and agency like PESO, DGMS etc.
- BIS License no. and date
- Applicable gas group etc.

2.13 Makes of major components shall be as follows if not otherwise specified in sub vendor list:-

- MCBs: MDS, Havell's, Indo-Asian, Legrand, ABB, Schneider.
- Fuses: L & T, GE, Indo-Asian, Siemens.
- Cable glands (Flame proof type): Baliga, Flameproof equipment, Prompt, FCG
- Terminal Block: Elemax, Connectwell

2.14 Make of cable glands suitable for the specified area classification shall be as per the makes given under "Hazardous Area Lighting Panels" (I above) if not otherwise specified in sub vendor list.

VII. FLEXIBLE WIRES:

- Flexible wires shall be single core, unsheathed, PVC insulated suitable for voltage grade 1.1kV and Class-5 flexibility. Type of insulation i.e. FRLS or FR, shall be as per illumination BOM (Annexure-II).
- The conductor shall be stranded Cu conductor. The cross-sectional area of conductor and colour of insulation shall be as indicated in Annexure-II.
- The standard length of bundle shall be 90m + 5%.
- Internal resistance and insulation thickness of the wire should be as per IS.
- 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. FLEXIBLE CONDUIT AND ACCESSORIES :

- Flexible conduits shall be made with bright, cold rolled annealed and electro-galvanized mild steel strips & coated with PVC.
- Internal dia of conduit is specified in annexure-II (Illumination BOM).
- Flexible conduit connector/reducer/PVC Gland shall be suitable for specified size GI conduit to connect flexible conduit to the GI conduit.
- Make of conduit shall be from reputed vendor with proven track record.
- 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. CABLE CLAMPS:

- Cable clamps and base shall be provided of size as mentioned in Annexure-II (Illumination BOM) to suit the cable size as specified.
- Cable clamps shall be of 1.6mm thick GI and base shall be of GI with 3mm thickness and required width.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 17 of 31	

1.3 All hardware including clamp base mounting screw and cable clamp mounting end screws, shall be provided along with each Cable clamp. All hardware shall be of stainless steel (SS304) / zinc passivated.

X. INDUSTRIAL WEATHERPROOF METAL CLAD PLUG SOCKET (20A, 240V, 2-POLE or 10A, 24V, 2-POLE):

1.1 Receptacles shall be of metal clad gasketed construction conform to IS 1293. Receptacles shall be heavy duty, dust and waterproof complete with individual socket (3pin, 1-Ph, 240V or 24V as per BOM) & isolating switch of required rating. The Isolating switch shall be of industrial type of category AC22 compressing to IS:13947 (Part-3).

1.2 Socket outlet shall be provided with 20A or 10A DP RCCB (30mA) as per BOM in the socket outlet box to control the supply against earth fault. Operating handle of isolating switch shall be fixed in such a manner that it will not be possible either to insert or to withdraw the plug without switching off the supply.

1.3 Receptacles enclosure shall made be 1.2mm thick(min.) CRCA sheet steel painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint shade of RAL 7032/ RAL7037 for indoor/ outdoor type socket (shall be finalized during detail engineering) if not otherwise specified.

1.4 Outdoor type of receptacle shall have IP 55 (Min.) degree of protection and shall be provided with external sheet steel canopy (2mm thick) to protect from heavy tropical rain from Top and Both sides.

1.5 Receptacles shall be suitable for wall / column mounting. Necessary mounting nuts & bolts shall be supplied along with receptacles. Hardware used in the receptacle box shall be Stainless steel (SS304) /zinc passivated.

1.6 Front cover shall be provided with neoprene gasket and shall be screwed to the fabricated box by screws & cup washers. This box shall have outlets at the bottom for incoming and outgoing cables.

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 type plug. The plug shall be provided with cord grips to prevent strain and damage to conductor /wires at connection and entry points. The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on the socket. Earth pin of the plug shall first engage with pin of socket / receptacle.

1.9 Terminal block suitable for 4 sq. mm wire shall be supplied with Crimp type heavy duty tinned Copper lugs for 4 sq.mm Cu 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 sqmm cu. wire.

1.11 Each outlet shall be provided with a spring either loaded hinged cover or 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. The

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 18 of 31	

sizes of cable entries & Cable glands shall be project specific as indicated in the illumination BOM or will be decided during drawing approval stage.

- 1.13 Inscription plate/Name plate shall be provided indicating voltage rating of the socket as per clause E-V. of this spec.
- 1.14 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 .
- 1.15 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. FLAME PROOF PLUG SOCKET FOR HAZARDOUS AREA (20A, 240V, 2-POLE or 10A, 24V, 2-Pole).

- 1.0 Certification:** The equipment shall be certified by testing authorities like CIMFR/ BASEEFA or equivalent as applicable for the service and the area of installation and shall be approved by PESO. All indigenous flameproof equipment Ex(d) shall be under BIS license & shall have marking as required by statutory authorities.
- 2.0 Technical particulars.**
 - 2.1 All plug-sockets shall have IP65 degree of protection and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA&IIB as per IS 2148). The socket shall be flameproof type Ex (d) with temperature rise limited to applicable classified area or T3 (min.).
 - 2.2 The socket enclosure 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.
 - 2.3 Outdoor type socket shall be provided with external (2mm thick) sheet steel/FRP canopy to protect from heavy tropical rains from Top and Both sides. These shall be suitable for wall/column mounting with external fixing lugs. Hole provided in the lugs shall be oblong type. All hardware provided like nuts, bolts, washer etc. shall be Stainless steel (SS304)/zinc passivated.
 - 2.4 Two numbers external earthing studs complete with two plain and one spring/lock washer and a nut on opposite side of the socket enclosure shall be provided. There shall also be 2nos. internal earthing screw to terminate earth wire of circuit cable.
 - 2.5 All non-current carrying metallic parts of the panel shall be inherently bonded together.
 - 2.6 All the accessories and loose items supplied with panel shall be suitable for applicable classified area.
 - 2.7 Terminal blocks suitable for connection of incoming and outgoing circuit cables shall be provided. Terminal blocks shall be stud/clamp type suitable for incoming and outgoing cables. 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.
 - 2.8 Sufficient space shall be provided (100 to 150mm) between gland plate and bottom of terminal block for easy termination of cables.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 19 of 31	

- 2.9 Receptacles shall be heavy duty complete with individual 20A or 10A as per BOM, 3-Pin, socket & interlocking rotary switch of required rating such that it cannot be switched ON unless plug is fully inserted & locked and Plug cannot be withdrawn unless switch is put OFF.
- 2.10 Socket outlet shall be provided with 20A or 6A DP RCCB (30mA) as per BOM in the socket outlet box to control the supply against earth fault. The RCCB shall be hand reset type, one no. door mounted reset push button shall be provided. The operating knobs (ON/OFF/RESET) shall be provided with suitable rack and pinion arrangement or cam type operating mechanism for operating smoothly from outside.
- 2.10 To avoid accidental removal of plug from socket, the engagement & disengagement shall be by two separate and distinct movement and position.
- 2.11 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
- 2.12 Sockets shall be provided with 2 nos. NPT cable entries suitable for approved type flameproof double compression Nickel-plated Brass Cable gland with PVC hood and required Nos. of Heavy duty Tinned Cu lugs. 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.
- 2.13 One FLP Brass blanking plug shall be provided. In addition, Stainless steel (SS304) Mounting nuts & bolts and Crimp type heavy duty tinned Copper lugs shall be supplied with each Socket.
- 2.14 All metal surfaces shall undergo manufacturer's standard cleaning/painting cycle. After preparation of under surface, equipment shall be painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint. Colour shade of final paint shall be 632 or RAL7035 for IIA&IIB, Light Yellow 355 for IIC. All unpainted steel parts shall be suitably treated to prevent rust formation.
- 2.15 Warning inscription: "Isolate power supply elsewhere before opening" is to be provided on the nameplate or the warning inscription is to be embossed on the enclosure.
- 2.16 Additionally following details are to be embossed on the nameplate:
 - (i) Details of testing agency (CMRI or equivalent)
 - (ii) Test certificate no. with date
 - (iii) Statutory approval no. with date and agency like PESO etc.
 - (iv) BIS License no. and date
 - (v) Applicable gas group etc.
- 2.17 Make of cable glands suitable for the specified area classification shall be as per the makes given under "Hazardous Area Lighting Panels" (I above) if not otherwise specified in the sub vendor list.

XII. 63A, 415V, 3PHASE, 4-PIN, INDUSTRIAL WEATHERPROOF WELDING SOCKET WITH PLUG (SAFE AREA) :

- 1.1 Receptacles shall be of metal clad gasketed construction conform to IS 1293. Receptacles shall be heavy duty, dust and water proof complete with individual 63A socket (4-Pin, 3-Ph+E, 415V) & 63A isolating switch. The Isolating switch shall be of industrial type of category AC22 compressing to IS:13947(Part-3).
- 1.2 Socket outlet shall be provided with 63A TP RCCB (30mA) in the socket outlet box to control the supply against earth fault. Operating handle of isolating switch shall be fixed in such a

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number PY55340	
			Rev. No.	01
			Sheet 20 of 31	

manner that it will not be possible either to insert or to withdraw the plug without switching off the supply.

- 1.3 Receptacles enclosure shall made be 1.2mm thick(min.) CRCA sheet steel painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint shade of RAL 7032/ RAL7037 for indoor/ outdoor type socket (shall be finalized during detail engineering) if not otherwise specified.
- 1.4 Outdoor type of receptacle shall have IP 55 (Min.) degree of protection and shall be provided with external Sheet steel/FRP (2mm thick) to protect from heavy tropical rain from Top and Both sides.
- 1.5 Receptacles shall be suitable for wall / column mounting. Necessary mounting nuts & bolts shall be supplied along with receptacles. Hardware used in the receptacle box shall be Stainless steel (SS304) /zinc passivated.
- 1.6 Front cover shall be provided with neoprene gasket and shall be screwed to the fabricated box by screws & cup washers. This box shall have outlets at the bottom for incoming and outgoing cables.
- 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 type plug. The plug shall be provided with cord grips to prevent strain and damage to conductor /wires at connection and entry points. The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on the socket. Earth pin of the plug shall first engage with pin of socket / receptacle.
- 1.9 Terminal block suitable for 50 sq. mm wire shall be provided and Crimp type heavy duty tinned Copper lugs for 35 sq.mm Cu cable shall be supplied for all outgoing and incoming cables for loop in and loop out facility.
- 1.10 All internal power wiring shall be done with 660V grade PVC insulated Cu wires of 16 sqmm cu. wire.
- 1.11 Each outlet shall be provided with a spring either loaded hinged cover or 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. 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.
- 1.13 Inscription plate/Name plate shall be provided indicating voltage rating of the socket as per clause E-V. of this spec.
- 1.14 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 .
- 1.15 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.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 21 of 31	

XIII. 63A, 415V, 3PHASE, 4-PIN, FLAME PROOF WELDING SOCKET WITH PLUG FOR HAZARDOUS AREA.

1.0 Certification: The equipment shall be certified by testing authorities like CIMFR/ BASEEFA or equivalent as applicable for the service and the area of installation and shall be approved by PESO. All indigenous flameproof equipment Ex(d) shall be under BIS license & shall have marking as required by statutory authorities.

2.0 Technical particulars.

- 2.1 All plug-sockets shall have IP65 degree of protection and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA&IIB as per IS 2148). The socket shall be flameproof type Ex (d) with temperature rise limited to applicable classified area or T3 (min.).
- 2.2 The socket enclosure 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.
- 2.3 Outdoor type socket shall be provided with external sheet steel/FRP (2mm thick) canopy to protect from heavy tropical rains from Top and Both sides. These shall be suitable for wall/column mounting with external fixing lugs. Hole provided in the lugs shall be oblong type. All hardware provided like nuts, bolts, washer etc. shall be Stainless steel (SS304)/zinc passivated.
- 2.4 Two numbers external earthing studs complete with two plain and one spring/lock washer and a nut on opposite side of the socket enclosure shall be provided. There shall also be 2nos. internal earthing screw to terminate earth wire of circuit cable.
- 2.5 All non-current carrying metallic parts of the panel shall be inherently bonded together.
- 2.6 All the accessories and loose items supplied with panel shall be suitable for applicable classified area.
- 2.7 Terminal block suitable for 50 sq. mm wire shall be provided and Crimp type heavy duty tinned Copper lugs for 35 sq.mm Cu cable shall be supplied for all outgoing and incoming cables for loop in and loop out facility.
- 2.8 Sufficient space shall be provided (100 to 150mm) between gland plate and bottom of terminal block for easy termination of cables.
- 2.9 Receptacles shall be heavy duty complete with individual 63A, 3-Phase+E, 4-Pin, socket & interlocking 63A rotary switch such that it cannot be switched ON unless plug is fully inserted & locked and Plug cannot be withdrawn unless switch is put OFF.
- 2.10 Socket outlet shall be provided with 63A TP RCCB (30mA) in the socket outlet box to control the supply against earth fault. The RCCB shall be hand reset type, one no. door mounted reset push button shall be provided. The operating knobs (ON/OFF/RESET) shall be provided with suitable rack and pinion arrangement or cam type operating mechanism for operating smoothly from outside.
- 2.11 To avoid accidental removal of plug from socket, the engagement & disengagement shall be by two separate and distinct movement and position.
- 2.12 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
- 2.13 Sockets shall be provided with 2 nos. NPT cable entries suitable for approved type flameproof double compression Nickel-plated Brass Cable gland with PVC hood and required Nos. of Heavy

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 22 of 31	

duty Tinned Cu lugs. 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.

- 2.14 One FLP Brass blanking plug shall be provided. In addition, Mounting nuts & bolts and Crimp type heavy duty tinned Copper lugs shall be supplied with each Socket.
- 2.15 All metal surfaces shall undergo manufacturer's standard cleaning/painting cycle. After preparation of under surface, equipment shall be painted with one shop coat of red oxide zinc chromate primer followed by a finish coat of paint. Colour shade of final paint shall be 632 or RAL7035 for IIA&IIB, Light Yellow 355 for IIC. All unpainted steel parts shall be suitably treated to prevent rust formation.
- 2.16 Warning inscription: "Isolate power supply elsewhere before opening" is to be provided on the nameplate or the warning inscription is to be embossed on the enclosure.
- 2.17 Additionally following details are to be embossed on the nameplate:
 - (vi) Details of testing agency (CMRI or equivalent)
 - (vii) Test certificate no. with date
 - (viii) Statutory approval no. with date and agency like PESO etc.
 - (ix) BIS License no. and date
 - (x) Applicable gas group etc.
- 2.18 Make of cable glands suitable for the specified area classification shall be as per the makes given under "Hazardous Area Lighting Panels" (I above) if not otherwise specified in the sub vendor list.

XIV. FLAME PROOF HAND LAMP:

1.0 Certification: The equipment shall be certified by testing authorities like CIMFR/ BASEEFA or equivalent as applicable for the service and the area of installation and shall be approved by PESO. All indigenous flameproof equipment Ex(d) shall be under BIS license & shall have marking as required by statutory authorities.

2.0 Technical particulars.

- 2.1 Hand lamp shall have IP65 degree of protection and shall be suitable for area classification as mentioned in the illumination BOM (i.e. Zone – I & II, Gas Group IIA & IIB). The light fittings shall be flameproof type Ex (d) with temperature rise limited to applicable classified area or T3 (min.).
- 2.2 The hand lamp shall be LED type of approximate wattage 20W suitable for 24V, 50Hz supply and shall be complete with necessary driver circuit.
- 2.3 The metal casing of the hand lamp shall be of corrosion resistant alloy LM6 and free from frictional sparking hazard. The enclosure shall be provided with gasket made of non-flammable and self-extinguishing material. All hardware provided like nuts, bolts, washer etc. shall be zinc passivated.
- 2.4 Hand lamp shall be provided with NPT cable entries suitable for flameproof double compression Nickel plated brass cable glands with PVC Hood.
- 2.5 Suitable handle for carrying hand lamp and stand type guard suspension hook shall be provided.
- 2.6 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).

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 23 of 31	

- 2.7 Hand lamp shall be provided with a galvanized steel wire protective cage having dimension not exceeding 50mm.
- 2.8 Suitable eye protector shall be provided at one side of the lamp enclosure to protect from glaring effect on eye.
- 2.9 Each hand lamp shall supplied with 50m length of 3Cx2.5sq.mm Cu conductor, PVC insulated, metal braided flexible, duly terminated in the hand lamp at one end. Termination of cable to hand lamp shall be through suitable FLP DC Brass cable gland.
- 2.10 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. Colour shade of final paint shall be 632 of IS:5 or RAL7035 for Gas group IIA & IIB and Light Yellow 355 of IS:5 for Gas group IIC. However, exact paint shade will be informed during detailed engineering. All unpainted steel parts shall be suitably treated to prevent rust formation.
- 2.11 Warning inscription: "Isolate power supply elsewhere before opening" is to be provided on the nameplate or the warning inscription is to be embossed on the enclosure.
- 2.3 Additionally following details are to be embossed on the nameplate:
 - I. Details of testing agency (CMRI or equivalent)
 - II. Test certificate no. with date
 - III. Statutory approval no. with date and agency like PESO etc.
 - IV. BIS License no. and date
 - V. Applicable gas group etc.
- 2.4 Make of cable glands suitable for the specified area classification shall be as per the makes given under "Hazardous Area Lighting Panels" (I above) if not otherwise specified in the sub vendor list.

XV. LIGHTING POLES (2.0m, 3.0m, 3.75m & 4.75m):

- 1.1 Lighting pole shall be of medium grade GI pipe with 100NB for 3.0 meter and above height pole and 50NB for 2.0 meter height pole as specified in the Drawing (Annexure-1).
- 1.2 Construction and other required accessories shall be as per drawing (Annexure-I) attached with this document.
- 1.3 The lighting poles with 3.0 mtr. and above height shall have fixing base plate for mounting of pole in concrete foundation as per drawing (Annexure-I).
- 1.4 The marshalling box to be supplied with 3.0 mtr. and above height pole. Marshalling box shall have IP 55 degree of protection, provided with hinged door & suitable locking arrangements. This box shall be of 300x210x150mm (min.) size and contain cable entries with cable gland, fuses, neutral links, terminal blocks, ground studs, etc. Marshalling box shall be epoxy painted of shade RAL7037 (shall be finalized during detail engineering) if not otherwise specified.
- 1.5 The poles shall have swan neck made of medium grade 50NB GI pipe with radius of 250mm as shown in the drawings (Annexure-I).
- 1.6 All poles should have required size holes at indicated location as shown in the drawing (Annexure-I) for routing of cable to the fixture.
- 1.7 All the accessories like reducer, coupler, bend pipe, U-bolt etc. as indicated in the drawing (Annexure-I) should be supplied with poles.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 24 of 31	

1.8 All hardware shall be of zinc passivated.

XVI. MOTOR JUNCTION BOX

- 1.1 The junction boxes shall be dust and weather proof and suitable for installation outdoors without extra protection. Junction box shall have IP-55 degree of protection.
- 1.2 The junction boxes shall be of hot dipped galvanized sheet steel of minimum 1.6mm thickness. All mechanical surfaces shall be free from burrs, dents and internal roughness. All screws/ hinges etc. shall be hot dipped galvanized.
- 1.3 The clearances and creepage distances shall be maintained inside the junction boxes as per relevant Indian standard. The junction boxes shall be suitable for wall / structure / ceiling mounting and necessary arrangement for mounting the same shall be provided.
- 1.4 The junction boxes shall be provided with continuous gasket made of neoprene or synthetic rubber to prevent ingress of dust. The gasket shall be held in position in groove provided in the enclosure and shall be pressed all around uniformly by suitably shaped projection of the door. Gaskets simply glued to the surface are not acceptable.
- 1.5 The junction boxes shall be provided with two nos. external earthing terminals and 1 no. internal earthing terminal with lugs, suitable for termination of 50x6mm GI flat. The earthing points shall be suitable for nut-bolt arrangement.
- 1.6 All live parts inside the junction boxes shall be insulated and shall withstand a test voltage of 2.5 KV for 1 minute.
- 1.7 The junction boxes shall be provided with a blank stainless steel tag plate fastened to the junction box top cover with two stainless steel screws. The plate shall be at least 25 mm wide, 100 mm long and 1 mm thick.
- 1.8 Design Ambient Temperature: 45 Deg.
- 1.9 Highest System Voltage: 1.1KV
- 1.10 Short Circuit withstand Capability: 50kA for 0.25 sec (RMS) & 105kA (Peak)
- 1.11 PH-PH and PH-E clearances: 25mm
- 1.12 Cable Details:

JB	Incoming cable details	Outgoing cable details	Remarks
3 Phase AC, 75KW motor	3CX120 SQ.MM, Al, Armoured Cable	3Rx1Cx70 SQ.MM, Cu, Flexible Cable	For Lube Oil Pumps and Vacuum Pumps
3 Phase AC, 55KW motor	3CX95 SQ.MM Al, Armoured Cable	6Rx1Cx25 SQ.MM, Cu, Flexible Cable	For Jacking Oil Pump drive motor & Hydraulic Barring Pump Drive Motor
2 Pole DC, 55KW motor	2Rx3CX150 SQ.MM Al, Armoured Cable	6Rx1CX70 SQ.MM Al, Armoured Cable	DC Jacking Oil Pump
2 Pole DC, 22KW motor	1Rx3CX150 SQ.MM Al, Armoured Cable	3Rx1CX25 SQ.MM Al, Armoured Cable	DC Emergency Oil Pump

Cable details are preliminary. Final cable sizes shall be informed during detailed engineering.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 25 of 31	

- 1.13 Junction box shall be supplied with complete termination accessories like cable Glands, Tinned heavy duty Copper lugs & Bi-metallic Strips etc. for above cable sizes. Glands type shall be double compression Nickel-plated brass with check nut and PVC shroud.
- 1.14 Cable Entry: Bottom entry
- 1.15 Type of Mounting: Wall / Column mounted
- 1.16 Dummy plugs shall be provided for all cable openings.
- 1.17 JBs shall be supplied with suitable Cu bus bars and terminals to meet current rating & Fault level.
- 1.18 Mounting Bars and Suitable Hardware like Bolts, Nuts and Washers (Hot dipped galvanized) shall be supplied along with JB.
- 1.19 Paint Shade: Dark admiralty grey shade 632 of IS-5. All unpainted steel parts shall be suitably treated to prevent rust formation. If these parts are moving elements then they shall be greased. Final paint shade shall be informed during detailed engineering.
- 1.20 Sufficient clearance/space shall be provided inside the JB for termination above cables to meet the bending requirement of cables.
- 1.21 Doors shall be screwed/bolted as per manufacturer's design.
- 1.22 Junction boxes shall be provided with Name plate, Tag plate and danger sign.

E. MARKING AND IDENTIFICATION:

I. Fixture & CG Box: 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:

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

III. Lighting Panel /24V Module Name Plate: Each lighting panel/24V module 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):

- a) Manufacturer's name & Model No.
- b) Complete Description of panel/ Module with mention of applicable classified area (i.e. Indoor/ Outdoor /Hazardous Classification etc.)
- c) Voltage rating & Applicable IP class
- d) Enclosure classification for flame proof Panel (Certificate No. & Date with name of certifying agency)
- e) 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.

- a) Manufacturer's name & Model No.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)		Std. / Doc. Number	
				PY55340	
				Rev. No.	01
				Sheet 26 of 31	

b) 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

I. All equipment shall be painted with epoxy-based paint using following method.

- All metal surfaces shall be thoroughly cleaned and degreased to remove scale, rust, grease and dirt.
- Fabricated structures shall be pickled and then rinsed to remove any trace of acid.
- The surface shall be prepared by applying a coat of phosphate paint and coat of yellow zinc chromate primer. The surface shall be made free from all imperfections before undertaking the finished coat.
- After preparation of the surfaces, the panels shall be powder coated with two coats of epoxy based final paint.
- Colour shade of final paint should be as per technical specification (will be decided during drawing approval).
- The finished coat shall be dried in stoving ovens in dust free atmosphere.
- Equipment finish shall be free from imperfections like pinholes, orange peels, runoff paint etc.

G. PACKING INSTRUCTION

I. PACKING:

- 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.
- 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.
- 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.
- 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".
- 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.
- Packing of conduits, pipes, Metsec channels shall be done with hessian bitumen coated polythene Kraft paper.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 27 of 31	

- 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.
- i) Mandatory spares items, if applicable, 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.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 28 of 31	

- 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”.
- 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 check list 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.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 29 of 31	

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 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 check list 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).
- (iv) Catalogue, datasheet, LM79 & 80 for LED Fixture.

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) 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's approval. BHEL 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.

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			PY55340	
			Rev. No.	01
			Sheet 30 of 31	

- 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 bidder at the time of technical scrutiny. For addition/reduction of quantity, unit rate quoted in the present offer 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
01	Weatherproof Illumination Package for TATA Kalinganagar	PY9755340017
02	Flameproof Illumination Package for TATA Kalinganagar	PY9755340025



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

Std. / Doc. Number

PY55340

Rev. No.	01
----------	----

Sheet 31 of 31

RECORD OF REVISIONS

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

Std. / Doc. Number

**Annexure-I to
PY55340**

Rev. No. 01

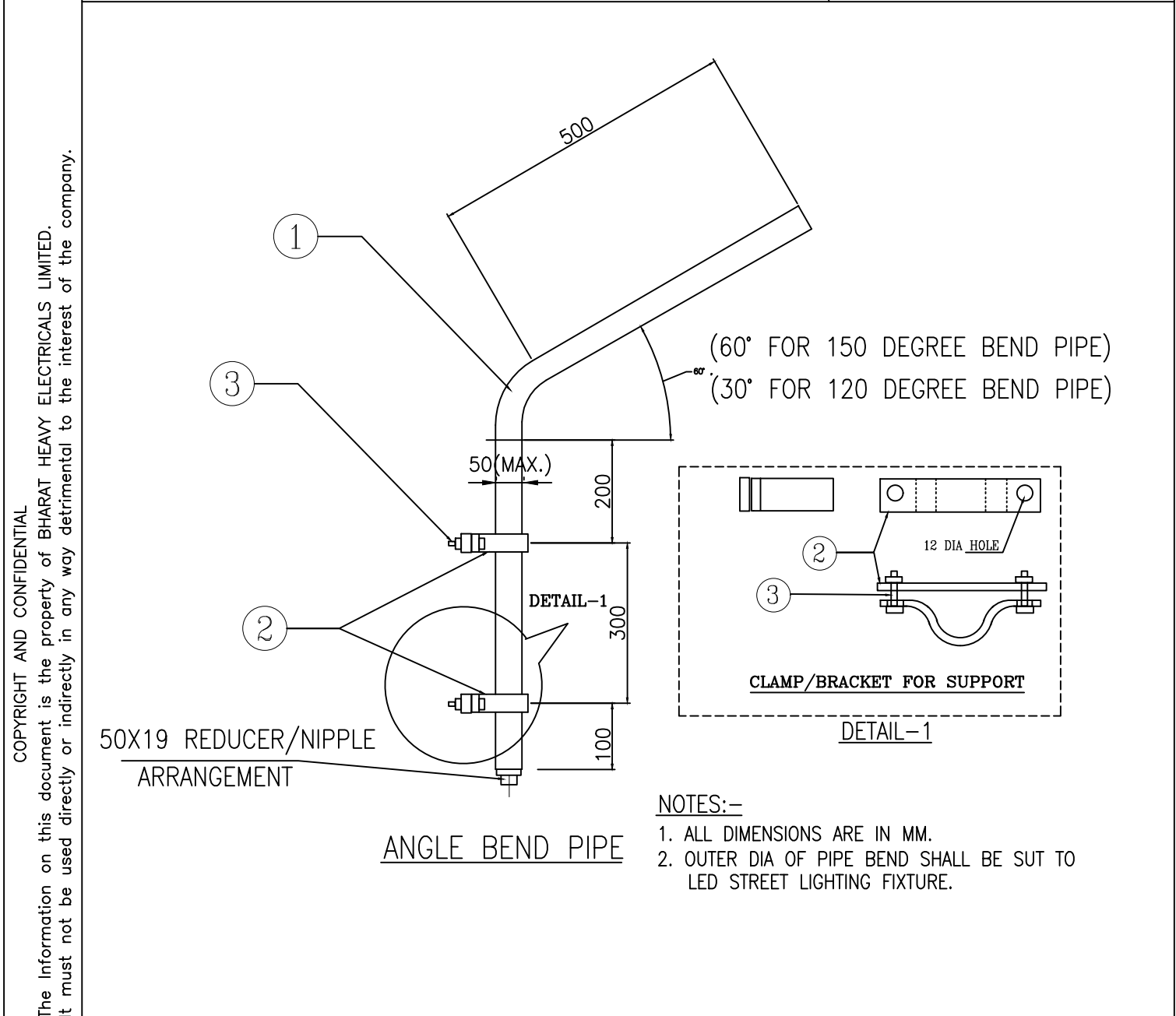
Sheet 1 of 3

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ANNEXURE – I

(TYPICAL ENGINEERING DRAWING OF MAJOR ILLUMINATION ITEMS)

DETAIL-2



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 MS CLAMP WITH BASE SUITABLE FOR COLUMN MOUNTING.	NO.	2
03	M10 NUTS AND BOLTS SUITABLE FOR CLAMP	NO.	04



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

Std. / Doc. Number

**Annexure-II to
PY55340**

Rev. No. 01

Sheet 1 of 3

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ANNEXURE – II
(ILLUMINATION BOM)

Project:-TATA-KALINGANAGAR ILLUMINATION BOQ			REV01
SITE CONDITION			
1. Design ambient temperature :- 45.0 Degree Celsius			
2. Relative humidity :- 95%			
3. Site Location:- Kalinganagar - Odisha			
PART-A:- BOQ FOR WEATHER PROOF ILLUMINATION PACKAGE (MATERIAL CODE - PY9755340017)			
SL NO.	DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)	UNIT	QTY.
A.1	Industrial LED Well Glass fixture (15W apprx, 220V DC) with minimum 1500 lumen output. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.	Nos	150
A.2	Industrial LED Well Glass fixture (35-45W apprx, 230V AC) with minimum 3500 lumen output. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.	Nos	950
A.3	LED Flood lighting Fixture (90 watt approx, 230V AC) with minimum 9000 lumen output. Fixture shall have integrated driver, heatsink and shall be supplied with suitable cable gland, Mounting hardware, Cu. lugs.	Nos	12
A.4	LED street lighting fixture (60W approx, 230V AC) with minimum 6000 lumen output. Fixture shall have integrated driver, heatsink and shall be supplied with Mounting hardware, Cu. lugs.	Nos	15
A.5	1200mm long 150 deg bend (50NB) pipe with 2 nos suitable clamp with base and anchoring bolts as indicated in the drawing at annexure-I. Outer dia of bend pipe shall be suitable for Street lighting fixture supplied with the package.	Nos	15
A.6	2 meter 50NB GI pole with 50NB Swan neck arrangement at the top. Pole shall be supplied with mounting accessories like U Bolt, Coupler etc. as per details at Annexure-I.	Nos	880
A.7	3-way JB (Thermoplastic or equivalent material) with 4 nos.terminal block (4sqmm). JB shall have cable entries with cable gland suitable for terminating 3Cx2.5sqmm armoured cable. Necessary cable gland, 2nos. stopper plug, cu. lugs and mounting hardware shall be supplied..	Nos	12
A.8	4 way 200x150x100mm rectangular sheet steel weatherproof JB (IP55) with four nos. Cable entry suitable for 3Cx2.5 sqmm. Cu. armoured cable along with cable glands, PVC gland hood. JB shall have Terminal block 4 nos. suitable for 6 sq.mm cu cable and shall be supplied with mounting hardware , suitable cu. lugs blanking plug/rubber grommet.	Nos	650
A.9	Weather proof Hot dip galvanised Junction box (IP55) for 3 Phase AC, 75KW motor	Nos	4
A.10	Weather proof Hot dip galvanised Junction box (IP55) for 3 Phase AC, 55KW motor	Nos	2
A.11	Weather proof Hot dip galvanised Junction box (IP55) for 2 Pole DC, 55KW motor	Nos	1
A.12	Weather proof Hot dip galvanised Junction box (IP55) for 2 Pole DC, 22KW motor	Nos	1
A.13	Wall/column mounted 6 way DC outdoor Lighting Panel with 32A DP MCB at incomer and 6Nos 10A DP MCB at outgoing and supplied with external canopy, necessary glands, Stopper plug etc. Panel shall have FRP/GI external canopy covering both side and top.	Nos	2
PART-B:- LIST OF ITEMS FOR FLAME PROOF ILLUMINATION PACKAGE (MATERIAL CODE - PY9755340025)			
SL NO.	DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)	UNIT	QTY.
B.1	Flameproof DC LED Well Glass fixture (35-45WApprox, 220VDC) with minimum 3500 lumen output, suitable for hazardous area Gas Group IIA & IIB and Zone 1 &2. Fixture shall be complete with integrated driver, heatsink, and shall be supplied with suitable FLP cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.	Nos	40
B.2	Flameproof LED Well Glass fixture (35-45WApprox, 230VAC) with minimum 3500 lumen output, suitable for hazardous area Gas Group IIA & IIB and Zone 1 &2. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable FLP cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.	Nos	290

B.3	Cable clamps suitable for 3Cx2.5sqmm Cu. Armoured Cable with base and hardware	Nos	10000
B.4	Cable clamps suitable for 3Cx6 sqmm Al. Armoured Cable with base and hardware	Nos	1000
B.5	Cable clamps suitable for 4Cx35 sqmm Al. Armoured Cable with base and hardware	Nos	1000
B.6	Flameproof Cast light alloy JB (200x150x100mm) suitable for Gas group IIA & IIB and Zone-1 &2 (IP65). JB Shall have Cable entries 4nos. suitable for 3Cx2.5 sqmm. Cu. armoured cable along with FLP Cable glands, PVC gland hood. JB shall also have Terminal block, 4 nos. suitable for 4 sq.mm Cu cable and shall be supplied with mounting hardware, suitable cu. lugs, Brass blanking plug.	Nos	225
B.7	Outdoor type (IP55) Industrial metal clad type 1Ph, 20A Socket with 20A rotary interlocked switch & Plug and 20A RCCB(30mA). Socket unit shall be supplied with external canopy, suitable cable gland & PVC gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.	Nos	60
B.8	Outdoor Type Flameproof 1-ph, 20A Socket with interlocked rotary switch & Plug and 20A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 &2. Socket unit shall be supplied with external canopy, suitable FLP Cable gland & PVC gland hood, mounting hardware, cu. lugs, Brass blanking plug.	Nos	16
B.9	Outdoor type (IP55) Industrial metal clad type 3-Ph+E, 63A (4-Pin) receptacle with interlocked rotary switch & Plug and and 63A RCCB(30mA). Receptacle unit shall be supplied with external canopy, suitable Cable gland & Gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.	Nos	20
B.10	Outdoor type Flameproof 3-Ph+E, 63A (4-pin) Receptacle with interlocked rotary switch & Plug and 63A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 &2. Receptacle unit shall be supplied with external canopy, suitable FLP Cable gland & Gland hood, mounting hardware, Cu. lugs, Brass blanking plug.	Nos	4
B.11	Outdoor type (IP-55) Industrial metal clad type 1-Ph, 24V, 10A Socket with rotary interlocked switch & Plug and 10A RCCB(30mA). Socket unit shall be supplied with suitable Cable gland & Gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.	Nos	18
B.12	Outdoor type Flameproof 1-Ph, 10A, 24V Socket with interlocked rotary switch & Plug and 10A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 &2. Socket unit shall be supplied with external canopy, Cable gland & Gland hood, mounting hardware, cu. lugs, Brass blanking plug.	Nos	8
B.13	Flameproof hand lamp of 20W LED (Approx.), suitable for Gas group IIA & IIB and Zone 1&2. Hand lamp shall be supplied with 50 Mtr PVC insulated metal braided 3Cx2.5sqmm flexible cable connected to hand lamp through FLP gland. Other end of cable shall have suitable plug for connecting to 24V socket.	Nos	12

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 the time of technical scrutiny. For addition/reduction of quantity, unit rate quoted in the present offer shall be considered.

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Illumination Items Package)	Std. / Doc. Number	
			Annexure-III to PY55340	
			Rev. No.	01
			Sheet 1 of 4	

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ANNEXURE – III

(UNPRICED PRICE SCHEDULE)

Project:- TATA-KALINGANAGAR		PRICE BREAKUP		REV01			
		Annexure-III to PY55340		Date:- 03.02.2020			
Enq. NO.:-							
Name of the Bidder:-							
Offer Ref. No.:-							
NOTE:-							
1. This format details the price weightage of items for the enquiry. No cognizance will be taken of any change made by bidder with respect to this format issued by BHEL and contents of this format shall prevail.							
2. Bids for Part-A & Part-B packages of the supply table below shall be evaluated separately on basis of grand total of package price quoted excluding GST. Total package price quoted shall be consist of basic price + packing & forwarding + freight + transit insurance.							
3. Bidder to filled in writing "Quoted" against each item of the package mentined in the format and submit along with technical offer as a token of his concurrence that all items were quoted along with unit prices. If 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.							
4. Vendor shall also fill up 8digit HSN code against each of the item in the unpriced price format and commercial offer.							
TABLE-1 FOR SUPPLY PACKAGES							
SL NO.	DESCRIPTION OF ITEM	UNIT	QTY.	TOTAL PRICE	QUOTED (YES/NO)		
A	PART-A:- WEATHERPROOF ILLUMINATION ITEMS PACKAGE (MATERIAL CODE - PY9755340017)	Set	1				
B	PART-B :- FLAMEPROOF ILLUMINATION ITEMS PACKAGE (MATERIAL CODE - PY9755340025)	Set	1				
WEIGHTAGES OF PART-A:- WEATHERPROOF ILLUMINATION PACKAGE (MATERIAL CODE - PY9755340017)							
SL NO.	DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)	HSN CODE (8DIGIT)	UNIT	QTY.	WEIGHT AGE	GST TAX SLAB	QUOTED (YES/NO)
A.1	Industrial LED Well Glass fixture (15W apprxx, 220V DC) with minimum 1500 lumen output. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.		Nos	150	0.0467		
A.2	Industrial LED Well Glass fixture (35-45W apprxx, 230V AC) with minimum 3500 lumen output. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.		Nos	950	0.3383		
A.3	LED Flood lighting Fixture (90 watt approx, 230V AC) with minimum 9000 lumen output. Fixture shall have integrated driver, heatsink and shall be supplied with suitable cable gland, Mounting hardware, Cu. lugs.		Nos	12	0.0088		
A.4	LED street lighting fixture (60W approx, 230V AC) with minimum 6000 lumen output. Fixture shall have integrated driver, heatsink and shall be supplied with Mounting hardware, Cu. lugs.		Nos	15	0.0089		
A.5	1200mm long 150 deg bend (50NB) pipe with 2 nos suitable clamp with base and anchoring bolts as indicated in the drawing at annexure-I. Outer dia of bend pipe shall be suitable for Street lighting fixture supplied with the package.		Nos	15	0.0021		
A.6	2 meter 50NB GI pole with 50NB Swan neck arrangement at the top. Pole shall be supplied with mounting accessories like U Bolt, Coupler etc. as per details at Annexure-I.		Nos	880	0.3367		
A.7	3-way JB (Thermoplastic or equivalent material) with 4 nos.terminal block (4sqmm). JB shall have cable entries with cable gland suitable for terminating 3Cx2.5sqmm armoured cable. Necessary cable gland, 2nos. stopper plug, cu. lugs and mounting hardware shall be supplied..		Nos	12	0.0022		

A.8	4 way 200x150x100mm rectangular sheet steel weatherproof JB (IP55) with four nos. Cable entry suitable for 3Cx2.5 sqmm. Cu. armoured cable along with cable glands, PVC gland hood. JB shall have Terminal block 4 nos. suitable for 6 sq.mm cu cable and shall be supplied with mounting hardware , suitable cu. lugs blanking plug/rubber grommet.		Nos	650	0.1921		
A.9	Weather proof Hot dip galvanised Junction box (IP55) for 3 Phase AC, 75KW motor		Nos	4	0.0262		
A.10	Weather proof Hot dip galvanised Junction box (IP55) for 3 Phase AC, 55KW motor		Nos	2	0.0101		
A.11	Weather proof Hot dip galvanised Junction box (IP55) for 2 Pole DC, 55KW motor		Nos	1	0.0094		
A.12	Weather proof Hot dip galvanised Junction box (IP55) for 2 Pole DC, 22KW motor		Nos	1	0.0066		
A.13	Wall/column mounted 6 way DC outdoor Lighting Panel with 32A DP MCB at incomer and 6Nos 10A DP MCB at outgoing and supplied with external canopy, necessary glands, Stopper plug etc. Panel shall have FRP/GI external canopy covering both side and top.		Nos	2	0.0119		
			Total Weightage		1.0000		
WEIGHTAGES OF PART-B:- :- FLAMEPROOF ILLUMINATION ITEMS PACKAGE (MATERIAL CODE - PY9755340025)							
B.1	Flameproof DC LED Well Glass fixture (35-45WApprox, 220VDC) with minimum 3500 lumen output, suitable for hazardous area Gas Group IIA & IIB and Zone 1 &2. Fixture shall be complete with integrated driver, heatsink, and shall be supplied with suitable FLP cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.		Nos	40	0.0612		
B.2	Flameproof LED Well Glass fixture (35-45WApprox, 230VAC) with minimum 3500 lumen output, suitable for hazardous area Gas Group IIA & IIB and Zone 1 &2. Fixture shall be complete with integrated driver, heatsink and shall be supplied with suitable FLP cable gland, Bracket, Pole reducer, Mounting hardware, Cu. lugs.		Nos	290	0.3940		
B.3	Cable clamps suitable for 3Cx2.5sqmm Cu. Armoured Cable with base and hardware		Nos	10000	0.0610		
B.4	Cable clamps suitable for 3Cx6 sqmm Al. Armoured Cable with base and hardware		Nos	1000	0.0068		
B.5	Cable clamps suitable for 4Cx35 sqmm Al. Armoured Cable with base and hardware		Nos	1000	0.0081		
B.6	Flameproof Cast light alloy JB (200x150x100mm) suitable for Gas group IIA & IIB and Zone-1 &2 (IP65). JB Shall have Cable entries 4nos. suitable for 3Cx2.5 sqmm. Cu. armoured cable along with FLP Cable glands, PVC gland hood. JB shall also have Terminal block, 4 nos. suitable for 4 sq.mm Cu cable and shall be supplied with mounting hardware, suitable cu. lugs, Brass blanking plug.		Nos	225	0.2751		
B.7	Outdoor type (IP55) Industrial metal clad type 1Ph, 20A Socket with 20A rotary interlocked switch & Plug and 20A RCCB(30mA). Socket unit shall be supplied with external canopy, suitable cable gland & PVC gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.		Nos	60	0.0278		
B.8	Outdoor Type Flameproof 1-ph, 20A Socket with interlocked rotary switch & Plug and 20A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 &2. Socket unit shall be supplied with external canopy, suitable FLP Cable gland & PVC gland hood, mounting hardware, cu. lugs, Brass blanking plug.		Nos	16	0.0217		
B.9	Outdoor type (IP55) Industrial metal clad type 3-Ph+E, 63A (4-Pin) receptacle with interlocked rotary switch & Plug and and 63A RCCB(30mA). Receptacle unit shall be supplied with external canopy, suitable Cable gland & Gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.		Nos	20	0.0824		
B.10	Outdoor type Flameproof 3-Ph+E, 63A (4-pin) Receptacle with interlocked rotary switch & Plug and 63A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 &2. Receptacle unit shall be supplied with external canopy, suitable FLP Cable gland & Gland hood, mounting hardware, Cu. lugs, Brass blanking plug.		Nos	4	0.0220		
B.11	Outdoor type (IP-55) Industrial metal clad type 1-Ph, 24V, 10A Socket with rotary interlocked switch & Plug and 10A RCCB(30mA). Socket unit shall be supplied with suitable Cable gland & Gland hood, mounting hardware, cu. lugs, blanking plug/Rubber grommet.		Nos	18	0.0084		

B.12	Outdoor type Flameproof 1-Ph, 10A, 24V Socket with interlocked rotary switch & Plug and 10A RCCB(30mA) suitable for Gas group IIA & IIB and Zone 1 & 2. Socket unit shall be supplied with external canopy, Cable gland & Gland hood, mounting hardware, cu. lugs, Brass blanking plug.		Nos	8	0.0109		
B.13	Flameproof hand lamp of 20W LED (Approx.), suitable for Gas group IIA & IIB and Zone 1&2. Hand lamp shall be supplied with 50 Mtr PVC insulated metal braided 3Cx2.5sqmm flexible cable connected to hand lamp through FLP gland. Other end of cable shall have suitable plug for connecting to 24V socket.		Nos	12	0.0206		
			Total Weightage		1.0000		



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

Std. / Doc. Number

**Annexure-IV to
PY55340**

Rev. No. 01

Sheet 1 of 4

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ANNEXURE – IV
(SUB VENDOR LIST)

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32	Annexure-IV to PY55340
		Rev 01
		Page 02 Of 03
SUB VENDOR LIST FOR ILLUMINATION PACKAGE		
PROJECT : TATA - KALINGANAGAR		
S.NO	ITEM DESCRIPTION	VENDOR
1	Flameproof Lighting Fixtures (AC & DC)	Havells
		Philips
		GE
		CGL
		SAFEX FLAMEPROOF CONTROLS (P) LTD
		PROMPT ENGINEERING WORKS, MUMBAI
		FLAMEPROOF EQUIPMENTS PVT. LTD.
		FCG FLAMEPROOF CONTROL GEARS
		BALIGA LIGHTING EQUIPMENTS (P)
		FCG POWER INDUSTRIES PVT LTD
		FLEXPRO ELECTRICALS PVT LTD
		Bajaj
2	Safe Area LED Light & Light Fittings (AC)	Havells
		Philips
		GE
		CGL
		Bajaj
3	Safe Area LED Light & Light Fittings (DC)	Havells
		Philips
		GE
		CGL
		Bajaj
		Pyrotech Electronics Pvt Ltd
3	Cable glands for safe Area	Tata Approved
		Electromac
		CCI
		Dowells
		Metal Craft Industries Rajkot
		Braco
		Commet
4	Cable glands for hazardous area	Baliga
		FCG FLAMEPROOF CONTROL GEARS
		FLAMEPROOF EQUIPMENTS PVT.LTD.
		PROMPT ENGINEERING WORKS, MUMBAI
		FCG POWER INDUSTRIES
		FLEXPRO ELECTRICALS PVT. LTD.
		UNITED AGRO ENGINEERING PVT. LTD
		CCI
		Electromac
		Dowells

SUB VENDOR LIST FOR ILLUMINATION PACKAGE		
PROJECT : TATA - KALINGANAGAR		
S.NO	ITEM DESCRIPTION	VENDOR
5	Junction Box (WP & FLP)	FCG Flame proof control gears limited
		FCG Power Industries Pvt. Ltd.
		Industrial Switchgear & Control
		Baliga
		Hensel (For thermolastic)
		PANAM CONTROLS,
		EX-PROTECTA
		FLAMEPROOF EQUIPMENTS PVT.LTD.
		PYROTECH ELECTRONICS PVT. LTD.
		SAFEX FLAMEPROOF CONTROLS (P) LTD
		Kaysons
		Stahl
6	Other Flameproof Items	FCG Flame proof control gears limited
		FCG Power Industries Pvt. Ltd.
		PROMPT ENGINEERING WORKS, MUMBAI
		Baliga
		FLAMEPROOF EQUIPMENTS PVT.LTD.
		Stahl
7	Timer	FLEXPRO ELECTRICALS PVT. LTD.
		Siemens
		BCH
		L&T
		Schneider - Telemechanique
8	MCBS	Alstom
		MDS
		GE India
		Standard
		Siemens
		L&T
		Schneider - Telemechanique
9	MCCBs	ABB
		L&T
		Siemens
		GE India
10	Control Transformer	ABB
		Indusree
		Adroit
		Kalpa
		Kappa
11	Terminal block	Anu Electricals
		Elmex
		Phoenik
		Connect well
		Schneider - Telemechanique
		Wago

SUB VENDOR LIST FOR ILLUMINATION PACKAGE		
PROJECT : TATA - KALINGANAGAR		
S.NO	ITEM DESCRIPTION	VENDOR
12	Cable Lugs	Dowells
		Phoenix
		Hex
		Connect well
13	Lighting Panel	C&S Electric
		Pyrotech Elect Pvt Ltd
		Indoasian
		Customer Approved

Note: Other items which are not appear in the above list shall be of reputed make with proven track record and manufactured in conformity to Indian Standard.



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

Std. / Doc. Number

Annexure-V to
PY55340

Rev. No. 01

Sheet 1 of 2

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ANNEXURE – V

(DEVIATION FORMAT)



**BHARAT HEAVY ELECTRICALS LIMITED
HYDERABAD -32**

Annexure-V to PY55340

Rev 01

Page 02 of 02

DEVIATION FORMAT

(TO BE FILLED BY BIDDER AND FURNISH ALONGWITH OFFER)

Project Name:-

Enquiry No.:-

Name of Bidder:-

Offer Reference No.:-

Sl.No	Item	Clause No. & Spec. No	Description as per specification	Deviation taken	Nature of Deviation	REMARKS

NOTES

1. Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule
2. Deviation Schedule constitutes this Sheet(with these Notes) duly signed & stamped.
3. Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored.
4. Additional sheets in the same format can be enclosed by the vendor, if necessary.
5. Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market.
6. No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
7. Reasons for the deviations shall be specified in the Remarks column.
8. If there are no deviations from the specifications, bidder still has to submit the Deviation Schedule by writing "NO Deviations" in this format.
9. If the "Deviation Schedule" is not submitted along with the offer, the bidder's offer is likely to be rejected without any further interaction with the bidder.

SIGNATURE OF BIDDER WITH SEAL & STAMP



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

Std. / Doc. Number

Annexure-VI to
PY55340

Rev. No. 01

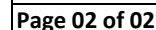
Sheet 1 of 2

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ANNEXURE – VI

(CHECK LIST OF BIDDER)



(TO BE FILLED BY BIDDER AND SUBMITTED ALONGWITH OFFER)

[illegible]



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

Std. / Doc. Number

**Annexure-VII to
PY55340**

Rev. No. 01

Sheet 1 of 11

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ANNEXURE – VII

**(QUALITY SYSTEM, TESTING &
INSPECTION REQUIREMENT)**

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

Std. / Doc. Number

**Annexure-VII to
PY55340**

Rev. No.

01

Sheet 2 of 11

**QUALITY SYSTEM, INSPECTION & TESTING OF EQUIPMENT AT
MANUFACTURER'S PREMISES****1. GENERAL:-**

- a) Inspection & testing of equipment shall be carried out by BHEL / CUSTOMER / BHEL appointed third party at the works of Vendor/Sub vendor during manufacturing and/or on final product to ensure conformity of the same with acceptable criteria of technical specifications, approve drawings, manufacturing drawing and acceptable national / international standards.
- b) Inspection & test carried out by BHEL or BHEL appointed third party shall not absolve the responsibility of the vendor to provide acceptable product as per terms of contract nor shall it preclude subsequent rejection.
- c) BHEL reserve the right to inspect any product at any stage of manufacturing beyond pre – identified stages & hold points of approve QAP.

2. QUALITY SYSTEM REQUIREMENTS

- a) The vendor must recognize the importance of quality and follow defined quality program in all stages of manufacturing and quality control activities of the product. Vendor must define and implement the tasks and control that will provide needed assurance for the procured components / items. All the brought out equipment or component shall be procured from vendors which are listed in the sub- vendor list.
- b) BHEL reserve the right to verify the quality programme of vendor & its sub vendors to ensure effectiveness of program to meet the intended and specified quality of the product.

3. QUALITY ASSURANCE PLAN

- a) The vendor shall furnish Quality assurance plan (QAP) for respective equipment after completion of detail engineering for BHEL approval.
- b) QAP shall be prepared & furnish by vendor as per guide lines mentioned at Annexure-XI.
- c) The vendor shall indicate procurement source and furnish following document to BHEL, during the submission of QAP for scrutiny & final approval by BHEL.
 - i. Copies of PO
 - ii. Technical specification
 - iii. BHEL approved GA drawings/ datasheets
 - iv. Detail manufacturer drawing
 - v. Back up reference materials
- d) The submission & subsequent approval of QAPs shall be ensured to be restricted to one round only.
- e) Inspection and test requirements shall be decided with due consideration of factors like safety, duty cycle, operating conditions, equipment life, environmental condition, place of installation and statutory regulation as applicable, for a particular equipment. Any additional type or special tests or routine tests if found necessary to establish the intended quality after detailed engineering then same shall have to be incorporated in the QAPs without any commercial implication.

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

Std. / Doc. Number

**Annexure-VII to
PY55340**

Rev. No.

01

Sheet 3 of 11

- f) The vendor shall submit documents to demonstrate that the vendor and his sub-vendors follow, QA/QC program meeting the requirements set forth in this section. Typical inspection requirements for some of the critical equipment are appended in this section of the specifications. These indicated requirements are minimum and from the BHEL's perspective. Vendor can review the same and supplement based on their experience and practice for all items.
- g) Detailed QAP shall be prepared by Vendor in consultation with their sub vendor/manufacturers to avoid any complicity later.

4. CALIBRATION OF MEASURING EQUIPMENT

- a) All the measuring equipment used for inspection & testing shall be calibrate and appropriate accuracy class of measuring equipment shall be used. Calibration standards used for calibration of measuring instrument shall be traceable to national standards of National Physical Laboratory (NP) with unbroken chains of comparison.
- b) Valid calibration certificates for all measuring instrument used during inspection and testing at manufacturer's works, with traceability to National standards of NPL/NABL accredited laboratories shall be furnished prior to undertaking inspection by BHEL.
- c) Calibration certificate shall also indicate reference no. of calibration standards calibrated by NPL/NABL accredited laboratories and copies of such calibration certificates of calibration standards shall be included in the complied dossiers of inspection/test result.

5. TEST CERTIFICATE AND DOCUMENT

- a) For each items being manufactured as per approved QAP, following test certificates and documents as applicable for each equipment/item, in the requisite copies including original, duly endorsed by the manufacturer/vendor with appropriate linkage to project, purchase order and acceptance criteria etc. shall be submitted to BHEL.
- Raw material identification & physical and chemical test certificates for all material used in manufacture of the equipment/item.
 - WPS, PQR & WPQ documents as per applicable code.
 - Details of stage wise inspection & rectification records of fabricated items, casting, forging and machined items.
 - Control dimension chart with records of alignment, squareness etc.
 - Manufacturer's material and performance/ relevant test certificate for all brought out items.
 - Details of heat treatment and stress relieving charts as per specification.
 - Non destructive test reports as per respective code.
 - Hardness test certificates.
 - Pressure/leakage test certificates.
 - Weather proof test certificates as per applicable codes.
 - Performance test certificates for all characteristics.
 - Routine/ type /calibration/acceptance/special test (Type test etc.) certificates.
 - Surface preparation and painting certificates.



PROJECT ENGINEERING & SYSTEMS DIVISION

(Technical Specification For Illumination Items Package)

Std. / Doc. Number

Annexure-VII to
PY55340

Rev. No.

01

Sheet 4 of 11

- xiv. Certificates from competent authority for the items coming under statutory regulations.(i.e. CIMFR, PESO, DGMS etc.
- xv. BIS license certificate.
- b) Where physical and chemical test certificates of material are not available, the vendor shall arrange to have specimens and test samples of the materials, tested in his own laboratory at his cost and submit copies of test results in requisite numbers to BHEL for review. Number of test samples against each batch of materials as applicable shall be as per relevant Indian or International standards.
- c) Where facilities for testing do not exist in the vendor or sub vendor's laboratories or in case of any dispute, samples and test pieces shall be drawn by the vendor in presence of BHEL or BHEL nominated third party and sealed sample shall be sent to any Govt. approve / NABL accredited laboratory for necessary tests at vendor's own cost.
- d) The BHEL shall have right to be present and witness all tests being carried out by the vendor/sub vendor/manufacturer at their own laboratory or approved laboratories. Also, the inspection team of BHEL shall reserve the right to call for confirmatory test on samples, at his discretion.
- e) Only latest edition of codes / standards and specification shall be used for materials and testing. The latest revision means the revision whose date of revision is closest to the contract date.

6. INTERNAL INSPECTION BY VENDOR/MANUFACTURER

- a) Inspection and tests shall be carried out by Vendor/manufacturer in accordance with BHEL approve drawings, Technical specification, PO and approve QAP. They shall maintain records of each inspection and test carried out and signed documents shall be submitted to BHEL for verification.
- b) The vendor shall carry out internal inspection & obtain clearance from statutory bodies e.g. IBR, CCE, TAC, weight & measures, safety, IE rules etc. prior to offering any equipment for BHEL inspection in accordance with approve QAP.
- c) The vendor shall identify all inspected equipment/items/raw material and shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification/rework, rejected etc.
- d) The vendor shall establish and maintain procedures to ensure that the product that does not conform to specified requirements is prevented from inadvertent dispatch. The description of non-conformity that has been accepted subsequently by BHEL by concession and/or repair shall be recorded.
- e) Repaired and reworked product shall be offered for re-inspection to BHEL along with records of corrective action taken.

7. METHOD OF UNDERTAKING INSPECTION & TESTING BY BHEL

- a) Inspection call shall be given only on readiness of the equipment/assembly and after approval of all relevant drawings and QAP.
- b) All documents like test certificates, internal inspection reports, PO, Technical specification, approve QAP, approve GA drawing/ datasheets, Manufacturing drawings, Inspection check list shall be arranged and handed over to inspector before inspection. **Inspection without above document shall be treated as incomplete.**
- c) The hard copy of such documents must also accompany a CD (comprising computer readable files) containing the identical documents.

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

Std. / Doc. Number

**Annexure-VII to
PY55340**

Rev. No.

01

Sheet **5** of **11**

- d) On receipt of inspection call pertaining to package equipment, QA & inspection group of BHEL shall organize inspection visit or will issue inspection assignment to BHEL approved third party (Based on the nearness to the manufacturer's works). For further inspecting pertaining to the same equipment, vendor may forward the subsequent inspection call to the concern inspection agency with a copy to QA & Inspection section of BHEL Hyderabad.

8. OBLIGATION OF VENDOR

- a) The vendor shall provide all facilities and ensure full and free access of the inspection Engineer of BHEL to their own or sub vendor's premises to facilitate him carry out inspection and testing of the product during manufacturing of the same.
- b) The vendor shall provide all instruments, tools, necessary testing & other inspection facilities to BHEL inspector free of cost for carrying out inspection.
- c) The vendor shall comply with instructions of BHEL fully and with promptitude.
- d) The cost of testing welds, radiographic and dye penetration tests etc. if applicable, in the fabrication workshop shall be borne by the vendor.
- e) The vendor shall ensure that the equipment/assembly/component require to be inspected, are not dispatched before inspection.
- f) Vendor shall submit Engineering design datasheet with necessary technical details and manufacturer design sketches of all offered items for review by BHEL and obtain approval for the same. It will be vendor's responsibility to revise the design as per the BHEL's observation made on the design datasheet in line with specification requirement till final approval is obtained. Vendor shall not proceed with manufacturing of item unless submitted design is approved by BHEL in all respect.
- g) Vendor may categorize some items for stage inspection with manufacturing of few sample item, if agreed by BHEL for clearance of mass production. After the mass production, vendor shall call BHEL for re- inspecting the lot. It will be vendor's responsibility to manufacture the item in line with inspected sample, BHEL will not be held responsible by anyway if the item is rejected due to deviation from sample item.
- h) For equipment not covered by any other approved standards, the tests to be carried out shall be in accordance with the Vendor's quality assurance program which to be agreed between the Vendor and the BHEL. Vendor shall furnish a comprehensive list of the tests for such items and include the same in the quality plan during offer.
- i) If vendor fails to furnish list of test to be carried out at vendor's works for items not covered by any approved standards, BHEL at his discretion may called for any test to be performed at vendor's works.
- j) Vendor is responsible for providing inspection check list as per attached format at annexure-VIII for each item to be inspected and get it endorsed by the inspector. Vendor shall submit signed copy of inspection check list along with other QAP documents as listed elsewhere to BHEL for their perusal.
- k) Dispatch clearance of any item will not be issued if vendor fails to provide satisfactory inspection checklist & test certificates and other quality related documents.

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 06 of 11	
MINIMUM INSPECTION REQUIREMENT					
FIXTURE					Action by BHEL
1. DOCUMENT		Purchase order, Technical specification of BHEL, BHEL approved drawings/documents/Datasheet,QAP, Consumables certificates and any special requirements			R
2. Materials	Enclosure, reflector, PVC Cables/wires, wire guard, gasket, bracket and brought out items	Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report			R
		If any specific / additional test requirements			R
3. In process inspection	Fabrication of enclosure, reflector, wire guard, bracket	Dimension, Drilling and weld quality			R
	Assembly of fixture	Dimension, cable opening, mounting arrangement			R
	Painting of fixture and finishing	Surface treatment, paint quality, finish colour, shade and thickness			R
	Wiring	Arrangement of terminal blocks, wiring continuity, clamping, Tag provision			R
5. Final inspection	Physical check	Fixture, internal & external reflector, Gasket, wire guard, Glass/acrylic cover, mounting arrangement , cable entries, IP class, Lamp holder type and voltage rating vs approved datasheet.			W
		Name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.			W
		Cable entry and terminal block size and type of cable gland used			W
		Make of fixture and accessories			W
		Paint quality, finish colour, shade and thickness			W
	Assembly check	lamp, reflector, cable gland, wire guard for proper fitment to the fixture.			W
	Functional check	Lamp with ballast & Control gear. For Non Integral type Fixture CG box shall be kept 30M away from lamp compartment.			W
		DC fixture with Convertor			W
	Document check	Material test certificate for all type of materials used, Painting quality test certificate, IP class test certificate, Routine test certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.			R
6. Packing & dispatch	Packing	Soundness of packing, preservation & documentation as per specification.			V
		Marking of packing for easy identification			V
	Dispatch	Format of Packing slip & quantity as per scope of supply			V
Abbreviations used : R- Review, W- Witness, V- Verify					

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 07 of 11
MINIMUM INSPECTION REQUIREMENT			
PANEL			Action By BHEL
1. DOCUMENT		Purchase order, Technical specification of BHEL, BHEL approved drawings/documents/Datasheet,QAP, Consumables certificates and any special requirements	R
2. Materials	Sheet, PVC cables/ wire, Channels & Frame, Brought out items etc.	Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report	R
		If any specific / additional test requirements	R
3. In process inspection	Fabrication of Panel	Dimension, Straightness, Drilling and weld quality	R
	Assembly of Panel	Dimension, Straightness, opening, Door clearance , mounting arrangement	R
	Painting of Panel and finishing	Surface treatment, paint quality, finish colour, shade and thickness	R
	Wiring	Arrangement of terminal blocks, wiring continuity, clamping, Ferrules terminals and Tag provision	R
5. Final inspection	Physical check	Panel dimension, rating, internal arrangement of components & wiring, mounting arrangement , cable entries, IP class and voltage rating vs approved datasheet, sheet gauge .	W
		Name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc., Component leveling , circuit diagram, warning label.	W
		Cable entry and terminal block size and type of cable gland used	W
		Make of Panel, sub component and accessories	W
		Paint quality, finish colour, shade and thickness	W
	Functional check	Circuit functional check, Routine test, continuity check.	W
		ELCB/RCCB functional check	W
	Document check	Material test certificate for all type of materials used, Painting quality test certificate, gasket material certificate, IP class test certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.	R
		Routine test certificates like HV Test, Insulation measurement before & after HV test, Continuty test, Functional test.	W
6. Packing & dispatch	Packing	Soundness of packing, preservation & documentation as per specification.	V
		Marking of packing for easy identification	V
	Dispatch	Format of Packing slip & quantity as per scope of supply	V
Abbreviations used : R- Review, W- Witness, V- Verify			

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 08 of 11	
MINIMUM INSPECTION REQUIREMENT					
JUNCTION BOXES					Action By BHEL
1. DOCUMENT			Paint quality , finish colour, shade and thickness		R
2. Materials	Sheet, Channels & Frame, Brought out items etc.		Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report		R
			If any specific / additional test requirements		R
3. In process inspection	Fabrication of JB		Dimension, Straightness, Drilling and weld quality		R
	Assembly of JB		Dimension, Straightness, opening, Door clearance , mounting arrangement		R
	Painting of JB and finishing		Surface treatment, paint quality, finish colour, shade and thickness		R
	Wiring		Arrangement of terminal blocks		R
5. Final inspection	Physical check		JB dimension, rating, mounting arrangement , cable entries, IP class and voltage rating vs approved datasheet, Sheet Gauge.		W
			Name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.		W
			Cable entry and terminal block size and type of cable gland used		W
			Make of JB, sub component and accessories		W
			Paint quality , finish colour, shade and thickness		W
	Document check		Material test certificate for all type of materials used, Painting quality test certificate, IP class test certificate, gasket certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.		R
			Routine test certificates like HV Test, Insulation measurement before & after HV test, Secondary current injection test if applicable.		W
6. Packing & despatch	Packing		Soundness of packing, preservation & documentation as per specification.		V
			Marking of packing for easy identification		V
	Dispatch		Format of Packing slip & quantity as per scope of supply		V
Abbreviations used : R- Review, W- Witness, V- Verify					

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 09 of 11	
MINIMUM INSPECTION REQUIREMENT					
POWER SOCKET					Action By BHEL
1. DOCUMENT		Purchase order, Technical specification of BHEL, BHEL approved drawings/documents/Datasheet,QAP, Consumables certificates and any special requirements			R
2. Materials	Sheet, PVC cables/ wire, Channels & Frame, Brought out items etc.	Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report			R
		If any specific / additional test requirements			R
3. In process inspection	Fabrication of socket	Dimension, Straightness, Drilling and weld quality			R
	Assembly of Socket	Dimension, Straightness, opening, Door clearance , mounting arrangement			R
	Painting of Socket and finishing	Surface treatment, paint quality, finish colour, shade and thickness			R
	Wiring	Arrangement of terminal blocks, wiring continuity, clamping, Ferrules terminals and Tag provision			R
5. Final inspection	Physical check	Socket rating, internal arrangement of components & wiring, mounting arrangement , cable entries, IP class and voltage rating vs approved datasheet.			W
		Name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.			W
		Cable entry and terminal block size and type of cable gland used			W
		Make of Socket, sub component and accessories			W
		Paint quality, finish colour, shade and thickness			W
	Functional check	Circuit functional check, continuity check.			W
		Plug & Socket interlocking check			W
	Document check	Material test certificate for all type of materials used, Painting quality test certificate, IP class test certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.			R
		Routine test certificates like HV Test, Insulation measurement before & after HV test, Secondary current injection test if applicable.			W
6. Packing & dispatch	Packing	Soundness of packing, preservation & documentation as per specification.			V
		Marking of packing for easy identification			V
	Dispatch	Format of Packing slip & quantity as per scope of supply			V
Abbreviations used : R- Review, W- Witness, V- Verify					

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 10 of 11	
MINIMUM INSPECTION REQUIREMENT					
POLES					Action By BHEL
1. DOCUMENT			Purchase order, Technical specification of BHEL, BHEL approved drawings/documents/Datasheet,QAP, Consumables certificates and any special requirements		R
2. Materials	Pipe		Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report		R
			If any specific / additional test requirements		R
3. In process inspection	Fabrication of Pole		Dimension, Straightness, Drilling and weld quality		R
	Assembly of Pole		Dimension, Straightness, Rigidity of different section joint		R
	Painting of Pole and finishing		Surface treatment, paint quality, finish colour, shade and thickness		R
5. Final inspection	Physical check		Dimension, assemble Check of different components, finishing		W
			Sub component like JB/Marshalling box Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.		W
			Marshalling Box/JB Cable entry and terminal block size and type of cable gland used		W
			Make of JB/Marshalling box, sub component and accessories		W
			Paint quality, finish colour, shade and thickness		W
	Document check		Material test certificate for all type of materials used, routine test certificate, Painting quality test certificate. For JB/ Marshalling Box - IP class test certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.		R
			For JB/Marshalling box:- Routine test certificates like HV Test, Insulation measurement before & after HV test, Secondary current injection test, if applicable		R
6. Packing & dispatch	Packing		Soundness of packing, preservation & documentation as per specification.		V
			Marking of packing for easy identification		V
	Dispatch		Format of Packing slip & quantity as per scope of supply		V
Abbreviations used : R- Review, W- Witness, V- Verify					

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32		Annexure-VII to PY55340 Rev 01 Page 11 of 11	
MINIMUM INSPECTION REQUIREMENT					
MISC. ITEM					Action By BHEL
1. DOCUMENT		Purchase order, Technical specification of BHEL, BHEL approved drawings/documents/Datasheet,QAP, Consumables certificates and any special requirements			R
2. Materials		Material test certificates, Inspection authority stamp correlation with material & TPI stamp verification, manufacturer guarantee certificate and routine test report			R
		If any specific / additional test requirements			R
3. In process inspection	Fabrication	Dimension, Straightness, Drilling and weld quality			R
	Assembly	Dimension, Straightness, opening, Door clearance , mounting arrangement			R
	Painting and finishing	Surface treatment, paint quality, finish colour, shade and thickness			R
	Wiring	Arrangement of terminal blocks, wiring continuity, clamping, Ferrules terminals and Tag provision			R
5. Final inspection	Physical check	Rating, internal arrangement of components & wiring, mounting arrangement , cable entries, IP class and voltage rating vs approved datasheet.			W
		Name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.			W
		Cable entry and terminal block size and type of cable gland used			W
		Make of main item, sub component and accessories			W
		Paint quality, finish colour, shade and thickness			W
	Functional check	Circuit functional check, continuity check.			W
	Document check	Material test certificate for all type of materials used, Painting quality test certificate, IP class test certificate, BIS License copy if applicable, Test certificates from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS for flame proof item, Guarantee/Warranty certificate.			R
		Routine test certificates like HV Test, Insulation measurement before & after HV test, Secondary current injection test if applicable.			W
6. Packing & dispatch	Packing	Soundness of packing, preservation & documentation as per specification.			V
		Marking of packing for easy identification			V
	Dispatch	Format of Packing slip & quantity as per scope of supply			V
Abbreviations used : R- Review, W- Witness, V- Verify					



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

Std. / Doc. Number

**Annexure-VIII to
PY55340**

Rev. No. 01

Sheet 1 of 07

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ANNEXURE – VIII

(INSPECTION CHECK LIST FORMAT)

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32								Annexure-VIII to PY55340 Rev 01 Page 02 of 07	
INSPECTION CHECK LIST FOR LIGHTING FIXTURE											
BHEL PO NO :											
Item PO.SL.No.											
PROJECT											
Description of Item											
Qty											
Referred BHEL Spec. NO.											
Referred Approved datasheet No.											
Name of the inspector											
Date of Inspection											
Points to check during Inspection in addition to applicable QAP/ IS requirements :					Inspector remarks				Inspector signature/date		
I Physical Checks :											
1	Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL). Please note that item not to be inspected without stamped and signed approved datasheet from BHEL.										
2	Physical check of Fixture along with all components like internal & external reflector, Gasket, wire guard, Glass/acrylic cover, mounting arrangement , cable entries, IP class, and voltage range etc. as per approved datasheet. Check the lamp holder type(i.e. Bi pin or screw type) is as per approved datasheet and suitable for lamp.										
3	Check the paint shed of fixture including accessories and quality of painting as per approved datasheet.										
4	Physical check of Material composition, dimension and thickness of enclosure, reflector etc. as mentioned in the datasheet. Also check finishing of end product.										
5	Physical check that accessories like cable glands are of approved make as per sub vendor list or BHEL. Spec.										
6	Physical verification of name plate for correct entries of Model No. Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.										
7	Suitability check of lamp for proper fitment to the fixture.										
8	Quantity check for loose accessories to be supplied along with fixture as per supply BOQ listed in datasheet.										
9	Check the size and type of Cable gland as per approved datasheet if applicable (i.e. FLP or safe area DC Brass suitable for 3Cx2.5 sqmm cu. Armoured cable)										
10	Suitability check of Cable gland with fixture cable entry if applicable										
11	Physical Check of DC to AC convertor along with it's enclosure for proper fitment and internal wiring(Applicable for DC Fixture with CFL Lamp)										
12	Suitability check of cable gland with Converter enclosure cable entry (Applicable for DC Fixture with CFL Lamp)										
13	Physical Check of Control gear box for proper type suitable for fixture (Applicable for Non integral type fixture)										
14	Suitability check of cable gland with CG box cable entry (Applicable for Non integral type fixture)										
15	Physical check of blanking plug (Aluminum) for proper fitment with Fixture enclosure, CG box cable entry if applicable.										
16	Physical check of terminal block for proper size suitable for terminating of two nos. 2.5 sqmm cu. Wire.										
17	Review of test certificate from CIMFR or equivalent laboratory, certified by NABL & approved from PESO/DGMS(details as mentioned in approved data sheet), for fixture, CG box and enclosure of converter as applicable(Applicable for Flame proof items only).										
18	Review of test certification for weather proof fixture, CG box and enclosure of converter as applicable(Applicable for weather proof items only with minimum IP52 protection).										
19	Physical verification of packing slip (For all line items including accessories to be supplied in loose.).										
20	Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.										
II Functional checks :											
1	Functional check on suitability of fixture and lamp for rated Supply voltage along with accessories like ballast CG box etc. .										
2	Functional check on suitability of DC convertor for rated DC voltage of project and lamp .(Applicable for DC Fixture with CFL Lamp)										

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32								Annexure-VIII to PY55340 Rev 01 Page 03 of 07	
INSPECTION CHECK LIST FOR LIGHTING PANEL											
BHEL PO NO :											
Item PO.SL.No.											
PROJECT											
Description of Item											
Qty											
Referred BHEL Spec. NO.											
Referred Approved datasheet No.											
Name of the inspector											
Date of Inspection											
Points to check during inspection in addition to applicable QAP/ IS requirements :						Inspector remarks			Inspector signature/date		
1		Physical Checks :									
1		Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL). Please note that item not to be inspected without stamped and signed approved datasheet from BHEL.									
2		Physical check of lighting panels alongwith all components like MCB, RCCB, Bus bars, external canopy(if applicable), Gasket etc. as per approved datasheet.									
3		Physical check of mounting arrangement , cable entries, IP class, and voltage range, etc. as per approved datasheet.									
4		Physical check of Material composition, dimension and thickness of enclosure, canopy(if applicable) etc. as mentioned in the datasheet. Also check finishing of end product.									
5		Check that all components are leveled and outgoing and incoming circuits are numbered at terminal blocks.									
6		Check the paint shed of Lighting panel including accessories and quality of painting as per approved datasheet.									
7		Physical verification of availability of name plate for correct entries of Model No. manufacturer name, Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc.									
8		Physical verification of availability of circuit diagram inside the front cover as per internal wiring of lighting panel. Also check that caution plate is available on front cover.									
9		Physical verification of availability of external canopy for outdoor type panel and its assymble check with lighting panel.(Applicable for outdoor type panel only).									
10		Quantity check for loose accessories to be supplied along with lighting panel as per supply BOQ listed in datasheet.									
11		Check the make, size and type of Cable gland (i.e. FLP, Double compression brass)as per approved datasheet. Please note Cable gland shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.									
12		Suitability check of Cable gland with lighting panel cable entry									
13		Physical check of Make, type & rating of MCB/MCCB/RCCB etc. as per approved datasheet. Please note MCB/RCCB/MCCB etc. shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.									
14		Physical check of blanking plug (Aluminum) for proper fitment with lighting panel cable entry.									
15		Physical check of Make, type & size of terminal block as per approved datasheet. Please note terminal block shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.									
16		Review of test certificate from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS(details as mentioned in approved data sheet) (Applicable for Flame proof items only).									
17		Review of IP class test certification (Applicable for item with minimum IP42 and higher protection).									
18		Physical verification of packing slip (For all line items including accessories to be supplied in loose.).									
19		Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.									

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32								Annexure-VIII to PY55340 Rev 01 Page 04 of 07	
INSPECTION CHECK LIST FOR POWER SOCKET AND RECEPTACLE											
BHEL PO NO :											
Item PO.SL.No.											
PROJECT											
Description of Item											
Qty											
Referred BHEL Spec. NO.											
Referred Approved datasheet No.											
Name of the inspector											
Date of Inspection											
	Points to check during inspection in addition to applicable QAP/IS requirements :					Inspector remarks				Inspector signature/date	
I	Physical Checks :										
1	Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL). Please note that item not to be inspected without stamped and signed approved datasheet from BHEL.										
2	Physical check of Power sockets along with all components like MCB, Plug assembly, external canopy(if applicable), Gasket etc. as per approved datasheet.										
3	Physical check of mounting arrangement , cable entries, IP class, and voltage range, etc. as per approved datasheet.										
4	Physical check of Material composition, dimension and thickness of enclosure, canopy(if applicable) etc. as mentioned in the datasheet. Also check finishing of end product.										
5	Check the paint shed of Socket/Receptacle including accessories and quality of painting as per approved datasheet.										
6	Physical verification of availability of name plate for correct entries of Model No. manufacturer name, Type, Classification details (i.e. FLP/WP etc.) IP class and voltage /Current rating etc. as per spec.										
7	Physical verification of availability of external canopy for outdoor type Socket/Receptacle (If asked in Datasheet) and its assembly check with Socket enclosure.(Applicable for outdoor type Socket/Receptacle only).										
8	Quantity check for loose accessories to be supplied along with Socket/Receptacle as per supply BOQ listed in datasheet.										
9	Check the make, size and type of Cable gland (i.e. FLP, Double compression brass)as per approved datasheet. Please note that Cable gland shall be of approved make as per sub vendor list or as mentioned in the vendor list/Illumination spec.										
10	Suitability check of Cable gland with Socket/Receptacle cable entry for proper fitment.										
11	Check interlocking arrangement of plug & socket (If asked in the data sheet).										
12	Physical check of blanking plug (Aluminum) for proper fitment with Socket/receptacle cable entry.										
13	Physical check of size of terminal block as per approved datasheet.										
14	Review of test certificate from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS (details as mentioned in approved data sheet) (Applicable for Flame proof items only).										
15	Review of IP class test certification for weather proof outdoor type Socket/Receptacle(Applicable for weather proof items only with minimum IP52 protection).										
16	Physical verification of packing slip (For all line items including accessories to be supplied in loose.).										
17	Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.										

		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32								Annexure-VIII to PY55340 Rev 01 Page 05 of 07	
INSPECTION CHECK LIST FOR LIGHTING POLE											
BHEL PO NO :											
Item PO.SL.No.											
PROJECT											
Description of Item											
Qty											
Referred BHEL Spec. NO.											
Referred Approved datasheet No.											
Name of the inspector											
Date of Inspection											
Points to check during Inspection in addition to applicable QAP/ IS requirements :						Inspector remarks			Inspector signature/date		
I		Physical Checks :									
1		Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL). Please note that item not to be inspected without stamped and signed approved datasheet from BHEL.									
2		Physical check of Poles along with all components like GI Pipe, Marshalling/Junction Box, arm, Swan neck, reducer, coupler etc. as per approved datasheet.									
3		Physical check of mounting arrangement , cable entries, IP class of marshalling /Junction box (for Street/Flood lighting pole) as per approved datasheet.									
4		Physical check of Material composition, dimension and thickness of different section of poles, accessories (as applicable) etc. as mentioned in the datasheet. Also check finishing of end product.									
		Physical check of availability of cable entry holes at different locations in the poles as per approved data sheet. Also check the size of holes for their suitability of required usage.									
5		Check the painting of poles and Marshalling box/ junction box including canopy(if applicable) and quality of painting as per approved datasheet or Illumination spec.									
6		Physical verification of availability of name plate in the Marshalling box/Junction box for correct entries of Model No. manufacturer name, Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc (Applicable for street & Flood lighting poles)									
7		Physical verification of availability of external canopy for marshalling box/ JB (if asked in data sheet)(Applicable for street & Flood lighting poles).									
8		Quantity check for loose accessories to be supplied along with Poles as per supply BOQ listed in datasheet.									
9		Check the make, size and type of Cable gland (i.e. FLP, Double compression brass) to be supplied along with marshalling box/Junction box as per approved datasheet(Applicable for street & Flood lighting poles). Please note Cable gland shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.									
10		Suitability check of Cable gland with cable entries at Marshalling/Junction box (Applicable for street & Flood lighting poles).									
11		Physical check of blanking plug (Aluminum) for proper fitment with Marshalling/Junction box cable entry (Applicable for street & Flood lighting poles).									
12		Physical check of Make, type & size of terminal block in the marshalling/Junction box as per approved datasheet (Applicable for street & Flood lighting poles).Please note terminal block shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.									
13		Review of test certificate from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS (details as mentioned in approved data sheet) (Applicable for Flame proof items only).									
14		Review of test certification for weather proof Marshalling/ Junction box (Applicable for street & Flood lighting poles).									
15		Physical verification of packing slip (For all line items including accessories to be supplied in loose.).									
16		Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.									
II		Assembly checks :									
1		Assemble the different part of poles and check for alignment and suitability of each parts of pole as per approved datasheet.									
2		Check for suitability of fitment different type of reducer (to be supplied against different type of fixture) to lighting pole Swan neck end (reducer 50/20). (Applicable for 2M, 3.75 & 4.75M pole with swan neck).									

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32										Annexure-VIII to PY55340 Rev 01 Page 06 of 07	
	INSPECTION CHECK LIST FOR MISC. ITEMS											
	BHEL PO NO : Item PO.SL.No. PROJECT Description of Item Qty Referred BHEL Spec. NO. Referred Approved datasheet No. Name of the inspector Date of Inspection											
	Points to check during Inspection in addition to applicable QAP/ IS requirements :						Inspector remarks				Inspector signature/date	
I	Physical Checks :											
1	Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL).											
2	Physical check the items alongwith all components for technical compatibility as per approved datasheet and Illumination spec.											
3	Physical check of Material composition, thickness, dimension, shape etc. as mentioned in the datasheet. Also check finishing of end product.											
4	Check the paint shed of items (if applicable) and quality of painting as per approved datasheet.											
5	Physical verification of availability of name plate for correct entries of Model No. manufacturer name, Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc (If applicable).											
6	Suitability check of all sub component of the item (If applicable).											
7	Quantity check for loose accessories to be supplied along with the item as per supply BOQ listed in datasheet.											
8	Check the make, size and type of Cable gland (i.e. FLP, Double compression brass) if supplied as per approved datasheet. Please note Cable gland shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.											
9	Suitability check of Cable gland with cable entries of equipment (If applicable).											
10	Physical check of Make, type & size of terminal block as per approved datasheet. Please note terminal block shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.											
11	Review of test certificate from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS(details as mentioned in approved data sheet) (Applicable for Flame proof items only).											
12	Review of test certification for weather proof (Applicable for weather proof items only with minimum IP52 protection).											
13	Physical verification of packing slip (For all line items including accessories to be supplied in loose.).											
14	Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.											
II	Functional checks :											
1	Functional check to be carried out on items like 24V Module & Hand lamp, Remote Emergency light etc. to ascertain their suitability of intend use.											
II	Assembly checks :											
1	Assembly check to be carried out on items like METSEC channel to ascertain the alignment and suitability of different component/accessories for intend use.											

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32										Annexure-VIII to PY55340
											Rev 01
											Page 07 of 07
INSPECTION CHECK LIST FOR JUNCTION BOX											
BHEL PO NO :											
Item PO.SL.No.											
PROJECT											
Description of Item											
Qty											
Referred BHEL Spec. NO.											
Referred Approved datasheet No.											
Name of the inspector											
Date of Inspection											
	Points to check during inspection in addition to applicable QAP/ IS requirements :						Inspector remarks			Inspector signature/date	
I	Physical Checks :										
1	Check availability of applicable spec. & approved datasheet (Approved as Code 1 or Code-2 by BHEL). Please note that item not to be inspected without stamped and signed approved datasheet from BHEL.										
2	Physical check of Junction box along with all components like terminal blocks, external canopy(if applicable), Gasket etc. as per approved datasheet.										
3	Physical check of mounting arrangement , cable entries, IP class, and voltage range, etc. as per approved datasheet.										
4	Physical check of Material composition, dimension and thickness of enclosure, canopy(if applicable) etc. as mentioned in the datasheet. Also check finishing of end product.										
5	Check the paint shed of junction box including canopy(if applicable) and quality of painting as per approved datasheet.										
6	Physical verification of availability of name plate for correct entries of Model No. manufacturer name, Type, Classification details (i.e. FLP/WP etc.) IP class and voltage range etc as per approved datasheet.										
7	Physical verification of availability of external canopy for outdoor type JB and its assemble check with JB(Applicable for outdoor type JB only).										
8	Quantity check for loose accessories to be supplied along with lighting JB as per supply BOQ listed in datasheet.										
9	Check the make, size and type of Cable gland (i.e. FLP, Double compression brass)as per approved datasheet. Please note Cable gland shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.										
10	Suitability check of Cable gland with cable entries at Junction box.										
11	Physical check of blanking plug (Aluminum) for proper fitment with Junction box cable entry.										
12	Physical check of Make, type & size of terminal block as per approved datasheet. Please note terminal block shall be of approved make as per sub vendor list or as mentioned in the Illumination spec.										
13	Review of test certificate from CIMFR or equivalent laboratory certified by NABL & approved from PESO/DGMS(details as mentioned in approved data sheet) (Applicable for Flame proof items only).										
14	Review of test certification for weather proof outdoor type JB (Applicable for weather proof items only with minimum IP52 protection).										
15	Physical verification of packing slip (For all line items including accessories to be supplied in loose.).										
16	Physical check of packing of all items including accessories are as per packing method mentioned in the illumination spec.										



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

Std. / Doc. Number

**Annexure-IX to
PY55340**

Rev. No. 01

Sheet 1 of 02

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ANNEXURE – IX

(TYPICAL PACKING SLIP FORMAT)

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD -32					Annexure-IX to PY55340	
						Rev 01	
	PACKING SLIP FORMAT					Page 02 of 02	
Project Name							
PO No. & Date :-							
Consignment No. & Date :-							
1	2	3	4	5	6	7	8
PO SL NO	ITEM DESCRIPTION	TYPE OF PACKING	Identification No. Of the Packing	Qty/pack	Total Qty supplied	NO Of Packet	Remarks
SUMMERY							
NO. OF CARTOON BOX							
NO. OF GUNNY BAG							
NO. OF BUNDLE OF POLES/CONDUIT							
NOTE:							
1. In packing detail at column 3 write type of the Packing used (i.e.Cartoon box, Gunney Bag, Bundle.etc.).							
2. In packing detail at column 4 write identification nos. of the Packing (i.e. PO NO/1,2,3....etc.).							
3. If item supplied as loose write only Identification no. assign to whole lot at column - 4 and write"loose supplied" in remarks column.							
4. Write qty of item packed in a Packet at column 5.							Vendor's sign with stamp
5. Write total qty. of item supplied at column 6.							
6. Write total no. of packet used for packing the supplied item at column 7.							
7. Write any special remarks in the remarks column at 8 (i.e. Acessories of item etc.)							



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

Std. / Doc. Number

**Annexure-X to
PY55340**

Rev. No. 01

Sheet 1 of 04

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ANNEXURE – X

(GUIDE LINES FOR PREPARATION OF QUALITY ASSURANCE PLAN)

TD-201 Rev No. 00 Form No.		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE-X to PY 55340
			Rev No. 01
			Page 2 of 4
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	QAP GUIDELINES & FORMAT (ANNEXURE-X TO SPECIFICATION PY 55340) The QAP format and Guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.		

Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE-X to PY 55340
			Rev No. 01
			Page 3 of 4
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<u>GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN</u> 1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10. 2. Each page of QAP shall contain the following information. a) Vendor's name & address. b) Customer: BHEL, Hyderabad. c) Project. d) BHEL Product Standard Number/revision number as referred in P.O. e) BHEL Purchase Order Number & Date. f) Product as per P.O. description. g) QAP Number (unique and shall not repeat)/revision number/date. h) Page number and number of pages 3. QAP shall contain four parts / stages as follows. a) Raw materials and bought out items. b) In process Control / Inspection. c) Final assembly, Inspection & Testing. d) Painting, preservation & packing. 4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc). 5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.) 6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic. 7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.) 8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.) 9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept. 10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.		
	Ref. Doc		

	Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE-X to PY 55340 Rev No. 01 Page 3 of 4
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		11. Please refer 'Agency' in QAP format. Under P: Perform, W: Witness, V: Verify Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR 2: (Vendor / Sub vendor) Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code1. 12. Under 'D' please put (☐ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification. 13. Vendor's signature & stamp should be available on each page of QAP. 14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings. 15. The following operations/characteristics/check points may be included (AS APPROPRIATE) a) Visual check b) Dimensional check c) Mechanical and Chemical properties. d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.) e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc. f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc. g) Verification of test certificate for protection class for the enclosures. h) Mechanical functioning of switches. i) Continuity of earthing and provision of earth points. j) Colour coding of wiring, size, tightness & dressing of wiring. k) Review of test certificates of assembled items, raw materials, internal test reports etc. l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc. m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc. n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.) o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests. p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating) q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole. r) Packing and Preservation.		
	Ref. Doc	16. <u>QAP Format enclosed.</u>		

VENDOR'S NAME & ADDRESS:			MANUFACTURING QUALITY PLAN						QP. NO.:				
									REV NO:		DATE:		
			CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:			BHEL P.O.NO.: P.O.DATE: BHEL SPEC:			REV:			PAGE 1 OF 1	
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
2.0	INPROCESS INSPECTION												
3.0	FINAL INSPECTION & TESTING												
4.0	PRESERVATION & PACKING												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP