

PROJECT: 3 x 800 MW PVUNL PATRATU TPP

PACKAGE: LIGHTING FIXTURES, LAMPS & MISC. ITEMS

ITEM: HIGH MAST FIXTURES

BOQ

MAIN SUPPLY:

SL. No.	ITEM DESCRIPTION	HSN CODE	UNIT	QUANTITY	REMARKS
1	Luminaire Type SF66 (LED)	9405	Nos.	1	Complete Fixture set required including Driver

PROJECT: 3 x 800 MW PVUNL PATRATU TPP

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ITEM: HIGH MAST FIXTURES

BOQ

MANDATORY SPARES:

SL. No.	ITEM DESCRIPTION	HSN CODE	UNIT	QUANTITY	REMARKS
1	Luminaire Type SF66 (LED)	9405	Nos.	1	Complete Fixture set required including Driver
2	Luminaire Type SF66 (LED) Driver	9405	Nos.	1	Only Driver required



PRE-QUALIFICATION REQUIREMENTS FOR FLOOD LIGHT FIXTURE FOR HIGH MAST

ITEMS : Flood light Fixture (150 W and above)

SCOPE: Supply: YES; Erection & Commissioning: NO.

1	Vendor should be manufacturer of applicable type of LED fixture.
2	Availability of type test certificates conducted at independent lab or witnessed by third party for applicable type of LED fixture as per IS 10322.
3	Availability of test reports (witnessed by third party) to establish in-house capability to carry out all routine and acceptance test as per IS 10322 / IS 16106 / IS 16107.
4	<p>Option -1: Performance / Experience certificates for min. 1 year of trouble free operation at minimum 2 different installations/sites for applicable type of fixture. Performance certificate should be from end user only.</p> <p>OR</p> <p>Option-2 : Repeat orders received from two different purchasers/end users for applicable type of fixture during last 5 years provided the gap between award of two PO's is minimum 1 year.</p> <p>OR</p> <p>Option-3 : 1 no. performance certificate (as per Option-1) and 1 no. repeat order (as per Option-2)</p>
5	Capacity of manufacturing 100 nos. of applicable type of fixture per month.
6	<ul style="list-style-type: none">Manufactured and supplied at least 300 nos. applicable type of fixture in one or more orders.Manufactured and supplied minimum 100 nos. nos. applicable type of fixture in one order.
7	Minimum 2 nos. purchase orders for applicable type of fixture shall be submitted which should not be more than five (5) years old from the date of techno- commercial bid opening for establishing continuity in business.

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NATIONAL THERMAL POWER CORPORATION LIMITED

3 X 800 MW PATRATU TPS

VOLUME – II

**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES FOR HIGH MAST
SPECIFICATION NO: PE-TS-434-558-E010, REV-0**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UTTAR PRADESH, INDIA – 201301**



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES FOR HIGH MAST**

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VOLUME II

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in BOQ-Cum-Price schedule of the specification shall not be considered (i.e. technical description & quantities as per specification shall prevail).



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SPECIFIC TECHNICAL REQUIREMENTS



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1.0 SCOPE OF SUPPLY AND SERVICES

1.1 SUPPLY:

Design, manufacture, assembly, inspection & testing at vendor's/ sub-vendor's works, proper packing and delivery to site of **LIGHTING FIXTURES suitable for mounting on High Mast** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation.

1.2 SYSTEM DESIGN ENGINEERING:

The lighting fixture shall be designed on the basis of best engineering practice and shall ensure uniform, reliable, aesthetically pleasing and glare free illumination. The lighting fixtures shall be designed for minimum glare and free from flicker. The finish of the fixtures shall be such that no bright spots are produced either by direct light source or by reflection. The diffusers/ louvers used in fixtures shall be made of impact resistant polystyrene sheet and shall have no yellowing property over a prolonged period. The Lux levels to be adopted are in line with the requirement as indicated elsewhere in this specification.

The lighting fixtures shall be of a proven design for applications in power plant environment and shall be weatherproof type.

1.3 Although Erection and Commissioning (E&C) and Supervision of E&C is not included in vendor's scope, the vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.

1.4 Standard technical requirements of the lighting fixtures, lamps & miscellaneous items and lighting system design requirements are indicated in Section-II. Project specific requirements/changes are listed in Section-I.

1.5 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail and govern in case of conflict between the corresponding requirements of Section-I and Section-II.

1.6 Review of sub-vendor's documents by the purchaser shall not relieve the vendor from the responsibility of design & supply.

1.7 The documents shall be in English language and MKS system of units.

1.8 Make of all equipment and components shall be as per attached Sub-Vendor List enclosed as per Annexure-A to section- I.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per BOQ-cum-price schedule as part of NIT.

3.0 STATUTORY AND REGULATORY REGULATION

3.1 Statutory and regulatory regulation shall be applicable as per Indian Electricity Rule, 1956 with amendment-3 Rule no. 35, 48, 49, 50, 61 & 64 for illumination & low voltage power services.

4.0 DOCUMENTATION

4.1 Documents required along with the technical offer: -

- Signed & Stamped copy of Compliance certificate
- Signed & stamped copy of unpriced price schedule with "quoted" word indicated against all items.



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c) Duly filled in signed & stamped copy of Datasheet-B.

4.2 Documents required after award of LOI/PO shall be as per Annexure -B (to be submitted by successful bidder).

5.0 SPECIFIC TECHNICAL REQUIREMENTS

5.1 LED Luminaires:

The Lighting Fixture shall be LED Type. The individual lamp wattage for LED shall be upto 3 watt. Fractional wattage LEDs are also acceptable. The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 80 Lm/W. Suitable heat sink shall be designed & provided in the luminaire. The LED used in the luminaires shall have colour rendering index (CRI) of Min 80.

Colour designation of LED shall be "cool day light" (min 5700K) type for indoor areas. However, for outdoor areas, the colour temperature of LED shall be min. 4000K, including rough & dust prone areas.

LED shall conform to the LM 80 requirements. The max. junction temperature of LED shall be 85 deg C. Further the lumen maintenance at this temperature shall be min 90%. The THD of LED Luminaires shall be less than 10%. Further the EMC shall be as per IS 14700. The power factor of the luminaire shall not be less than 0.9.

The marking on luminaire & safety requirements of luminaire shall be as per IS standards. Suitable heat sink with proper thermal management shall be designed & provided in the luminaire.

The connecting wires used inside the system, shall be low smoke halogen free, fire retardant type and fuse protection shall be provided in input side specifically for LED luminaires. Care shall be taken in the design that there is no water stagnation anywhere in the housing of luminaire. The entire housing shall be dust and water proof protection as per IS 12063.

Driver Circuit

LED modules and drivers shall be compatible to each other. The LED module driver's ratings and makes shall be as recommended by corresponding LED chip manufacturer.

LED Drivers shall have following control & protections :-

- Suitable precision current control of LED.
- Open Circuit Protection
- Short Circuit Protection
- Over Temperature Protection
- Overload Protection
- Surge Protection

Wiring

Wiring shall be done with following conductor sizes:

- Luminaires – 1.5/ 2.5 sq. mm Cu

Fixture shall be suitable for termination of the conductor size.



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Earthing

Fixture shall be suitable for earthing with 14/ 16 SWG GI Wire.

All lighting fixtures and control gears shall be powder coated.

SL. No.	Type of Luminaire	Description	Total Luminous flux (Lumen) of luminaire- Minimum value	Measured Electrical Input Power(Watt)- Maximum value
1	SF66 (LED)	Flood light, heavy duty type LED fixture	45000	500

Notes:

- 1) The Luminaire must comply all the parameters of IS 16106 or IESNA LM-79-08.
- 2) The LED driver should comply to IEC 61347-2-13, IS 15885: Part 2: Sec 13, IEC 62384, IS 16104 and CISPR 15.
- 3) The luminaire complete with all accessories shall comply to relevant specified standards.
- 4) The values of minimum luminous flux & maximum measured electrical input power are specified above for the luminaire (including any accessories like driver module etc). These values shall be measured as per IS 16106 & shall not be subject to any further tolerance.
- 5) All parameters mentioned in Section-II, Clause 5.2.1 are to be complied in totality.

5.2 TESTS

a) The contractor shall carry out the type tests as listed in this specification on the LED fixtures to be supplied under this contract.

b) The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days' notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

c) In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening : **08.09.2018** , he may submit during detailed engineering the type test reports to the owner for waiver of conductance of such type test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.

d) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.



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e) Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant I.S

f) Type test reports of the Lighting Fixtures of each type as per technical specification requirements/ standards shall be submitted for approval.

Type test reports for LED as per standards for following shall be submitted for approval.

1. Visual and Dimension check
 2. Proof of procurement of LEDs
 3. Safety tests
 - a) Marking
 - b) Construction
 - c) Provision for Earthing
 - d) External and Internal wiring
 - e) Protection against electrical shock
 - f) Endurance and Thermal
 - g) Insulation resistance & electrical strength
 - h) Resistance to heat fire & tracking
 - i) Resistance to Humidity
 4. Fire Retardant test
 5. Performance tests (electrical, Photometric color and Life)
 6. Burn-in Test
 7. Power Cycling
 8. Temperature rise test
 9. Emission Tests
 - a) Radiated & conducted emission
 - b) Harmonics & flickers
 10. Immunity tests
- In addition, following test reports to be submitted for LED chip/LED luminaire:
- a) LED parameters like Lumen per watt, CRI, Beam angle from manufacturer
 - b) LM 80/IS: 16105 report.
 - c) LM 79/IS: 16106 report.



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CODES AND STANDARDS

All standards and codes of practice referred to herein shall be the latest edition including all applicable official amendments & revisions as on date of bid opening. In case of conflict between this specification and those (IS codes, standards etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards & codes.

16101:2012	General Lighting. LEDs and LED modules Terms and definitions
16102(Part 1):2012	Self Ballasted LED Lamps for General Lighting Services. Part-1 Safety Requirements.
16102(Part 2):2012	Self Ballasted LED Lamps for General lighting Services. Part-2 Performance Requirements.
16103(Part I):2012	LED modules for General lighting Safety Requirements.
15885(Part 2/Sec. 13) :2012	Lamp control gear Part 2 particular Requirements Section 13 d.c. or a.c. Supplied Electronic control gear for LED modules
16104:2012	d.c. or a.c. Supplied Electronic control gear for LED modules - Performance Requirements.
16105:2012	Method of Measurement of Lumen maintenance of Solid-state Light (LED) Sources.
16106:2012	Method of Electrical and photometric Measurements of Solid State Lighting (LED) Products
16107:2012	Luminaires Performance
16108:2012	Photobiological safety of Lamps and Lamp Systems
IS 513	Cold rolled low carbon steel sheets and strips
IS 12063	Classification of degree of protection provided by enclosures.
IS 14700	Electro magnetic compatibility (EMC) – Limits (Part 3/Sec. 2) for Harmonic current emission – THD < 15% (equipment, input current < 16 Amps. per phase.
IS 9000 (Part 6)	Environment testing: Test Z – AD: composite temperature/humidity cyclic test.
IS 15885	Lamp control gear: particular requirements for (Part 2/Sec. 13) DC or AC supplied electronic control gear IS 16004 – 1 and 2) for LED modules.
IS 4905	Method for random sampling

LUMINAIRES

IS 10322	Luminaires
IS 1777	Industrial luminaires with metal reflector
IS 3287	Industrial lighting fittings with plastic reflectors
IS 5077	Decorative lighting outfits



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IS 3528	Waterproof electric lighting fittings
IS 3553	Watertight electric lighting fittings
IS 4012	Dust-proof electric lighting fittings
IS 4013	Dust-tight electric lighting fittings
IS 2206	Flameproof electric lighting fittings - well glass & bulk head types
IS 8224	Electric lighting fittings for division 2 areas
IS 1913	General & Safety requirement of Luminaire

Electrical Installation Practices & Miscellaneous

IS:1944	Code of practice for lighting of public thorough fare
IS:3646	Code of practice for interior illumination.
IS:5572	Classification of Hazardous areas (other than Mines) having flammable gases and Vapours for electrical installation
S:6665	Code of practice for industrial lighting.
.	National Electrical Code
-	Indian Electricity Rules.
	Indian Electricity Act
IS:5	Colour for ready mixed paints & enamels.
IS:280	Mild steel wires for general engineering purposes.
IS:374	Electric ceiling type fans & regulators.
IS:732	Code of practice for electrical wiring installations
IS:1255	Code of practice for installation and maintenance of power cables Upto and including 33KV rating.
IS:2062	Steel for general structural purposes
IS:2629	Recommended practice for hot-dip galvanizing of iron and steel.
IS:2633	Methods for testing uniformity of coating of zinc coated articles.
IS:2713	Tubular steel poles for overhead power lines.
IS:3043	Code of practice for earthing
IS:5216	Guide for safety procedures and practices in electrical work.
IS:5571	Guide for selection of electrical equipments for hazardous areas.
BS:6121	Mechanical cable glands



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DATASHEET A

S.No	Specification Parameter name	Bid Requirement (Allowed Values)
	STANDARDS	
1	LED Luminaire conformity to IS:10322/Part 5/Section 5/2012 latest and IS: 16107 (Part 2/Sec 1):2012 latest	Yes
2	Photo biological safety of LEDs used shall be as per IS:16108/2012 (exempt group)	Yes
3	Types of LED Luminaire as per the IS: 16107(Part-2/ Sec.-1)/2012	Type B
4	Types of LED Modules as per the IS: 16103(Part-2)/2012	Type 3
5	LED Rating/System Wattage/Rated Power	Refer Technical Specification Sec-I Cl.5.0
6	Luminaire System Efficacy (Lumen/watt)	>= 90 lumen / watt
7	Ingress Protection (IP Rating) as per IS:10322 (Part 1):1982 latest	IP65
8	Mounting brackets (included)	Adjustable
9	Warranty for free replacement (in Years)	3 Years.
	ELECTRICAL EFFICIENCY	
1	Input operating Voltage range and frequency	240 V & 50 Hz
2	Automatic Higher Cut off voltage above 300 volt	Yes
3	Rated voltage	240V
4	AC Power Factor at full load	>= 0.95
5	Driver Efficiency (in %age)	>=85
6	The total circuit power shall not be more than 110 percent of the value declared by the manufacturer	Yes
	OPTICAL	
1	LED chip Efficacy	>=120 Lumen / watt
2	Colour temperature (+/-500K)	min 4000K
3	Working life for LED (Minimum 50,000 burning hours as per LM-80 report)	Yes
4	Beam Angle	>=120
5	Optic lense material (UV stabilised) (Write NA for without optic lense supply)	Poly carbonate lense
	THERMAL MANAGEMENT	
1	Heat sink should be die-cast aluminium along with sufficient heat sink fins to dissipate heat effectively	YES
2	Capacitor shall be rated for a temperature of 105 deg. celsius or better	Yes
3	Junction temperature	<85 Deg C
4	Operating temperature range	-10 deg C to + 55 deg C.
5	Operating Humidity Range	10% to 95% RH



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DATASHEET A

S.No	Specification Parameter name	Bid Requirement (Allowed Values)
	PROTECTION	
1	Short circuit Protection	Yes
2	Over load protecton	Yes
3	Over Voltage protection	Yes
4	Reverse polarity	Yes
5	High voltage test (1.5 KV for one minute between supply terminals and body of the unit)	Yes
6	Insulation resistance between earth and current carrying part	>100M ohm.
7	The luminaire shall be protected against surges and transients (Internal)	2 kV
8	The luminaire shall be protected against surges and transients of >=10KV (External)	Yes
	CONSTRUCTIONAL	
1	The Luminaires casing/housing (single piece housing) shall be pressure die casted aluminium alloy with higher thermal conductivity	CRCA
2	The luminaire body must be corrosion resistant epoxy powder coated	Yes
3	All fastners must be of stainless steel	Yes
4	The entire housing (both LED section and driver section) shall be dust and water proof having IP 66 protection as per IS:10322 (Part 1):1982 latest	Yes
5	Extruded silicon loop gasket shall be provided in the lantern body to ensure weather proof seal between the UV Glass cover and the metal housing to exclude the entry of the dust, water, insects etc.	Yes
6	Luminaries light transparency should be of Toughened glass	Yes
7	Toughned transparent glass cover thickness	>= 4mm.
8	Toughned Glass shall not get discoloured shall not suffer degradation due to heat and ageing within warranty period	Yes
9	Number of electronic control gear (power supplies)	1 No
10	Driver components shall be industrial grade or above	Yes
11	PCB shall be FR4 grade minimum 0.8 to 1.0 mm thick or more	Yes
12	The Luminaires works on single phase three wires system (Phase, Neutral and Earth)	Yes
13	Suitable connector shall be provided for LED connection between driver output and LED	Yes , including suitable brackets for ceiling / pole mounting. FLP Cable glands and plugs.
14	Length of ISI marked three core wire (shall be provided along with supply of material)	50 m
15	Light Source	SMD LED chip as per LM 80 / IS 16106



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S.No	Specification Parameter name	Bid Requirement (Allowed Values)
	MARKING	
1	Manufactures Name and and brand on the aluminium die cast body	Engraved / Embossed
2	Manufacturer's name, model number, serial number	Yes
3	Date of manufacture (month-year), and lot number as identification mark inside each unit and the outside of each packaging box	Yes
4	The operation characteristics voltage and power be marked inside of each LED luminaire unit	Yes
	REPORTS AND CERTIFICATIONS	As per Technical Specification Section-I Cl. NO 5.2(F)
ADDITIONAL TECHNICAL PARAMETERS : FLOOD LED LIGHT FIXTURES		
S.No	Specification Parameter name	Bid Requirement (Allowed Values)
1	Total Harmonics Distortion (in %age)	Less than 10%
2	Colour Rendering Index(CRI)	Min 80.
3	Conductance of test	Refer QP
4	The luminaire shall be protected against surges and transients (Internal)	2 kV
5	Make	Refer PQR
6	Design Ambient	50 Deg C
7	Voltage variation (permissible)	+10% to -10%
8	Frequency variation (permissible)	+3% to -5%
9	Combined voltage & frequency variation (sum of absolutes permissible)	10%
10	System fault level & duration	50kA for 1 sec.

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DATA SHEET - B

SL. NO.	DESCRIPTION	LUMINAIRE MAKE AND MODEL	MEASURED ELECTRICAL INPUT POWER (W) MAX. VALUE	TOTAL LUMINOUS FLUX (LUMEN) OF LUMINAIRE - MIN. VALUE
	MAIN SUPPLY ITEMS			
1.0	Lighting Luminaires (complete with accessories)			
1.14	Luminaire Type SF66 (LED)			

NOTE :

- Bidder to fill details of luminaires as per parameters mentioned above and furnish Data Sheet - B along with technical offer

ANNEXURE-A
LIST OF APPROVED MAKE

		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017	
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS	

18.	Lighting fixtures with accessories	I	12			M/s Crompton	Mumbai	A#		#- "A"- for filament type and "DR" for LED Type
						M/s Bajaj Electricals	Mumbai	A		
						M/s Philips	Noida	A#		
						M/s Wipro	Mumbai	A		
						M/s Surya Rosini	Kashipur	A		
						M/s Goldwyn	Noida	A		





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ANNEXURE-B

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S.NO No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	Primary / Secondary	Delivery schedule for vendor
1.	OGA of fixtures	PE-V0-434-558-101A	Primary	Refer note no 2 below.
2.	Datasheet of Fixture	PE-V0-434-558-102A	Primary	
3.	MQP for luminaires	PE-V0-434-558-901A	Primary	
4.	TTR for lighting fixtures	PE-V0-434-558-E104A	Secondary	Within 2 months from lot clearance of applicable items.
5.	FQP for lighting fixtures	PE-V0-434-558-E105A	Secondary	Within 3 months from PO.
6.	Mounting arrangement drawings	PE-V0-434-558-E106A	Secondary	Alongwith respective OGA.

NOTE:

1.

Drawing/Documents indicated above shall be submitted through document management system (DMS).

2. Primary Docs: R-0 within **14 days from PO Date** & subsequent revisions within **10** days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.

PACKING SPECIFICATIONS- LIGHTING FIXTURES, LAMPS & MISC. ITEMS

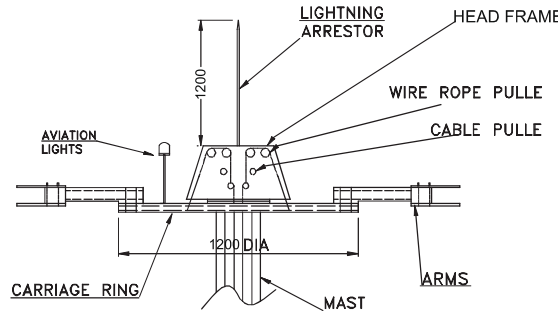
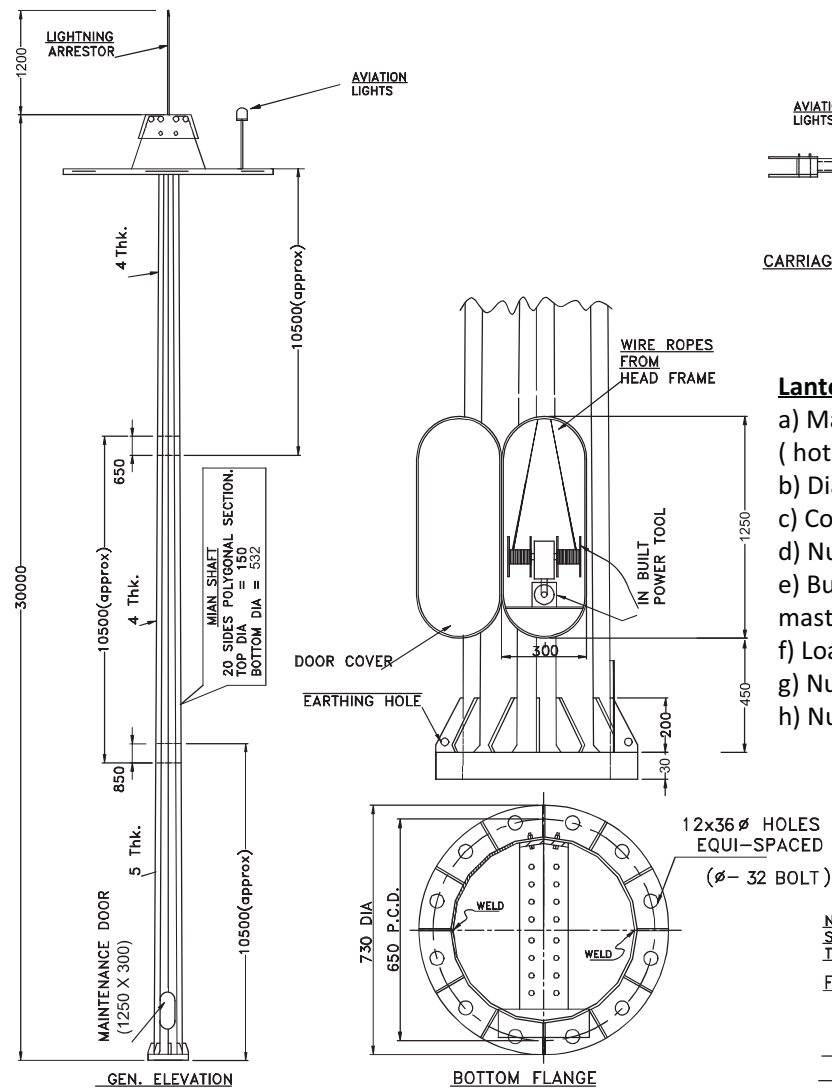
PACKING

1. The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling.
2. Lighting Fixtures, Lamps, Receptacles, Switchboards, 24V Supply modules, 24V sockets, Junction Boxes, Exit signs shall be clean and dry prior to packaging.
3. All items specified at sl. No.2 above shall be supplied in packed cartons. The tapes used for packing shall not bleed, leave residue, or damage the item when removed.
4. Fixtures & other lighting material shall be wrapped in weather proof material such as polythene sheets, air bubble sheets/ thermocol etc. The lighting fixtures shall be placed in a corrugated paperboard/ fibreboard container/ mono carton.
5. The mono cartons shall be wrapped or bagged or tied in place in master cartons. The master carton shall be taped and then wrapped with cushioning material.
6. The dimensions of cartons shall be as per manufacturer's recommendations.
7. For items like step ladder, wheel mounted ladder and flexible conduits, packing shall be as per manufacturer standard.

Note: In case Manufacturer has a different packing standard which is **equivalent or better** same to be submitted for approval during contract stage.

THIS IS A GA DWG/ DETAILS OF HIGH MAST FOR GUIDANCE ONLY. LIGHTING FIXTURES SHALL BE MOUNTED ON THE LIGHTING MAST. IT IS TO BE NOTED THAT ALL ACCESSORIES CLAMPS / CHANNEL/ BASE PLATE/ BASE FRAME/ CHAINS / CLIPS / STEEL ROPE / PINS ETC. REQUIRED FOR MOUNTING OF FIXTURE ON THE LIGHTING MAST AS PER GA DWG OF LIGHTING MAST SHALL BE PART OF FIXTURES ONLY AND SHALL BE PROVIDED BY THE BIDDERS.

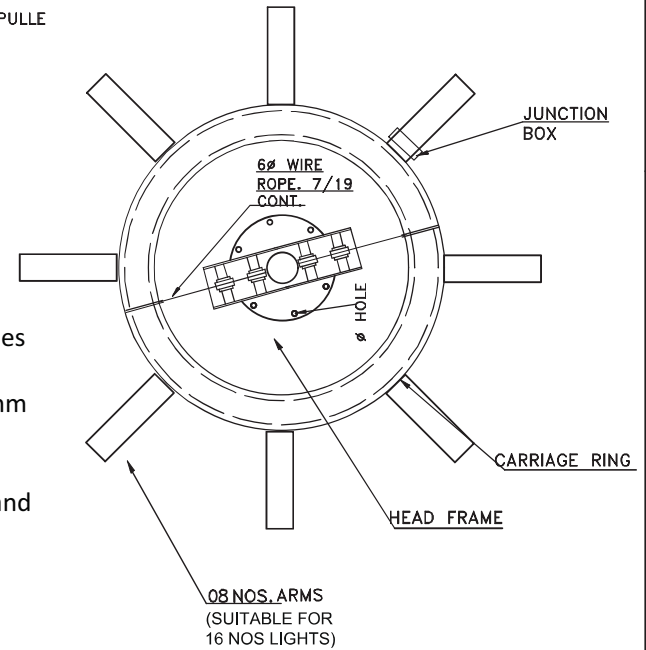
ANNEXURE-D



DISTRIBUTION OF LUMINARIES
ELEVATION

Lantern carriage

- a) Material of construction : 50 NB MS pipes (hot dip galvanized)
- b) Diameter of carriage ring (mm) : 1200mm
- c) Construction : Welded
- d) Number of joints : 2
- e) Buffer arrangement between carriage and mast : PVC sleeve on guard ring
- f) Load carrying capacity : 750Kg
- g) Number of arms : 08 numbers
- h) Number of fittings : Suitable 16 Nos.



CATEGORY OF DRG.		APPROVAL	INFORMATION	REFERENCE	RECORD	CONSTRUCTION
PROJECT						
PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE - I (3 X 800 MW)						
CLIENT						
DESIGN		TITLE				
DRAWN						

THIS DRAWING IS CONFIDENTIAL & SHOULD NOT BE DISCLOSED, COPIED OR LENT TO A THIRD PARTY WITHOUT WRITTEN CONSENT OF SG ASSOCIATES EXCEPT FOR THE PURPOSE OF CONSTRUCTION, OPERATION AND MAINTENANCE OF THE SYSTEM FOR WHICH THE DRAWING IS MEANT.

S.NO.	DRG.NO.	TITLE	NOTES	NO.	DATE	DESCRIPTION	BY	APPD
REFERENCES			NOTES		REVISIONS			

4

3

2

1

ized) b).



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2.0	CODES & STANDARDS
3.0	DESIGN CRITERIA
3.1	GENERAL REQUIREMENTS OF DESIGN
3.2	SOURCES OF POWER SUPPLY
4.0	GENERAL REQUIREMENTS OF LUMINAIRES
4.1	LUMINAIRE & OTHER ITEMS
5.3	CONTROLGEAR BOX (NON-INTEGRAL TYPE)
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INTENT OF SPECIFICATION

- 1.1 The requirements given in specification for supply of equipment shall be fully complied with.
- 1.2 For the equipment of supply in vendor's scope, the "design" shall broadly cover the selection of components, materials, sizes etc. and complete responsibility of establishing the correctness of equipment design rests with the vendor.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing required function in a manner acceptable to Purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgement is not in full accordance herewith.
- 1.4 Make of all equipment and components shall be to the approval of Purchaser. Bidder to comply to Sub-vendor list enclosed as Annexure to Section I, however same shall be subjected to end client approval without any commercial implication.

2.0 CODES & STANDARDS

- 2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 2.2 The material, construction, manufacture, inspection and testing shall conform to the latest revisions of standards as specified in Data Sheet-A.
- 2.3 In case of conflict between the applicable reference standard and this specification, stringent requirement shall govern.

3.0 DESIGN CRITERIA:

3.0.1 General Requirements of Design

- a) Lighting system shall be provided to ensure adequate visual performance, safety and reliability and shall be free from excessive glare and flicker from discharge lamps.

3.0.2 Sources of Power Supply

Normal AC Lighting System

Normal AC lighting system 415V, 3 phase, 4 wire, will be fed from lighting panels (LPs) which in turn will be fed from the lighting distribution boards (LDBs). Street lights/ flood lights shall be fed from Street Lighting Panel (SLP), Welding receptacles shall be fed from Welding DB/ MCC in offsite areas.



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4 LUMINAIRES, ACCESSORIES AND LAMPS

4.0 GENERAL REQUIREMENTS OF LUMINAIRES

- a) All luminaires and accessories shall be designed for continuous operation and shall be suitable for the system design data given in Data Sheet A.
- b) Luminaires shall be complete with accessories mounted inside the luminaire assembly.
- c) All luminaires and accessories shall be suitable for operation in the atmospheric conditions prevailing at site.
- d) Luminaires shall be designed for minimum glare. No bright spots should appear from the lamp or from the reflectors.
- e) All accessories shall be wired upto a terminal block or a separate weather proof metallic terminal box suitable for 2.5 sq. mm. copper wire termination.
- f) All internal wiring shall be of PVC or silicon rubber insulation, capable of withstanding the maximum temperature to which it will be subjected under specified service conditions without deterioration.
- g) All luminaires and accessories including the breathing holes shall be vermin proof.
- h) Surface Treatment:
 - All surfaces after manufacture shall be thoroughly cleaned and degreased. Pre-treatment of surfaces shall be as per the applicable standard. Pretreated surfaces shall be free from rust, sharp edges, scales and burrs.
 - Finish of surfaces shall be non-porous, smooth and unfaded.
- i) All metal parts of the luminaires shall be bonded and connected to the earthing terminal. Earthing terminal shall be suitable for connecting 14 SWG GI wire.
- j) Flood lights shall be provided with base frame / base plate for mounting on structural steel arm/ member of High Mast (Refer GA DWG of High Mast).
- k) All weather proof luminaires shall have the control gear housed in a weather proof enclosure with necessary gaskets, mounting bracket, locking screws etc.

4.1 LUMINAIRE TYPES & OTHER ITEMS

General requirements depending upon type of luminaire are listed below.

a) Flood Lighting Luminaires



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- Flood light lamp housing and reflector shall be separate from controlgear box. Requirements of controlgear box are specified elsewhere.
- Lamp reflectors shall be of high purity spun aluminium attached to the cast aluminium lamp holder housing at the rear. Lamp holder housing shall be provided with cooling fins.
- Reflector shall be closed from the front by heat resistant toughened glass and synthetic "S" type weather proof gasket.
- Luminaire shall be provided with special lamp centering and focussing device ensuring good beam control.
- MS mounting bracket shall allow fixation of the flood light in any position in a horizontal plane and the flood light can be locked in at any set angle in the vertical plane. Cast iron base and / or two protector scales shall also be provided where specified in "Luminaire Details"

b) LED type Luminaires:

- LED Luminaires shall be used for the lighting if specified in BOQ as part of NIT.
- In false ceiling area LED luminaires shall be recessed mounting type & in non-false ceiling area the LED luminaires shall be surface mounting type.
- The individual lamp wattage for LED shall be upto 3 watt.
- The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 70Lm/W.
- The LED used in the luminaires shall have colour rendering index (CRI) of Min 65. Colour designation of LED shall be "cool day light" (min 5700K) type.
- The LED luminaire shall have minimum life of 25,000 burning hours with 80% of lumen maintenance at the end of the life.
- The beam angle for LED chip shall be 120 degrees.
- The max. junction temperature of LED shall be 85 deg C, further the lumen maintenance at this temperature shall be min 90%.
- The THD of LED Luminaires shall be less than 10%. Further the EMC shall be as per IS 14700. The power factor of the luminaire shall not be less than 0.9.
- The marking on luminaire & safety requirements of luminaire shall be as per IS standards.
- Suitable heat sink with proper thermal management shall be designed & provided in the luminaire.



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- The connecting wires used inside the system, shall be low smoke halogen free, fire retardant PTFE cable.
- Fuse protection shall be provided in input side specifically for LED luminaires.
- Care shall be taken in the design that there is no water stagnation anywhere. The entire housing shall be dust and water proof protection as per IS 12063.
- Driver Circuit: LED modules and drivers shall be compatible to each other. The LED module driver's ratings and makes shall be as recommended by corresponding LED manufacturer. LED Drivers may have following control & protections:
 - Suitable precision current control of LED.
 - Open Circuit Protection
 - Short Circuit Protection
 - Over Temperature Protection
 - Overload Protection

5.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE) (IF APPLICABLE)

- a) Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket.
- b) Boxes shall be provided with HRC fuse mounted on a removable tray. Boxes shall be provided with all necessary components having a neat layout arrangement such that it is possible to test, inspect or replace any component without difficulty.
- c) Boxes shall be suitable for mounting on structures, walls and columns.
- d) Suitable number of terminals shall be provided for looping-in and looping-out of cable connections and also connections to the luminaire(s).
- e) Cable / conduit knock-outs shall be for each loop-in and loop-out connection and also connection to the luminaire(s).

5.4 REFLECTORS

- a) Reflectors shall be made of sheet steel or aluminium as applicable.
- b) The aluminium reflectors shall be made of high purity aluminium sheet. Sheet will be polished, electrochemically brightened and anodised.



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- c) Wherever reflectors are separate from housing, they shall be securely attached to the luminaire by means of easily accessible fastening devices such that they are readily removable from the housing for maintenance.

5.5 STARTER HOLDERS

- a) Starter holders shall be designed and manufactured as per the applicable standard.

5.6 BALLASTS

- a) Fluorescent fixtures shall have electronic ballasts. Ballasts shall be totally enclosed type.
- b) Ballasts shall be easily removable type.
- c) Core shall be made of low loss, electrical grading stampings.
- d) End connections shall be made available in a terminal block, rigidly fixed to the ballast enclosure.
- e) Ballasts shall be free from humming.
- f) Ballast shall be provided separately for each lamp in a multi-lamp luminaire.
- g) Tappings shall be provided to set the voltage within range for HPMV & HPSV luminaires.

5.7 STARTERS

- a) Starters shall be made of aluminium material. Plastic or any other material if used shall be subject to purchaser's approval.
- b) Starters shall have bi-metal electrodes.
- c) Starter shall be replaceable without the use of any tool and without disturbing any accessory or lamp.
- d) Starters shall have high mechanical strength.
- e) Starters shall be provided with radio interference suppressing capacitors.
- f) Starters shall have brass contacts.

5.8 CAPACITORS

- a) Capacitors shall have constant value of capacitance, suitable for operation at supply voltage.
- b) Capacitors shall be hermetically sealed, preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.



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5.9 CABLE GLANDS

- a) Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.
- b) Rubber components used in the gland shall be of neoprene.
- c) Name / trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved / indelibly printed on the cable gland.

5.10 CABLE LUGS

- d) All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.
- e) Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

6.0 SURFACE TREATMENT

- 6.1 All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case of reflectors, shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil & scale from them & then rinsed in water. Alternatively, they may be shot / sand blasted.
- 6.2 Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets & then rinsed to remove traces of the acid. The cleaning and pretreatment of all metal parts shall be as per applicable standard.
- 6.3 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pretreatment shall conform to the applicable standard.
- 6.4 All parts shall then be subjected to a coat of red oxide primer paint.
- 6.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.
- 6.6 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.
- 6.7 Wherever possible, finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

7.0 PACKING

- 7.1 Vendor shall furnish packing procedure along with packing drawing at contract stage for applicable items for purchaser approval.



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7.2 Containers adequate for storing 70% of P.O. quantity material at site are to be supplied. Vendor shall furnish suitable justification to purchaser during detailed engineering for the number and size of containers being supplied.

7.3 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.

8.0 GUARANTEED PERFORMANCE REQUIREMENTS

8.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.

8.2 Vendor shall ensure satisfactory performance for lighting system designed by them at site.

9.0 INSPECTION & TESTING

9.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-558-E006) without any deviations. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of any changes in QP during contract stage.

9.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards. Charges for these tests shall be deemed to be included in equipment price.

9.3 All the specified type and routine tests shall be carried out to verify the rating and performance of the equipment. Where valid type test certificates in evidence of equipment performance claimed are available & approved by purchaser, the requirements for conducting type tests may be waived. The general arrangement of object under test shall be to purchaser's approval.

9.4 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.

9.5 Inspection for dimensional & visual checks especially of the following, with respect to contract drawings, documents & standards shall be conducted:

- a) General sturdiness & rigidity of equipment
- b) Surface finishing
- c) Gasketting
- d) Inter-changeability
- e) Constructional features viz. location, accessibility & marking of components, segregation, accessibility to live parts (shrouding) etc.



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f) Completeness of scope

- 9.6 Equipment shall be liable for rejection if tolerances on the values of dimensions, power consumption, impedances, temperature rise etc. exceed the specified values by purchaser and / or standards.

10.0 SPARES

- 10.1 Mandatory spares (if applicable) are indicated in BOQ-cum-price schedule.
- 10.2 Erection & commissioning spares are included in the bidder's scope of supply. BE&C spares are indicated in BOQ-cum-price schedule.
- 10.3 A list of recommended O&M spares quantities for a duration of 3 years A shall be filled up in the applicable schedule / format and submitted by bidder along with offer. However, the acceptance of the same shall not be binding on purchaser.

11.0 DOCUMENTATION

11.1 Documents to be submitted by the vendor immediately after award of contract

- a) Bar chart of activities of manufacture, testing, inspection and despatch.

11.2 Documents to be submitted during detailed engineering of contract

Engineering documents (refer clause 4.3) to be generated by the vendor,

- a) Final Quality Plans
- b) Technical data sheet
- c) Polar curves, zonal flux diagram and CoU charts of luminaires.
- d) Complete design calculations for arriving at number of luminaires.
- e) Fixing / mounting details of luminaires and other items.
- f) General arrangement drawings of Luminaire/ Fixture
- g) Field Quality Plan as per General Technical Conditions.
- h) Control Scheme
- i) Type test certificates.
- j) Catalogues / leaflets
- k) Master Bill of Material.
- l) Packing Procedure & drawing.
- m) Calculation for selection of no. & size of container

11.3 Operation and Maintenance (O&M) manual :

The document shall comprise of installation, operating and maintenance instructions for various items / components. The O&M manual shall include the following :



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- a) Write ups / instructions / procedures for
 - i. Storage at site.
 - ii. Unpacking.
 - iii. Handling at site.
 - iv. Erection.
 - v. Pre-commissioning / commissioning tests.
 - vi. Operating procedures.
 - vii. Maintenance procedures.
 - viii. Precautions to be taken during operation and maintenance work.
 - ix. Trouble shooting charts covering problems, cause and solution.
- b) Approved Technical Data Sheets.
- c) Technical leaflet of various items / components.
- d) Copies of the type, acceptance and routine test certificates in bound volume.
- e) Details of all components liable to be replaced during the life of the equipment.
- f) List of maintenance tools required.
- g) List of testing equipment required.

ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				REVIEWED BY		APPROVED BY	
COMPONENT & OPERATIONS	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	CONFORMING TO CODE : As applicable		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS	
			TYPE OF CHECK	QUANTUM OF CHECK					
				G.M	G.CN				
2	3	4	5		7				
LED type Lighting fixture									
Bought out items / in-process checks									
LED Chip	LED chip efficacy	Major	Visual	Mnfr Std.	Mnfr Std.	NTPC Spec/ Appd Data sheet/ LM 80 report	LM 80 report		At the time of final inspection
	LED chip CRI and CCT	Major	Visual	Mnfr Std.	Mnfr Std.	NTPC Spec/ Appd Data sheet/ LM 80 report	LM 80 report		At the time of final inspection
	Reported TM21 (L80) lifetime of LED chip	Major	Visual	Mnfr Std.	Mnfr Std.	NTPC Spec/ Appd Data sheet/ LM 80 report	LM 80 report		At the time of final inspection
1 LED Driver	Compatibility with LED module/chip, controls & protection features as per NTPC spec	Major	Visual	-	-	Certificate of compliance by LED driver manufacturer / lighting fixture supplier that driver meets all NTPC specification requirements	Certificate of compliance		
Castings	THD and pf check	Major	Electrical	Mnfr std.	-	THD < 10% and pf >= 0.9	Inspection report	P/ V	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier
	Freedom from defects	Major	Visual	Mnfr std.	-	Castings shall be free from any defects such as blow holes, surface blisters, cracks and cavities etc.	Inspection report	P/ V	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier
Sheet metal forming and fabrication	Freedom from defects	Major	Visual	Mnfr std.	-	sheet metal fabrication / forming etc should be as per manufacturer standards and good engg practices	Inspection report	P/ V	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier
Pre-treatment and powder coating	Pre-treatment process checks, Powder coating finish, thickness, uniformity of coating and adhesion	major	Visual, chemical & mech	Mnfr std.	-	Nominal coating thickness 50 microns or more	Inspection report	P/ V	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/ SUB-SUPPLIER: C: MAIN SUPPLIER, N: NTPC
P: PERFORM W: WITNESS AND V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS 'W'.

Engg. Div./QA&I

ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				REVIEWED BY		APPROVED BY			
S/No	COMPONENT & OPERATIONS	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REVIEWED BY	APPROVED BY
					6.M	6.ON					
1	2	3	4	5	6	7	8	9	10	11	12
B	Acceptance Tests on LED Lighting fixture	a Details of lot offered and Certificate of compliance that lighting fixture supplier has inspected the offered lot as per their own standard	Major	Visual	-	-	lighting fixture supplier to submit the details of lot offered for NTPC inspection (Type of lighting fixtures, their batch number, sub-vendor name, quantity)	-	List	P	V
		b LED chip make	Major	Visual	-	-	NTPC accepted type test reports (LM80/LM79) report	Certificate of compliance	Certificate of compliance	V	V
		c Constructional features including: Internal wiring, terminal block, earthing terminal, safety chain (if applicable)	Major	Visual	1 sample per type	1 sample per type	NTPC specification and NTPC approved data sheet/drg.	NTPC specification and approved data sheet/drg.	Inspection report	P	W
		e Resistance to moisture test in case of lighting fixtures having IP X4 and above rating	Major	Mechanical	1 sample per type	1 sample per type	NTPC approved data Sheet	IS 10322 Part 1	Inspection report	P	W
		f Resistance to dust (applicable if IP5X and above)	Major	optical	Mnfr std.	Mnfr std	NTPC accepted type test reports \$	Certificate of compliance	Certificate of compliance	P/ V	V
		f Photometry check	Major	optical	Mnfr std.	Mnfr std	NTPC accepted type test reports, LM 79, IS 16106, IS 16107	Certificate of compliance for the batch: that offered lighting fixture LOR and lighting fixture efficacy is not be less than 90% (refer IS 16107) with reference to type test reports	Certificate of compliance	P/ V	V

<

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/ SUB-SUPPLIER: C: MAINS SUPPLIER, N: NTPC
P: PERFORM W: WITNESS AND V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS 'W'.
Format No.: QS-01-QAI-P-10/F3-R0
Engg. Div./QA&I

ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN					REVIEWED BY		APPROVED BY		
SI No	COMPONENT & OPERATIONS	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REVIEWED BY	APPROVED BY
					6.M	6.C/N					
1	2	3	4	5			7	8	9	10	11
		g Dimensions	Major	Visual	1 sample per type	1 sample per type	NTPC specification and approved data sheet/drg.	NTPC specification and approved data sheet/drg.	Inspection report	P W W	W
		i LED driver: THD and pf check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	THD < 10% and pf >= 0.9	Inspection report	P W W	W
		j LED driver: Precision current control check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	NTPC specification and NTPC approved data sheet	Inspection report	P W W	W
		k LED driver: Open circuit protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	NTPC specification and NTPC approved data sheet	Inspection report	P W W	W
		l LED driver: Short circuit protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	NTPC specification and NTPC approved data sheet	Inspection report	P W W	W
		m LED driver: Over temperature protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	NTPC specification and NTPC approved data sheet	Inspection report	P W W	W
		n LED driver: Overload protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	NTPC specification and NTPC approved data sheet	Inspection report	P W W	W
		o LED driver: Surge protection compliance check	Major	Electrical	-	-	NTPC specification	Certificate of compliance that surge protection is provided	Certificate of compliance	V V V	V

T PE TEST SHALL BE AS PER TECHNICAL SPECIFICATION SECTION-I CL. 5.2
PACKING SHALL BE WITNESSED AS PER TECHNICAL SPECIFICATION SECTION-I ANNEXURE-C

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/ SUB-SUPPLIER: C: MAIN SUPPLIER, N: NTPC
P: PERFORM W: WITNESS AND V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS "W".

Format No.: QS-01-QAI-P-10/F3-R0

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