

**SUPPLY OF 10 Nos. HIGH MAST  
AT  
AT 1 X 800 MW SUPER CRITICAL EXPANSION UNIT, DEEN BANDHU CHOTU RAM TPP YAMUNA  
NAGAR, HARAYANA**

**VOLUME – I  
CONSISTING OF:**

- **Volume-IA: Technical Conditions of Contract,**



**Bharat Heavy Electricals Limited  
(A Govt. Of India Undertaking)  
Power Sector – Northren Region,  
Plot No. 25 , Sector - 16A ,  
Distt. Gautam Budh Nagar, NOIDA – 201 301 (INDIA)**



# TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-II: SCOPE OF WORK

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### SCOPE OF WORK

#### 2.1 SUPPLY

Designing, engineering, manufacturing, supplying, dispatching to site with transit insurance, of lighting mast, complete in all respects including luminaries at 1x800 MW Yamunanagar Project.

- **Technical data sheet, GA and ref. QAP to be followed is enclosed.**

These shall be complying with the Technical Specifications, as detailed below.

Necessary design and engineering of civil works is in the scope of the bidder. The foundation bolts and necessary hardware is also in the scope of the bidder. **BHEL will complete the supply of civil materials, construction of foundation.**

BHEL shall provide power supply up to Control Panel of High Mast. The bidder shall carry all further necessary power distribution.

#### 2.2 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.

2.3 Although Erection and Commissioning (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.

2.4 Standard technical requirements of the high mast, lighting fixtures, lamps & miscellaneous items and lighting system design requirements are indicated in Technical specification.

2.5 Lighting Mast shall be of continuously tapered polygonal cross section hot dip galvanised.

2.6 The Mast shall be of 30 M or suitable height with lantern carriage to enable raising/lowering for ease of maintenance, including the Head Frame, Double Drum Winch, continuous stainless-steel wire rope, in built power tool, luminaires, suitable aviation warning light, lightning along with necessary power cable

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-II: SCOPE OF WORK

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within the mast. The mast shall be delivered in not more than three sections & shall be joined together by slip stressed fit method at site. No site welding or bolted joints shall be done on the mast.

2.7 The Mast together with the fixtures shall be capable of withstanding the appropriate wind loads as per **IS: 875 part 3**.

2.8 The Mast shall be fabricated from special steel plates conforming to BS-EN10-025 and folded to form apolygonal section. Carriage shall be provided with JB type M to Facilitate interconnection to lighting fixtures.

2.9 Earthing of High mast shall be done using 2 no. 50X6mm GS which in turn shall be connected to one 40 mm dia MS earth electrode of 3-meter length driven vertically in the ground. The earthing flat and electrode is not in the bidder scope. Mast shall be provided with 1200mm long air termination for the lightning protection. Suitable arrangement for connection of down comer shall be provided. Provision of earth connection of GI strip shall also be kept at a height of one meter from the ground.

2.10 Lighting Mast with 30 m height

2.11 Suitable feeder pillar with TPN MCB, contactors, timer, MCB and other necessary accessories for operation & protection of the mast and fixtures shall be provided.

2.12 It shall also include all accessories for high mast including head frame, steel wire rope 6mm dia, trailing cable, double drum winch, galvanized lantern carriage arrangement suitable for 12 nos luminaries and its control gear boxes. The mast shall have an integral power tool installed inside the base compartment for its operation. The mast shall be supplied complete with foundation bolts manufactured from special steel along with nuts, washers and anchor plates. Suitable control panel housing control circuit for operation and control for power tool motor shall be provided with mast. Each Lighting mast shall be supplied along with 12nos. 2x450W (max.) **LED** fixtures and one no. twin dome aviation obstruction **LED** light. The mast with control panel shall be fenced with locking arrangement.

2.13 Apart from the standards mentioned in supply & installation part of section & following standards shall also be followed:

- i) BS-EN10-025
- ii) IS:280
- iii) IS : 1255
- iv) BS :6121
- v) BS EN ISO 1461

2.14 Lighting mast design shall be suitable for following:

- a) 30M Height of the lighting mast
- b) Maximum number of luminaires as per Technical specification.
- c) Additional load of 500 kg towards the weight of maintenance crew.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-II: SCOPE OF WORK

- d) Permissible design parameters should be according to relevant standard. The deflection under the maximum wind pressure of 150 kg/sq.m shall not exceed 1 in 360.
- e) All steel sections, members and hardware used shall be hot dip galvanized as per applicable standard.
- f) Provision shall be made for supporting cables, down conductors etc. at regular intervals on lighting tower. Hot dip galvanized brackets of required size shall be provided for the same.
- g) Make of all components like: Integral motor, trailing cable, feeder pillar, contactor, MCB shall be of reputed make.
- h) EPR / PCP cable required for lighting mast shall be provided by vendor. Cables from feeder pillar to fixtures shall be supplied by vendor. Power cable make shall be Universal, Polycab, CCI, Delton, Havells, NICCO, and Paramount
- i) Soil bearing capacity for design of foundation for lighting masts shall be considered as 7 T/m<sup>2</sup>
- j) Wind speed to be considered for lighting mast design shall be 50 m/s.

### 2.15 LED Luminaires:

S.No	Clause reference of section-II	Project specific requirement (to be read as)
1	The luminaire efficacy shall be not less than 70Lm/W.	The luminaire efficacy shall be not less than 100 Lm/W.
2	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 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.
3	LED Drivers may have following control & protections: Suitable precision current control of LED. Open Circuit Protection Short Circuit Protection Over Temperature Protection Overload Protection	LED Drivers shall have following control & protections: 1. Suitable precision current control of LED. 2. Open Circuit Protection 3. Short Circuit Protection 4. Over Temperature Protection 5. Overload Protection 6. Surge Protection
4	PACKING	Packing shall be as per technical specification
5	QP	At contract stage, the successful bidder shall submit the same QP for BHEL approval. There shall be no commercial implication to BHEL on

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-II: SCOPE OF WORK

		account of any changes in QP during contract stage.
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The Lighting Fixture shall be LED Type of **reputed make**. 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. Suitable heat sink shall be designed & provided in the luminaire. The LED luminaires shall have a minimum life of 25000 burning hours with 80% of lumen maintenance at the end of the life. 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.

Alternatively, vendor may offer technically superior and proven product subject to approval of employer.

### 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.

### Wiring

Lighting wires shall be 1100 V grade, light duty PVC insulated unsheathed, stranded copper/aluminium wire for fixed wiring installation. Colour of the PVC insulation of wires shall be Red, Yellow, Blue and Black for R, Y, B phases & neutral, respectively and white & grey for DC positive & DC negative circuits, respectively. Minimum size of wire shall not be less than 1.5 sq. mm. for copper and 4 sq.mm. for aluminium.

Fixture shall be suitable for termination of the conductor size.

### EARTHING & LIGHTNING PROTECTION

Lighting panels, etc. shall be earthed by two separate and distinct connections with earthing system. Switch boxes, junction boxes, lighting fixtures, fans, single phase receptacles etc. shall be earthed by means of separate earth continuity conductor. The earth continuity conductor 14 SWG GI wire shall be run along with each conduit run. Cable armours shall be connected to earthing system at both the ends.

S.No.	Type of Luminaire	Description	Total Luminous	Measured Electrical
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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-II: SCOPE OF WORK

			flux (Lumen) of luminaire- Minimum value	Input Power(Watt)- Maximum value
1	SF66 (LED)	Flood light, heavy duty type LED fixture	45000	450

### 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.

### 2.16 SUPERVISION SERVICES

The Supplier will arrange for supervision during commissioning of High Mast. The supervision date will be intimated 1 week in advance by BHEL for commissioning of High Mast. Total supervision man-day for commissioning will be 01 days per High Mast i.e. total 10 days (total visits three).

### 2.17 PACKAGING AND FORWARDING

The High Mast etc. as described in this scope should be packed as per relevant IS.

### 2.18 TRANSPORTATON

The transportation and freight insurance from works of the bidder to the site mentioned is also in the scope of the supplier.

### 2.19 TOOLS AND TACKLE

2.20 Tools & tackle which are essential to facilitate assembly, adjustments, erection, maintenance & dismantling of equipment shall be provided as part of equipment supplied.

2.21 The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

2.22 Vendor shall also submit a list of recommended tools and tackle. Acceptance of these tools and tackle shall not be a binding on the purchaser.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## STANDARDS APPLICABLE

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### 1.0 LIST OF STANDARDS APPLICABLE

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	Photo biological 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	Electromagnetic 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
IS 3528	Waterproof electric lighting fittings
IS 3553	Watertight electric lighting fittings
IS 4012	Dust-proof electric lighting fittings



## TECHNICAL CONDITIONS OF CONTRACT (TCC) STANDARDS APPLICABLE

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
IS: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 equipment for hazardous areas
BS:6121	Mechanical cable glands

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## STANDARDS APPLICABLE

### DATASHEET – A (HIGH MAST)

#### 1.0 APPLICABLE STANDARDS & CODES

##### **[A] POLES AND HIGH MAST**

1.	Tubular steel poles for over head power lines	IS 2713	
2.	Code and practice for design loads for structures	IS 875 Part III	
3.	Code of practice for general construction in steel	IS 800	
4.	European structural steel standard	BS-EN 10025	
5.	Code of practice for phosphating of iron and steel	IS 6005	
6.	Colour for ready mixed paints & enamels	IS 5	
7.	Recommended practice for hot dip galvanising of iron & steel	IS 2629	
8.	Method of testing uniformity of on zinc coated articles	IS 2603	coating
8.	Method of sampling for steel pipes, tubes & fittings	IS 4711	
10.	Method of chemical analysis of pig iron, cast iron and plain carbon & low alloy steel	IS 228	
11.	Steel tubes for structural purposes	IS 1161	
12.	Mechanical testing of metals-Tensile Testing	IS 1608	
13.	Specification for hot dip zinc coatings on structural steel and allied products	IS 4759	
14.	Method for testing uniformity of coating on zinc coated articles	IS 2633	

## TECHNICAL CONDITIONS OF CONTRACT (TCC) STANDARDS APPLICABLE

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### **[B] ASSEMBLED EQUIPMENT AND COMPONENTS**

- |    |  |           |
|----|--|-----------|
| 1. | Low voltage switchgear and controlgear   | IEC 60947 |
| 2. | General requirements for enclosures for accessories for household and similar fixed electrical installations | IS 14772  |
| 3. | Electrical accessories- Circuit breaker for overcurrent protection for household and similar installations   | IEC 60898 |
| 4. | Low voltage Fuses for voltages not exceeding 1100V AC or 1500V DC  | IS 13703  |
| 5. | Visual indicator lamps   | IS 1901   |

### **[C] ADDITIONAL STANDARDS FOR MAST**

- |    |  |                    |
|----|--|--------------------|
| 1. | Welding                                | BS 5135/AWS        |
| 2. | Galvanizing                            | BS.ISO 1461        |
| 3. | UK Specification for Mast & Foundation | TR No. 7200 of ILE |

**NOTE:** This list of standards applicable is indicative in nature and cannot be taken as a comprehensive list. All the other standards which are applicable as per the statutory rules and regulations are applicable to this scope.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## DETAILED TECHNICAL SPECIFICATIONS

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### **2.0 TECHNICAL SPECIFICATION**

#### **6.1 WINCH**

The winch shall be of completely self-sustaining type, without the need for brake shoe, springs or clutches. Driving spindle of the winch shall be locked when not in use. The capacity, operating speed, safe working load, recommended lubrication and serial number of the winch shall be clearly marked on the winch.

The winch drum shall be grooved to ensure perfect seat for stable and tidy rope lay, with no chances of rope slippage. The rope termination in the winch shall be such that distortion is eliminated and at least 5 to 6 turns of rope remains on the drum even when the lantern carriage is fully lowered and rested on the rest pads. It should be possible to operate the winch manually by a suitable handle in-case of problem with electrically operated tool.

#### **6.2 HEAD FRAME**

The head frame, which is to be designed as a unit of the mast, shall be of welded steel construction, galvanized both internally and externally after assembly. The top pulley shall be of appropriate diameter, large enough to accommodate the stainless steel wire rope and the multicore electric cable. The pulley block shall be made of non-corrodible material, and shall be of die cast Aluminium Alloy. Pulley made of synthetic Materials such as Plastic or PVC is not acceptable. Self-Lubricating bearings and stainless steel shaft shall be provided to facilitate smooth and maintenance free operation for a long period. The pulley assembly shall be protected by a canopy galvanized internally and externally, close fitting guides and sleeves shall be provided to ensure that the ropes and cables do not get dislodged from their respective positions in the grooves. The head frame shall be provided with guides and stops with PVC buffer for docking the lantern carriage.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### DETAILED TECHNICAL SPECIFICATIONS

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#### **6.3 LANTERN CARRIAGE**

A fabricated MS hot dip galvanized lantern carriage shall be provided for mounting of luminary arm assemblies. The diameter of the lantern carriage shall not be less than 1200 mm.

#### **6.4 STAINLESS STEEL WIRE ROPES**

The High Mast Light has an optimally balanced system for raising and lowering of the luminaries. The suspension system shall be of non-corrodible stainless steel of AISI 316 or better grade. The stainless steel wire ropes shall be of suitable size, the central core being of the same material. The overall diameter of the rope shall not be less than 6mm. Continuous length of stainless steel wire ropes shall be used in the system. There shall be no intermediate joints/ terminations, either bolted or any other type, on the wire ropes.

#### **6.5 ELECTRICAL SYSTEM, CABLE AND CABLE CONNECTIONS**

A suitable terminal box shall be provided at the base compartment of the high mast for terminating the incoming cable. The electrical connections from the bottom to the top shall be made by special trailing cable. Size of the cable shall be minimum of 5C x 4 sq. mm copper. At the top there shall be weather proof junction box to terminate the trailing cable. Connections from the top junction box to the individual luminaries shall be made by using 3C x 2.5 sq. mm Copper flexible PVC cables of reputed make. The system shall have inbuilt facilities for testing the luminaries while in lowered position. Also suitable provision shall be made at the base compartment of the mast to facilitate the operation of internally mounted, electrically operated power tool for raising and lowering of the lantern carriage assembly. The trailing cable of the lantern carriage rings shall be terminated by means of metal clad, multi-pin plug and socket provided in the base compartment to enable easy disconnection when required.

## TECHNICAL CONDITIONS OF CONTRACT (TCC) DETAILED TECHNICAL SPECIFICATIONS

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The fitting and control gear boxes offered should be suitable for outdoor application and properly sealed to prevent rain water entry.

### **6.6 LUMINARIES AND LAMPS**

The luminaries and lamp should be of Phillips / Bajaj / GE / Wipro / Crompton Greaves.

### **6.7 POWER TOOL FOR THE WINCH**

A suitable, high-powered, electricity driven, internally mounted power tool, with manual over ride shall be supplied for the raising and lowering of the lantern carriages for maintenance purpose. The speed of the power tool shall be to suit the system. The power tool shall be single speed, provided with a motor of the required rating. The power tool shall be supplied complete with suitable control. The capacity and speed of the electric motor used in the power tool shall be suitable for the lifting of the design load installed on the lantern carriage. The power tool mounting shall be so designed that it will be not only self-supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also, a handle for the manual operation of the winches in case of problems with the electrically operated tool shall be provided.

### **6.8 LIGHTNING ARRESTOR**

One number heavy duty hot dip galvanized lightning spike rod shall be provided for each mast. The lightning spike rod shall be minimum 1.2 m in length and shall be provided at the center of the head frame. It shall be bolted solidly to the head frame to get a direct conducting path to the earth through the mast.

### **6.9 AVIATION OBSTRUCTION LIGHT**

Suitable Aviation Obstruction Lights of reliable design and reputed manufacturer shall be provided on top of each mast.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## DETAILED TECHNICAL SPECIFICATIONS

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### **6.10 EARTHING TERMINALS**

Suitable earth terminals (Minimum 04 nos.) shall be provided at a convenient location on the base of the mast, for lightning and electrical earthing of the mast and Including Earth Links up to each of these Earth Pits.

There will be two nos. of earth pits for High Mast & Control Panel and two nos. of earth pits for Lightning Protection. Earth Pit shall be made as per drawing attached.

Type of Earth Pit: - Treated earth pit with 40 mm GI Pipe, 3m depth with chamber, CI Cover, painting etc. as per **IS: 3043**.

### **6.11 CONTROL PANEL**

Incoming TPN Switch Fuse Unit with HRC fuses or MCCB of suitable current rating, incoming/ outgoing terminals and control for the power motor, suitable digital timer of reputed make, with necessary contactors, wiring for ON/OFF control of the lamps shall be provided in the control panel. Cable for incoming source to Control Panel shall be arranged by BHEL. However, suitable lugs and glands shall be arranged by vendor at Control panel end. Power/ Control cable from Control panel to High Mast JB shall be in the scope of vendor.

### **6.12 RESTING STOPPERS**

Necessary arrangements shall be made to rest the lantern carriage on the stoppers in lowered position. The stoppers should be capable of withstanding the mast weight.

### **6.13 QUALITY REQUIREMENT**

Test certificate shall be furnished by the contractor, obtained from the original equipment manufacturer (OEM) for each winch including wire rope, in support of the minimum load operated by the winch.

## TECHNICAL CONDITIONS OF CONTRACT (TCC) DETAILED TECHNICAL SPECIFICATIONS

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### **6.13.1 Bidder to submit the following information along with the offer:**

- a) Technical details of the mast & accessories offered.
- b) List of clients to whom similar masts have been supplied in the past and present order in hand.
- c) Minimum & maximum lux level.
- d) Types of luminaries offered.
- e) Quality Plan (in line with attached sample plan)
- f) Product Catalogue along with detailed specification of item.

### **6.13.2 Bidder to submit the following documents at the time of delivery:**

- a) Operation & Maintenance Manual.
- b) Technical details of the High Mast Light System mentioning technical specification of all the equipment & accessories used in the High Mast Light system.
- c) Manufacturer's Test Certificate.
- d) Warrantee Certificate.

### **6.14 WARRANTY TERMS**

Minimum 12 months from the date of commissioning or 18 months from the date of supply, whichever is later.

### **6.15 SPARES**

Item wise rates of each spares used in the high mast light should be attached for future reference.

### **6.16 INSPECTION REQUIREMENTS**

- 6.16.1 Supplier shall arrange for pre-dispatch inspection at their works/store/factory. Bidders quoted rates shall be inclusive of all necessary arrangements for pre-dispatch inspection at supplier's end. Pre-dispatch inspection call shall be raised 5 days in advance for complete set of instruments.
- 6.16.2 For Dispatch of material, clearance shall be obtained by supplier from BHEL. Delivery schedule also includes pre-dispatch inspection. Even if any rework has to be carried by the supplier after inspection, it has to be completed within the delivery schedule mentioned above.



# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## DETAILED TECHNICAL SPECIFICATIONS

### DATASHEET – (HIGH MAST)

S. No.	Description	Unit	Value
1.0	<b>System Design Data</b>		
a	Rated voltage	V	415
b	Rated frequency	Hz	50
c	Voltage and frequency variation (permissible)	%	Voltage: $\pm 10\%$ Frequency: $\pm 5\%$
d	Combined voltage & frequency variation (permissible)	%	10% absolute
e	System fault level & duration	kA, sec	50kA for 1 sec
2.0	<b>Lighting Masts</b>		
a	Number of luminaires on each mast	nos.	<input type="checkbox"/> 12 <input type="checkbox"/> 16 <i>[Each luminaire shall be of 450 MW (max. LED type).</i>
b	Type of design		Telescopic tubular, Polygonal shape
c	Material		GI
d	Height	meter	<input type="checkbox"/> 20 <input type="checkbox"/> 25 <input checked="" type="checkbox"/> 30
e	Grade of concrete		<input type="checkbox"/> M20 <input checked="" type="checkbox"/> M25 <input type="checkbox"/> M30
f	Galvanisation details		Galvanization <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
i)	Process		Hot dip
ii)	Min weight of zinc coating	gm/m <sup>2</sup>	610
iii)	Avg. thickness of zinc coating	Microns	86
3.0	<b>Feeder Panel</b>		
a	Enclosure material		<input type="checkbox"/> FRP <input checked="" type="checkbox"/> CRCA Sheet.
b	Enclosure thickness	mm	2
c	Degree of protection		IPW-55 (min.) with canopy
d	Paint shade		RAL9002
i)	Paint type		Electrostatic coating/ powder coating

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### DETAILED TECHNICAL SPECIFICATIONS

ii)	Paint thickness	micron	50
4.1	<b>Switch-Fuse Unit</b>		
a	Utilisation category for main contacts		AC23
4.2	<b>Miniature Circuit Breaker</b>		
a	SPN MCB rating (min)	A	20
b	DP MCB rating (min)	A	20
c	TPN MCB rating (min)	A	63
d	Short time rating	kA	10
e	Magnetic short circuit protection required		<input type="checkbox"/> Yes <input type="checkbox"/> No
f	Thermal overload protection required		<input type="checkbox"/> Yes <input type="checkbox"/> No
4.3	<b>Power Contactors</b>		
a	AC contactors voltage coil rating	V	240
b	DC contactors voltage coil rating	V	220
4.4	<b>Selector switch</b>		
a	Type of selector switch		<input type="checkbox"/> Stay put <input type="checkbox"/> Wing knob
b	Lockable		<input type="checkbox"/> Yes <input type="checkbox"/> No
4.5	<b>Push Button</b>		
a	Voltage grade	V	500
b	Potential free contacts		2NO+2NC
4.6	<b>Time switch</b>		
a	Type		Digital synchronous
b	Range	Hr	00-24
c	Coil voltage rating	V	240
4.7	<b>Timer</b>		
a	Type		
b	ON delay timer range	Sec	0-5
c	OFF delay timer range	Sec	0-180
d	AC Coil voltage rating	V	240
e	DC Coil voltage rating	V	220

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### DETAILED TECHNICAL SPECIFICATIONS

6.0	<b>Cable Glands</b>		<b>By vendor for all incoming and outgoing cables at feeder panel</b>
a	Type		[V ] Double compression [ ] Single compression
b	Material		Brass
c	Nickel Plating provided		[V ] Yes [ ] No
d	Size		During detailed engineering.
7.0	<b>Cable Lugs</b>		<b>By vendor for all incoming and outgoing cables at and feeder panel</b>
a	Type		[V ] Crimping type [ ] Ring type
b	Material		Tinned copper
c	Size		During detailed engineering.
8.0	<b>OTHER DETAILS</b>		
a	Cable gland of nickel plating, brass, double compression type		YES (Suitable for cable size 3.5C x 25 sqmm Al)
b	Cable lugs of tinned copper, crimping type		YES (Suitable for cable size 3.5C x 25 sqmm Al)
c	Supply of 3.5C x 25 sqmm cable (from feeder pillar to power source i.e. LDB/ MCC)		This cable is excluded from bidder's scope. All other cables/ wires required in lighting high mast shall be in bidder's scope.
d	BIS		YES
e	Availability of type test reports of product from Central govt./ NABL accredited lab showing compliance to the specification		YES
f	Test reports and approval to be furnished to the buyer on demand		YES
g	Drg/ docs wrt GA of mast, feeder pillar, circuit/ wiring diagram including components make & qty, structural design calculation and foundation arrangement of Mast etc. to be furnished for purchaser's approval.		YES

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## DETAILED TECHNICAL SPECIFICATIONS

### DATASHEET – (LIGHTING FIXTURES)

S. No.	Description	Unit	Value
1.0	<b>System Design Data</b>		
1.1	Design ambient	deg cel	50
1.2	AC supply		
a	Rated voltage	V	415
b	Rated frequency	Hz	50
c	Voltage and frequency variation (permissible)	%	Voltage: $\pm 10\%$ Frequency: $\pm 5\%$
d	Combined voltage & frequency variation (permissible)	%	10%
e	System fault level & duration	kA, sec	50kA for 1 sec
2.0	Scope of system design engineering		Included in vendor's scope
3.0	<b>Luminaires &amp; Accessories</b>		
4.0	<b>Cable Glands</b>		<b>By vendor for all incoming and outgoing cables</b>
a	Type		<input type="checkbox"/> Double compression <input type="checkbox"/> Single compression
b	Material		Brass
c	Nickel Plating provided		<input type="checkbox"/> Yes <input type="checkbox"/> No
d	Flameproof glands with flameproof equipment		<input type="checkbox"/> Yes <input type="checkbox"/> No
7.0	<b>Cable Lugs</b>		<b>By vendor for all incoming and outgoing cables</b>
a	Type		Crimping type/ ring type
b	Material		Tinned copper

Note :

1. Detailed luminaire data shall be placed by vendor after award of contract.
2. Galvanization wherever applicable shall be hot dip galvanized with weight of Zinc as 460g/m<sup>2</sup> (65 micron)

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## ANNEXURES

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### **GENERAL REQUIREMENTS – COMMON TO ALL WORKS**

- 7.1** The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.
- 7.2** The terminal points decided by BHEL shall be final and binding on the Contractor for deciding the scope of work and effecting payment for the work done.
- 7.3** The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Contractor and his personnel shall cooperate with personnel of BHEL, BHEL'S Customer, Customer's consultants and other Contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.
- 7.4** The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management.
- 7.5** Any other items not described above but required for satisfactory performance of the illumination system are deemed to have been included in the scope of the bidder / contractor at no extra cost implication to owner.
- 7.6** It is not the intent to specify completely herein all the details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the Bidder's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance there with. The offered equipment shall be complete with all components necessary for their effective and trouble-free operation. Such, components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## ANNEXURES

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1. Technical details of High Mast
2. High Mast GA drawing
3. Quality Plan

## **TECHNICAL DATA SHEET FOR 30 MTR. HIGH MAST**

### **HIGH MAST STRUCTURE**

HEIGHT OF HIGH MAST	:	30 MTR.
MAKE	:	
MATERIAL OF CONSTRUCTION	:	BSEN 10025 S 355 OR EQUIVALENT
CROSS SECTION OF MAST	:	20 SIDED
THICKNESS OF MATERIAL	i. TOP SECTION	: 4 MM
	ii. MIDDLE SECTION	: 4 MM
	iii. BOTTOM SECTION	: 5 MM
LENGTH OF INDIVIDUAL SECTION	i. TOP SECTION	: 10500 MM ( APPROX )
	ii. MIDDLE SECTION	: 10500 MM ( APPROX )
	ii. BOTTOM SECTION	: 10500 MM ( APPROX )
BASE & TOP DIAMETER	i. BASE DIA	: 540 MM
	ii. TOP DIA	: 150 MM
TYPE OF JOINT	:	STRESS SLIP FIT JOINTS ( NO WELDING SHALL BE DONE AT SITE )
LENGTH OF OVERLAP	:	800 MM / 700 MM
METAL PROTECTION TREATMENT FOR MAST SECTION	:	HOT DIP GALVANISED BOTH INTERNALLY & EXTERNALLY AS PER IS 4759
METHOD OF DIPPING	:	SINGLE DIPPING
THICKNESS OF GALVANISED	i. TOP SECTION	: AVERAGE 85 MICRONS
	ii. MIDDLE SECTION	: AVERAGE 85 MICRONS
	iii. BOTTOM SECTION	: AVERAGE 85 MICRONS
SIZE OF DOOR OPENING AT BASE OF MAST	:	1200 MM X 250 MM
TYPE OF LOCKING ON DOOR PANEL	:	ANTI VANDALISM TYPE WITH 2 NOS ALLEN BOLTS
SIZE OF BASE PLATE	i. DIAMETER	: 730 MM
	ii. THICKNESS	: 25 MM
DETAILS OF ANCHOR PLATE	:	730 DIA X 4 MM P. C. D. 650 MM X 12 HOLE
DETAILS OF TEMPLATE	:	730 DIA X 4 MM P. C. D. 650 MM X 12 HOLE
MAXIMUM WIND SPEED	:	180 KM / HR AS PER IS: 875 (Part 3)
FACTOR OF SAFETY FOR WIND LOAD	:	1.15

FACTOR OF SAFTY FOR OTHER LOADS	:	1.11
NO OF FOUNDATION BOLTS	:	12 NOS.
P. C. D. OF FOUNDATION BOLTS	:	650 MM
DIAMETER OF FOUNDATION BOLTS	:	30 MM DIA ( 750 MM LONG )

#### **LANTERN CARRIAGE.**

MATERIAL OF CONSTRUCTION	:	48 MM DIA ERW CLASS B - GI PIPE
DIAMETER OF LANTERN CARRIAGE RING	:	710 MM
NUMBER OF JOINTS.	:	3 JOINTS
BUFFER BETWEEN CARRIAGE & MAST	:	RUBBER PADED GUIDE RING
LOAD CARRING CAPACITY (MINIMUM)	:	750 KGS.
NO. O F LED FITTINGS	:	
AVIATION FIXTURE	:	PROVIDED

#### **WINCH**

NUMBER OF DRUM PER WINCH	:	DOUBLE DRUM DOUBLE GEAR TYPE
MAKE	:	
GEAR RATIO	:	30 : 1 ..
CAPACITY	:	SWL 750 KGS.
METHOD OF OPERATION	:	MOTOR AND MANUAL ( MANUAL HANDLE WILL BE PROVIDED )
LUBRICATING ARRANGEMENT	:	SELF LUBRICATING
TYPE OF LUBRICANT	:	GREASE / GEAR OIL / SAE 90 / SAE 140
TESTED LOAD PER DRUM	:	750 KGS.

#### **WIRE ROPE**

DIAMETER OF ROPE	:	6 MM
NO OF ROPES	:	3 NOS
GRADE	:	AISI 316
CENTRE CORE MATERIAL	:	STAINLESS STEEL CORE
CONSTRUCTION OF ROPE	:	7/19.

Trailing Cable (5Cx4 samm)- 35 Meter



BREAKING LOAD CAPACITY	: 2350 KG.
FACTOR OF SAFETY	: > 5 FOR SYSTEM AT FULL LOAD
THIMBLE & TERMINALS	: PROVIDED

**POWER TOOL**

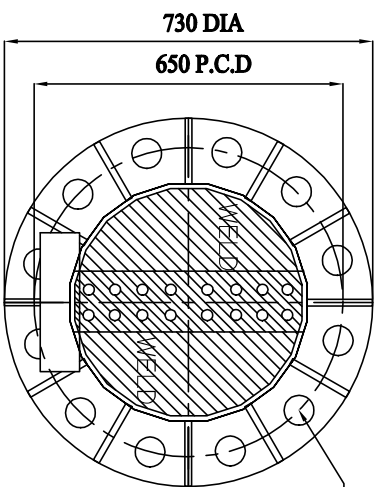
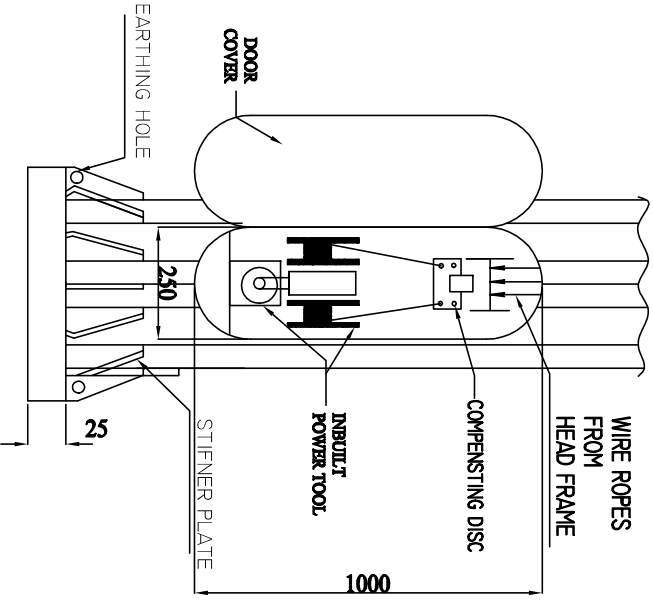
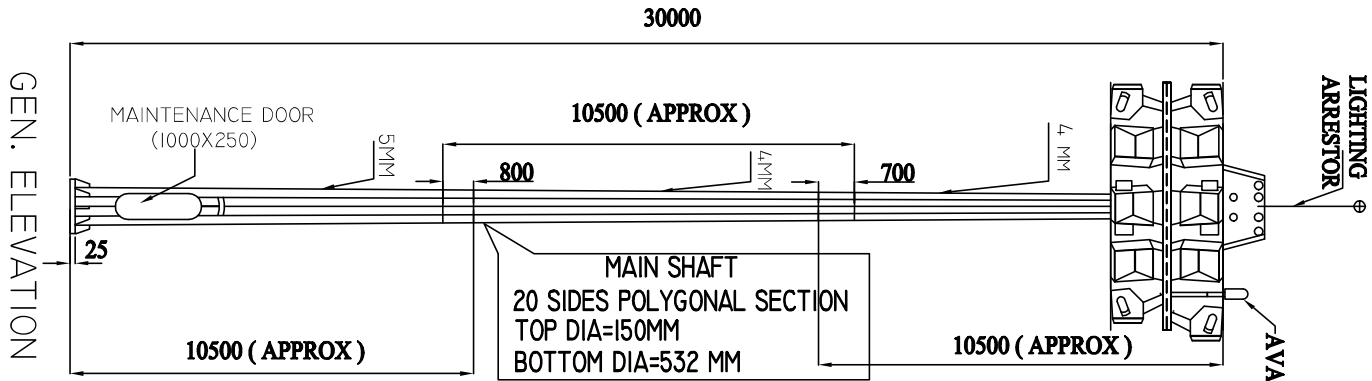
MOTOR CAPACITY	: 1.5 HP
NO OF SPEED	: SINGLE SPEED
REVERSABLE / NON-REVERSABLE	: REVERSABLE
NO. OF LED LAMP FITTING	: 12 NOS.

**CABLE**

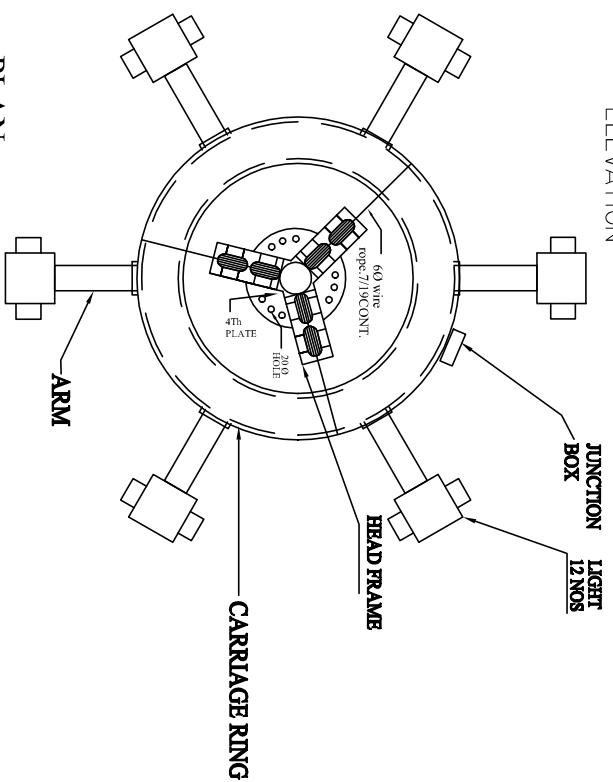
TYPE	: TRAILING CABLE
CONDUCTOR SIZE	: COPPER 5 CORE 4 SQ. MM
INSULATION	: PVC SHEATHED FLEXIBLE Cu CABLE
NO. OF CIRCUIT PER MAST	: ONE

**LIGHTING ARRESTER**

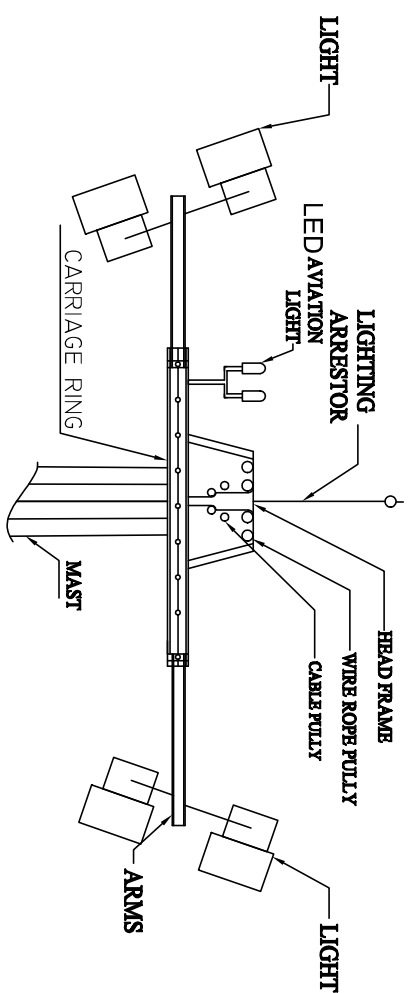
LIGHTING ARRESTER	: 16 MM DIA HEAVY DUTY HOT DIP GALVANIZED SPIKE (1200 MM LONG) AS PER IS2309:1989/IEC-62305
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PLAN



DISTRIBUTION OF LUMINARIES ELEVATION



- NOTE :-**
1. ALL DIMENSION ARE IN MM.
  2. WIND SPEED = 180 KM/HR.
  3. DIMENSION TOLERANCE BSEN 40
  4. SHAFT MATERIAL AS PER BSEN 10025/EQUIVALENT.
  5. BASE PLATE MATERIAL AS PER IS 2062.
  6. MATERIAL TOLERANCE IS 1852-1965
  7. MATERIAL PROTECTION = HOT DIP GALVANIZED
  8. GALVANIZING AND FINISHING STANDERD EN ISO-1461:1999 AND IS 11759-1985.

• 167 A, VIVEKANANDA ROAD • KOL-700006		NAME
TITLE :- LIGHTING MAST (SEC-3) 30 MTRS. NO. OF LUMINARIES= 12 NOS.		DESIGN
SCALE: N.T.S.		DRAWING G. P.
REV. NO.		CHECKED G. K.
APPR.		BPP
DRN NO :-		APPR.

QUALITY PLAN														
ITEM(MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC) LIGHTING MAST WITH RAISE & LOWER TYPE LANTERN CARRIAGE				CONFIRMING TO CODE : TECHNICAL SPECIFICATION										
SI No	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
					6M	6 C/N				M	C			
1	Steel for mast shaft/gussets/Head Frame	3	4	5			7	8	9	D*	**	10	11	
1		Chemical composition & Mechanical Properties	Major	Chemical & Mechanical	Sample as per mnfr std	Same as 6 M	Specification/Manufacturer's plant standard	Specification/Manufacturer's plant standard	TC	✓	P	V		
		Thickness	Major	Measurement	Sample as per mnfr std	Same as 6 M	Specification/Manufacturer's plant standard	Specification/Manufacturer's plant standard	TC	✓	P	V		
2	High Mast continuously tapered polygonal cross section													
		a	Dimention Cross section	Major	Measurement	100%		approved Drawing	approved Drawing	Internal Inspection Report		P	-	
		b	Longitudinal weld	Critical	Visual	Sample as per mnfr std	Same as 6 M	apdd Drg/Data sheet/Manufacturer Standard	Single defect free longitudinal weld	Internal Inspection Report		P	V	
	c	Galvanisation chekrs (Thickness uniformity of coating & adhesion)	Major	Measurement	Sample as per mnfr std	Same as 6 M	approved Data sheet/Drawing Manufacturer Standard:IS 2629/IS 2633 ISO:1461	NTPC approved Datasheet/Drawing	Internal Inspection Report	✓	P	V		
3	Luminaire, Carriage Head Frame, Pulley Block													
		a	Dimention, Mati of	Major	Measurement/Verify	1	Same as 6	approved Drawing	approved Drawing			P	V	
		b	inner lining with PVC	Major	Visual	1		approved Data sheet/Drag Manufacturer Standard	approved Data sheet/Drag Manufacturer Standard	Internal Inspection Report		P	-	
		c	Weld Joint	Major	Visual	Sample as per mnfr std	Same as 6 M	Manufacturer Standard	No abnormally	Internal Inspection		P	V	
		d	Galvanisation chekrs (Thickness uniformity of coating & adhesion)	Major	Measurement	Sample as per mnfr std	Same as 6 M	approved Data sheet/Drawing Manufacturer Standard:IS 2629/IS 2633 ISO:1461	approved Data sheet/Drawing	Internal Inspection Report	✓	P	V	
		e	minaire mounting/ Fixing dimension ch	critical	Measurement	1	Same as 6 M	approved Drg/Manufacturer drg	approved Drg/Manufacturer drg	Internal Inspection Report	✓	P	V	
	f	Pully Block Material & Smooth Rotation	critical	Verify	1	Same as 6 M	approved Drg/Manufacturer drg	approved Drg/Manufacturer drg	TC	✓	P	V		

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 \* P: Perform W: Witness V: Verification

QUALITY PLAN													
CONFIRMING TO CODE :													
ITEM(MATERIAL,CLASS,GRADE,RATING,RANGE,SIZE ETC) LIGHTING MAST WITH RAISE & LOWER TYPE LANTERN CARRIAGE													
SI No	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS	
					6M	6 C/N				M	C		
4	Raising/ Lowering mechanism	a	Type & Rating Check on Which Power Tool & Torque Limitor	Visual	100%	Same as 6 M	approved Datasheet / Drg.	approved Datasheet / Drg.	Internal Inspection Report	✓	P	V	Coc of motor manufacturer shall be authenticated for BHEL Review
		b	Load Testing On Winches	Mechanical	Sample as per mnfr std	Same as 6 M	Manufacturer Standard	Manufacturer Standard	TC	✓	P	V	
		c.	Functional Testing on Load Limitor	Mechanical	Sample as per mnfr std	Same as 6 M	Manufacturer Standard	Manufacturer Standard	TC	✓	P	V	
		d.	Funtional & Assembly Check manual& motorised	Mechanical	100%	Same as 6 M	Manufacturer Standard	Manufacturer Standard	Internal Inspection Report		P	V	
5	Stainless Steel Wire Rope	a.	Mechanical Properties including breaking Load	Mechanical	Sample as per mnfr std	Same as 6 M	approved Datasheet/Drawing	approved Datasheet/Drawing	TC	✓	P	V	
b.		Continous Rope without any joint	Visual	Sample as per mnfr std	Same as 6 M	approved Datasheet/Drawing	approved Datasheet/Drawing	Internal Inspection Report	✓	P	V		
c.		Dimention & Construction	Measurement	Sample as per mnfr std	Same as 6 M	approved Datasheet/Drawing	approved Datasheet/Drawing	Internal Inspection Report	✓	P	V		
6	Foundation Bolts	a.	Mechanical Properties	Mechanical	Sample as per mnfr std	Same as 6 M	approved Datasheet/Drawing/IS 13967	approved Datasheet/Drawing/IS 13967	TC	✓	P	V	
b.		Dimensions	Measurement	Sample as per mnfr std	Same as 6 M	approved Drg / Manufacturer drg	approved Drg / Manufacturer drg	TC	✓	P	V		
7	Power Cable & Connector	a	Size Rating & Type	Visual	100%	–	approved Datasheet / Drg.	approved Datasheet / Drg.	Internal Inspection Report		P	–	
		b	Routine Test Report ( For Cable Only)	Major	Visual	1	–	IS 9968	IS 9968	TC		P	V

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QUALITY PLAN															
CONFIRMING TO CODE :															
COMPONENTS & OPERATIONS		CHARACTERSTICS		CLASS	TYPE OF CHECK		QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS		
SI No	2	3		4	5		6M	6 C/N	7	8	9	M	C		
1	Feeder Pillar Panel	a	Pre-treatment chemical regime record verification	Critical	Verification	Sample as per mnfr std	Same as 6 M		Chemical regime supplier recomandation & Manufacturer Standard	Chemical regime supplier recomandation & Manufacturer Standard	Internal Inspection Report	✓	V	Record of chemical concentration of pre-treatment tanks to be verified	
8		b	Dimensions, Degree of protection check by proper insertion method	Major	Measurement & Test	100%	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
		c	Powder coating shade & thickness check	Major	Mechanical Check	Random Sample	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
		d	Powder coating adhesion check by cross hatch method using packing tape	Major	Mechanical Check	Random Sample	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
		e	Make type & rating check of components mounted in feeder pillar	Major	Visual	100%	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
		f	HV & IR check	Major	Electrical	100%	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
		g	Functional testing	Major	Electrical	100%	Same as 6 M		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report	✓	P	V	
9	Luminaires with controlgear and aviation obstruction light	a	Make type & rating check	Critical	Visual	100%	100%		approved datasheet /	approved datasheet / Drg.	Internal Inspection Report		P	V	Make Shall be indicated
		b	Routine & batch test Certificates	Major	Verification	100%	100%		approved datasheet /	approved datasheet / Drg.	TC	✓	V	V	Manufacturer's CoC for Aviation obstruction light

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QUALITY PLAN															
CONFIRMING TO CODE :															
ITEM(MATERIAL,CLASS,GRADE,RATING,RA NGE,SOZE ETC) LIGHTING MAST WITH RAISE & LOWER TYPE LANTERN CARRIAGE		COMPONENTS & OPERATIONS		CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS	
SI No				3	4	5	6M	6 C/N			9	M	C		
1					4	5			7	8		D*	**	10	11
10	Final test			High Mast Structure Cross - section Dimension Measurement	Major	Measurement	100%	100%	approved Drawing	approved Drawing	Internal Inspection Report	P	W		
		a		Galvanising Coating Thickness, uniformity of coating and adhesion	Major	Measurement	1 sample per shaft	1 sample per shaft	approved Data sheet/Drawing Manufacturer Standard IS 2629/IS 2633 ISO:1461	approved Datasheet	Internal Inspection Report	P	W		
		c		Feeder pillar Dimensions check	Major	Measurement	100%	Same as 6 M	approved datasheet Drg.	approved datasheet / Drg.	Internal Inspection Report	✓	P	W	
		d		Feeder pillar Powder coating shade & thickness check	Major	Mechanical Check	Random Sample	Same as 6 M	approved datasheet Drg.	approved datasheet / Drg.	Internal Inspection Report	✓	P	W	
		e		Feeder pillar Powder coating adhesion check by cross hatch method using packing tape	Major	Mechanical Check	Random Sample	Same as 6 M	approved datasheet Drg.	approved datasheet / Drg.	Internal Inspection Report	✓	P	W	
		f		Feeder pillar make, type & rating check of components mounted in feeder pillar	Major	Visual	100%	Same as 6 M	approved datasheet Drg./IS	approved datasheet / Drg.	Internal Inspection Report	✓	P	W	
		g		Feeder pillar Functional Test	Major	Electrical	100%	100%	Specification/ Approved Drawing	Specification/ Approved Drawing	Internal Inspection Report		P	W	
		h		Feeder pillar IR test before & after HV	Major	Electrical	100%	100%	AS per IS 8623	AS per IS 8623	Internal Inspection Report		P	W	
		i		Feeder Pillar HV test	Major	Measurement	100%	100%	AS per IS 8623	AS per IS 8623	Internal Inspection Report		P	W	
		i		Completeness of lighting mast components.	Major	Visual	100%	100%	Specification/ Approved Drawing	Specification / Approved Drawing	Internal Inspection Report		P	W	

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