3 X 660 MW NORTH KARANPURA STPS

TECHNICAL SPECIFICATION

FOR

STATION LIGHTING SYSTEM (LIGHTING MAST)

SPECIFICATION NO. : PE-TS-405-558–E001 R0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP [INDIA]

PREAMBLE

1 The Tender documents contain three (3) volumes. The bidder shall meet the requirements of all three volumes.

1.1 **VOLUME - I** **CONDITIONS OF CONTRACT**

This consists of four parts as below:

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

1.2 **VOLUME – II** **TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume – II, which comprises of:-

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A: This section outlines the Intent of Specification.

Section – B: This section provides “Project Information”.

Section – C: This section indicates Technical Requirements specific to Contract, not covered in Section – D.

Section – D: This section comprises of Technical requirements specific to Contract.

Data Sheet-A: Specific data and other requirements pertaining to the equipments.

Data sheet–C: Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)

CONTENTS

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 6.1 of Section-C, Volume-II-B of the specification, Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:

    a. Unpriced Price Schedule (Annexure-A: BOQ, as enclosed with the specification) with bidder's signature and company stamp.
    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
    c. A copy of previous sheet ("List of Contents"), with bidder's signature and company stamp.

2. No technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.

3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

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 cable description/ quantities, notes etc. from those given in Annexure-A to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS)

SCOPE OF ENQUIRY

1.0 This specification covers the design, manufacture, assembly, inspection and testing at manufacturer's works, proper packing and delivery to 3 X 660MW NORTH KARANPURA TPS site, storage, erection & commissioning of **STATION LIGHTING SYSTEM (LIGHTING MAST)** as mentioned in different sections of this specification for the project as indicated in Section B (Project Information).

2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.

3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere be hereby made part of technical specification.

4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.

5.0 Requirements of the specification including the QP shall be agreed upon for total compliance by Bidders without any deviations. Price offers of only those bidders complying with the above requirement shall be acceptable.

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

7.0 For every shipment made to site, a shipping list, containing item reference [item number and description as per specification Bill of Materials or package drawings], and quantity of the same [in nos./ weight] shall be provided by vendor at the time of despatch of materials to site.

SECTION- B

SUB-SECTION–I-B

PROJECT INFORMATION

1.00.00 **BACKGROUND**

North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand.

The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.

1.01.00 **Location and Approach**

The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.
Major rail/road distances from the project site are as under:

City		**Distance Approx. (kms)**
Ranchi	:	150
Khalari	:	40

The site is located near Tandwa town having latitude and longitude of about 23^0 50' N to 23º 52' N and 84^0 59' E to 85º 2' E respectively. The Vicinity Plan of the project is placed at **Annexure-I.**

Further to the information given in this sub-section, Bidders are also advised to visit the project site and collect data on local site conditions.

1.02.00 **Land**

About 2245 acres of land is being acquired for the project. About 1500 acres of land is under possession/legal possession and out of 1500 acres, about 890 acres of land is to be used for plant, ash dyke and initial enabling township. No additional land is envisaged to be acquired in plant area. About 15 acres of land is envisaged to be acquired in Hazaribagh city for Township.
Commissioner, Chatra vide dated 25.05.1999 and 14.06.2000 has given in-principle clearance for NKSTPP.

1.03.00 **Water**

Make up water available for this project would be about 22 cusec and will be arranged by constructing a dam/reservoir across river Garhi.

1.04.00 **Fuel (Coal)**

1.04.01 **Coal Requirement, Availability and Linkage**

Coal requirement for the project is estimated as 10.6 Million Tonne/Annum (MTPA), considering a GCV of 3800 kcal/kg. Ministry of Coal vide letter dated 21.10.99 accorded in-principle coal linkage of 10.00 MTPA subject to ratification by Standing Linkage Committee-Long Term (SLC (LT)), of MOC. SLC (LT) in its meeting held on 15.12.2000 firmed up the coal linkage of 10.24 MTPA for the project. Subsequently, the coal linkage was withdrawn by SLC (LT) in its meeting held on 22/23.10.08.

Cabinet Committee on Investment (GOI) in its meeting on 20.02.13 decided in-principle to restore the original coal linkage granted to NKSTPP (i.e. from Magadh Coal Block) with the stipulation that the coal supply will commence during the 13th Five Year Plan. MOC vide letter dated 09.05.2013 restored the coal linkage with the stipulation that the coal supply will commence during the 13th five year plan.

1.04.02 **Coal Transportation**

Coal from Magadh block of North Karanpura Coalfields is proposed to be transported to the project site through conveyor belt system. One external coal handling plant and one internal coal handling plant are envisaged.

1.05.00 **Meteorological Data**

Important meteorological data from nearest observatory at Hazaribag is placed at Annexure-II**.**

1.06.00 **Plant Water Scheme**

The Plant water scheme is described below.

1.06.01 **Condenser Cooling System**

It is proposed to adopt Air Cooled Condenser for the project.

1.06.02 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through heat exchangers by auxiliary cooling water system. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.

1.06.03 **Ash Water System**

It is proposed to have HCSD (High concentration Slurry Disposal) system for combined fly ash and bottom ash. No recirculation of ash water from ash disposal area is envisaged.

1.06.04 **Other Miscellaneous Water Systems**

(a) Raw water shall be used for meeting the Fly ash and bottom ash system requirement etc.

(b) The service water shall be taken from clarified water tank of Pretreatment plant. Service water (wash water) collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use.

(c) The drinking water requirement of the plant shall be provided from water treatment plant.

(d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Demineralising plant.

(e) The quality of Raw water is enclosed with this sub-section as Annexure-III.

1.07.00 **Criteria for Earthquake Resistant Design of Structures and Equipment**

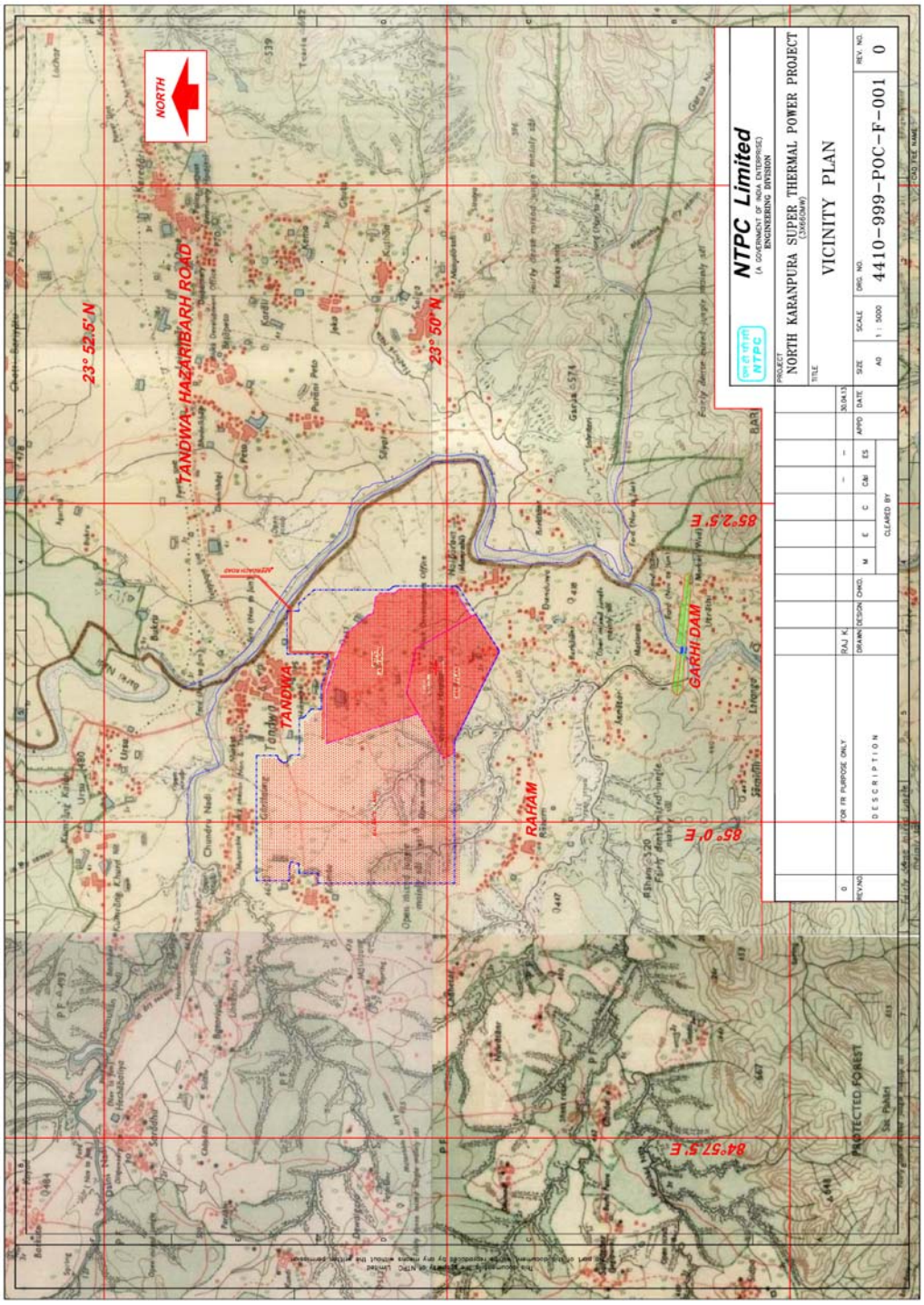
All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in the Part - B of this section.

1.08.00 **Criteria for Wind Resistant Design of Structures and Equipment**

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part B of this section.

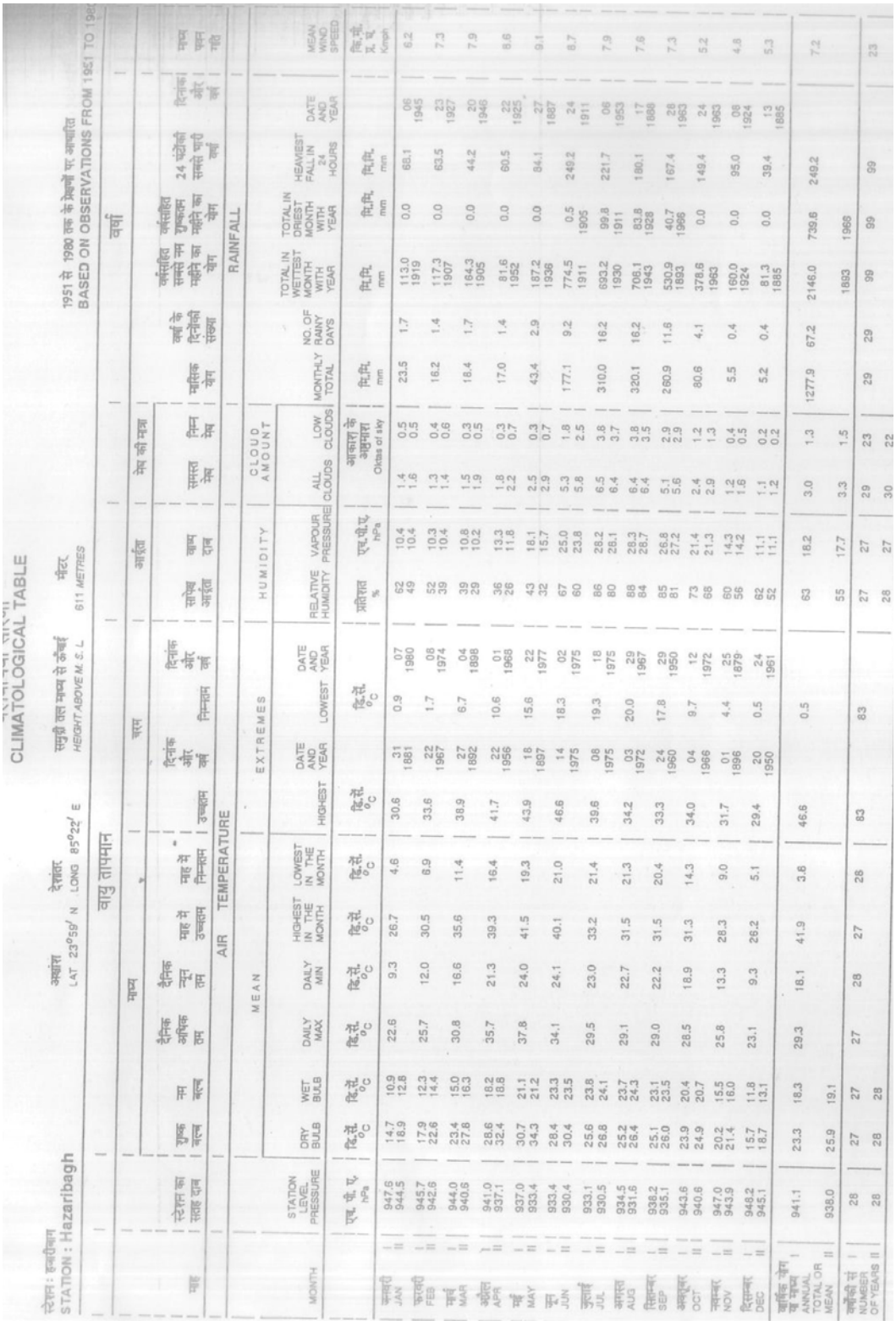
Annexure-I

VICINITY PLAN



Annexure-II

CLIMATOLOGICAL TABLE



CLIMATOLOGICAL TABLE

स्टेशन : हजारीबाग STATION : Hazaribagh

अक्षांश LAT 23°59′ N देशांतर LONG 85°22′ E समुद्री तल माध्य से ऊँचाई HEIGHT ABOVE M. S. L. 611 METRES

1951 से 1980 तक के प्रेक्षणों पर आधारित BASED ON OBSERVATIONS FROM 1951 TO 1980

MONTH	STATION LEVEL PRESSURE एच. पी. ए. hPa	AIR TEMPERATURE MEAN DRY BULB डिग्री से. °C	MEAN WET BULB डिग्री से. °C	MEAN DAILY MAX डिग्री से. °C	MEAN DAILY MIN डिग्री से. °C	HIGHEST IN THE MONTH डिग्री से. °C	LOWEST IN THE MONTH डिग्री से. °C	EXTREMES HIGHEST दैनिक और उच्चतम	DATE AND YEAR	EXTREMES LOWEST दैनिक और निम्नतम	DATE AND YEAR	HUMIDITY RELATIVE HUMIDITY प्रतिशत %	VAPOUR PRESSURE एच.पी.ए. hPa	CLOUD AMOUNT ALL CLOUDS आकाश के अष्टमांश Oktas of sky	LOW CLOUDS	MONTHLY TOTAL मि.मि. mm	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	TOTAL IN WETTEST MONTH WITH YEAR मि.मि. mm	TOTAL IN DRIEST MONTH WITH YEAR मि.मि. mm	HEAVIEST FALL IN 24 HOURS मि.मि. mm	DATE AND YEAR	MEAN WIND SPEED कि.मी. प्र. घं. Kmph
जनवरी JAN	I 947.6	14.7	10.9	22.6	9.3	26.7	4.6	30.6	31 1881	0.9	07 1980	62	10.4	1.4	0.5	23.5	1.7	113.0 1919	0.0	68.1	06 1945	6.2
	II 944.5	18.9	12.8									49	10.4	1.6	0.5							
फरवरी FEB	I 945.7	17.9	12.3	25.7	12.0	30.5	8.9	33.6	22 1967	1.7	08 1974	52	10.3	1.3	0.4	16.2	1.4	117.3 1907	0.0	63.5	23 1927	7.3
	II 942.6	22.6	14.4									39	10.4	1.4	0.8							
मार्च MAR	I 944.0	23.4	15.0	30.8	16.6	35.6	11.4	38.9	27 1892	6.7	04 1898	39	10.8	1.5	0.3	18.4	1.7	164.3 1905	0.0	44.2	20 1946	7.9
	II 940.6	27.8	16.3									29	10.2	1.9	0.5							
अप्रैल APR	I 941.0	28.6	18.2	35.7	21.3	39.3	16.4	41.7	22 1956	10.6	01 1968	36	13.3	1.8	0.3	17.0	1.4	81.6 1952	0.0	60.5	22 1925	8.6
	II 937.1	32.4	18.8									26	11.8	2.2	0.7							
मई MAY	I 937.0	30.7	21.1	37.8	24.0	41.5	19.3	43.9	18 1897	15.6	22 1977	43	18.1	2.5	0.3	43.4	2.9	187.2 1936	0.0	84.1	27 1887	9.1
	II 933.4	34.3	21.2									32	15.7	2.9	0.7							
जून JUN	I 933.4	28.4	23.3	34.1	24.1	40.1	21.0	46.6	14 1975	18.3	02 1975	67	25.0	5.3	1.8	177.1	9.2	774.5 1911	0.5 1905	249.2	24 1911	8.7
	II 930.4	30.4	23.5									60	23.8	5.8	2.5							
जुलाई JUL	I 933.1	25.6	23.8	29.5	23.0	33.2	21.4	39.6	08 1975	19.3	18 1975	86	28.2	6.5	3.8	310.0	16.2	693.2 1930	99.8 1911	221.7	06 1953	7.9
	II 930.5	26.8	24.1									80	28.1	6.4	3.7							
अगस्त AUG	I 934.5	25.2	23.7	29.1	22.7	31.5	21.3	34.2	03 1972	20.0	29 1967	88	28.3	6.4	3.8	320.1	16.2	706.1 1943	83.8 1928	180.1	17 1886	7.6
	II 931.6	26.4	24.3									84	28.7	6.4	3.5							
सितम्बर SEP	I 936.2	25.1	23.1	29.0	22.2	31.5	20.4	33.3	24 1960	17.8	29 1950	85	26.8	5.1	2.9	260.9	11.8	530.9 1893	40.7 1966	167.4	28 1963	7.3
	II 935.1	26.0	23.5									81	27.2	5.6	2.9							
अक्टूबर OCT	I 943.6	23.9	20.4	28.5	18.9	31.3	14.3	34.0	04 1966	9.7	12 1972	73	21.4	2.4	1.2	80.6	4.1	378.6 1963	0.0	149.4	24 1963	5.2
	II 940.6	24.9	20.7									68	21.3	2.9	1.3							
नवम्बर NOV	I 947.0	20.2	15.5	25.8	13.3	28.3	9.0	31.7	01 1896	4.4	25 1879	60	14.3	1.2	0.4	5.5	0.4	160.0 1924	0.0	95.0	06 1924	4.8
	II 943.9	21.4	16.0									56	14.2	1.6	0.5							
दिसम्बर DEC	I 948.2	15.7	11.8	23.1	9.3	26.2	5.1	29.4	20 1950	0.5	24 1961	62	11.1	1.1	0.2	5.2	0.4	81.3 1885	0.0	39.4	13 1885	5.3
	II 945.1	18.7	13.1									52	11.1	1.2	0.2							
वार्षिक योग ANNUAL TOTAL OR MEAN	I 941.1	23.3	18.3	29.3	18.1	41.9	3.8	46.6		0.5		63	18.2	3.0	1.3	1277.9	67.2	2146.0 1893	739.6 1968	249.2		7.2
	II 938.0	25.9	19.1									55	17.7	3.3	1.5							
वर्षों की सं. NUMBER OF YEARS	I 28	27	27	27	28	27	28	83		83		27	27	29	23	29	29	99	99	99		23
	II 28	28	28									28	27	30	22							

Annexure-III

RAW WATER ANALYSIS

Sl. No.	Constituent	as	mg per litre
1.	Calcium	CaCO3	65
2.	Magnesium	CaCO3	41
3.	Sodium	CaCO3	98
4.	Potassium	CaCO3	5
5.	Total Cations	CaCO3	209
6.	Total Alkalinity	CaCO3	150
7.	Chloride	CaCO3	25
8.	Sulphate	CaCO3	34
9.	Total Anions	CaCO3	209
9.	Silica (Reactive)	SiO2	9
11.	Iron	Fe	1.2
12.	pH Value	-	7.6-8.2
13.	Turbidity	NTU	200
14.	Organics(As per KMnO4 method)	Number	2

ANNEXURE-IV-1

TABLE-1

LIGHT DIESEL OIL CHARACTERISTICS
(AS PER IS 15770-2008)

	Characteristics	LDO
1.	Pour Point (max)	21 ℃ & 12℃ for Summer and Winter respectively
2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0
3.	Sediment percent by mass (max)	0.10
4.	Total sulphur percent by mass (max)	1.5
5.	Ash percentage by mass (max)	0.02
6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50
7.	Acidity inorganic	Nil
8.	Flash point (Min.) - Pensky Martens	66 deg.C
9.	Copper strip corrosion for 3 hours at 100℃	Not worse than No. 2
10.	Water content, % by volume (max)	0.25
11.	GCV(kcal/kg)	10,000

TABLE-2 **ANNEXURE-IV-2**

HIGH SPEED DIESEL OIL CHARACTERISTICS

[AS PER IS **1460-2005 (BS-II)**]

S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES		
	a. Distillation volume recovery @ 350^0C	% vol. (min)	85
	b. Distillation volume recovery @ 370^0C	% vol. (min)	95
	c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0
	d. Density @ 15 Degree C	kg/m^3	820 – 860
	e. Pour Point		
	- Summer	Degree C (max)	15
	- Winter	Degree C (max)	03
	f. Cold Filter Plugging Point		
	- Summer	Degree C (max)	18
	- Winter	Degree C (max)	06
	g. Flash Point (Abal)	Degree C (max)	35
	h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460
2.	HEATING VALUE		
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300
3.	ACIDITY		
	a. Inorganic	mg KOH/g	Nil
	b. Total	mg KOH/g	0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100^0C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS		
	a. Ash	ppm (wt.)	100 (max)
	b. Sediments	% wt	0.05 (max)
	c. Total Sulphur	% wt	0.05 (max)
	d. Water Content	% volume	0.05 (max)
	e. Trace Metals		
	- Na + K	ppm (wt)	0.30 (max)
	- Vanadium	ppm (wt)	0.50 (max)
	- Lead	ppm (wt)	0.50 (max)
	- Calcium	ppm (wt)	2.0
	- Ni + Zn	ppm (wt)	Nil
7.	Nitrogen content (FBN)	% wt.	0.015

TABLE-3

ANNEXURE-IV-3

PROPOSED COAL CHARACTERISTICS FOR NORTH KARANPURA STPP (3 x 660 MW)

S.No.	Characteristics (as received basis)	Range of 95 % coal supplies			Range of 5 % coal supplies
		Column - 1	Column - 2	Column - 3	
1.0	PROXIMATE ANALYSIS	Design	Worst	Best	
1.1	Total Moisture (%)	15	18	12	12-18
1.2	Ash (%)	40	46	36	33-46
1.3	Volatile Matter (%)	19	18	22	23-18
1.4	Fixed Carbon (%)	26	18	30	31-18
1.5	Total (%)	100	100	100	
2.0	ULTIMATE ANALYSIS				
2.1	Carbon (%)	29.73	23.08	37.32	40.62-23.08
2.2	Hydrogen (%)	3.7	3.54	3.92	4.02-3.54
2.3	Sulphur (%)	0.5	0.6	0.4	0.4-0.6
2.4	Nitrogen(%)	1.8	1.45	1.6	1.4-1.45
2.5	Oxygen(%)(By difference)	8.66	6.7	8.32	8.12-6.7
2.6	Carbonates (%)	0.58	0.6	0.4	0.4-0.6
2.7	Phosphorous(%)	0.03	0.03	0.04	0.04-0.03
2.8	Total Moisture (%)	15	18	12	12-18
2.9	Ash (%)	40	46	36	33-46
	Total	100	100	100	
2.10	GCV (Kcal/Kg)	3300	2800	4000	4300-2800
2.11	Hard Grove Index	55	50	60	50-65
3.0	ASH ANALYSIS				
3.1	Silica (%)	59.79	61.3	56.7	62-56
3.2	Alumina(%)	25.36	28	23.5	28-23
3.3	Iron Oxide (%)	7.2	6	10	6-10
3.4	Titania	1.2	1	1.5	1-1.7
3.5	Phophoric Anhydride (%)	2.6	1.5	3	1-3
3.6	Lime (%)	0.88	0.5	1.5	0.5-1.7
3.7	Magnesia (%)	0.55	0.4	1	0.4-1.1
3.8	Sulphuric Anhydride (%)	1.2	0.5	1.4	0.5-1.7
3.9	Alkalies (by difference)	1.22	0.8	1.4	0.6-1.8
	Total	100	100	100	
4.0	ASH FUSION RANGE				
	REDUCING ATMOSPHERE				
4.1	Initial Deformation Temp.(oC	1100	1100	1100	1100-1150
4.2	Hemispherical Temp. (oC)	1300	1250	1350	1250-1400
4.3	Fusion Temperature (oC)	1400	1400	1400	1400-1450

ANNEXURE-IV-4

TABLE – 4

TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS

Sl.No.	Characteristics (as received basis)	Imported Coal	
		Worst	**Best**
1.0	**Proximate Analysis**		
1.1	Total Moisture (%)	20	16
1.2	Ash (%)	10	10
1.3	Volatile Matter (%)	30	45
1.4	Fixed Carbon (%)	40	29
1.5	Total (%)	100	100
2.0	**Ultimate Analysis**		
2.1	Carbon (%)	56.4	62.4
2.2	Hydrogen (%)	4.5	4.9
2.3	Sulphur (%)	0.9	0.8
2.4	Nitrogen (%)	0.9	0.5
2.5	Oxygen (%) (By difference)	7.3	5.4
2.6	Carbonates (%)	0	0
2.7	Phosphorous (%)	0	0
2.8	Total Moisture (%)	20	16
2.9	Ash (%)	10	10
	Total	100	100
2.10	GCV (Kcal/Kg)	5800	6500
2.11	Hard Grove Index	45	60
2.12	YGP (mg/kg)	100	70
3.0	**Ash Analysis**		
3.1	Silica (SiO2) (%)	32.74	34.94
3.2	Alumina(Al2O3) (%)	30.5	28.43
3.3	Iron Oxides(Fe2O3) (%)	18.2	15.2
3.4	Titania (TiO2)	1.56	1.76
3.5	Phosphoric Anhydride(P2O5) (%)	0.44	0.54
3.6	Lime (CaO) (%)	6.12	7.62
3.7	Magnesia (MgO) (%)	1.83	1.93
3.8	Sulphuric Anhydride (%)	6.95	7.65
3.9	Sodium Oxide (Na2O) (%)	0.3	0.4
3.10	Balance alkalies (by difference)	1.36	1.56
	Total	100	100
4.0	**Ash Fusion Temperature reducing temperature**		
4.1	Initial deformation Temp (ºC)	1100	1250
4.2	Hemispherical Temp. (ºC)	1300	1350
4.3	Flow Temp. (ºC)	1400	1400

SECTION- C

1.0 This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing and despatch to site, site unloading & handling, site storage including storage facility (only graded land shall be provided by purchaser), erection and commissioning of lighting system as described in the various sections of this specification. Lighting system shall generally conform to IS. It is not the intent to completely specify all details of design and construction herein. However, the equipment shall conform to acceptable standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Contractor, who shall be entitled to reject any work or materials, which in his opinion is not in conformity with the duty requirements.

2.0 SCOPE OF SUPPLY AND SERVICES

The scope of supply and services covers the complete supply of equipment and services for lighting in accordance with the requirements of various sections of this specification.

2.1 The scope of supply shall be as per Price Schedule for Station Lighting System. The complete installation, testing, commissioning and performance testing of lighting mast and associated control panel as per Schedule of Equipment & Services enclosed shall be in bidder scope.

2.2 Consumable such as conduit accessories, conduit boxes, saddles, clamps, screws, switch boxes, supports, down rods, ball and sockets, fixing hardware etc, as described in various clause shall deemed to be included by the bidders.

3.0 Lighting Mast shall be of continuously tapered polygonal cross section hot dip galvanised. 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 cables 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 The Mast together with the fixtures shall be capable of withstanding the appropriate wind loads as per IS:875. The Mast shall be fabricated from special steel plates conforming to BS-EN10-025 and folded to form a polygonal section. Suitable feeder pillar with TPN MCB, contactors, timer, MCB and other necessary accessories for operation & protection of the mast and fixtures shall be provided.

Lighting fixtures shall generally be group controlled directly from lighting panel. However, in office areas, control shall be provided through switch boxes. Each switch shall control a maximum of three fluorescent fixtures.

A.C. normal, AC emergency and DC system wiring shall run throughout in separate conduits. Wires of different phase shall run in different conduits.

Alternately Vendor may offer technically superior and proven product subject to approval of employer.

3.1 It shall also include all accessories for high mast including head frame, steel wire rope 6mm dia, trailing cable, double drum winch, galvanised lantern carriage arrangement suitable for 16 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. Lighting mast shall be supplied along with 16nos. 2x400W fixtures and one no. twin dome aviation obstruction light with lamp. The mast with control panel shall be fenced with locking arrangement.

4.0 **DESIGN**

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

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

Lighting mast design shall be suitable for following:

a) 30M Height of the lighting mast

b) Maximum number of luminaires as per Data Sheet A.

c) Additional load of 500 kg towards the weight of maintenance crew.

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 galvanised as per applicable standard.

f) Provision shall be made for supporting cables, down conductors etc. at regular intervals on lighting tower. Hot dip galvanised 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.

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. Earthing of High mast shall be done using 2 no. 25X6mm GS which in turn shall be connected to one 20 mm dia MS earth electrode of 3 meter length driven vertically in the ground. The flat, earthing wire and electrode shall be supplied by the bidder and price of these shall be included in the price of individual mast.

Mast shall be provided with 600mm 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 metre from the ground.

5.0 STATUTORY & REGULATORY REQUIREMENT

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.

6.0 Design engineering includes submission of data sheets, GA drawings of equipment, mounting details, various schedules, lighting design calculation sheets, lighting distribution scheme, lighting layout drawings and bill of material drawings. Conduit layout drawings shall be submitted to meet the E&C schedule.

7.0 Basic Design Documents covers: Drawings/ documents schedule, technical data sheets, GA drawings of equipment, quality plan, type test reports & type test proposal (as required) for Station Lighting System.

8.0 Bidder after award of contract shall prepare all GA, schemes and lighting layout drawings in AUTOCAD 2008. Both hard as well soft copies of dwg/documents will be required for the purchaser's review/ approval.

9.0 INSPECTION & TESTING

9.1 Standard quality plan of various items are enclosed. For non-SQP items, bidder shall furnish their QP after award of contract. Inspection shall be carried out as per Quality Plan (QP) approved by Customer/BHEL without any implication on cost and delivery.

All material used for the construction of the equipment shall new and shall be in accordance with the requirements of this specification. Materials utilized shall be those which have established themselves for use in such applications.

9.2 All acceptance and routine tests as per relevant standards and specification shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.

9.3 Type test for lighting fixtures and accessories covered in the specification shall be carried out as per relevant standards

9.4 For all components / materials, for which Type tests have not been specified in the specification, only type test reports shall be furnished by the bidder. Such Type tests should have been carried out as on the date of bid opening, on identical components / materials. In absence of such type tests reports or in case such reports are not found to be meeting the specification/standards requirements, bidder shall conduct, free of cost to the purchaser, all such type tests according to the relevant standards and reports shall be submitted to the owner for approval.

All the components and completely assembled switchboards shall be tested as per the latest edition of standards.

9.5 All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

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.

Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant I.S 5.05.00 Type test reports of the following items as per relevant standards shall be submitted for approval.

10.0 Makes of sub-vendor and equipment/components shall be subject to Customer/BHEL approval during detailed engineering without any implication on cost and delivery. For BHEL approved sub-vendor list, refer enclosed Annexure-A.

11.0 Bidder shall furnish Field QP after award of contract for purchaser’s approval.

12.0 Bidder shall furnish various schedules/data sheets completely filled and duly stamped and signed as per various sections of this specification

13.0 Number of copies of documents/data to be submitted by the successful bidder shall be as per enclosed Annexure-B.

14.0 PRICES

14.1 The bidder shall quote prices for supply, erection, testing & commissioning of complete lighting system as per format attached with the specification.

14.2 Unit price quoted for erection, testing & commissioning of items listed under BOM shall be deemed to have been included the prices for erection material as described in clause 1.4 of standard specification of lighting system (installation) of section-C of this specification and other relevant clauses of this specification for various lighting equipment.

14.3 The unit rates of supply & installation for all equipment and service quoted by the bidder shall be firm for a variation of quantities limited to

a) ±30% of total order value till finalization of engineering details & BOQ.

14.4 Purchaser reserves the right to delete / add any equipment or services from the bidders scope, and for price adjustment in such cases, unit prices quoted by the bidder will be considered.

14.5 Bidder to note that the price quoted for System Engineering Design for lighting system shall be fixed for the project and will not vary with the change in scope of supply of equipment.

15.0 Bidder after award of contract shall prepare and submit the area drawings as per various sections of this specification within 4 weeks of the input given by the purchaser. The total engineering along with freezing of BOM shall be completed in line with specification requirement.

After completion of work at site, bidder shall prepare 'AS BUILT' drawings and furnish the same in floppy as well as in CD ROM.

16.0 Engineering, Supply and E&C schedule:

As per NIT (Notice Inviting Tender).

17.0 EXCLUSION

Incoming power for each mast shall be made available by purchaser along with cables.

TECHNICAL SPECIFICATION FOR

LIGHTING SYSTEM (SUPPLY)

SPECIFICATION NO. PE-TS-405-558-E001

CONTENTS

1.0 SCOPE

1.1 GENERAL

a) This specification covers the design, manufacture, assembly, testing and inspection at vendor's / sub-vendor's works, packing and despatch to site of lighting system and low voltage power services equipment.

b) The "design" shall broadly cover the selection of components, materials, sizes etc. for the equipment of supply in vendor's scope. Complete responsibility of establishing the correctness of equipment design rests with the vendor.

c) It is not the intent to specify here 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 the required duties in a manner acceptable to Engineer / 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.

d) Make of all equipment and components shall be to the approval of purchaser.

1.2 ENGINEERING

a) Specification also covers the aspect of System Design Engineering generally termed as "Engineering". Engineering shall be the purchaser to the successful bidder shall furnish the responsibility of vendor if indicated in Data Sheet A. Engineering inputs.

b) Engineering, if covered in vendor's scope, shall include design of complete lighting system for outdoor areas. The aspect of engineering covers preparation of electrical distribution and control schemes, quantity estimation, wiring schemes upto luminaires, cable schedules and all associated design work not specifically mentioned in the specification.

c) Complete engineering shall be as per the guidelines of purchaser and shall be subject to the purchaser's approval.

1.3 The requirements given in enclosed drawings, documents and Data Sheet A form part of this specification and shall be fully complied with. In case any discrepancy arises, the requirements of Data Sheet A shall prevail.

2.0 CODES & STANDARDS

2.1 Unless specified otherwise, the latest revisions of standards, codes and other applicable statutory rules and regulations specified in Annexure-I are applicable and shall be referred to.

3.0 SYSTEM DESIGN ENGINEERING

Engineering shall be done by the vendor only during the contract engineering stage if the same is covered in his scope. During tender stage, bidder shall make his quotation on the basis of BOQ furnished by the purchaser with the tender document.

4.0 LUMINAIRES, ACCESSORIES AND LAMPS

4.1 GENERAL REQUIREMENTS OF LUMINAIRES

4.1.1 All luminaires and accessories shall be designed for continuous operation and shall be suitable for the system design data given in Data Sheet A.

4.1.2 Luminaires shall be complete with accessories mounted inside the luminaire assembly. Lamps shall be supplied separately as per BOQ.

4.1.3 All luminaires and accessories shall be suitable for operation in the atmospheric conditions prevailing at site.

4.1.4 Power factor for fluorescent lamp luminaires shall be 0.9 or more and that for HPMV / HPSV luminaires shall be 0.85 or more. Power factor correction capacitors shall be provided for this purpose.

4.1.5 Luminaires shall be designed for minimum glare. No bright spots should appear from the lamp or from the reflectors.

4.1.6 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.

4.1.7 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.

4.1.8 All luminaires and accessories including the breathing holes shall be vermin proof.

4.1.9 Surface Treatment:

a) 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.

b) Finish of surfaces shall be non-porous, smooth and unfaded.

4.1.10 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.

4.1.11 Flood lights shall be provided with base frame / base plate for mounting on structural steel members / wall.

4.1.12 All weather proof luminaires shall have the control gear housed in a weather proof enclosure with necessary gaskets, mounting bracket, locking screws etc.

4.2 LUMINAIRE TYPES

Specific requirements of each luminaire are indicated in “Luminaire Details” enclosed as Annexure-II.

4.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE)

4.3.1 Non-integral controlgear boxes shall be of 1.6 mm thick CRCA sheet steel construction unless specified otherwise in Data Sheet A.

4.3.2 Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket. Unless mentioned otherwise in Data Sheet A, degree of protection shall be IP:55.

4.3.3 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.

4.3.4 Boxes shall be suitable for mounting on structures, walls and columns.

4.3.5 Unless mentioned otherwise in Data Sheet A, boxes shall be galvanised.

4.3.6 Suitable number of terminals shall be provided for looping-in and looping-out of cable connections and also connections to the luminaire(s).

4.3.7 Cable / conduit knock-outs shall be for each loop-in and loop-out connection and also connection to the luminaire(s).

4.4 REFLECTORS

4.4.1 Reflectors shall be made of sheet steel or aluminium as applicable, minimum 20SWG thick, securely fixed by fastening device of captive type.

4.4.2 The aluminium reflectors shall be made of high purity aluminium sheet. Sheet will be polished, electrochemically brightened and anodised.

4.4.3 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.

4.5 LAMP HOLDERS

4.5.1 Holders shall be resistant to wear and shall be smooth in operation.

4.5.2 Contacts shall be of durable quality.

4.5.3 Holders shall hold the lamp under condition of shock and vibration.

4.5.4 Lamp holders for fluorescent lamp shall be spring loaded, bi-pin, rotor type with low contact resistance.

4.5.5 Live parts of the holder shall not be exposed when the lamp is inserted or removed in case of fluorescent luminaires.

4.5.6 Lamp holders for HPMV & HPSV lamps shall be of porcelain material.

4.5.7 Holders shall be screw type for HPSV & HPMV lamps. Holders for incandescent lamps shall be screw type, unless mentioned otherwise in Data sheet A.

4.5.8 Lamp holders for incandescent lamps shall be of brass or porcelain.

4.6 CAPACITORS

4.6.1 Capacitors shall have constant value of capacitance, suitable for operation at supply voltage.

4.6.2 Capacitors shall be hermetically sealed, preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.

4.7 LAMPS

4.7.1 Lamps shall be suitable for use in any position.

4.7.2 Lamps shall be capable of withstanding small vibrations without breakage to filaments / electrodes and lead-in wire.

4.7.3 Type of Lamps

a) Sodium Vapour Lamps

i. Lamps shall be ovoid shaped with diffusing powder coating.

ii. Lamps shall be provided with external igniters and rapid restart facility.

iii. Lamp caps shall be screw type.

5.0 DESIGN REQUIREMENTS (MAIN EQUIPMENT EXCEPT LUMINAIRES AND LAMPS)

5.1 LIGHTING MASTS

5.1.1 The lighting mast (tower) shall be of steel sections having lattice structure construction with ladder, cage and top platform.

5.1.2 Lighting mast design shall be suitable for following :

a) Height of the lighting mast as per type.

b) Maximum number of luminaires as per Data Sheet A.

c) Additional load of 500 kg towards the weight of maintenance crew.

5.1.3 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.

5.1.4 All steel sections, members and hardware used shall be hot dip galvanised as per applicable standard.

5.1.5 The mast shall be provided with a platform at the top, a steel cage ladder connecting to the ground and a midway landing. Height of the platform provided on the top of the mast shall be 2.0 metre and mid-way landing platform height shall be minimum 1.0 metre.

5.1.6 The span of rung shall not be less than 300mm and spacing between two adjacent rungs shall not be more than 300mm. Diameter of cage for ladder shall not be less than 1000 mm. Ladder shall be supported to give adequate rigidity.

5.1.7 Necessary mounting facilities for mounting of luminaires and controlgear boxes shall be provided at top platform. This shall include provision of holes in the fixing bracket for movable fixing plate. Adequate number of movable plates affixed to the bracket shall also be provided. Size of movable plates and the position of holes shall match with the luminaire fixing arrangement.

5.1.8 Mast shall be provided with 600mm long air termination for the lightning protection. Suitable arrangement for connection of down comer (not in the scope of vendor) shall be provided. Provision of earth connection of GI strip shall also be kept at an height of one metre from the ground.

5.1.9 Provision shall be made for supporting cables, down conductors etc. at regular intervals on lighting tower. Hot dip galvanised brackets of required size shall be provided for the same.

5.1.10 Height of lighting tower shall be the height of tower above the ground and upto the top of the top platform. Other members such as foundation members and lightning arrester shall not be considered for defining the height of tower.

5.1.11 Types of Lighting Masts

a) LM25 - Lighting Mast with 25 m height

b) LM28 - Lighting Mast with 28 m height

c) LM30 - Lighting Mast with 30 m height

d) LM32 - Lighting Mast with 32 m height

c) LM35 - Lighting Mast with 35 m height

5.2 JUNCTION BOXES

5.2.1 Junction boxes with terminals shall be supplied for branching and terminating lighting wires/cables whenever required, as specified.

5.2.2 Construction Features

The junction boxes shall be fabricated out of MS sheet of thickness not less than 2.0mm and shall be of rectangular shape. The cover shall be hinged or bolted with captive nuts and bolts and shall be provided with neoprene gasket lining all over.

The junction boxes shall be provided with suitable knock outs/ gland plates for conduit/ cable connection. The conduit connection shall be properly sealed. The junction boxes meant for cable connection shall be complete with removable gland plates, glands and cable lugs, as required. The junction boxes shall be provided with two earthing terminals suitable for GI earthing wires.

The junction boxes shall be weather proof type conforming to IP-55 of IS:2147. Junction boxes for street light poles and lighting/lightning masts shall be provided with hinged doors and allen keys with bolts as locking arrangement.

The boxes and cover shall be hot dip galvanised. Junction boxes for corrosive areas like DM Plant, water treatment plant etc. shall have additional epoxy/acrylic coating of thickness not less than 50microns on outer surface.

The junction boxes shall be suitable for mounting on wall, columns, lighting poles, mast structures etc. The brackets, bolts, nuts, screws and any other erection accessories required for erection shall be included in the erection price. Circuit number, number of street lighting panel and pole/mast at site by the contractor after their installation.

5.2.3 Terminals

Multiway terminal blocks of approved type and make complete with galvanised screws, nuts, washers and marking strips shall be furnished for terminating the lighting wires.

All the terminals blocks shall be of 650V grade one piece construction with insulating barriers. These terminals shall be made of copper alloy and shall be stud type. Each terminal provided on junction box shall be suitable for terminating two numbers of aluminium conductors of the size as specified without any damage to the conductors or looseness.

5.2.4 The junction boxes shall be of following types:

Type of junction boxes:

Type	Description
JB-F	Provided with four (4) way stud type terminals for terminating upto 2Nos. 10 mm2 stranded aluminium conductors on each terminal, suitable for outdoor installations.
JB-FE	Same as above but with an additional epoxy coating of 50micron thickness.
JB-S	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 16mm2 stranded aluminium conductors & with one no.6A HRC fuse and link.
JB-M	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of incoming 35mm2 stranded aluminium conductors, with three nos. 25A HRC fuses, one link, and one number 32A TPN switch, and four way stud type terminals each suitable for terminating 16sq.mm. Al conductor outgoing cable.
JB-M1	6way stud type terminal block for three phases and three neutrals of adequate size to receive 4C-16mm2 incomer cables and three nos. 2Cx2.5mm^2 Cu conductor outgoing cables.
JB-SW1	Provided with four (4) way stud type terminals each terminal suitable for terminating to 10mm2 stranded aluminium conductor.
JB-SW2	Similar to the JB-SW1 but provided with ten (10) way terminals.
JB-SW3	Similar to JB-SW1 but provided with eighteen (18) way terminals.

5.3 FUSE BOXES

5.3.1 Boxes shall be suitable for accommodating fuses, neutral links and termination of cables on each side.

5.3.2 Boxes shall be of rectangular shape and fabricated out of sheet steel, hot dip galvanised and of weather proof construction.

5.3.3 Sheet steel thickness shall be 1.6 mm, unless mentioned otherwise in Data Sheet A.

5.3.4 Unless specified otherwise in Data Sheet A, degree of protection of fuse boxes shall be IP:55.

5.3.5 Galvanisation shall be done corresponding to the sheet thickness and as per the applicable standard.

5.3.6 Boxes shall be provided with a hinged lockable door with neoprene gasket lining all over. Lock shall be operable with an allen key.

5.3.7 Terminals shall be stud type suitable for ring type lugs. The size of cable shall be intimated during detailed engineering.

5.3.8 Boxes shall be provided with suitable knock outs for conduit / cable connections.

5.3.9 Two earthing terminals suitable for GI earthing wire shall be provided for each box.

5.3.10 Boxes shall be suitable for mounting on walls, structural members etc. Suitable welded fixing brackets shall be provided for this purpose.

5.3.11 Fuse boxes shall be provided with a danger plate for the rated line to line voltage.

5.3.12 Types of Fuse Boxes

a) FB - 1 Fuse Box with 1 fuse and 1 link

b) FB - 2 Fuse Box with 2 fuses and 2 links

c) FB - 3 Fuse Box with 3 fuses and 3 links

d) FB - 4 Fuse Box with 3 fuses and 1 link

6.0 COMPONENTS OF MAIN EQUIPMENT (OTHER THAN LUMINAIRES)

6.1 SWITCH-FUSE UNITS

6.1.1 These units shall preferably comprise of switches having integral fuses, called composite units. Alternatively, combination units of separate switch and fuse may also be acceptable.

6.1.2 These units shall be provided for general purpose i.e. incoming or outgoing units.

6.1.3 The units shall be of the air break air insulated type and designed to ensure safety to operating personnel.

6.1.4 Composite units shall have integral fuses i.e. fuse carrier with fuse link (fuse link forming the moving contact). The design shall ensure that the moving contact is not live when switch is open i.e. in OFF position, so as to facilitate removal of fuse.

6.1.5 The switch shall be capable making and carrying the system prospective fault current, but limited in magnitude and duration by the cut off characteristics of the largest HRC fuse link that may be fitted to that unit.

6.1.6 The fixed contact shall be so shrouded that maintenance of the unit can be carried out in safety with the busbars live.

6.1.7 Where one isolating switch is used as the incoming device, the incoming side fixed contacts shall be shrouded to ensure that maintenance can be carried out with the remote fuse and switch closed.

6.1.8 Composite switch-fuse or the combination of switch and fuse shall meet the requirements of its components as follows:

6.1.9 Isolating Switch

a) Switches shall be air-break, quick make, quick break heavy duty type conforming to applicable standard.

b) All switches shall have visible ON / OFF position indication and shall be padlockable in any (ON / OFF) position.

c) Switches shall be door interlocked such that it shall not be possible to gain access to inside the unit unless the isolating switch is in OFF position.

d) The switches shall be suitable for independent manual operation.

e) The switch contacts shall be of silver alloy or silver plated copper and springs of non-corrosive material.

f) Inter-phase barriers shall be provided to prevent possibilities of phase to phase fault in the switch. The switch shall also be shrouded from all sides to prevent access to live parts on the switch after opening the unit door. The barriers and shrouding shall extend upto the height of switch to fully enclose both side terminals of the device. The arrangement shall permit easy maintenance.

6.1.10 High Rupturing Capacity (HRC) Fuses

a) The fuse serving as the short-circuit protective device in isolating fuse-switch units shall be of HRC cartridge, current limiting and plug-in non-deteriorating type.

b) The fuse carriers shall be easily withdrawable for replacement of fuse. Insulated fuse pullers shall be provided where fuses are not mounted in insulating carriers to remove and replace fuses in live conditions.

c) Fuses shall preferably be fitted with a device to indicate operation (i.e. when the fuse has blown).

d) Live terminals of fuse bases shall be shrouded to prevent contact with personnel where fuse links are not mounted in carriers and are directly plugged into the fuse base. Inter-phase barriers extending throughout the length of the fuse base shall be provided to prevent inter-phase short circuit. They shall be shrouded from all sides to prevent accidental contact.

e) Fuse carriers and bases shall be of good quality moulded insulating material. Porcelain fuse bases and carriers will not be accepted.

f) The rating and characteristics of fuse links shall be chosen appropriately for short circuit protection of circuits down stream.

6.2 INDICATING METERS

6.2.1 Meters shall be panel mounted, flush type and suitable for rear terminal connection.

6.2.2 Meters and instruments shall be enclosed in dust proof, moisture resistant black finished cases and shall be suitable for tropical use. Instruments shall be suitable for operation from the secondary windings of CTs and VTs.

6.2.3 All instruments shall be calibrated to enable direct reading of primary quantities. Instruments shall be adjusted and calibrated at manufacturer's works and shall have means of calibration, checking and zero adjustment at site.

6.2.4 Instruments pointer shall have 90^0 movement. All the divisions and the quantity to be measured shall be clearly marked. Instruments shall conform to applicable standard and shall have accuracy class 1.5 or better having black numerals and lettering on white anti-parallax dial with knife edge pointer. Indicating instruments shall be of moving iron type for AC and moving coil type for DC circuits.

6.2.5 Ammeter, voltmeter etc. shall be of 96mm x 96mm (minimum) size.

6.2.6 Instruments having metallic cases shall be fitted with earthing terminals.

6.3 CONTACTORS

6.3.1 Contactors shall be of the air break type fitted with arc shields.

6.3.2 The operating coil shall be suitable for satisfactory operation in the range of 85% - 110% of nominal voltage specified under the Data Sheet A. The coil shall be tropicalized having insulation not less than class 'E'.

6.3.3 Electrically independent auxiliary contacts not less than 2NO + 2NC for interlocking and indication shall be fitted to individual power contactor.

6.3.4 All springs shall be made out of a corrosion proof material.

6.4 MINIATURE CIRCUIT BREAKERS

6.4.1 The use of miniature circuit breakers (MCBs) combining thermal overload and magnetic short circuit protection shall be application for the outgoing circuits of Lighting Panels.

6.4.2 MCBs shall have suitable rating but not less than 20A, 9kA.

6.4.3 MCBs shall be suitable for housing in the lighting panel and for connection of copper link bus bar at the incoming and copper lugs at the outgoing ends.

6.4.4 The terminals of MCB and ON / OFF positions shall be clearly and indelibly marked.

6.5 INDICATION LAMPS

6.5.1 Indication lamps shall be complete with lens covers and holders.

6.5.2 Each lamp shall be fitted with a durable resistance integrally wired in series with the lamp. Alternatively, lamps with built in transformers are acceptable.

6.5.3 The lamp cover (lens) shall be translucent of appropriate colour.

6.5.4 Bulbs and covers shall be interchangeable, easily replaceable from the front without the need for any special means.

6.5.5 Terminals having potential above 120V shall be shrouded to prevent contact with personnel.

6.6 PUSH BUTTONS

6.6.1 Push button shall be heavy duty, flush mounted suitable for the application.

6.6.2 Push button shall be provided with integral escutcheon plates marked with its function identified as per schemes.

6.6.3 Colour shall be appropriate to the function.

6.6.4 Minimum number of contacts shall be 1 NO + 1 NC or as per the requirements of control scheme.

6.7 TERMINALS

6.7.1 Terminals shall be stud type of copper material.

6.7.2 Terminals shall be provided with transparent cover(s).

6.7.3 Separate terminals shall be available for each termination of loop-in and loop-out power connections.

6.7.4 Terminals shall be suitable for ring type copper cable lugs of size depending upon the circuit rating.

6.8 CABLE GLANDS

6.8.1 Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.

6.8.2 Cable glands shall be single compression type of brass material.

6.8.3 Cable glands shall be nickel plated, unless specified otherwise in Data Sheet A.

6.8.4 Rubber components used in the gland shall be of neoprene.

6.8.5 Name / trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved / indelibly printed on the cable gland.

6.9 CABLE LUGS

6.9.1 All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.

6.9.2 Cable lugs shall be of tinned copper.

6.9.3 Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

6.10 TIMERS

6.10.1 Time Switch

a) Time switch shall be suitable for automatic switching ON and OFF of street lighting / flood lighting circuits.

b) Time switch have 00 - 24 hrs clock base.

c) Time switch shall indicate actual time and shall permit accurate time setting.

d) Time switch shall be rugged, independent of normal fluctuations of voltage / frequency and free from maintenance.

e) Contact rating, clock accuracy, rated voltage rating and frequency rating of timer shall be suitable to its application.

f) Time switch shall be provided with Ni-Cd battery.

g) Time switch shall be suitable for mounting inside the panel.

6.10.2 On Delay Timer

a) On delay timer shall be required for continuation of DC supply for a limited duration when the AC Emergency supply has been restored and DG set is under stabilisation.

b) Timer shall be fully static and suitable for operation on normal frequency and system voltage.

c) Timer shall have high setting accuracy, high repeat accuracy, low reset time and low power consumption.

d) Timer shall have the time setting range of 24 - 240 seconds, unless mentioned otherwise in Data Sheet A.

e) Timer shall be suitable for mounting inside the panel.

7.0 LABELING

7.1 Labels to identify all the Main assemblies, Sub-assemblies and components of the LDBs and LPs shall be provided.

7.2 Name and rating plate / marking shall be provided as required by relevant standard applicable to each component / assembly to be identified.

7.3 Labels shall be of two colour, three layer plastic material with matt or semi matt finish or of the anodised aluminium sheet.

7.4 All labels other than “Danger” or “Warning” labels shall have black lettering on a white background. Danger labels shall be as per applicable standard and shall not be affixed on to removable parts.

7.5 All labels shall be securely fixed on to the equipment by means of self tapping screws or other approved means.

7.6 Stick-on type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.

7.7 A list of all such items to be labeled and text and type of labels to be provided is given below :

a) OUTGOING - FEEDER DESIGNATION

i. Inscription : Module number, feeder number / purpose.

ii. Material : Black engraving on white anodised aluminium plate of thickness 1.6 mm or more. Plate to be secured with screws.

b) COMPONENT DESIGNATION

i. Inscription : Letter symbol / Legend as assigned in schemes.

ii. Location : Near or on the component

iii. Material : Stick-on type

7.8 CIRCUIT DIAGRAM / DIRECTORY PLATE

7.8.1 A diagram is to be prepared for fixing to the inside cover of every lighting panel giving details of the points controlled by each circuit.

7.8.2 The circuit list shall be typed or printed stating the location of the equipment served, rating of the protective unit and the circuit loadings.

7.8.3 The list shall be mounted on the inside of the cover door and shall be protected by an acrylic sheet cover to be easily removable to permit circuit modifications.

8.0 SURFACE TREATMENT

8.1 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.

8.2 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.

8.3 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.

8.4 All parts shall then be subjected to a coat of red oxide primer paint.

8.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.

8.6 Paint thickness shall be minimum 80 microns unless specified otherwise in Data Sheet A.

8.7 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.

8.8 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.

9.0 PACKING

9.1 Packing procedure shall conform to the General Technical Conditions (Volume IIC).

10.0 GUARANTEED PERFORMANCE REQUIREMENTS

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

10.2 For the general requirements of performance guarantees refer to other parts of the specification.

11.0 INSPECTION & TESTING

11.1 Inspection and testing of Lighting equipment shall be performed as per BHEL standard Quality Plans. Bidder shall sign and stamp the Quality Plans for conforming compliance. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. Purchaser's comments shall be incorporated and final QPs shall be submitted for purchaser's approval during contract engineering stage. Modifications in the QP shall be incorporated without any cost implication to the purchaser.

11.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards indicated in Annexure-I.

11.3 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.

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

11.6 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.
f) Completeness of scope.

11.7 Safety interlocking verification shall be done.

11.9 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.

12.0 QUANTITY VARIATION

12.1 Quantities of various items are indicated in BOQ as part of Section C, Volume IIB for the purpose of bidding.

12.2 Purchaser reserves the right to delete / add any of the equipment from the vendor's scope of supply. Unit prices quoted shall be considered for this purpose.

12.3 Unless stated otherwise in Data Sheet A, the unit rates quoted by the bidder for various equipment shall be firm for a variation of quantities limited to as follows :

a) +/- 30% of the total order value till the finalisation of engineering details and Master BOQ.

13.0 SPARES

13.1 A list of commissioning spares and O&M spares' quantities for a duration specified in Data Sheet A shall be filled up in the applicable schedule / format and submitted by bidder along with offer.

13.2 The bidder shall indicate any additional start-up and O&M spares and their recommended quantities, which may be required as per vendor's usual practice. However, the acceptance of the same shall not be binding on purchaser.

14.0 TOOLS AND TACKLE

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

14.2 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.

14.3 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.

14.4 Schedule of tools & tackle shall be filled up by bidder.

15.0 DOCUMENTATION

15.1 Purchaser's documents as part of tender

Purchaser's single line diagrams, schematic drawings, documents etc. being enclosed in the specification are listed in Data Sheet A.

15.2 Documents to be submitted by the Bidder along with the bid.

a) Complete technical literature on luminaires, accessories and lamps.

b) Quality Plans enclosed with the tender with bidder's seal and signature of acceptance on each sheet.

c) Quality Plan for additional items.

d) Catalogues / technical leaflets of all major components.

e) Unpriced Price Schedules enclosed.

f) Schedule of quantities of commissioning spares.

g) Schedule of quantities of O&M spares.

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

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

15.4 Documents to be submitted during detailed engineering of contract

15.4.1 Engineering documents to be generated by the vendor, if applicable.

a) Lighting calculations for outdoor areas.
b) General arrangement drawings.
c) Master Bill of Material.

15.4.2 Other documents : (As applicable)

a) Final Quality Plans

b) Polar curves, zonal flux diagram and CoU charts of luminaires.

c) Complete design calculations for arriving at number of luminaires.

d) Fixing / mounting details of luminaires and other items.

e) General arrangement drawings of following :

i. Luminaires
ii. Controlgear boxes
iii. Lighting Masts
iv. JBs
v. Fuse Boxes

f) Field Quality Plan as per General Technical Conditions.

h) Structural design calculations for lighting mast.

i) Foundation design calculations for lighting mast.

j) Control Scheme for fluorescent and HPSV luminaires.

l) Type test certificates.

m) Catalogues / leaflets

15.4.3 Operation and maintenance (O&M) manual :

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

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) Characteristic curves of HRC fuses, MCBs etc.

d) Technical leaflet of various items / components.

e) Copies of the type, acceptance and routine test certificates in bound volume.

f) Details of all components liable to be replaced during the life of the equipment.

g) List of maintenance tools required.

h) List of testing equipment required.

15.4.3.2 Draft O & M manual shall be submitted for approval

15.4.3.3 Final O&M shall be submitted in bound volume.

15.5 AS BUILT DRAWINGS

15.5.1 In case Engineering is the scope of vendor, the preparation of As Built Drawings shall be the scope of vendor.

15.5.2 The As Built Drawings shall be prepared on the basis of marked up copies received from the erection contractor.

15.5.3 Entire work of As Built Drawings shall be to the satisfaction of purchaser. Requisite number of prints and RTFs shall be submitted by vendor.

15.6 Number of copies of documents to be submitted by vendor shall be as per section-C of specification.

ANNEXURE-I

LIST OF APPLICABLE STANDARDS

ILLUMINATION

1.	Code of practice for interior illumination	[ ] IS 3646
2.	Code of practice for industrial lighting	[ ] IS 6665
3.	Code of practice for design of electrical street lighting installations	[ ] IS 1944

LUMINAIRES

4.	General and safety requirement for electric lighting fittings	[ ] IS 1944
5.	Luminaires	[ ] IS 10322
6.	Industrial lighting fittings with metal reflector	[ ] IS 1777
7.	Industrial lighting fittings with plastic reflectors	[ ] IS 3287
8.	Decorative lighting outfits	[ ] IS 5077
9	Water proof electric lighting fittings	[ ] IS 3528
10.	Water tight electric lighting fittings	[ ] IS 3553
11.	Dust proof electric lighting fittings	[ ] IS 4012
12.	Dust tight electric lighting fittings	[ ] IS 4013
13.	Flame proof electric lighting fittings well glass & bulk head types	[ ] IS 2206
14.	Electric lighting fittings for division 2 areas	[ ] IS 8224

LAMPS

15.	Electric lamps, tungsten filament general service	[ ] IS 418
16.	Tubular fluorescent lamps for general lighting service	[ ] IS 2418

17.	High pressure mercury vapour lamps	[ ] IS 9900
18.	High pressure sodium vapour lamps	[ ] IS 9974

LUMINAIRE COMPONENTS

19.	Ballast for fluorescent lamps for switch start circuits	[ ] IS 1534
20	Ballast for high pressure mercury vapour lamps	[ ] IS 6616
21.	Capacitors for electric discharge lamps (fluorescent and MV)	[ ] IS 1569
22.	Bi-pin lamp holders for tubular fluorescent lamps	[ ] IS 3223
23.	Methods of measurement of lamp cap temp. rise	[ ] IS 8913
24.	Starters for fluorescent lamps	[ ] IS 2215
25.	Holders for starters for tubular fluorescent lamps	[ ] IS 3324
26.	Cast acrylic sheets for use in luminaires	[ ] IS 7569

ASSEMBLED EQUIPMENT AND COMPONENTS

27.	General requirements for swgr. and control gear for voltage not exceeding 1000 V AC or 1200 V DC	[ ] IS 4237
28.	Code of practice for selection, installation & maintenance of switchgear & control gear	[ ] IS 10118
29.	Flame proof enclosures for electrical apparatus	[ ] IS 2148
30.	Classification of hazardous areas for electrical installations	[ ] IS 5572
31.	Degree of protection provided by enclosures for LV switchgear & control gear	[ ] IS 2147
32.	Dry type transformers	[ ] IS 11171

33.	Air break switches, disconnector etc. and fuse combinations units	[ ] IS 4064
34.	Miniature air break circuit breaker for voltages not exceeding 1000 V	[ ] IS 8828
35.	Low voltage Fuses	[ ] IS 9224
36.	Contactors for voltags not exceeding 1000 V AC or 1200V DC	[ ] IS 2959
37.	Indicator lamps (visual)	[ ] IS 1901

POLES, SOCKETS AND OTHER MISCELLANEOUS

38.	Tubular steel poles for over head power lines	[ ] IS 2713
39.	Three pin plugs and sockets	[ ] IS 1293
40.	Switch socket outlets (non-interlocking)	[ ] IS 4615
41.	Interlocking switch socket outlet	[ ] IS 4160
42.	Structural steel (Standard quality)	[ ] IS 226
43.	Danger notice plates	[ ] IS 2551
44.	Boxes for enclosure of electric accessories steel & cast iron boxes	[ ] IS 5133
45.	Code of practice for general construction in steel	[ ] IS 800
46.	Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes	[ ] IS 5082
47.	Code of practice for phosphating of iron and steel	[ ] IS 6005
48.	Colour for ready mixed paints & enamels	[ ] IS 5
49.	Recommended practice for hot dip galvanising of iron & steel	[ ] IS 2629
50.	Method of testing uniformity of coating on zinc coated articles	[ ] IS 2603

ANNEXURE-II

LUMINAIRE DETAILS

LUMINAIRE CODING SCHEME

1.0 Code Structure

A A NN (no. x W) — Number of lamps x Wattage of each lamp
- NN — Classified Serial Number (Numeric)
- A — Luminaire type (Alpha)
- A — Lamp type (Alpha)

2.0 Lamp types

a) F - Fluorescent
b) M - Mercury Vapour
c) S - Sodium Vapour
d) T - Tungsten
e) H - Halogen

3.0 Luminaire types

a) C - Channel Mounted (Fluorescent)
b) B - Bay Mounted
c) W - Well Glass
d) S - Street Lighting
e) F - Flood Lighting
f) H - Bulk Head
g) P - Post Top Lantern
h) E - Emergency Lighting
i) X - Others

4.0 Serial Numbers

a) 01 - 20 General Purpose (Industrial)
b) 21 - 40 Decorative
c) 41 - 50 Vapour Proof
d) 51 - 60 Dust Proof
e) 61 - 70 Drip Proof
f) 81 - 90 Corrosion Proof
g) 91 - 99 Flame Proof

NOTES :

1. Flood lighting luminaires to have non-integral control gearbox.

2. All other luminaires shall have integral control gearbox, unless specifically mentioned otherwise in enclosed sheets.

3. For more details of each luminaire, refer specification.

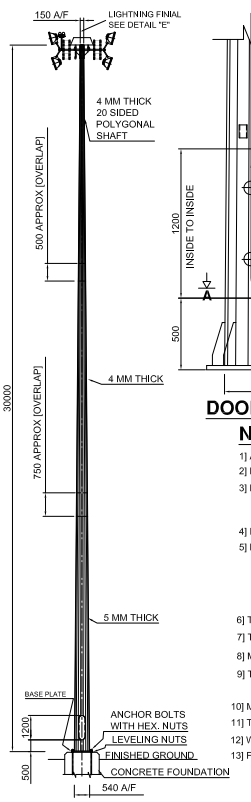
1.0 **High Pressure Sodium Vapour (HPSV) Lamp Luminaire**

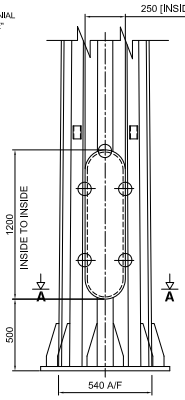
1.1	SB01	1 x 150	Sodium, high bay, industrial type.
1.2	SB02	1 x 250	Sodium, high bay, industrial type.
1.3	SB03	1 x 400	Sodium, high bay, industrial type.
1.4	SB04	1 x 150	Sodium, high bay, totally enclosed industrial type.
1.5	SB05	1 x 250	Sodium, high bay, totally enclosed industrial type.
1.6	SB06	1 x 400	Sodium, high bay, totally enclosed industrial type.
1.7	SB07	1 x 150	Sodium, high bay with non-integral controlgear box.
1.8	SB08	1 x 250	Sodium, high bay with non-integral controlgear box.
1.9	SB09	1 x 400	Sodium, high bay with non-integral controlgear box.
1.10	SB11	1 x 150	Sodium, medium bay, industrial type.
1.11	SB12	1 x 250	Sodium, medium bay, industrial type.
1.12	SB13	1 x 150	Sodium, medium bay, totally enclosed industrial type.
1.13	SB14	1 x 250	Sodium, medium bay, totally enclosed industrial type.
1.14	SB17	1 x 70	Sodium, low bay, industrial type.
1.15	SB18	1 x 150	Sodium, low bay, industrial type.
1.16	SB19	1 x 70	Sodium, low bay, totally enclosed industrial type.
1.17	SB20	1 x 150	Sodium, low bay, totally enclosed industrial type.
1.18	SW41	1 x 70	Sodium, well glass, vapour proof with vitreous enamelled reflector.
1.19	SW42	1 x 150	Sodium, well glass, vapour proof with vitreous enamelled reflector.
1.20	SW51	1 x 70	Sodium, well glass, dust proof with vitreous enamelled reflector.
1.21	SW52	1 x 150	Sodium, well glass, dust proof with vitreous enamelled reflector.
1.22	SW91	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.
1.23	SW92	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.
1.24	SW93	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast iron housing.
1.25	SW94	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast iron housing.

1.26	SW95	1 x 70	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2 areas.
1.27	SW96	1 x 150	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2 areas.
1.28	SS61	1 x 70	Sodium, street light with one piece cast aluminium body.
1.29	SS62	1 x 150	Sodium, street light with one piece cast aluminium body.
1.30	SS63	1 x 250	Sodium, street light with two piece cast aluminium body.
1.31	SS64	1 x 400	Sodium, street light with two piece cast aluminium body.
1.32	SF61	1 x 250	Sodium, flood light, general purpose.
1.33	SF62	1 x 400	Sodium, flood light, general purpose.
1.34	SF63	1 x 250	Sodium, flood light, heavy duty type.
1.35	SF64	1 x 400	Sodium, flood light, heavy duty type.
1.36	SF65	2 x 250	Sodium, flood light, heavy duty type.
1.37	SF66	2 x 400	Sodium, flood light, heavy duty type.
1.38	SP21	1 x 70	Sodium, post top lantern.

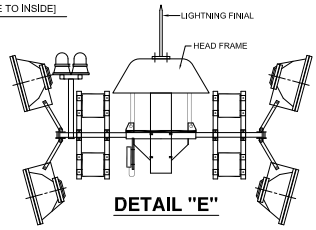
UNLESS OTHERWISE MENTIONED TOLERANCES ARE AS PER IS-2102

ALL DIMENSIONS ARE IN M.M UNLESS OTHERWISE MENTIONED.





DOOR DETAILS



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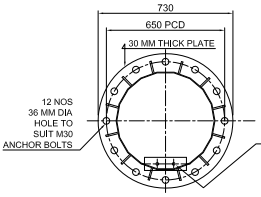
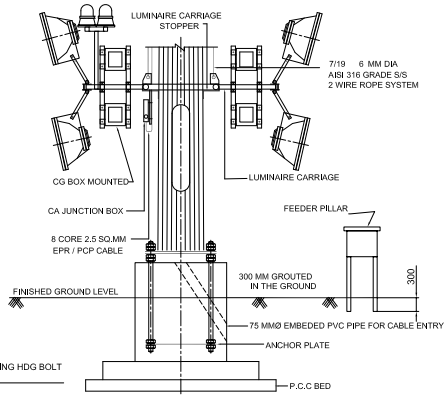


VIEW "A"-"A"



ENLARGED DETAIL AT BASE WITH LUMINAIRE CARRIAGE LOWERED

NOTES

1] ALL DIMENSIONS ARE IN M.M.

2] DESIGN STANDARD I.L.E TECHNICAL REPORT NO. 7:2000

3] MATERIALS :
SHAFT/GUSSETS : S355 AS PER BS EN 10025 : 2004
FLANGE/DOOR STIFFNER : AS PER IS-2062

4] FINISHING : HOT DIP GALVANISED TO BS EN ISO 1461

5] LENGTH OF SECTION
a] BOTTOM - 10980 MM APPROX.
b] MIDDLE - 10980 MM APPROX.
c] TOP - 9290 MM APPROX.
d] THE TOLERANCE IN A/F DIMENSION ARE -0/+3mm

6] THE A/F DIMENSIONS ARE OUTSIDE TO OUTSIDE.

7] THE DOOR SHALL BE VANDAL PROOF AND WEATHER PROTECTED -IP55

8] MAKE OF THE MAST SHALL BE "BAJAJ".

9] THE MAST WILL HAVE PADLOCKING ARRANGEMENT IN THE CENTER AND 2 Nos ALLEN BOLT AT TOP AND BOTTOM

10] MAKE OF THE INTEGRAL MOTOR SHALL BE HINDUSTAN BRAND

11] TRAILING CABLE MANSFIELD/SUN BRAND/BMI/UNIFLEX

12] WIRE ROPE - BHARAT WIRE ROPES LTD. / SSWRL

13] FOUNDATION BOLT SHALL BE-
T.S. 600 N/Sq.mm Y.S.-405 N/Sq.mm

14] THE MAST SHALL BE SUPPLIED WITH 16 NOS.TWIN 400 W HPSV FLOOD LIGHT & LANTERN CARRIAGE SUITABLE FOR THE SAME

15] JB SHALL BE IP 55

01 16] INDUSTRIAL TYPE CA JUNCTION BOX.

17] ALL MAKE SHALL BE AS PER NTPC QA APPROVAL

18] EXPOSED PORTION OF BOLT NUT & WASHERS HOT DIP GALVANIZED.

19] INCOMING CABLE MAX. 3.5C X 25 / 4CX16 / 4C X 2.5 SQ. MM

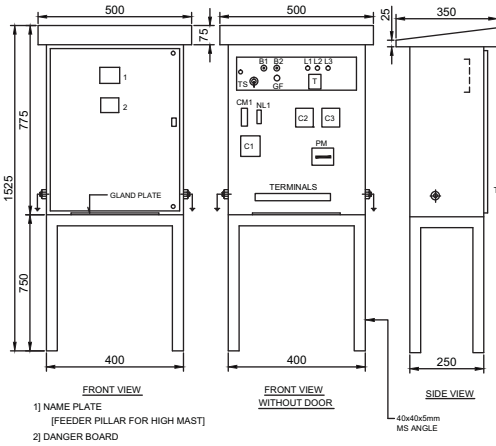
02 20] NEOPRENE GASKET SHALL BE PROVIDED TO THE HIGH MAST DOOR.

21] PLEASE REFER GA DRAWING OF LIGHTING FIXTURE TYPE BGENF 22(2X400SV)[NTPC TYPE SF4] . DRG NO. (9661-243-02PE-PVE-B-027)

RFERENCE GA DRAWING FOR LIGHTING MAST

UNLESS OTHERWISE MENTIONED TOLERANCES ARE AS PER IS-2102

ALL DIMENSIONS ARE IN M.M UNLESS OTHERWISE MENTIONED.



FRONT VIEW

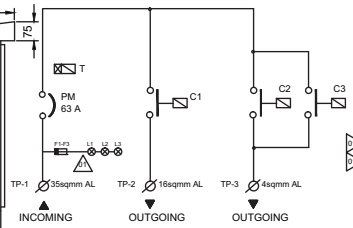
FRONT VIEW WITHOUT DOOR

SIDE VIEW

40x40x5mm MS ANGLE

1] NAME PLATE
[FEEDER PILLAR FOR HIGH MAST]

2] DANGER BOARD



SINGLE LINE DIAGRAM

BILL OF MATERIALS				
S.No.	DESCRIPTION	SYMBOLS	QTY.	MAKE
1	63A TPN MCB	PM	1 NO	LEGRAND/HAGGER
2	45 AMPS CONTACTOR	C1	1 NO	L&T
3	9A CONTACTOR	C2,C3	2 NOS	L&T
4	TIME SWT.WITH BYPASS (SINGLE DIAL)	T	1 NO	L&T (GIC)
5	CONTROL MCB 6A	CM1	1 NO	LEGRAND/HAGGER
6	GLASS FUSE	GF	1 NO	CONNECT WELL/ELMEX
7	TOGGLE SWITCH	TS	1 NO	KAYCEE
8	PUSH BUTTON	B1,B2	2 NOS	TEKNIC
9	LED INDICATING LAMPS	L1-L2-L3	3 NOS	L&T, SIEMENS, VAISHNO ELECTRICALS, TEKNIC CONTROLS
10	HRC FUSE	F1-F2-F3	3 NOS	GE POWER CONTROL, L&T, SIEMENS, INDO ASIAN FUSE GEAR
11	NEUTRAL LINK	NL1	1 NO	
12	TERMINALS	TER		
	INCOMING 35sqmm	TP-1	4 NOS	AL. BUSBARS
	OUTGOING 16sqmm (CLOSE)	TP-2	4 NOS	CONNECT WELL/ELMEX
	OUTGOING 4sqmm (CLOSE)	TP-3	4 NOS	CONNECT WELL/ELMEX

GENERAL NOTES

> SYSTEM : 415V, 63 AMPS TPN, 50HZ SUPPLY

> TYPE : OUTDOOR TYPE, STAND MOUNTING DUST & VERMIN PROOF, IP-55

> CONSTRUCTION : FABRICATED OUT OF 14 SWG CRCA SHEET STEEL.

> PAINT : PANEL WILL HAVE POWDER COAT FINISH TO SHADE 631 OF IS 5 AFTER PRETREATMENT AND STAND BLACK ENAMEL PAINT

> CABLE ENTRY : BOTTOM [DETACHABLE GLAND PLATE]

> CABLE SIZE : FOR POWER - 16 SQ.MM [BLACK/GREY]
FOR STARTER - 2.5 SQ.MM [BLACK/GREY]
FOR CONTROL - 1.5 SQ.MM [BLACK/GREY]

> LABELS : ALUMINIUM ANODISED

> STAND : 40 x 40 x 5 M.S ANGLE

> LAMINATED CIRCUIT DIAGRAM SHALL BE PASTED INSIDE THE DOOR.

> POWER CIRCUIT SHALL HAVE COLOUR SLEEVE & FERRULE ON CU LUGS AND CONTROL CIRCUIT SHALL HAVE FERRULE AND INSULATED CU LUGS

> ARRANGEMENT OF COMPONENTS SHOWN ARE INDICATIVE. RELOCATION OF PARTS & COMPONENTS IS POSSIBLE AT THE TIME OF ACTUAL MANUFACTURING.

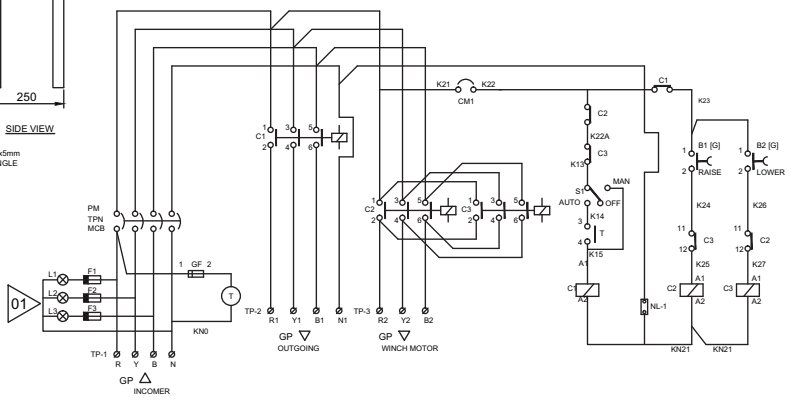
> NAME PLATE DETAIL SHALL BE GIVEN IN THE P.O / INDENT

> TOLERANCE ON DIMENSION IS +/-5 MM.

> FEEDER PILLAR SHALL HAVE PAD-LOCKING ARRANGEMENT.

> 2 NO. EARTH TERMINALS BY 12MM DIA BOLT SHALL BE PROVIDED.

> THE PANEL MANUFACTURER SHALL BE - ABAK / ANTLER / KAMRAN / SUNLIGHT / FAB CONTROL / POPULAR / PYROTECH / SAMCON / CCL OPTO / Popular Switchgears /POSITRONICS / PRATHOMA Switchgears / VICTOR Switchgears ARROW ENG. / MECKINS / SREE OM INDUSTRIES / SANSAR METAL / PARADISE ENGG./ MEDICHEM / VICTOR



INTERLOCKS

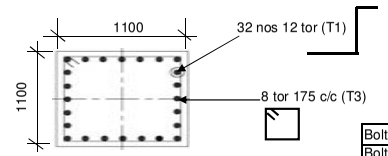
1] MOTOR CIRCUIT CAN BE OPERATED ONLY WHEN POWER CONTACTOR IS OFF AND VICE VERSA.

GLAND PLATE KNOCK OUT.	QUANTITY
A] 3.5 C x 50 SQ.MM AYFY	01 NO.
B] 3.5 C x 35 SQ.MM AYFY	01 NO.
C] 4.0 C x 16 SQ.MM AYFY	01 NO.
D] 4.0 C x 10 SQ.MM AYFY	01 NO.
E] 3.0 C x 04 SQ.MM YWY	01 NO.

REFERENCE GA DRAWING FOR FEEDER PILLAR

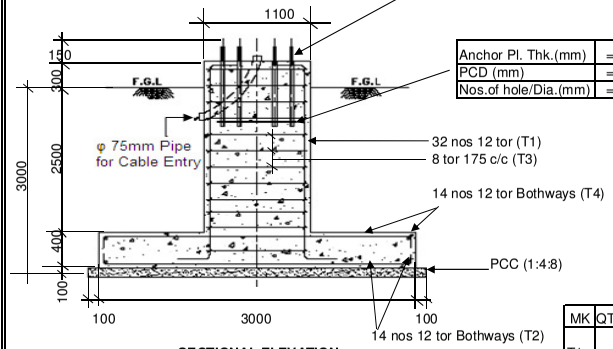
BEFORE CASTING THE FOUNDATION VERIFY THE DIMENSIONS OF THE FOUNDATION BOLT (DIA.& QTY.) AND ANCHOR PLATE (PCD) WITH RESPECT TO THE DIMENSIONS MENTIONED IN THIS DRG.

FOUNDATION LOADINGS		
WIND SPEED	(M/SEC)	47
BENDING MOMENT	(T-M)	19.490
HORIZONTAL SHEAR	(T)	1.414
VERTICAL LOAD	(T)	1.993
MAX GR BEARING PRESSURE	(T/M^2)	10.907
SAFETY FACTOR AGAINST OVERTURNING		2.060
CONCRETE MIX VIBRATED		M-25
MIN COVER	(MM)	50
STEEL		Fe-415
Net SBC	(T/M^2)	10.00
PROJECTED AREA	(M^2)	1.906



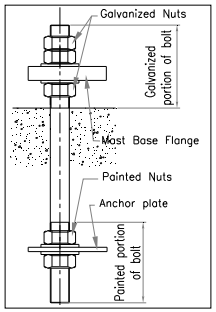
DETAIL OF PEDESTAL

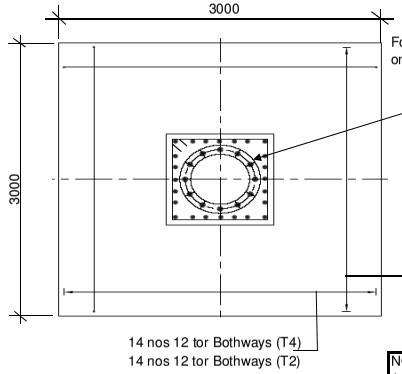
Bolt Nos.	=	12
Bolt Dia.	=	30 mm
Length	=	850 mm



Anchor Pl. Thk.(mm)	=	8 mm
PCD (mm)	=	650 mm
Nos.of hole/Dia.(mm)	=	12 / 32

SECTIONAL ELEVATION





SECTIONAL PLAN

BAR BENDING SCHEDULE

MK	QTY	SIZE	LENGTH	SHAPE
T1	32	Φ12	3495	3075, 100, 320
T2	28	Φ12	3140	120, 2900
T3	19	Φ8	4192	1000, 1000
T4	28	Φ12	3100	100, 2900

QUANTITIES

RCC (M^3)	PCC (M^3)	STEEL (kg)
6.99	1.02	301.541

NOTES
1- ALL DIMENSIONS ARE IN MM. DO NOT SCALE THE DRAWING
2- MIN. LAP LENGTH OF BARS SHALL BE 50xD. UNLESS OTHERWISE STATED.
3- WE RECOMMANDED THAT MAST FLANGE REMAIN UNGROUTED
4- IF GROUTING IS CARRIED OUT IT IS ESSENTIAL TO LEAVE A MINIMUM OF 4 NOS 25MM DIA DUCTS EQUALLY SPACED AROUND THE FLANGE TO ALLOW DRAINGE AND VENTILATION
5- BARS DRAWN IN THE DRAWING ARE FOR ILLUSTRATION ONLY. REFER TO THE NUMBERS SHOWN FOR ACTUAL REINFORCEMENT QUANTITY.
6- FOUNDATION SHOULD REST ON VIRGIN SOIL. IF LOOSE SOIL/ BLACK COTTON SOIL/SWELLING INDEX OF SOIL IS FOUND.ENTIRE SOIL ARE TO BE REMOVED & TO BE FILLED BY P.C.C.
7- NET SBC CONSIDERED AT FOUNDING LEVEL IS 10T/M2. IN CASE ANY LOOSE POCKET IS OBSERVED AT FOUNDING LEVEL THE SAME SHALL BE EXCAVATED TILL SIMILAR STRATA AT FOUNDING LEVEL SHALL BE ACHIEVED & SHALL BE FILLED UP WITH PCC (FILL CONC. GRADE-M7.5).

REFERENCE GA FOR FOUNDATION OF 30M HIGH MAST

TECHNICAL SPECIFICATION FOR

LIGHTING SYSTEM (INSTALLATION)

SPECIFICATION NO. PE-TS-405-558-E001

CONTENTS

1.0 SCOPE OF WORK

The scope of installation work of the complete lighting and low voltage power services equipment shall be as follows:

1.1 Receipt at site, unloading, handling, unpacking, storing and preservation of all lighting equipment specified under technical specification (Supply) of Section-D and all other materials required for completion of this package.

1.2 Erection, testing and commissioning of complete lighting and low voltage power services for the power station.

1.3 The contractor's scope shall also be deemed to include all such other equipment/materials and services required for the completeness of the job, but not listed above, as applicable and shall be quoted for accordingly.

1.4 Supply & erection of consumable like conduit accessories & fittings, conduit boxes, saddles, clamps, flexible conduit, junction boxes, fixing hardwares, anchors, wedges, nuts & bolts, concrete inserts, materials required for mounting the fixtures, consumable and other incidental materials required to complete the installation testing & commissioning of complete lighting system for successful operation, & to the satisfaction of purchaser/ customer. Supply scope of these items shall form part of the installation rates quoted for the item.

Minor civil works Plumbing/Grouting/Foundation required to complete the lighting installation are covered under the scope of this contract and form part of the item installation cost and are not payable separately.

1.5 Power cables from lighting distribution boards LDBs to lighting panels (LPs), LDBs to street lighting panel, street lighting panels to poles and control cables from LDBs to remote street lighting control panel will be supplied by purchaser as free issue item to contractor, Laying & termination of these cables are to be done by the bidder.

1.6 Supply & Erection of supporting structural steel i.e. angles, channels etc. are to be quoted on tonnage basis. During contract stage contractors has to furnish total requirement for structural steel.

1.7 All tools & tackles, ladders, testing equipment etc. required for erection, testing & commissioning of complete lighting system are to be arranged by the contractors.

1.8 The entire work shall be carried out in accordance with specified installation instruction, manufacturer's recommendations, purchaser's approved drawings and/or as directed by the purchaser. Manufacturer' drawings and instructions shall be correctly followed in handling setting, testing and commissioning of all equipment and care shall be taken in handling to avoid distortion to structures, marring of finished surface, damage to delicate instruments etc. The equipment shall be installed in a neat work-manship like manner.

1.9 The erection work shall conform to latest applicable Indian standards, codes and practices, Electricity rules, fire insurance regulations and safety regulations of the locality where the equipment will be installed. All apparatus, wiring and connections shall be designed so as to minimise risk of fire or any damage which will be caused in the event of fire. Contractor to furnish the installation drawings of all equipment for purchaser's approval.

2.0 CODES AND STANDARDS

The design, Manufacture and performance of equipment shall comply with all currently applicable regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be constructed to relieve the bidder of these responsibilities.

2.1 Unless otherwise specified, equipment offered shall conform to latest applicable Indian and IEC standards. Equipment complying with any other authoritative standards such as British, U.S.A, VDE etc. may also be considered provided these standards ensure performance equivalent to or superior to Indian Standards. In such cases the Bidder shall clearly indicate the standard adopted and furnish a copy of the latest English version of the standard along with the tender. Should there be any dispute of design standard, the most stringent one shall be followed. The relevant Indian Standards are:

Lighting Wires

IS: 694	PVC insulated cables for working voltages upto and including 1100V.
IS: 3961	Recommended current ratings for PVC insulation light out put cables.
IS: 5331	PVC insulation and sheath of electric cables
IS: 8130	Conductors for insulated electric cables and flexible cards.
IS: 10810	Methods of tests for cables.

Conduits & Accessories and Junction Boxes

IS: 1653	Rigid steel conduits for electrical wiring.
IS: 3480	Flexible steel conduit for electrical wiring.
IS: 2667	Fittings for rigid steel conduits for electrical wiring.
IS: 3837	Accessories for rigid steel conduits for electrical wiring.
IS: 4649	Adaptors for flexible steel conduits.
IS: 5077	Decorative Lighting outfits.
IS: 5133	Steel and Cast Iron Boxes. (Part-I)
IS: 5133	Boxes made of Insulating materials (part-II)
IS: 2629	hot dip galvanising of iron & Steel.
IS: 9537	Specification for conduits for Electricals installation. (part-I & II)

Electrical Installation Practices & Miscellaneous

IS: 5	Colour for ready mixed paints 2 enamels.
IS: 1293	3 Pin, Plug & Socket Outlets.
IS: 226	Structural steel (standard quality).
IS: 2509	Rigid non metallic conduits for electric wire.
IS: 371	Ceiling roses
IS: 3854	Switches for domestic and similar purposes.
IS : 5216	Guide for safety procedures and practices in electrical work.
IS: 1913	General and safety requirements for electric lighting fittings.
IS: 3419	Fittings for rigid non metallic conduit.
IS: 732	Code of practice for Electrical Wiring installation (System Voltage not exceeding 650V).
IS: 3646	Code of practice for interior illumination part I, II & III.
IS: 1944	Code of practice for lighting of public thorough forces.
IS: 3106	Code of practice for selection of installation and maintenance of fuses. (Voltage not exceeding 650V).
IS: 4615	Switch socket out let (Non-locking).
IS: 5571	Guide for selection of electrical equipment for hazardous areas.
IS: 5572	Classification of hazardous areas electrical installation.
IS: 800	Code of practice for use of structural steel in general building construction.
IS: 2633	Method of testing uniformity of coating in zinc plated articles.
IS: 6005	Code of practice for phosphating of form & steel.
IS: 3043	Code of practice for earthing.
IS : 280	Mild steel wires for general engineering purposes.
IS : 1255	Code of practice for installation and maintenance of power cables upto & including 33 kV rating.
BS : 6121	Mechanical cable galnds

INDIAN ELECTRICITY ACT AND RULES

IS: 6665 Code of practice for industrial lighting.

IS: 458 Specification for concrete pipes.

Fire Insurance Regulations

Rule no. 35, 48, 49, 50, 61 & 64 of Indian Electricity Rule with amendment-3 rules 1986 Regulations laid down by the chief Electrical Inspector of the State.

3.0 GUIDELINES FOR LIGHTING SYSTEM ERECTION WORK.

3.1 The contractor shall work in co-ordination with BHEL SITE.

3.2 The contractor shall be responsible if any parts of lighting fixtures, are lost or damaged and lamps are broken during installation. All damage and thefts shall be made good by the contractor till the installation is handed over to the customer.

3.3 The contractor shall note that for any change in the location of lighting panels, lighting fixtures, switch boxes/receptacles, no extra charges will be paid so long as the modifications are indicated to the contractor before commencement of the work on that particular equipment or circuit.

3.4 The contractor shall have a separate cleaning gang to clean all equipment under erection as well as the work area and the project site at regular intervals to the satisfaction of Engineer-in-charge. In case this is not done, the purchaser will have the right to carry out the cleaning operation and any expenditure incurred in this regard will be to the contractor account.

3.5 After installation of lighting fixtures/receptacles, panel number and circuit number shall be painted on them at a suitable place

3.6 Lighting Fixtures and Accessories.

3.6.1 Lighting fixtures of appropriate type as per the lighting layout drawings shall be installed by the contractor. The type of mounting. arrangement of fixtures shall be selected from the typical arrangements shown in enclosed fixture mounting details drawings in section-E. The type of mounting will generally be indicated on the layout drawings. The exact mounting will, however, be decided at site depending upon the actual space/other facilities available at site.

3.6.2 The contractor shall submit for purchaser's approval the drawings showing the detailed mounting arrangements of fixtures prior to installation.

3.6.3 A four (4) way terminal junction box type F shall be provided near each lighting fixture, for loop-in, loop-out and off connection of lighting wires or as required.

3.6.4 To distinguish emergency AC fixtures form normal AC fixtures, red painted circular mark of 1 cm dia. shall be provided on emergency fixtures.

3.6.5 The self contained emergency lighting fixtures shall be installed in required areas. Mounting brackets are to be provided by the contractor.

3.7 Lighting wires

3.7.1 Lighting wires from lighting panels to junction boxes and junction boxes to lighting fixtures, switch boxes and receptacle boxes shall run in conduits (Rigid/flexible).

3.7.2 All wires in a conduit shall be drawn simultaneously. No subsequent drawing is permissible.

3.7.3 Wires shall not be pulled through more than two equivalent 90 deg. bends in a single conduit run. Wherever required, suitable conduit junction boxes/pull boxes shall be provide. All types of wiring, concealed or unconcealed shall be capable of easy inspection.

3.7.4 Receptacles and lighting circuits shall be fed from different circuits. The switch controlling these circuits shall be on the live side (phase wire) of the circuits.

3.7.5 A.C. normal, A.C. emergency and D.C. emergency system wiring shall run throughout in separate conduits.

3.7.6 Wiring shall be spliced only at junction boxes. Maximum two wires shall be connected at each terminal.

3.7.7 In vertical run of wires in conduit the wires shall be suitably supported by means of wooden/hard rubber plugs at each pull/junction box.

3.7.8 All lighting wires shall be crimped using suitable type of solderless, crimping, tinned fork type copper lugs. Cost of the lugs shall be included in the erection price of wire.

3.8 Junction Boxes

3.8.1 Junction boxes having volume upto 1600 cubic centimetre may be installed without any support other than that resulting from connecting conduits where two or more rigid metallic conduits enter and accurately position the box. Boxes shall be installed so that they are levelled, properly aligned and present a pleasing appearance. Boxes with volumes greater that 1600 cubic cm. or for other reasons not rigidly held, shall be adequately supported. The contractor shall perform all drilling, cutting, welding, shimming and bolting required for attachment to supports.

3.8.2 Necessary holes for conduit/cable entry shall be done during installation depending on the requirement. The holes shall be drilled/punched neatly and shall be dust/vermin proof after installation of the conduit.

3.8.3 All welds, bolts holes, conduit entry holes etc,. made during installation as mentioned above shall be wire brushed and touched up with metal primer (lead oxide and zinc chromate in synthetic medium

3.9 Lighting Mast

3.9.1. The lighting mast shall be erected by the contractor at different locations as described by site / customer and shall be got approved from the purchaser. The erection work shall include

making of foundations (with supply of all materials). Installation of necessary wiring/ cabling, junction/ switch box and mounting of assembled fittings The cable from junction box/ feeder pillar/ JB/ panel upto the lighting fixture shall be supplied by the contractor. All the above erection work shall be done by contractor for lighting masks including making of foundations. 50mm GI pipe shall be provided for cable protection from trench to junction box by the contractor for loop-in-loop-out cables.

3.9.2 The lighting mast shall be painted with two coats of aluminium paint after completion of installation or as specified by purchaser.

3.9.3 The flood light fixtures shall be mounted on galvanised M.S. base making use of shop drilled holes or by suitable clamps. No cutting or drilling of galvanised structure is permitted.

3.9.4 Each lighting poles and lighting/lightning mast junction box shall be earthed by 25X6 mm GS flat bonded to one (1) 20 mm dia MS earth electrode of 3 meter length driven vertically in the ground. The flat and electrode shall be supplied by the bidder and price of these shall be included in the erection price of individual pole/mast. 14 SWG GI wire shall be taken from fixture to JB.

The bidder shall submit the foundation drgs of masts for purchaser's approval.

3.10 Earthing of Lighting system

3.10.1 All junction boxes, receptacles, switch boxes, lighting fixtures, conduit etc. shall be earthed in compliance with the provision of I.E. rules and applicable Indian Standard amended upto date.

3.10.2 A continuous earth conductor of 14 SWG G.I. wire shall be run all along each conduit run and bonded at every 600 mm by not less than two turns of the same size of wires. This conductor shall be connected to the earth bus of lighting panel from which the conduits originate. All junction boxes, receptacles, lighting fixtures etc. shall be connected to this 14 SWG GI earth conductor. All panels shall be earthed by GI flats to the purchasers earthing bus. The supply of GI flat and erection shall be in contractor's scope and rates of the same shall be included in the erection rates of the respective LDB/LP.

3.11 Foundation & Civil Works

3.11.1 Equipment foundations, for lighting mast & other panels mounting foundation and other civil work including supply of cement, steel and other materials as per relevant drawings and specification clauses shall be provided by the contractor. Cost of foundation works , including supply of necessary material is to be quoted as part of E & C rates for these items.

3.11.2 All foundation drawings shall be subject to the purchaser's approval. However, it shall be the responsibility of the contractor to check these foundations before commencement of erection to ensure their suitability.

3.11.3 Al final adjustment of foundation levels, chipping and dressing of foundation surfaces, setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil work as may be required for erection.

3.11.4 Any cutting of masonry/concrete work, which is necessary, shall be done by the contractor at his own cost and shall be made good to match the original work. The contractor shall obtain approval of the purchaser before proceeding with any cutting of masonry/concrete work.

3.11.5 The contractor shall perform all excavation and backfilling as required for ground connections and casting foundations.

3.11.6 Excavation shall be performed upto the required depth. Such measures shall be taken as may be necessary for protection of the wall.

3.11.7 The contractor shall make use of his own arrangements for pumping out any water that may be accumulated in the excavation.

3.11.8 All excavation shall be backfilled to the original level with good consolidation.

3.12 Cabling work:

3.12.1 The owner will supply necessary cables required for the system as per the specification & the bidder shall have to lay & terminate the same. This shall include all clamping, fixing, drilling, cutting, glanding, luging, connecting to terminal blocks, grounding etc. as required to complete the job. Cost of all consumable materials required for cable laying & cable termination shall be included in the erection rate to be quoted by the bidder.

3.12.2 Bidder shall supply all necessary glands & lugs required for cable termination carried out by him. Size of glands & lugs shall be as per the size of the cables selected during detailed engg.

3.12.3 Cable glands shall be double compression type & made of tin plated heavy duty brass casting and machine finished. Glands shall be of robust construction capable of clamping cable & cable armour firmly without injury to the cable. Thickness of tin coating shall not be less than 10 microns. All washers and hardwares shall be made of brass & tinned. Rubber components used in the glands shall be made of neoprene of tested quality.

3.12.4 Cable lugs shall be tinned copper, solderless crimping type, conforming to IS:8309 suitable for Al or Cu conductors. Crimping of terminals shall be done by using corrosion inhibitory compound.

3.12.6 Cables shall be laid in owner's trays wherever available. In areas, where owners trays are not available, cable shall be clamped to the structures or laid in conduit or buried depending on the area.

3.12.7 Each cable shall be tagged with the cable no. as per cable schedule. The tag shall be of rectangular shape & attached to the cable by not less than two turns of 20 SWG GI wire. Cable tag shall be provided at each end of the cable before entering the equipment enclosure, on both sides of wall or floor crossing and every 30 meter of cable runs.

3.12.8 Minimum bending radius for the cables shall not be less than 12D, where D is the overall dia of the cable.

3.13 Steel Fabrication

3.13.1 The steel structures supplied and fabricated by the contractor shall be made from standard quality steel sections/flats/plates. The steel fabricated structures shall be free from defects, cleaned of rust, grease, oil etc,. and sharp edges shall be removed.

3.13.2 The welds shall be wire brushed or cleaned otherwise. The holes shall be touched up with metal primer.

3.13.3 All steel fabrications shall be painted with two coats of metal primer (lead oxide and zinc chromate in synthetic medium) followed by two coats of aluminium paint. The welds to galvanised steel shall be touched up with galvanised weld rod applied in accordance with manufacturer's instruction.

3.14 Cutting & wastage allowances:

3.14.1 Contractor shall carefully plan cutting schedule of each cable drum, conduit, lighting wires, GI wires such that wastage's are minimised and any resultant short length can be used where appropriate route length are available. The following wastage's allowances are permissible for various materials.

3.14.2 Power cables, and control cables, Cutting & wastage's allowance shall be computed on the length actually measured, used & accepted. Break up of above 3% wastage allowances are given below :

a) 1% unaccountable wastage.
b) 2% accountable wastage.

Note: Usable length to be returned to purchaser. Minimum wastage length is to be decided in consultant with site engineers.

3.14.3 The contractor shall take-back the unused installation materials which has not been entered in the measurement records by the purchaser after completion of job.

3.15 Quantity measurement:

3.15.1 For all payment purpose, measurement shall be made on physical measurements. Physical measurements shall be made by the contractor in the presence of the site engineer/purchaser.

3.15.2 The measurement of cable laying shall be made on the basis of length actually laid from lug to lug including that of loops provided.

3.15.3 In the measurement of conduits, the accessories will not be include GI wire / GI strip.

3.15.4 The E & C cost of of lighting wires and earthing wires shall be included in the E & C cost of conduits. No separate cost of erection of lighting wires and earthing wires shall be paid.

3.15.5 The accountable wastage to be returned to purchaser's store in good condition and as directed by site engineer.

3.15.6 Any wastage granted by the vendor in excess of the allowable percentage shall be charged at the panel rates decided by the site engineer whose decision shall be final and binding on the vendor.

3.16 Contractor to make a protocol in consultation with site engineer and customer's representative for erection, testing & commissioning of all lighting equipment.

4.0 TESTING & INSPECTION AT CONTRACTOR'S WORKS

4.1 Standard quality plan (QP) for lighting equipment is enclosed. Bidder to confirm compliance to this QP by signing every page of it.

4.2 All accessories shall be subject to routine and type tests in accordance with requirement of appropriate IS in the presence of purchaser's representative.

4.3 Samples selected by the purchaser of all galvanising material shall be subjected to galvanising tests. All fittings, fabrications, hardwares etc. as specified shall be inspected & tested in accordance with IS recommendation. Type test certificates from National Test House or from reputed agency shall be considered.

4.4 Field quality plan for quality checks to be observed at site during erection, testing & commissioning shall also be furnished by contractor alongwith offers as per standard format.

4.5 Testing and commissioning

4.5.1 On completion of erection work, the contractor shall request the site engineer for inspection and test.

4.5.2 The site engineer shall arrange for joint inspection of the installation by purchaser's and customers representative for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the contractor.

4.5.3 The installation shall be then tested and commissioned in presence of the site Engineer & customer's representative

4.5.4 The contractor shall provide all men, material and equipment required to carry out the tests.

4.5.5 All rectification's, repairs or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the contractor without nay extra cost. The handing over of the lighting installation shall be effected only after the receipt of written instruction from the site engineers/ customer.

4.5.6 The testing shall be done in accordance with the applicable Indian standards and codes of practice. The following tests shall be specifically carried out for all lighting installation.

i. Insulation resistance
ii. Testing of earth continuity path
iii Polarity test of single phase switches.

4.5.7 The lighting circuits shall be tested in the following manner.

i. All switches ON and consuming devices in circuit, both poles connected together, to obtain resistance to earth.

ii. Insulation resistance between poles with lamps and other consuming devices removed and switches ON

5.0 DRAWINGS/ DOCUMENTS

REFER VARIOUS CLAUSES OF ELSEWHERE

6.0 PRICES

6.1 The contractor shall quote his prices for supply, erection, testing & commissioning of complete lighting system as per format attached with the specification.

6.2 Unit price quoted for erection, testing & commissioning of items listed under B O M shall be deemed to have been included the prices for erection material as described in clause 1.4 of this specification and other relevant clauses of this specification for various lighting equipment.

6.3 The unit rates of supply & installation (E & C) for all equipment and service quoted by the bidder shall be firm for a variation of quantities limited to

a. ±30% of total order value till finalisation of engineering details & BOQ.

6.4 Purchaser reserves the right to right to delete/add any equipment or services from the bidders scope, and for price adjustment in such cases, unit prices quoted by the bidder will be considered.

6.5 The bidder shall furnish unpriced price schedule of all equipment and services inclusive of E & C and recommended spares alongwith the technical bid.

ANNEXURE-A
SUB VENDOR LIST

3X660MW North Karanpura

		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL		REF NO.:9596-108 REV NO.:00			
	CONTRACTOR: BHEL PEM	SUB SYSTEM: TG & AUX - ELECTRICAL					
	CONTRACT NO.:CS-9596-108			DATE:10.05.2011			
1	LIGHTING POLE	BIS LICENSEE AS PER IS 2713& Bajaj - Pune			I		Part of station lighting packg.
2	LUMINARIES	CROMPTON	MUMBAI	A	I		
		BAJAJ ELECTRICALS	MUMBAI	A	I		Part of station lighting packg
		PHILIPS	KOLKATA	A	I		
		WIPRO	MUMBAI	A	I		
3	LAMPS	CROMPTON	MUMBAI	A	III		Part of station lighting packg
		BAJAJ ELECTRICALS	MUMBAI	A	III		
		PHILIPS	KOLKATA	A	III		
		WIPRO	MUMBAI	A	III		
4	LIGHTING PANELS	POSITRONICS	VADODARA	A	I		Part of station lighting packg
		MIMIC & CONTROL	KOLKATA	A	I		
		L&T	COIMBATOR/MUMBAI	A	I		
		MAKTEL	VADODARA	A	I		WALL MOUNTED TYPE ONLY
		JAKSON	NOIDA	A	I		
		SWITCHING CIRCUIT	KOLKATA	A	I		WALL MOUNTED TYPE ONLY
		SARVANA SWITCHGEAR	BANGALORE	A	I		
		ERA ELECTRICALS	MURTHAL(SONEPAT)	A	I		
		C&S	NOIDA/HARDWAR	A	I		
		GEII	BANGALORE	A	I		
		ICA	MUMBAI	A	I		
		ISC	MUMBAI	A	I		
		SIEMENS	MUMBAI	A	I		
		AVAIDS TECHNOVATORS	GURGAON	A	I		
		JASPER	GURGAON	A	I		
		VIDYUT CONTROL	GHAZIABAD	A	I		
		ANAND POWER	NOIDA	A	I		
		UNILEC	GURGAON	A	I		
		PYROTECH	UDAIPUR	A	I		
5	LIGHTING WIRE	BIS LICENSEE			III		Part of Station Lighting Package
	INDUSTRIAL RECEPTACLES & BOXES	SCHNEIDER	NASIK	A	III		
		BCH	FARIDABAD	A	III		
		AJMERA	MUMBAI	A	III		
		SAKTHI & CROWN	CHENNAI	A	III		

		LIST OF ITEMS REQUIRING QUALITY PLAN		REF NO.:9596-108			
	PACKAGE: TG	AND SUBCONTRACTOR APPROVAL		REV NO.:00			
	CONTRACTOR: BHEL PEM	SUB SYSTEM: TG & AUX - ELECTRICAL					
	CONTRACT NO.:CS-9596-108			DATE:10.05.2011			
6	CEILING FANS WITH REGULATORS AND EXHAUST FANS	CROMPTON	MUMBAI	A	III	NOTED	Part of Station Lighting Package
		ORIENT	FARIDABAD	A	III	NOTED	
		KHAITAN	FARIDABAD		III	NOTED	
		POLAR	NOIDA		III	NOTED	
		GEC	KOLKATA		III	NOTED	
7	EMERGENCY LIGHT	BHEL APPROVED SOURCES			III		

8 INTEGRAL MOTOR : HINDUSTAN BRAND

9 TRAILING CABLE : MANSFIELD / SUN BRAND / BMI / UNIFLEX

10 WIRE ROPE : BHARAT WIRES ROPES LTD . / SSWRL.

ANNEXURE - B

Nos. OF DRAWINGS/ DOCUMENTS REQUIRED FROM VENDOR

1.0 Document distribution schedule for the project shall be as below after award of contract for All Documents / Drawings.

S. NO.	DESCRIPTION	HARD COPY (NO.)	SOFT COPY (AUTOCAD/PDF)	CD
1	All drawings / documents – first submission / resubmission	4	YES	-
2	Final drawings / documents after approval for distribution purpose	10	YES	-
3	As built drawings / documents	10	YES	1
4	Instruction manual (erectio, O&M), commissioning procedure, data books / plant handbooks / catalogues etc.	7	-	-
5	Performance and guarantee test report	11	YES	1

ANNEXURE - C

3 X 660MW NORTH KARANPURA TPS

PRICE SCHEDULE FOR STATION LIGHTING SYSTEM (SUPPLY)

Item No.	DESCRIPTION	UNIT	QTY	SUPPLY	
	MAIN EQUIPMENT (SUPPLY)			UNIT EX-WORKS	TOTAL EX-WORKS
1.0	Complete Lighting Mast 30 M with mounting arrangement & required accessories (including earthing material, raise/lower arrangement with electrical winch, mounting arrangement, lighting fixtures, lamps, junction box, feeder pillar etc.) as per specification.	Nos.	24		

NOTES:

1. The unit rates of supply & installation for all equipment and services quoted by the bidder shall be firm for a variation of quantities limited to:

a) ±30% of total order value till finalization of engineering details & BOQ.

2. 'Basic Design Documents' cover: Drawings/ documents schedule, technical data sheets, GA dwgs. of equipments, quality plan, type test reports and type test proposal (as required) for Station Lighting System.

ANNEXURE - D

3 X 660MW NORTH KARANPURA TPS

PRICE SCHEDULE FOR STATION LIGHTING SYSTEM (E&C)

Item No.	DESCRIPTION	UNIT	QTY	E & C	
	Erection & Commissioning			UNIT EX-WORKS	TOTAL EX-WORKS
1.0	Complete Lighting Mast 30 M with mounting arrangement & required accessories (including earthing material, raise/lower arrangement with electrical winch, mounting arrangement, lighting fixtures, lamps, junction box, feeder pillar etc.) as per specification.	Nos.	24		

NOTES:

1. The unit rates of supply & installation for all equipment and services quoted by the bidder shall be firm for a variation of quantities limited to:

a) ±30% of total order value till finalization of engineering details & BOQ.

2. 'Basic Design Documents' cover: Drawings/ documents schedule, technical data sheets, GA dwgs. of equipments, quality plan, type test reports and type test proposal (as required) for Station Lighting System.

3. Erection & commissioning materials (such as double compression cable glands, conduit fittings viz. couplers, elbows, bends, tees, circular boxes etc., conduit accessories viz. clips, saddles, spacing plates, entry bushes, lock nuts, plugs, heavy duty lugs, ferrules, expansion fastners, ball & sockets, earth clips, fan boxes, clamps, screws etc. form part of erection activities) and accessories including commissioning & operational spares upto system handing over to customer has to be worked out for complete and successful erection & commissioning of the total supply as per BOQ. The price to be quoted for E & C accordingly for equipment and fittings.

4. All measuring and testing instruments required during erection, testing, commissioning and performance testing shall be arranged by the bidder and taken back.

ANNEXURE - E

3 X 660MW NORTH KARANPURA TPS

UNIT PRICE SCHEDULE FOR STATION LIGHTING SYSTEM

Item No.	DESCRIPTION UNIT PRICE	UNIT	QTY	UNIT EX-WORKS SUPPLY	UNIT EX-WORKS E&C
1	Luminaire Type SF66 (*)	No.	1		
2	400 W HPSV Lamp	No.	1		

NOTE : (*) Bidder's type reference

1.0 **SYSTEM DESIGN DATA**

1.1 Design Ambient : 50^0C

1.2 Details of Operating Parameters

a) AC Supply

i. Rated Voltage : 415 V

ii. Rated Frequency : 50 HZ

iii. Voltage variation: (Permissible) ± 10%

iv. Frequency variation (Permissible) : +3% to - 5%

v. Combined voltage & frequency variation (sum of absolutes permissible) : 10 %

vi. System fault level at rated voltage : 50 KA for 1sec

b) DC Supply

i. Rated Voltage : 220 V

ii. Voltage variation (Permissible) : + 10% to - 15%

iii. System fault level at rated voltage : 20 KA

2.0 **APPLICABLE STANDARDS** : As per specification

3.0 **LIGHTING CONCEPT**

3.1 Areas

a) Location : [ ] Indoor [√] Outdoor
[ ] Both

4.0 **SCOPE OF SYSTEM DESIGN ENGG**. : [√] Included in vendor's scope
[ ] Excluded from vendor's scope

5.0 **LUMINAIRES, LAMPS & ACCESSORIES**

5.1 Whether all type of luminaires as per BOQ offered: [√] Yes [ ] No

5.1.1 If no, Types of luminaires not offered as per BOQ : NA

5.2 List of lamps which can be installed only specified angle. : None

5.3 Type of false ceiling for recessed fluorescent luminaire : NA

5.4 Degree of Protection for drip proof luminaires : IP55

5.6 Non-Integral control gear box

a) Sheet thickness : 3 mm

b) Degree of protection : IP-55

c) Surface treatment : [√] Painted (powder coated) [ ] Galvanised

d) If galvanised

i. Wt. of Zinc : NA.
ii. Process : NA

e) If painted

i. Colour to IS : Relevant IS

ii. Minimum paint thickness : 80 micron

5.7 Tap setting for Ballasts

a) HPSV luminaires : 220, 240 V

b) HPMV Luminaires : 220, 240 V

5.8 Lamps

a) Type of lamp cap for HPSV : [√] Screw Type

b) Type of beam for

i. HPSV lamps : [ ] Short beam [ ] Long beam [√]Both

6.0 DESIGN PARAMETERS OF MAIN EQUIPMENT

6.1 Lighting Panel

6.1.1	Application	:	[ ] Indoor [√] Outdoor [ ] Both
6.1.2	Sheet thickness	:	2 mm
6.1.3	Degree of protection		
	a) Indoor	:	IP-52
	b) Outdoor	:	IP-55 with canopy
6.1.4	Type of Incomer	:	[ ] Switch-Fuse [√] TPN MCB
6.1.5	Busbar material	:	Aluminium
6.1.6	Whether hinged door with locking facility provided	:	[√] Yes [ ] No
6.1.7	Whether earthing studs provided	:	[√] Yes [ ] No

6.2 Lighting Masts

6.2.1	Number of luminaires on each mast	:	Lantern carriage shall be provided with 16 nos. twin 400W HPSV flood light fixture
6.2.2	Type of design	:	Polygonal shape
6.2.3	Material	:	GI
6.2.4	Height	:	30 meter
6.2.5	Galvanization		
	a) Process	:	Hot dip
	b) Wt. of Zinc deposited	:	610 gm / m^2
6.2.6	Photocell and timer required	:	[√] Yes [ ] No

6.3 Street Lighting Pole Junction Boxes

6.3.1	Material	:	CRCA sheet
6.3.2	Sheet thickness	:	1.6 mm
6.3.3	Galvanization		
	a) Process	:	Hot dip

b) Wt. of zinc deposited : 610 gm / m^2

6.3.4 Degree of protection : IP-55

6.4 **Fuse Boxes**

6.4.1 Material : CRCA sheet

6.4.2 Sheet thickness : 1.6 mm

6.4.3 Galvanization

a) Process : Hot dip

b) Wt. of zinc deposited : 610 gm / m^2

6.4.4 Degree of Protection : IP-55

7.0 **COMPONENT OF LIGHTING SYSTEM EQUIPMENT**

7.1 **Switch-Fuse Unit**

7.1.1 Utilisation category for main contacts : AC 23

7.2 **Power Contactors**

7.2.1 Coil Voltage (nominal)

a) AC contactors : 240 V

b) DC contactors : 220 V

7.3 **Under Voltage Relay**

7.3.1 Type : [ ] Static [√] Electromagnetic

7.3.2 Coil Voltage Rating :

7.3.3 Means for in-built testing provided : [√] Yes [ ] No

7.4 **Miniature Circuit Breaker**

7.4.1 Min. Rating : As per spec.

7.4.2 Short Time rating : 9 KA

7.4.3 Thermal overload and magnetic short circuit protection provided : [√] Yes [ ] No

7.5 **Selector Switch**

7.5.1 Type of selector switch : [√] Stay put [ ] Wing knob

7.5.2 Lockability : [ ] Provided [√] Not provided

7.6 **Indication Lamps**

7.6.1 Lens Colour

a) On condition : Red

b) OFF condition : Green

7.6.2 Circuit Voltage : As per control supply voltage

7.7 **Push Buttons**

7.7.1 Voltage Grade : 500 V

7.7.2 No. of Contacts : (2NO + 2NC)

7.8 **Terminals**

7.8.1 Type : 660V Grade box clamp, 10 mm² minimum

7.8.2 Material : Copper

7.8.3 Whether inter-terminal barrier provided : [√] Yes [ ] No

7.9 **Cable Glands**

7.9.1 Provision for all power and control cables considered : By vendor for all incoming & outgoing cables

7.9.2 Type : Double compression

7.9.3 Material : Brass

7.9.4 Nickel Plating provided : [√] Yes [ ] No

7.10 **Cable Lugs**

7.10.1 Provision for all power and control terminations considered : By vendor for all power & control connections

7.10.2 Type : Crimping type

7.10.3 Material : Tinned copper

7.11 **Timers**

7.11.1 Time Switch

a) Type : As per spec.

b) Range : 00 - 24 Hours

7.11.2 Delay Timer :

a) No. of Contacts As per scheme

i. ON time delay :

ii. OFF time delay :

iii. Instantaneous : -

b) Coil Voltage Rating

i. AC timer : 240 V

ii. DC timer : 220 V

c) Time delay range

i. AC timer : 1 – 99 Sec.

ii. DC timer : 24 – 240 Sec.

8.0 **LABELING**

Requirement of Specification complied : [√] Yes [ ] No

9.0 **MAKE** : As per spec

10.0 QUANTITY VARIATION (Limited to the value of the Contract)

a) Till the "Engineering" is complete : ± 30 % (As per spec.)

1.0 SYSTEM DESIGN DATA

1.1 Design Ambient : ^{o}C

1.2 Details of Operating parameters

a) AC Supply

i. Rated voltage : V

ii. Rated frequency : Hz

iii. Voltage variation (Permissible) : %

iv. Frequency variation (Permissible) : %

v. Combined voltage & frequency variation (sum of absolutes permissible) : %

vi. System fault level at rated voltage :

b) DC Supply

i. Rated voltage : V

ii. Voltage variation (Permissible) : %

iii. System fault level at rated voltage :

2.0 APPLICABLE STANDARDS : As per Annexure-I

3.0 LIGHTING CONCEPT

3.1 Areas

a) Location : [ ] Indoor [ ] Outdoor [ ] Both

b) Street Lighting : [ ] Yes [ ] No

3.2 Types of supplies considered (other than AC Normal)

a) DC Normal : [ ] Yes [ ] No

b) DC Emergency : [ ] Yes [ ] No

c) AC Emergency : [ ] Yes [ ] No

4.0 **SCOPE OF SYSTEM DESIGN ENGINEERING** : [ ] Included in vendor's scope
[ ] Excluded from vendor's scope

5.0 **LUMINAIRES, LAMPS & ACCESSORIES**

5.1.0 **LUMINAIRES**

5.1.1 Whether all types of luminaires as per BOQ offered : [ ] Yes [ ] No

5.1.2 If no,
Types of luminaires not offered as per BOQ :

5.1.3 List of lamps which can be installed only at specified angle :

5.1.4 Degree of protection for drip proof luminaires :

5.1.5 Non-integral control gear box

a) Sheet thickness :

b) Degree of protection :

c) Surface treatment : [ ] Painted
[ ] Galvanised

d) If galvanised

i. Wt. of zinc : gms / m^2

ii. Process :

e) If painted

i. Colour to IS :

ii. Minimum paint thickness : microns

5.1.6 Type of lamp holder for incandescent luminaires : [ ] screw type
[ ] Pin type

5.1.7 Tap setting for Ballasts

a) HPSV luminaires :

b) HPMV luminaires :

5.2 **LAMPS** :

d) Type of lamp cap for HPMV & HPSV :

e) Type of beam for

i. HPMV lamps : [ ] Short beam [ ] Long beam [ ] Both

ii. HPSV lamps : [ ] Short beam [ ] Long beam [ ] Both

6.0 **DESIGN PARAMETERS OF MAIN EQUIPMENT**

6.1 **Lighting Panel**

6.1.1 Application : Outdoor

6.1.2 Sheet thickness : mm

6.1.3 Degree of protection

a) Indoor : IP :

b) Outdoor : IP :

6.1.4 Type of Incomer : [ ] Switch-Fuse [ ] MCB

6.1.5 Busbar material :

6.1.6 Whether hinged door with with locking facility provided : [ ] Yes [ ] No

6.1.7 Whether earthing studs provided : [ ] Yes [ ] No

6.1.8 Painting details (if applicable)

a) Shade as per IS:5 :

b) Paint thickness : microns

6.2 **Lighting Masts**

6.2.1 Number of luminaires (max.) on each mast :

6.2.2 Type of design :

6.2.3 Material :

6.2.4 Height (above ground) excluding Lightning Arrester : meters

6.2.5 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.2.6 Weight : Tonnes

6.3 **Street Lighting Pole Junction Boxes**

6.3.1 Material :

6.3.2 Sheet thickness : mm

6.3.3 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.3.4 Degree of protection : IP :

6.4 **Fuse Boxes**

6.4.1 Material :

6.4.2 Sheet thickness : mm

6.4.3 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.4.4 Degree of protection : IP :

7.0 **COMPONENT OF LIGHTING SYSTEM EQUIPMENT**

7.1 **Switch-Fuse Unit**

7.1.1 Utilization category for main contacts : AC -

7.1.2 Indication Lamps :

7.1.3 Lens colour :

a) ON condition :

b) OFF condition :

7.1.4 Circuit voltage :

7.2 **Push Buttons**

7.2.1 Voltage Grade : Volt

7.2.2 No. of Contacts : (NO + NC)

7.2.3 Terminals

7.2.4 Type :

7.2.5 Material :

7.2.6 Whether inter-terminal barriers provided : [ ] Yes [ ] No

7.3 **Cable Glands**

7.3.1 Provision for all power and control cables considered : [ ] Yes [ ] No

7.3.2 Type :

7.3.3 Material :

7.3.4 Nickel plating provided : [ ] Yes [ ] No

7.4 **Cable Lugs**

7.4.1 Provision for all power and control terminations considered : [ ] Yes [ ] No

7.4.2 Type :

7.4.3 Material :

7.5 **Timers**

7.5.1 Time Switch

a) Type :

b) Range :

7.5.2 Delay Timer

a) No. of contacts

i. ON time delay : (NO + NC)

ii. OFF time delay : (NO + NC)

iii. Instantaneous : (NO + NC)

b) Coil voltage rating

i. AC timer : volt

ii. DC timer : volt

c) Time delay range

i. AC timer : sec.

ii. DC timer : sec.

6.0 LABELING

Requirement of specification complied with : [ ] Yes [ ] No

QUALITY PLAN

NTPC	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SOZE ETC.): LIGHTING MAST WITH RASIE & LOWER TYPE LANTERN CARRIAGE	STANDARD QUALITY PLAN	QP.NO:0000-999-QOE-S-52	REVIE
		CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION	Rev No.: 0	D.K. Di
			Date: 31-01-13	V. Talw
			VALID UPTO: 30.01.2016	Sunil M

Sl No	COMPONENT & OPERATIONS		CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
						6 M	6 C/N					M	C	N	
1	2		3	4	5			7	8	9	D*	**	10		11
1	**Steel for mast shaft / gussets /Head Frame**	a	Chemical composition & Mechanical properties	Major	Chemical & Mechanical	Sample as per mnfr std	Same as 6 M	NTPC Specification / Manufacturer's plant standard	NTPC Specification / Manufacturer's plant standard	TC	√	P	V	V	
		b	Thickness	Major	Measurement	Sample as per mnfr std	Same as 6 M	NTPC Specification / Manufacturer's plant standard	NTPC Specification / Manufacturer's plant standard	TC	√	P	V	V	
2	**High Mast continuously tapered, polygonal cross section**	a	Dimension, Cross Section	Major	Measurement	100%	-	NTPC approved Drawing	NTPC approved Drawing	Internal Inspection Report		P	-	-	
		b	Longtudinal weld	Critical	Visual	Sample as per mnfr std	Same as 6 M	NTPC Appd Drg/Data sheet / Manufacturer Standard	Single defect free longitudinal weld	Internal Inspection Report		P	V	V	
		c	Galvanisation checks (Thickness, uniformity of coating & adhesion)	Major	Measurement	Sample as per mnfr std	Same as 6 M	NTPC approved Datasheet/ Drawing; IS 2629/IS 2633/ ISO : 1461	NTPC approved Datasheet/ Drawing	Internal Inspection Report	√	P	V	V	
3	**Luminiare Carriage,Head Frame,Pulley Block**	a	Dimension,Matl of	Major	Measurement / verify	100%	Same as 6	NTPC approved Drawing	NTPC approved Drawing			P	V	-	
		b	Inner Lining with PVC sleeve	Major	Visual	100%	-	NTPC approved Datasheet/ Drg./ Manufacturer Standard	NTPC approved Datasheet/ Drg./ Manufacturer Standard	Internal Inspection Report		P	-	-	
		c	Weld Joint	Major	Visual	Sample as per mnfr	Same as 6 M	Manaufacturer Standard	No abnormality	Internal Inspection		P	V	V	
		d	Galvanisation checks (Thickness, unformity of coating & adhesion),if applicable	Major	Measurement	Sample as per mnfr std	Same as 6 M	NTPC approved Datasheet/ Drawing; IS 2629/IS 2633/ ISO : 1461	NTPC approved Datasheet/ Drawing	Internal Inspection Report	√	P	V	V	
		e	Luminaire mounting /fixing dimensions check	critical	Measurement	100%	Same as 6 M	NTPC approved Drg./ Manufacturer drg.	NTPC approved Drg./ Manufacturer drg.	Internal Inspection Report	√	P	V	V	
		e	Pulley Block-Material & Smooth Rotation	critical	Verify	100%	Same as 6 M	NTPC approved Drg./ Manufacturer drg.	NTPC approved Drg./ Manufacturer drg.	TC	√	P	V	V	

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

NTPC	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SOZE ETC.): LIGHTING MAST WITH RASIE & LOWER TYPE LANTERN CARRIAGE	STANDARD QUALITY PLAN CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION	QP.NO:0000-999-QOE-S-52 Rev No.: 0 Date: 31-01-13 VALID UPTO: 30.01.2016	REVIE D.K. Di V. Talw Sunil M

Sl No	COMPONENT & OPERATIONS		CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
						6 M	6 C/N					M	C	N	
1	2		3	4	5			7	8	9	D*	**	10		11
4	**Raising / Lowering Mechanism**	a	Type & rating check on Winch, Power tool & torque Limitor	Major	Visual	100%	Same as 6 M	NTPC approved Datasheet/ Drg.	NTPC approved Datasheet/ Drg.	Internal Inspection Report	√	P	V	V	CoC of motor manufacturer shall be submitted for NTPC's review
		b	Load testing on winches	Major	Mechanical	Sample as per mnfr std	Same as 6 M	Manufacturer Standard	Manufacturer Standard	TC	√	P	V	V	
		c	Functional testing on Load Limitor	Major	Mechanical	Sample as per mnfr std	Same as 6 M	Manufacturer Standard	Manufacturer Standard	TC	√	P	V	V	
		d	Functional & Assembly Check -manual & motorised	Major	Mechanical	100%	Same as 6 M	Manufacturer Standard	Manufacturer Standard	Internal Inspection Report		P	V	V	
5	**Stainless Steel Wire Rope**	a	Mechanical Properties including breaking load	Major	Mechanical	Sample as per mnfr std	Same as 6 M	NTPC approved Datasheet/ Drawing	NTPC approved Datasheet/ Drawing	TC	√	P	V	V	
		b	Continuous rope without any joint	Major	Visual	100%	Same as 6 M	NTPC approved Datasheet/ Drawing	NTPC approved Datasheet/ Drawing	Internal Inspection Report	√	P	V	V	
		c	Dimension & Construction	Major	Measurement	100%	Same as 6 M	NTPC approved Datasheet/ Drawing	NTPC approved Datasheet/ Drawing	Internal Inspection Report	√	P	V	V	
6	**Foundation Bolt**	a	Mechanical Properties	Major	Mechanical	Sample as per mnfr std	Same as 6 M	NTPC approved Datasheet/ Drawing / IS 1367	NTPC approved Datasheet/ Drawing / IS 1367	TC	√	P	V	V	
		b	Dimensions	Major	Measurement	Sample as per mnfr std	Same as 6 M	NTPC approved Drg./ Manufacturer drg.	NTPC approved Drg./ Manufacturer drg.	TC	√	P	V	V	
7	**Power Cable & Connector**	a	Size, rating & Type	Major	Visual	100%	-	NTPC approved Datasheet/ Drg	NTPC approved Datasheet/Drg	Internal Inspection Report		P	-	-	
		b	Routine Test Reports (for cable only)	Major	Visual	100%	-	IS 9968	IS 9968	TC		P	V	-	BIS mark cable

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N: NTPC; P: PERFORM, W: WITNESS, V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS "W"

	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SOZE ETC.): LIGHTING MAST WITH RASIE & LOWER TYPE LANTERN CARRIAGE	STANDARD QUALITY PLAN	QP.NO:0000-999-QOE-S-52	RE
एनटीपीसी NTPC		CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION	Rev No.: 0	D.I
			Date: 31-01-13	V.
			VALID UPTO: 30.01.2016	Sup

Sl No	COMPONENT & OPERATIONS		CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
						6 M	6 C/N					M	C	N	
1	2		3	4	5			7	8	9	D*	**	10		11
8	**Feeder Pillar Panel**	a	Pre-treatment chemical regime records verification	critical	Verification	Sample as per mnfr std	Same as 6 M	Chemical regime supplier recommendations & Manufacturer Standard	Chemical regime supplier recommendations & Manufacturer Standard	Internal Inspection Report	√	V	V	V	Records of chemical concentration of pre-treatment tanks to be verified
		b	Dimensions, Degree of protection check by paper insertion method	Major	Measurememt & Test	100%	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
		c	Powder coating shade & thickness check	Major	Mechanical check	Random sample	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
		d	Powder coating adhesion check by cross hatch method using packing tape	Major	Mechanical check	Random sample	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
		e	Make, type & rating check of components mounted in feeder pillar	Major	Visual	100%	Same as 6 M	NTPC approved datasheet / Drg. / IS	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
		f	HV & IR check	Major	Electrical	100%	Same as 6 M	NTPC approved datasheet / Drg. / IS	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
		g	Fucntional testing	Major	Electrical	100%	Same as 6 M	NTPC approved datasheet / Drg. / IS	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	
9	**Luminaires with controlgear and Aviation Obstruction light**	a	Make, type & rating check	critical	Visual	100%	100%	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	V	V	Make shall be indicated in the proj-pkg specific endorsement sheet and shall be subject to NTPC approval
		b	Routine & batch Test Certificates	Major	Verification	100%	100%	NTPC approved datasheet / Drg. / IS	NTPC approved datasheet / Drg.	TC	√	V	V	V	Mfrr's CoC for aviation obstruction light

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N: NTPC; P: PERFORM, W: WITNESS, V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS "W"

एनटीपीसी NTPC	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SOZE ETC.): LIGHTING MAST WITH RASIE & LOWER TYPE LANTERN CARRIAGE	STANDARD QUALITY PLAN	QP.NO:0000-999-QOE-S-52	RI
		CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION	Rev No.: 0	D.
			Date: 31-01-13	V.
			VALID UPTO: 30.01.2016	Su

Sl No	COMPONENT & OPERATIONS		CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
						6 M	6 C/N					M	C	N	
1	2		3	4	5			7	8	9	D*	**	10		11
10	Final test	a	High Mast Strcuture Cross-section and Dimension Measurement	Major	Measurement	100%	100%	NTPC approved Drawing	NTPC approved Drawing	Internal Inspection Report		P	W	W	
		b	Galvanising Coating Thickness, uniformity of coating & adhesion	Major	Measurement	1 sample per shaft	1 sample per shaft	NTPC approved Datasheet/ Drawing; IS 2629/IS 2633/ ISO : 1461	NTPC approved Datasheet	Internal Inspection Report		P	W	W	
		c	Feeder Pillar Dimensions check	Major	Measurememt	100%	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	W	W	
		d	Feeder Pillar Powder coating shade & thickness check	Major	Mechanical check	Random sample	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	W	W	
		e	Feeder Pillar powder coating adhesion check by cross hatch method using packing tape	Major	Mechanical check	Random sample	Same as 6 M	NTPC approved datasheet / Drg.	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	W	W	
		f	Feeder Pillar make, type & rating check of components mounted in feeder pillar	Major	Visual	100%	Same as 6 M	NTPC approved datasheet / Drg. / IS	NTPC approved datasheet / Drg.	Internal Inspection Report	√	P	W	W	Makes of Bols shall be indicated in the proj-pkg specific endorsement sheet and shall be subject to NTPC approval
		g	Feeder Pillar Functional Test	Major	Electrical	100%	100%	NTPC Specification/ Approved Drawing	NTPC Specification/ Approved Drawing	Internal Inspection Report		P	W	W	
		h	Feeder Pillar IR test before & after HV	Major	Electrical	100%	100%	As per IS 8623	As per IS 8624	Internal Inspection Report		P	W	W	
		i	Feeder Pillar HV test	Major	Measurement	100%	100%	As per IS 8623	As per IS 8624	Internal Inspection Report		P	W	W	
		j	Completeness of lighting mast compnents	Major	Visual	100%	100%	NTPC Specification/ Approved Drawing	NTPC Specification/ Approved Drawing	Internal Inspection Report		P	W	W	

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

3 x 660 MW NORTH KARANPURA STPS

Sl. No.	Description of Items	Total	UOM	Make of Component
1	High Mast 30 Mtr with Bracket			Bajaj Electricals Ltd.
2	Lantern Carriage			Bajaj Electricals Ltd.
3	Head Frame			Bajaj Electricals Ltd.
4	Winch DDMFO 35/6			Bajaj Proprietory item
5	TRAILING CABLE 8CX2.5 SQ. MM (33 Mtr)			Mansfield / Centurion / SUN Brand/ BMI
6	Power Tool (Motor)			Hindustan Brand / Anson
7	6MM 316 SS WIRE ROPE (60.5 Mtr)			Bharat Wire Rope Ltd.
8	10 PIN POWER PLUG / SOCKET			Jetronics/ALLIED
9	CONTROL PANEL			Antler / Meckins / Sree Om Industries Kamran / Abak/ PARADISE
		Sl. No.		
		1	63A TPN MCB	MDS / MERLIN
		2	45A CONTACTOR	L&T / SIEMENS
		3	9A CONTACTOR	L&T / SIEMENS
		4	TIME SWITCH	L&T / MDS
		5	TOGGLE SWITCH	KAYCEE
		6	PUSH BUTTON	TECKNIC / BCH
		7	TERMINALS	CONNECT WELL / ELEMEX
10	BGEF 22 CA(2 X 400W)			Bajaj Brand - Manufactured by Konark Fixtures Limited
11	BJAOL 2 with GLS lamp (Aviation)			Bajaj Electricals Ltd.
12	Foundation Bolts			International Transmission Products Pvt. Ltd.

NOTE : Make/model with mark of CE/UL/VDE/CSA/BIS marked with valid CML no for 63A TPN MCB, Time switch, Toggle switch, Push button & Terminals to be indicated.