DEENDAYAL PORT AUTHORITY

Erstwhile Deendayal/Kandla Port Trust) Ministry of Ports, Shipping & Waterways, Govt. of India

Mechanical Engineering Department

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No.: EL/AC-EOI /2885-I Date: 08/11/2025

EXPRESSION OF INTEREST [EOI]

"Supply, installation, testing and commissioning of High Mast Lighting Tower at extended newly custom bounded area along with CAMC for the period of 5 Years.

(This EOI is issued to elicit Expression of Interest from the parties interested in the work anddoes not constitute any binding commitment from the Deendayal Port Authority to proceed with the work or invite any or all the parties in the subsequent bidding process. (The Open Tenders will be issued subsequently.)

Executive Engineer (Electrical), DPA invites Expression of Interest for the work of "Supply, installation, testing and commissioning of High Mast Lighting Tower at extended newly custom bounded area along with CAMC for the period of 5 Years" from the reputed firms from those who have executed similar work in Government / Public Sector and other leading private organizations. The Expression of Interest (EOI) documents containing details of Scope of Work and Technical Specifications are enclosed herewith.

The interested firms are requested to submit their Expression of Interest (EOI) for the said work in BOQ format as enclosed, along with credential for similar nature of work & firm GST No. The EOI shall be submitted to the office the undersigned on or before 15/11/2025. A soft copy of EOI is also acceptable through e- mail Id deepak.hazra@deendayalport.gov.in & anil.rautiya@deendayalport.gov.in

Sd/-
Executive Engineer (E)
Deendayal Port Authority

SCOPE OF WORK

The Deendayal Port Authority (DPA) is one of the Major Ports in India. The Specification is intended to provide illumination at with 38 Nos. 30m High Mast lighting towers. The contractor shall read carefully the tender condition & technical specification & site visit mandatory to familiar the site condition and acknowledge the site work.

The Work Covers Supply, installation, erection, testing & commissioning of 38 (Thirty-eight) 30m High Mast towers at newly extended custom bonded area (newly developed 50 hector). The scope of work envisages, Supply, laying & end termination of 11kV XLPE Power Cable; Supply, laying & end termination of 1.1kV XLPE Power Cable; Supply, installation, erection & commissioning of 30 m High Masts lighting towers, LED floodlight luminaries for the High Masts, Load point panels, Feeder pillars for High Mast lighting towers, 630 KVA compact substations, Electrical Substation tapping of Power Supply from the HT Power Cable.

The work shall be executed to the satisfaction of the Engineer in charge. The contractor shall submit layout drawing (colored) for complete of installation (HM, CSS, MLP, SLP, FP) distribution network (HT, LT) distribution in Seven Set hard copy & Soft copy after completion of the work.

The contractor shall construct civil foundation for high mast as per the drawing. The high mast foundation work shall be executed under supervision of Civil Engineering Department, DPA. Before commencing any civil work, such as excavation, breaking of RCC/CC, crossing of RCC platform/Road/Railway and high mast foundation, permission shall be taken from Civil Engineering Department, DPA.

The scope of work will cover 05 (five) years comprehensive annual maintenance services. The contract shall be comprehensive in nature where in preventive as well as breakdown maintenance of entire HM lighting system and its accessories along with power supply (HT & LT), CSS, Load point panel , feeder panel at different location in the to be attended by the contractor including the arrangement of spares, tools, consumables, technical expertise and manpower.

TECHNICAL SPECIFICATION

Technical Specification No. 1:

The works include **630 KVA** outdoor type compact Substation hermitically sealed along with metering system, the CSS consist Ring main unit configuration shall NON extensible Compact Switchgear consist of One VCB as a I/c (+) One out going feeder VCB shall be electrically operated (+) One transformer circuit breaker (TCB). Each VCB Circuit breaker facilitate with Isolator & earth switch in RMU panel all shall be non-draw out type in fixed position. Breakers and load switches shall be SF6 gas or Vacuum type (with Isolator & earth Switch). Make of CSS: - ABB/SIEMENS /Schneider.

The following salient features & standard must be adhering for 630 KVA CSS.

1. Standard: - As per IEC: - 62271-202.
2. CSS Degree of Protection
   a. HV compartment: - IP 54.
   b. LV compartment: - IP 54.
   c. Transformer compartment: - IP23D.
   d. For stainless steel SF-6 tank :-IP 67.
   e. For switchgear: - IP 2X.
3. Enclosure Thickness: - **2mm Thick GI**.
4. Base Frame of **HRCA Hot Dip Galvanized & 4mm Thickness**.

5. Transformer Compartment Roof is detachable type, so that whenever Transformer require to remove from compartment it is possible without disturbing HV & LV Compartment.
6. Paint thickness: - Minimum 160 Micron (Duplex Powder coating).
7. Bus Bar Insulation Gas: - SF6.
8. Nominal operating Gas pressure: - 1.4 Bar @20-degree C.
9. Bus Bar Material: - CU.
10. Paint shade: - RAL 7035.
11. Main Bus Bar: - 240 sq.mm Copper for HV.
12. Earth Bus Bar: - 120 sq.mm copper HV.
13. CSS is internal Arc Type Tested for 21 KA for 1 sec. as per IC: -62271-202.

RMU Construction.

- RMU panel construction shall be metal enclosed framed compartmentalized panel construction with hermitically sealed. Consisting of 4 no's lifting lugs & cable entry from bottom. The cable gland plate shall be made form 3 mm metallic removable type & split type in two parts.
- The bus bar rating 630 Amps. (Copper), with supported by insulator made from SMC resin type. The earth bus bar shall be of copper suitable for rated fault duty for 1 sec and earth bus internal connection to all non-current metal parts by 2.5sq mm copper flexible wire.
- Hardware's should be used of high quality Stainless steel except termination nut-bolts which should be high Grade Stainless Steel.
- Make of vacuum Interrupter & Make of RMU should be same manufacturer.

a). VCB with Load Break Switch (ISOLATER & Earth Switch)

a)	Type	Three pole operated simultaneously by a common shaft , VCB with **(ISOLATER & Earth Switch)** and fault making in SF6 tank
b)	No of phase	3
c)	Arc interruption in dielectric medium	Vacuum
	Type of Charging, Mechanism:	Manual (spring assisted) as well as motorized with 24 V DC operated motor.
d)	Ratted Current	630Amps
e)	Rated Breaking Capacity	630Amps
f)	Fault making Capacity	52.5KA Peak
g)	Short time current for 3 sec	21KA
g)	No of poles	3
i)	Current transformer	3 nos. epoxy cast Current Transformers with 2.5 VA burden STR of 21 KA for 3 second metering accuracy Class 0.5 and protection accuracy 10P10 and having of CTR 150/75- 1A.
k)	Protection Relay	Numeric type or latest updated version (Make: ABB/SIEMENS) with the protection of inverse, definite time, short circuit, over current, instantaneous and earth fault, master trip and trip supervision.
l)	Metering Compartment	Multi-Function meter having digital type (single) with voltage, current, PF, frequency, KW and KWH (Make – ENCRON/L&T / Conzerv) with Mod Bus RS-485.

m)	Operating Mechanism	One no. shunt trip and tripping coil operating on 24 V DC. 2 nos. of space heater with ON/OFF switch and thermostat in each side of panel & Cable chamber.
(n)	Protection system:	Relay must be Numeric type with following features: a) Self-Powered OC+EF Protection Relay b) Control voltage, 24 V DC c) Interference RS-485 port d) Instantaneous Over Current e) short Circuit protection, Inst. Earth fault (50,51,50N & 51N) Instantaneous definite time & inverse type protection of over current.
p		Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
q		Capacitive voltage indication fixed type
r	Battery & Charger	2x 12 Volt DC , battery & Battery charger to be supplied along RMU.

The 2 no's of VCB with isolators & earth switch unit are for receiving of 2 No's Incoming 11 KV 3C x 150 Sq.mm XLPE cable from sub-stations/LILO and also with mechanical & Electrical interlocking between them so that one incomer may be taken on load and another will remain in standby position.

b). TRANSFORMER CIRCUIT BREAKER.

a)	Type	Three pole operated simultaneously by a common shaft , VCB with **(ISOLATER & Earth Switch)** and fault making in SF6 tank
b)	No of phase	3
c)	Arc interruption in dielectric medium	Vacuum
	Type of Charging, Mechanism:	Manual (spring assisted) as well as motorized with 24 V DC operated motor.
d)	Ratted Current	630Amps
e)	Rated Breaking Capacity	630Amps
f)	Fault making Capacity	52.5KA Peak
g)	Short time current for 3 sec	21KA
g)	No of poles	3
i)	Current transformer	3 nos. epoxy cast Current Transformers with 2.5 VA burden STR of 21 KA for 3 second metering accuracy Class 0.5 and protection accuracy 10P10 and having of CTR 100-50/ 1A.
k)	Protection Relay	Numeric type or latest updated version (Make: ABB/SIEMENS) with the protection of inverse, definite time, short circuit, over current,

		instantaneous and earth fault, master trip and trip supervision.
l)	Metering Compartment	Multi-Function meter having digital type (single) with voltage, current, PF, frequency, KW and KWH (Make – ENCRON/L&T / Conzerv) with Mod Bus RS-485.
m)	Operating Mechanism	One no. shunt trip and tripping coil operating on 24 V DC. 2 nos. of space heater with ON/OFF switch and thermostat in each side of panel & Cable chamber.
(n)	Protection system:	Relay must be Numeric type with following features: f) Self-Powered OC+EF Protection Relay g) Control voltage, 24 V DC h) Interference RS-485 port i) Instantaneous Over Current j) short Circuit protection, Inst. Earth fault (50,51,50N & 51N) Instantaneous definite time & inverse type protection of over current.
		Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
		Capacitive voltage indication fixed type

The SF-6 breaker shall be completed with necessary interconnection with fine wiring, ferruled properly including foundation bolts, earthling etc. The layout drawing, dimensional drawings and electrical wiring diagram and operation & maintenance manuals shall be supplied with SF-6 Breaker. The SF-6 breaker shall be supplied in conformity with relevant ISS i.e. with up to date amendments along with manufacturers test certificate.

c) TRANSFORMER:

The transformer shall be fully tested for routine tests, as per BIS-1985. This specification covers the requirements of design, manufacture, testing and supply of cast resin dry type transformers complete with all the accessories and fittings for efficient and trouble-free operation. The equipment covered by this specification shall, unless Otherwise stated to be designed, constructed and tested in accordance with latest revisions of relevant Indian standards / IEC publications. All transformers shall be of the latest design, dry type Cast Resin only. The type of cooling shall be Natural Air cooled (AN) and the corresponding ratings for each transformer. The transformers shall be designed to be capable of with-standing, without injury, the thermal and mechanical effects of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding for periods given in relevant standards. The transformer shall be capable of continuous operation at full load rating under the following conditions. a) Voltage variation = ± 10% b) Frequency variation = ± 5% c) Combined voltage and frequency variation (Absolute sum) = 5%. All Routine Tests in accordance with IEC 60076 / IS 2026 shall be carried out on each transformer.

Core: - The double wound Core shall be constructed from non-ageing cold rolled Grain oriented

steel sheets. The built core shall be painted with high temperature resistant paint to prevent corrosion at the edges of core plates and to withstand high temperatures. By using different core material optimization of core losses shall be achieved. The yokes shall be firmly clamped between yoke channels or plates. The top & bottom yoke frames shall be secured to each other by means of tie-rods, which help in securing the winding in place.

WINDINGS: - **Resin Casted both Windings (HV & LV)** shall be of electrolytic copper conductors (circular in shape) of high conductivity and 99.9% purity. Windings shall be designed to withstand the specified thermal and dynamic short circuit stresses. The windings shall be duly sectionalized. Accessible joints brazed or welded and finished smooth shall connect similar sections. No corona discharge shall result on the winding upon testing the transformer for induced voltage test as specified in IS. The end turns of the high voltage windings shall have reinforced insulation to take care of the voltage surges likely to occur during switching or any other abnormal condition. The high voltage and low voltage winding are shall be made of copper Conductors. HV winding will be always be resin casted under vacuum while LV winding can either be casted or pre-impregnated with resin.

The tenderer shall furnish details regarding adequacy DIN of Transformer capacity.

a)	Transformer capacity	630 KVA (DRY TYPE) Three Phase, 50 Hz, Core type, two winding, Cast Resin Dry type Transformer
b)	Primary voltage	11 KV +/- 10%
c)	Frequency	50 HZ
d)	No. of Phases	3
e)	**Insulation Class**	**'H'**
f)	Cooling	Natural Air
g)	Temperature	Max 115 C by RTD
h)	Percentage Rise	As per IS
i)	In winding	115 degree C , Over ambient temp. of 50 degree
j)	Winding connection	Star/Delta
k)	Impedance	4.5 (Tolerance as per IS)
l)	Vector Group	Dyn 11
m)	Neutral Grounding	HV ungrounded LV Solidly Grounded
n)	Winding material	Copper
o)	Noise Level	As per NEEMA Standard
p)	Tapping Range (HV Side)	-10 % & + 5% in steps of 2.5 % , off circuit tap links
q)	Painting	632 Shed of IS:5 or BIS/DIN Standard
r)	Tapping Range	+/- 5%
s)	Losses (No Load & Full load)	As per IS:-2026
t)	Make	Voltamp/Hitachi/Siemens/Schneider
u)	Fittings	2 Numbers Earthing Terminals, Rating and Diagram Plate, Lifting Lugs, Winding Digital Temp Scanner with RTD.
v)	Losses	AS Per IS :-2026. No load: - 1600 Watt. Load losses at 75 degree C :- 6400 Watt. (Maximum)

Contractor shall facilitate for following stage inspection:

[1] Core assembly of transformers,

[2] Final testing in accordance with IS: 2026 and as per Technical Specification, approved drawing & QAP.

Contractor shall furnish the following documents in regards of procurement of core material at the time of inspection & before dispatch clearance.

a. Invoice of supplier.
b. Packing list.
c. Raw Material Test Certificate as per BOM.

Description of material, Electrical analysis, physical inspection certificate for surface defects, thickness & width of material.

d. LV SWITCHGEAR.

The L.V side should be designed to equip the following: -

a) Low voltage Bus bar system

The equipment shall have all the following features -

a)	LV bus bar	From transformer LV bushing to ACB and from ACB to MCCBs
b)	Bus bar size for phase & neutral	Tinned copper busbar, size shall be as per manufacturer design. **All the phases and neutral busbar shall be same rating & size.** Bus bar size for phase & neutral Suitable spreader to be provided at outgoing side of MCCB to connect 300 sqmm cable through aluminium lug.
c)	Bus bar support	By epoxy insulators
d)	Bus bar sleeve	insulation Color coded
e)	Bus bar rated current	Suitable for 1250 A continuous current rating within the 10K class enclosure @ 50 Degree C ambient temp
f)	Bus bar short circuit	withstand 50 kA for 1 sec

e. Low voltage switchgear, ACB.: - 1250 amp., 4P, 50 KA – Electrically operated manually draw out Type (EDO) ACB.

The equipment shall have all the following features -

a)	Rated operational voltage (V) at 50 Hz	440V
b)	Rated frequency (Hz)	50Hz
c)	Current rating Amps (rms)	1250 Amps
d)	Rated insulation voltage (V) at 50 Hz	690 Volt
e)	Number of poles	4
f)	Rated impulse withstand voltage(kV)	8
g)	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz (kA rms) Icu	50
h)	Rated Service Short circuit breaking capacity at 415 V,50 Hz (kA rms), Ics	50
i)	Rated short circuit making capacity at 50Hz (kA peak), expressed as multiples of Icu	105
j)	Rated short time withstand current for1 sec at 50 Hz (kA rms), Icw, expressed as percentage of Icu	50
k)	Category of utilization	B
l)	Shutters on 'Trip' & 'Close' push button	Yes

	with sealing facility	
m)	Accessory mounting	Accessories shall be front accessible plug in type. Accessories namely motor shunt trip & closing coil, UVT etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
n)	Operating mechanism	Spring charging stored energy type , manual & motorized.
o)	Mechanical life (Operating cycles)	20000
p)	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4. SPRING CHARGE STATUS
q)	Sensing	True RMS based
r)	Type	Microprocessor based
s)	Control Terminal	Should be front accessible and minimum NO/NC contacts shall be provided for electrical interlocking.
t)	Protection	<u>Overload protection</u> Pick up 0.4 to 1.0 Time delay 0.2 to 40 sec <u>Short Circuit</u> Pick up 2 to 10 Time delay 20 to 400 Micro sec <u>Instantaneous Over current</u> Pick up 4 to 16 & OFF <u>Earth Fault</u> Pick up 0.2 to 0.6 & OFF Time delay 100 to 400 msec
u)	Metering required	Multi-Function meter for measuring 3 Ph current,3 Ph Voltage, KWH, KVAH, Power Factor, Max Demand (KVA), communication Protocol :- Mode Bus RS 485.
v)	Indication	Release shall give individual indication for each type of fault

f. Low voltage switchgear, MCCB.

a)	a) For 600 Amps, 4P, 50KA b) For 400 Amps. 4P, 50 KA. c) For 250 Amps. 4 P, 50 KA	Outgoing feeders – 4 nos. Outgoing feeders – 2 nos. Outgoing feeders – 2 nos.
b)	MCCBs rated voltage & Rated frequency (Hz)	415v +/- 10% at 50Hz
c)	Number of poles	4

d)	Current rating Amps (rms)	600/400/250 Amps
e)	MCCB rated 3 phase short circuit breaking capacity Ics = Icu Rated impulse withstand voltage(kV)	50 KA minimum at 415v and 50Hz
f)	MCCB rated 3 phase short circuit withstand capacity, Icw	8kA for 1sec
g)	Rated insulation voltage (V) at 50 Hz	690
	MCCB mechanical & electrical endurance	As per IS 13947 / IEC
h)	MCCB category of duty	B as per IS / IEC 947
i)	MCCB indications	ON, OFF & TRIP
j)	MCCB protection	front accessible Adjustable thermal and fixed magnetic setting. (Thermal setting for overload adjustable from 40 % - 100%

Safety Devices:
Rubber Mates, Fire Extinguisher & First Aid Box

- **Front Plate:**

The front shall include a clear mimic diagram which indicates different functions. The position indicators shall give a true reflection of the position of the main contacts and shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The manufacturer's plate shall include the switchboard's main electrical characteristics.

- **Danger Board:**

The danger Board plate as per relevant IS shall be riveted on the front plate of the CSS RMU in Languages viz. Gujarati, Hindi, English.

TYPE and ROUTINE TESTS:

Type tests:

Units should be type tested in accordance with IEC: - 62271 -202. The following type tests should perform on the HT Switchgear and report should submit during the approval. –
Short time and peak withstand current test –
Temperature rise tests –
Dielectric tests –
Test of apparatus i.e. circuit breaker and earthing switch
Arc fault test –
Measurement of resistance of main circuit.
Mechanical endurance test. –
Duty cycle test. –

- **ROUTINE TESTS:**

Routine tests should be carried out in accordance with IEC 62271-200, IS: - 2026(Trafo) , IS :- 8623 (LV), IEC 62271-202 standards. These tests should be ensuring the reliability of the unit. Below listed test should be performed as routine tests before the delivery of units;

- Withstand voltage at power frequency

- Measurement of the resistance of the main circuit

- Withstand voltage on the auxiliary circuits

- Operation of functional locks, interlocks, signaling devices and auxiliary devices

- Suitability and correct operation of protections, control instruments and electrical connections of the circuit breaker operating mechanism

- Verification of wiring - Visual inspection

All acceptance and routine tests as stipulated in the respective applicable standards amended up to date for all the equipment shall be carried out by the contractor in the presence of DPA representative & TPIA without any extra cost to DPA before dispatch.

The contractor, in the presence of representative of DPA & TPIA, shall carry out all above acceptance and routine tests.

- **DRAWINGS:**

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in ink.

The Contractor shall submit dimensional general arrangement drawings of the equipment, illustrative and descriptive literature in double copy for various items in the CSS, which are allessentially required for future automation.

i) Schematic diagram of the RMU, Trafo, HV-LV panel
ii) Instruction manuals
iii) Catalogues of spares recommended with drawing to indicate each items of spares
iv) List of spares and special tools recommended by the supplier.
v) Copies of Type Test Certificates as per latest IS/IEC.
vi) Drawings of equipment, relays, control wiring circuit, etc.
vii) Foundation drawings of CSS.
viii) Dimensional drawings of each material used for item
ix) Actual single line diagram of CSS with or without extra combinations shall be made displayed on the front portion of the MV/LV so as to carry out the operations easily.

<u>The following should be supplied by contractor:</u>

Copies in triplicate of printed volumes of operation, maintenance and erection manuals in English along with the copies of approved drawings and test reports etc. sets of the manuals as above shall be supplied to the Engineer-in-Charge along with a soft copy of the all Technical and Drawing.

- **NAME PLATE:**

CSS and its associated equipment shall be provided with a nameplate legible and indelibly marked with at least the following information.

- Name of manufacturer
- Type

- Serial number
- Voltage Current
- Frequency
- Purchase Order number and date
- Month and Year of supply.

Technical Specification No. 2:

This includes Installation, testing & Commissioning of Compact S/S, including Battery Charger, Safety Devices as per standard which includes outdoor type SF6 filled, with combinations of load break isolators & breakers.

The scope includes, provide Civil Foundation, necessary trench (for cable in/Out) as per approved foundation drawing (Provided by manufacturer), after erection of CSS, necessary testing & commissioning as per QAP (Provided by manufacturer) shall be in the scope contractor, the works also include with necessary Tools, Tackle, Cable end termination kits, cable laying. After installation of panel, necessary test and trial are to be carried out for proper functioning of safety, devices, relay etc. and before charging RMU Panel, all the tests required under relevant ISS and IEC – Rules 1956 shall be carried out and the result shall be in conformity with specifications and copies of test results shall be furnished to Engineer-in-Charge. The work includes supply & fixing of required length of insulated Rubber Mat having withstand capacity up to 22 kV, the Rubber Mat shall be laid in such a way, near the panel for operation of System.

If required, some alteration / modification is in the scope of contractor as per the instructions of Engineer-in- Charge. The work includes all labor & material required for installations, testing and commissioning of RMU as directed by Engineer-in-Charge.

Technical Specification No. 3:

This item includes supply at site following type & size of XLPE Insulated 11kV grade aluminum conductor XLPE insulated armoured cable confirming to IS: 7098 (Part-II) 1988 with latest amendments with ISI mark. The cable shall have marking/embossing at the interval of every meter showing its progressive length. The contractor shall submit type test certificate at the time of supply of Cable at site. The type test certificate shall not be more than 3 years old. The rate shall be inclusive of all taxes (excluding GST), packing, forwarding, insurance, transportation, and unloading at site of work.

a) 3 Core, 150 Sq. mm (E).

Technical Specification No. 4:

This includes supply at site 1.1 kV grade, following size of aluminum conductor XLPE insulated armoured cable confirming to IS: 7098 (Part-I) 1985 with up to date amendments and of approved make with ISI mark. The cable shall have marking/embossing at the interval of every meter showing its progressive length.

The size of LT armoured XLPE aluminum conductor cable are:

a) 4 Core, 300 Sq.mm,
b) 4 Core, 50 Sq.mm,

The contractor shall submit type test certificate at the time of supply of Cable at site. The type test certificate shall not be more than 3 years old. The rate shall be inclusive of all taxes (excluding GST), packing, forwarding, insurance, transportation, and unloading at site of work.

Technical Specification No. 5:

The item includes laying of cable of size 3 Core, 150 Sq. (E) mm XLPE Insulated aluminum conductor XLPE insulated armoured cable of 11kV grade in the various route. The contractor shall providing & fixing heat shrinkable straight through joint of relevant size of approved make if the laying of cable shall be more than standard drum length. The scope also includes providing & fixing (including required foundation) necessary route indicated in day & night visible, 11 KV route marker (Made by RCC approx. 300 mm width 1000 mm height) wherever cable laid in underground approx. every 100 mtr or as decided by EIC, accordingly calculate the Qty.

5(a). Through HDD by providing & laying cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) in Railway / road /RCC/culvert etc. The cable shall be laid after through HDD for passing the single / double cable, in case of separate cable separate HDD will be required. Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall arrange JCB Machine / pneumatic breakers for excavation in RCC/Road, water for drilling, de- watering pump, HDD equipment's at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per I Schedule-B Item No.02 (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE shall be pass through a road /rail / Culvert crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

5(b). Through Excavation in hard & soft soil and laying cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) etc. The trench to be excavated of 300 mm width & 1.0-meter depth. Clean the trench area & provide 50mm of riversand bed in the bottom of the excavated trench. The cable shall be laidover inside the HDPE pipe & pipe shall be putted over the bed of river sand. The HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall have arranged JCB Machine / pneumatic breakers for excavation in Hard / soft soil, if de- watering pump is required for removal of muddy water from the trench, same shall be in the scope of Contractor, at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast PCC chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per Item No. 02 of Schedule-B (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at through Hard /Soft Soil or as per directed by EIC. For single cable individual HDPE shall be passes through Hard /Soft Soil or as per directed by EIC, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench, parallels. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits/Trench as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

5(C): - The item includes laying of cable size 3 Core, 150 Sq. mm XLPE Insulated aluminum conductor XLPE insulated armoured cable of 11kV grade in the existing cable trench. The cable shall be laid after opening of trench by removing the RCC NP-2 Hume pipe /RCC covers /MS chequered plates. After laying of the cable, cable trench shall be properly covered with existing RCC NP-2 Hume pipe /chequered plates as per original. The item includes required material

and labour as directed by Engineer in charge.

Technical Specification No. 6:

The item includes laying cable of size 4 Core, 300 Sq. mm LT XLPE Insulated aluminum conductor in the various route. The contractor shall provide heat shrinkable straight through joint of relevant size of approved make if the laying of cable shall be more than standard drum length. The scope also includes providing & fixing (including required foundation) necessary route marker (day & night visible) for LT cable route (Made by RCC approx. 300 mm width 1000 mm height) wherever cable laid in underground approx. every 100 mtr or as decided by EIC, accordingly calculate the qty.

6(a). Through HDD by laying 4Cx 300 sq.mm LT XLPE, aluminum armored cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) in Railway / road /RCC/culvert etc. The cable shall be laid after through HDD for passing the single / double cable, in case of separate cable separate HDD will be required. Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall arrange JCB Machine / pneumatic breakers for excavation in RCC/Road, water for drilling, de- watering pump, HDD equipment's at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast PCC chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per Item No. 02 Schedule-B (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE shall be pass through a road /rail / Culvert crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

6(b). Through Excavation in hard & soft soil and laying cable 4Cx 300 sq.mm LT XLPE, aluminum armored cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) etc. The trench to be excavated of 300 mm width & 1.0-meter depth. Clean the trench area & provide 50mm of riversand bed in the bottom of the excavated trench. The cable shall be laidover inside the HDPE pipe & pipe shall be putted over the bed of river sand. The HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall have arranged JCB Machine / pneumatic breakers for excavation in Hard / soft soil, if de- watering pump is required for removal of muddy water from the trench, same shall be in the scope of Contractor, at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast PCC chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per Item No. 02 Schedule-B (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at through Hard /Soft Soil or as per directed by EIC. For single cable individual HDPE shall be passes through Hard /Soft Soil or as per directed by EIC, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench, parallels. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits/Trench as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

Technical Specification No. 7:

The item includes laying cable of size 4 Core, 50 Sq. mm LT XLPE Insulated aluminum conductor in the various route. The contractor shall provide heat shrinkable straight through joint of relevant size of approved make if the laying of cable shall be more than standard drum length. The scope

also includes providing & fixing (including required foundation) necessary route marker (day & night visible) for LT cable route (Made by RCC approx. 300 mm width 1000 mm height) wherever cable laid in underground approx. every 100 mtr or as decided by EIC, accordingly calculate the qty.

7(a). Through HDD by laying 4Cx 50 sq.mm LT XLPE, aluminum armored cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) in Railway / road /RCC/culvert etc. The cable shall be laid after through HDD for passing the single / double cable, in case of separate cable separate HDD will be required. Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall arrange JCB Machine / pneumatic breakers for excavation in RCC/Road, water for drilling, de- watering pump, HDD equipment's at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast PCC chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per Item No. 02 of Schedule-B (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE shall be pass through a road /rail / Culvert crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

7(b). Through Excavation in hard & soft soil and laying cable 4Cx 50 sq.mm LT XLPE, aluminum armored cable in HDPE pipe (I.D. 6'' & wall thickness 12mm) etc.The trench to be excavated of 300 mm width & 1.0-meter depth. Clean the trench area & provide 50mm of river sand bed in the bottom of the excavated trench. The cable shall be laidover inside the HDPE pipe & pipe shall be putted over the bed of river sand. The HDPE (I.D. 6'' & wall thickness 12mm)} shall in contractor scope), the contractor shall have arranged JCB Machine / pneumatic breakers for excavation in Hard / soft soil, if de- watering pump is required for removal of muddy water from the trench, same shall be in the scope of Contractor, at their own cost. In every 30 mtr or as per direction of EIC contractor shall provide Pre Cast PCC chamber with RCC covers to connect the onward HDPE through chamber by providing suitable CAP (as per Item No. 02 Schedule-B (Civil Part). Contractor responsible to arrange the continue length HDPE pipe as per route for cable laying, or as directed by EIC. No Jointing by nut & bolt in HDPE pipe allow by DPA, HDPE pipe shall be join (if required) by special splashing method. The cable shall be pass through heavy duty HDPE pipe buried at through Hard /Soft Soil or as per directed by EIC. For single cable individual HDPE shall be passes through Hard /Soft Soil or as per directed by EIC, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench, parallels. After standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated hole/ pits/Trench as per its original position is in contractor scope. This includes all labour and material as directed by Engineer-in-Charge.

Technical Specification No. 8:

(a) Main Load Point Panel:

This item includes design, manufacture, testing & supply at site outdoor type Load Point Panel with double door, top canopy, handle with locking arrangement (pad lock 5 level with keys).

- Load point panel shall be fabricated from Stainless Steel sheet of 2.00 mm thick, 304 Grade Stainless Steel.
- Load point panel each & individual feeder (O/C & I/c) shall be compartmentalized.
- The Board shall be enclosed by stainless sheet steel of minimum 2 mm thickness

smoothly finished & level, door & covers shall be made 1.6 mm thick stainless sheet steel. Adequate stiffeners shall be provided wherever necessary.

- Load point panel shall be dust & vermin proof.
- Protection Class: IP 65.
- Load point panel shall have bottom Cable entry.
- All panel edges and door edges shall be reinforced against distortion. Cut outs shall be true in shape and devoid of sharp edges.
- Continue SS metal Hinged support shall be provided for Door.
- The complete structure shall be rigid, self-supporting free from vibration, twists & bends.

  The Load Point Panel shall be specious for easy maintenance and shall be provided with following electrical items:

1) 600 Amp FP MCCB, 415 Volt, 35 kA breaking capacity with Microprocessor based: 2No. for Incomer.
2) 600 amp FP changeover switch. : -1 Nos.
3) 400 Amp FP MCCB, 415 Volt, 25kA: 10 Nos. as Outgoing feeder
4) Digital Multi-Function Energy Meter, Accuracy Class 0.5 with RS485: 1 No. for Incomer
5) 600/5 Amp CT (Class 0.5): 3 Nos.
6) Phase R, Y & B Indication Lamp: 3 Nos.

Main Bus & Taps:

The board shall be provided with three phase and neutral bus-bar. Bus-bars shall be of uniform cross section throughout the length of the board and up to the incoming terminals of feeder circuit breaker/switch. The bus-bars shall be made of high conductivity aluminum alloy of E91E grade, Bus bar joints shall be complete with high tensile steel bolt and washers and nuts, having current capacity 1000 amps. Bus-bars shall be thoroughly cleaned at the joint locations and suitable contact grease shall be applied just before making a joint, separate supports shall be provided for each phase of the bus-bars. If a common support is provided for all three phase, anti- tracking barriers shall be incorporated. Bus-bars shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Bus bar supports shall be made of hylum sheets; glass reinforced moulded plastic material or cast resin.

All these components shall be mounted/erected in the Load Point Panel by means of suitable cadmium passivated hardware. The Panel shall be complete in all respects with cable glands, lugs for incoming and outgoing cables including interconnection with PVC insulated cable single core, standard copper conductor of 650/1100V grade. Load point panel shall be provided with 2 Nos. SS terminals for earthing.

The Load Point Panel shall be tested as per the relevant IS standard. Before Manufacturing the Load Point Panel, the relevant test certificate in support of Panel manufacturing, along with design & drawing shall be submitted to DPA for approval and also all Electrical accessories shall be used as per approved Make List of DPA.

The rates shall be inclusive of all the taxes (excluding GST), insurance, transportation,

unloading as directed by Engineer-in-Charge.

(b) <u>Sub Load Point Panel</u>:

This item includes design, manufacture, testing & supply at site outdoor type Load Point Panel with double door, top canopy, handle with locking arrangement (pad lock 5 level with keys).

- Load point panel shall be fabricated from Stainless Steel sheet of 2.00 mm thick, 304 Grade Stainless Steel.
- Load point panel each & individual feeder (O/C & I/c) shall be compartmentalized.
- The Board shall be enclosed by stainless sheet steel of minimum 2 mm thickness smoothly finished & level, door & covers shall be made 1.6 mm thick stainless sheet steel. Adequate stiffeners shall be provided wherever necessary.
- Load point panel shall be dust & vermin proof.
- Load point panel shall have bottom Cable entry.
- All panel edges and door edges shall be reinforced against distortion. Cut outs shall be true in shape and devoid of sharp edges.
- Continue SS metal Hinged shall be provided for Door.
- Protection Class: IP 65.
- The complete structure shall be rigid, self-supporting free from vibration, twists & bends.

  The Load Point Panel shall be specious for easy maintenance and shall be provided with following electrical items:

1) 400 Amp FP MCCB, 415 Volt, 35 kA breaking capacity with Microprocessor based: 2 No. for Incomer.
2) 150 Amp FP MCCB, 415 Volt, 25kA: 10 Nos. as Outgoing feeder
3) Digital Multi-Function Energy Meter, Accuracy Class 0.5 with RS485: 1 No. for Incomer
4) 400/5 Amp CT (Class 0.5): 3 Nos.
5) Phase R, Y & B Indication Lamp: 3 Nos.

Main Bus & Taps:

The board shall be provided with three phase and neutral bus-bar. Bus-bars shall be of uniform cross section throughout the length of the board and up to the incoming terminals of feeder circuit breaker/switch. The bus-bars shall be made of high conductivity aluminum alloy of E91E grade, Bus bar joints shall be complete with high tensile steel bolt and washers and nuts. Bus-bars shall be thoroughly cleaned at the joint locations and suitable contact grease shall be applied just before making a joint, separate supports shall be provided for each phase of the bus-bars. If a common support is provided for all three phase, anti-tracking barriers shall be incorporated. Bus-bars shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Bus bar supports shall be made of hylum sheets; glass reinforced moulded plastic material or cast resin.

All these components shall be mounted/erected in the Load Point Panel by means of suitable cadmium passivated hardware. The Panel shall be complete in all respects with cable glands, lugs for incoming and outgoing cables including interconnection with PVC insulated cable single core, standard copper conductor of 650/1100V grade. Load point panel shall be provided with 2 Nos. SS terminals for earthing.

The Load Point Panel shall be tested as per the relevant IS standard. Before Manufacturing the Load Point Panel, the relevant test certificate in support of Panel manufacturing, along with design & drawing shall be submitted to DPA for approval and also all Electrical accessories shall be used as per approved Make List of DPA.

The rates shall be inclusive of all the taxes (excluding GST), insurance, transportation, unloading as directed by Engineer-in-Charge.

(c) FRP Feeder Pillar High Mast:

This item includes design, manufacture, testing & supply at site outdoor type FRP Feeder Pillar for High Mast lighting tower. The Feeder Pillar shall be outdoor pedestal type with door, handle with locking arrangement (pad lock 5 level with keys) and top canopy. The Feeder Pillar shall be of suitable size; however, it shall be specious for easy maintenance and also, the minimum depth of the Feeder Pillar shall be 300mm.

The FRP Feeder Pillar shall have following features:

- The material for the enclosure shall be Fiber Reinforced Polyester (FRP) with F1 grade raw material of ultra-guard.
- Protection Class: IP 65.
- Impact Resistance: IK 10
- FRP Feeder pillar sheet thickness shall be minimum 4 mm.
- Feeder Pillar's gasket shall be of properly greed with proper compression to maintain the ingress protection.
- FRP Feeder Pillar enclosure shall comply with the requirement of dielectric strength as per IEC62208 standard, ultraviolet resistance test as per UL746C standard and glow wire test with flammability of 5VA as per UL94 standard.
- The FRP Feeder Pillar shall have continuous hinges. All the accessories like hinges, locking arrangement, screws & mounting brackets shall be of SS304 or higher grade SS.
- The FRP feeder Pillar shall have backside mounting arrangement.
- All panel edges and door edges shall be reinforced against distortion. Cut outs shall be true in shape and devoid of sharp edges.
- The complete structure shall be rigid, self-supporting free from vibration, twists & bends.
- Finished painted appearance of equipment shall present an aesthetically, pleasing appearance, free from dents and uneven surfaces.

The FRP feeder pillar panel shall be provided with following electrical items:

1) Incomer – 63 Amp TPN MCCB, 25 kA, 50Hz: 1 No.
2) Outgoing – 32 Amp TPN MCB, 10kA, C Curve: 3 Nos.

3) Wiring: Internal with complete wiring with suitable size of flexible copper cable for I/c to O/g, suitably bind with proper gap as per IS.

4) 70A, 415V, 3 phase contactor with coil voltage 215-240 V: 1 No.

5) 9A, 415V, 3 phase contactor with coil voltage 215-240 V: 2 No.

6) Digital Timer switch for switching, single phase operated: 1 No.

7) Digital Multi-Function Energy Meter, Accuracy Class 0.5 with RS485: 1 No.

8) 60/5 Amp CT (Class 0.5): 3 Nos.

The panel shall be complete in all respects having interconnection with PVC insulated cable single core, standard copper conductor of 650/1100V grade. The cable entry and exit shall be from bottom of the feeder pillar.

The panel shall be provided with 2 Nos. SS terminals for earthing. Before placing the order for manufacturing the panel drawing should be approved by Engineer in charge showing the arrangement of the electrical components and should fulfil the needs of IE rules. The Feeder Pillar shall be manufactured from type test certificate holder for Feeder Pillar of similar or above rating.

The rate shall be inclusive of all taxes (excluding GST), packing, forwarding, insurance, transportation, and unloading at site of work.

Technical Specification No. 9:

(a) The work includes installation, testing & commissioning of supplied Main Load Point Panel. The Load Point Panel shall be erected on cement concrete platform duly plastered with tapped collar of suitable size having height of 1750 mm above ground level including grouting of stainless steel legs of 304 Grade in reinforced foundation of suitable design is in the scope of contractor. This work also includes termination of the incoming & outgoing Cable along with providing suitable size of glands (Gland suitable for XLPE aluminium Incoming cable size: 300 sq.mm & Outgoing cable size: 300 sq.mm) and necessary earth linking connection. The scope of works includes necessary marking with radium sticker danger board in three languages. The work includes all material, labour, tools & tackles as directed by Engineer-In-charge.

(b) The work includes installation, testing & commissioning of supplied Sub Load Point Panel. The Load Point Panel shall be erected on cement concrete platform duly plastered with tapped collar of suitable size having height of 1750 mm above ground level including grouting of stainless steel legs of 304 Grade in reinforced civil foundation of suitable design is in the scope of contractor. This work also includes termination of the incoming & outgoing Cable along with providing suitable size of glands (Gland suitable for XLPE aluminum Incoming cable size: 300 sq.mm & Outgoing cable size: 50 sq.mm) and necessary earth linking connection. The scope of works includes necessary marking with radium sticker danger board in three languages. The work includes all material, labour, tools & tackles as directed by Engineer-In-charge.

(c) This includes installation, testing & commissioning of FRP Feeder Pillar. FRP Feeder pillar shall be installed on base frame (four leg) made of Stainless Steel (Grade SS 304) angle of size 25mm×5mm with leg length 1750 mm. The base frame shall have

extendedangle of suitable length for fixing of Feeder Pillar. The panel shall be erected on CC foundation of suitable size having height of 300mm above ground level and shall be grouted 500 mm below ground level by providing reinforced Civil foundation of suitable design is in the scope of contractor. The grouting portion shall be such that the height of the base frame should be 600mm above ground level. This work also includes termination of the incoming & outgoing Cable along with providing suitable size of glands & PVC shroud (Gland suitable for XLPE aluminum Incoming/outgoing cable size: 35 sq.mm) and necessary earth linking connection. The work includes all labour and material as directed by Engineer in-charge.

Technical Specification No. 10:

This include supply & fixing of indoor end termination kit suitable for 3C x 150 sq.mm HT XLPE, HT armored aluminum conductor XLPE Cable of 11 kV grade. The joint shall make in such a way that joined section can be reeled without sagging and the joint shall be electrically and mechanically permanent. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 11:

This include supply & fixing the HT heat Shrinkable Straight Joint kit suitable for 3C x 150 sq.mm HT XLPE, HT armored aluminum conductor XLPE Cable of 11 kV grade. The joint shall make in such a way that joined section can be reeled without sagging and the joint shall be electrically and mechanically permanent. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 12:

(a) SUPPLY OF HIGH MAST:

(1) SCOPE:

The scope of this specification covers supply of 38 (Thirty-eight) numbers high mast system at the site, the high mast system shall be complete in all respect with all parts & accessories to put into operation after erection & completion of the work. The high mast shall be suitable for withstanding tropical climate having high humidity and saline atmosphere prevailing atKandla.

List of Make of High Mast: Bajaj, Philips, Transrail, Valmont, BPP, RR Ispat-Consoul, Utkarsh.

The contractor shall submit Structural Stability Certificate for Structural Design of High Mast from any Indian Institute of Technology or any Institute/ University of Gujarat Government. The cost incurred towards the certification/vetting shall be borne by contractor. The Structural Stability Certificate along with vetted structural design report of high mast shall be submitted to Engineer-in-Charge, DPA before undertaking manufacture of High Mast.

The contractor shall proceed for manufacture of High Mast after completion of sufficient quantity of High Mast Foundation for erection of High Mast.

Accordingly, the contractor shall take necessary clearance from Engineer-in-Charge to proceed for undertaking manufacture of High Mast.

(2) APPLICABLE STANDARDS:

The following shall be the Reference Standards for the loading of the High mast:

Code No.	Title
IS 875 (Part III) 2015	Code of practice for Design loads (other than earth quake) D for building and structure
IS 1893	Criteria for Earthquake resistant design of structure
BSEN 10025	Grades of MS Plates (Gr – S 355) for shaft
IS 2062	Base Plate (Grade E 350)
EN 8	Foundation bolt
BS ISO 1461 , IS 4759	Galvanizing
TR No. 7 2000 of ILE, UK	Structural calculation
BS 5135 or IS 9595	Welding
IS 3043	Code of practice for Earthing

(3) HIGHMAST:

3.1 Structure:

The High mast shall be of continuously tapered, polygonal cross section, at least 20 sided, presenting a good and pleasing appearance and shall be based on proven In-Tension design conforming to the standards referred to above, to give an assured performance, and reliable service. The high mast structure with luminaries etc. all fixed and lantern carriage shall be capable of withstanding the external forces exerted on it by wind speed as specified in IS 875, part 3, 2015 with an adequate load factor. Essentially mast should be capable of withstanding the 3-second gust of 55 m/sec. The factor of safety for wind load shall be 1.25 and for other loads 1.15 considering Seismic Zone V.

3.2 Construction:

The mast shall be manufactured using special steel plates, conforming to BS-EN10-025, S355 and shall be delivered in multiple sections of effective length 10 meters. Thus, a 30m mast shall be delivered in three sections to site. Thickness of Top, Middle & Bottom section shall be minimum 5 mm, 5 mm & 6 mm respectively. Each section shall be fabricated out of single plate duly folded and welded. There shall be only one longitudinal seam weld per section**.** Sections with more than one weld, circumferential or longitudinal, shall not be accepted. At site the sections shall be joined together by slip-stressed-fit method. No site welding or bolted joint shall be done on the mast. The minimum overlap distance shall be 1.5 times the diameter at penetration. The minimum top diameter shall be 200 mm. The minimum Bottom diameter shall be 630 mm. The minimum diameter and thickness of the base plate shall be 880 mm & 30 mm respectively. Manufacturer of the mast must have conducted Wind Tunnel testing on their mast sample. Parameters (Force coefficient) considered for design shall be taken from the Wind Tunnel testing. Wind tunnel test should be conducted after latest amendment of IS 875 at 2015. The mast shall be provided with fully penetrated flange, which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section. The base flange shall be provided with supplementary gussets between the bolt holes to ensure elimination of helical stress concentration. The entire fabricated mast shall be hot dip g a l v a n i z e d , internally and externally, having a uniform average thickness of 85 microns for plates with more than 5 mm thickness and 70 microns for 5 mm or less. Galvanizing shall be done in single dipping method for better adhesion and life.

3.2.1 Door Opening:

An adequate door opening shall be provided at the base of the mast and the opening shall be such that it permits clear access to equipment like winches, cables, plug and socket, etc.

and also facilitate easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weatherproof door, provided with a heavy duty double internal lock with special paddle key.
The door opening shall be carefully designed and reinforced with welded steel section, so that the mast section at the base shall be unaffected and undue buckling of the cut portion is prevented. Size of door opening shall not be more than 1200 × 250 mm to avoid buckling of the mast section under heavy wind conditions.

3.3 Dynamic Loading for the Mast:

The mast structure shall be suitable to sustain an assumed maximum reaction arising from a wind speed as per IS 875 (three second gust), and shall be measured at a height of 10 meters above ground level. The design life of the mast shall be 25 years.

3.4 Lantern Carriage:

3.4.1 Fabrication:

A fabricated Lantern Carriage shall be provided for fixing and holding flood light fittings and control gearboxes. The Lantern Carriage shall be of special design and shall be of steel tube construction, the tubes acting as conduits for wires, with holes fully protected by grommets. The Lantern Carriage shall be so designed and fabricated to hold 24 number of LED flood light fittings with 12 Arm, and shall also have a perfect self-balance. Intern Diameter (ID) of the lantern carriage should not be less than 1000mm. The Lantern Carriage shall be fabricated in two halves and joined by bolted flanges with stainless steel bolts and nyloc type stainless steel nuts to enable easy installation or removal from the erected mast. The inner lining of the carriage shall be provided with protective PVC arrangement, so that no damage is caused to the surface of the mast during the raising and lowering operation of the carriage. The entire Lantern Carriage shall be hot dip galvanized after fabrication**.**

3.5 Raising and lowering mechanism:

For the installation and maintenance of the luminaries and lamps, it will be necessary to lower and raise the Lantern Carriage Assembly. To enable this, a suitable Winch Arrangement shall be provided, with the winch fixed at the base of the mast and the specially designed head frame assembly at the top.

3.5.1 Winch:
The winch shall be of completely self-sustaining type, without the need for brake shoe, springs or clutches. Each driving spindle of the winch shall be positively locked when not in use, gravity activated Pawls. The capacity, operating speed, safe working load, recommended lubrication and serial number of the winch shall be clearly marked on each winch**.**
The gear ratio of the winch shall be 53:1. However, the minimum working load shall be not less than 1400 kg. The winch shall be self-lubricating type by means of an oil bath and the oil shall be readily available grades of reputed producers. The winch drums shall be grooved to ensure perfect seat for stable and tidy rope lay, with no chances of rope slippage. The rope termination in the winch shall be such that distortion or twisting is eliminated and at least 5 to 6 turns of rope remains on the drum even when the lantern carriage is fully lowered and rested on the rest pads. It should be possible to operate the winch manually by a suitable handle or by an integral power tool. It shall be possible to remove the double drum after dismantling, through the door opening provided at the base of the mast. A test certificate shall be furnished by the Vendor from the original equipment manufacturer, for each winch in support of the maximum load operated by the winch. Offered type of winch shall be type

tested from IIT/NIT and the type test report shall be submitted.

3.5.2 Head Frame:

The head frame which is to be designed as a capping unit of the mast, shall be of welded steel construction, 22pecialize both internally and externally after assembly. The top pulley shall be of appropriate diameter, large enough to accommodate the stainless steel wire ropes and the multi-core electric cable. The pulley block shall be made of non-corrodible material, and shall be of die cast Aluminium Alloy (LM 6). Pulley made of synthetic materials such as Plastic or PVC are not acceptable. Self-lubricating bearings and stainless steel shaft shall be provided to facilitate smooth and maintenance free operation for a long period. The pulley assembly shall be fully protected by a canopy 22pecialize internally and externally.
Close fitting guides and sleeves shall be provided to ensure that the ropes and cables do not dislodged from their respective positions in the grooves. The head frame shall be provided with guides and stops with PVC buffer for docking the lantern carriage.

3.5.3 Stainless Steel Wire Ropes:

The suspension system shall essentially be without any intermediate joint and shall consist of only non-corrodible stainless steel of AISI 316 grade.
The stainless steel wire ropes shall be of 7/19 construction, the central core being of the same material. The overall diameter of the rope shall not be less than 8 mm. The breaking load of each rope shall not be less than 3200 kg. Giving a factor of safety of over 5 for the system at full load as per the TR-7 referred to in the beginning of this specification. The end constructions of ropes to the winch drum shall be fitted with talurit. The thimbles shall be secured on ropes by compression splices. Two continuous lengths of stainless steel wire ropes shall be used in the system and no intermediate joints are acceptable in view of the required safety. No intermediate joints/ terminations, either bolted or else, shall be provided on the wire ropes between winch and lantern carriage.

3.6 Electrical System, Cable and Cable Connections:

A suitable terminal box shall be provided at the base compartment of the high mast for terminating the incoming cable. The electrical connections from the bottom to the top shall be made by two runs of special trailing cable. The cable shall be EPR insulated and PCP sheathed to get flexibility and endurance. Size of the cable shall be minimum 5 core, 4 sq. mm copper. The cable shall be of approved make. At the top there shall be weather proof junction box (IP 65) to terminate the trailing cable and the individual luminaries by flexible PVC cables. Also, suitable provision shall be made at the base compartment of the mast to facilitate the operation of internally mounted, electrically operated power tool for raising and lowering of the lantern carriage assembly. The trailing cables of the lantern carriage rings shall be terminated by means of specially designed, metal clad, multi pin plug and socket provided in the base compartment to enable easy disconnection when required.

3.7 Power Tool for the Winch:

A suitable, high powered, electrically driven, internally mounted power tool, with manual over ride shall be supplied for the raising and lowering of the lantern carriage for maintenance purposes. The speed of the power tool shall be to suit the system. The power tool shall be single speed, provided with a motor of the required rating. The power tool shall be supplied complete with suitable control. The capacity and speed of the electric motor used in the power tool shall be suitable for the lifting of the design load installed on the lantern carriage.

The power tool mounting shall be so designed that it will be not only self-supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also, a handle for the manual operation of the winches in case of problems with the electrically operated tool, shall be provided and shall incorporate a torque limiting device. The power tool operation shall always be through a separate torque limiting device to protect the wire ropes from over stretching. It shall be mechanical with suitable load adjusting device. The torque limiter shall trip the load when it exceeds the adjusted limits. There shall be suitable provision for warning the operator once the load is tripped off. The torque limiter is a requirement as per the relevant standards in view of the overall safety of the system. Each mast shall have its own power tool motor. Also, the power tool shall be supplied complete with push button type remote control switch, together with suitable length of power cable, so that the operations can be carried out from a safe distance of five meter.

Contractor can offer make of the motor from the list of make or its equivalent. However, the offered make which is not in the list of make of Electric Motor, should have been type tested as per relevant IS/ IEC and it should have valid BIS certification.

3.8 Lightning Finial

One number heavy duty hot dip 23specialize lighting finial shall be provided for each mast. The lightning finial shall be minimum 1.2 m in length and shall be provided at the center of the head frame. It shall be bolted solidly to the head frame to get a direct conducting path to the earth through the mast. The lightning finial shall not be provided on the lantern carriage under any circumstances in view of safety of the system. Separate earth pit with GI pipe shall be constructed.

3.9 Aviation Obstruction Lights:

Suitable twin dome LED type aviation obstruction lights of reliable design and reputed manufacturer shall be provided on top of each mast.

3.10 Earthing Terminals:

Suitable earth terminal using 12 mm diameter stainless steel bolts shall be provided at a convenient location on the base of the Mast, for lightning and electrical earthing of the mast.

3.11 Incoming Power Cable Provision:

Power Cable shall be taken to the base compartment of the high mast through the provision made in the foundation.

3.12 Test Certificates:

The following test certificates shall be submitted along with supply of high mast system:

- Supplier's test certificate for each reel of rope.
- Test certificate of chemical composition and mechanical properties of sheets and flange plates as per the relevant standards.
- Test certificate of head frame assembly, mast sections, trailing cable and cable connector as per relevant standards.
- Welding and fabrication detail shall be submitted. These should be as per relevant standard, rules, regulations and practices.
- Test certificate for thickness of internal and external Galvanization as per relevant standard.

(b) ERECTION, TESTING AND COMMISSIONING OF HIGH MAST:

This includes erection, testing and commissioning of high mast on civil foundation, feeder cable up to the bottom of the high mast and complete with all items required for safe and efficient operation and maintenance of the high mast lighting system whether explicitly stated or not, shall be included by the contractor. After completion of erection of the high mast the lowering and hoisting of the lantern carriage with the luminaries lighting installations shall be tested for smooth and easy operation maintaining a perfect horizontally it throughout the height of the high mast. The rate shall include hire charges of Crane along with all material, labour, tools & tackles as directed by Engineer in charge.

(c) Civil Foundation of High Mast:

The contractor shall construct civil foundation for high mast as per the high mast foundation drawing provided in tender.

The details of anchor bolt, base plate provided in the foundation drawing is subject to change as per the vetted structural design report of high mast from any Indian Institute of Technology or any reputed Institute/ University of Gujarat Government.

The provision of high mast foundation shall be executed well in advance and sufficient curing shall be given after completion of concrete works. Any valuable/archaeology found at site during execution/construction shall remain property of DPA. The high mast foundation shall be carried out in accordance with the best standards of workmanship and to the entire satisfaction of the Civil Engineering Department, DPA. The decision of the Civil Engineering Department will be final and binding on the contractors with regard to the quality and suitability of the materials for high mast foundation. The high mast foundation work shall be executed under supervision of Civil Engineering Department, DPA.

TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

Detailed Specifications for Materials to be used for Civil Works

1.1. General

1.1.1. Except where otherwise specified or authorized by the Engineer-in-Charge, materials supplied by the contractor shall conform to the latest edition of code of practices published by the Bureau of Indian Standard. Samples of materials to be supplied by the contractor shall be shown to the Engineer-in-Charge sufficiently in advance for approval of its quality for use on the work.

1.1.2. The contractor shall arrange to supply samples of coarse aggregate and fine aggregate etc. to the Port Laboratory for mix design for concreting works. Mixing of cement concrete works shall be on Volumetric basis. For better workability contractor is free to use Plastisizers/Super plastisizer without any extra cost. The minimum cement content shall be as per IS 456 – 2000.

1.1.3. The cubes casted at site shall be brought to Port Laboratory, Kandla for testing and test results shall conform to IS 456 (latest edition). Testing charges of the cubes for 28 days test only shall be born by the contractor.

1.1.4. If the result is not satisfactory, the concrete work will have to be 24pecialize and

redone by the contractor at his own cost.

1.1.5. The Engineer-in-charge reserves the right to ask contractor to cast additional c.c. cubes at the different stages and works for testing, if required at 3/7 days period. No separate payment shall be made to the contractor on account of the cost of the labour and materials required for casting of the cubes required for 3/7 days testing. The testing charges for these cubes shall be borne by Department.

1.1.6. The Engineer In charge reserves the right to make necessary changes in the diameter of bars provided in the drawings and no claims what-so-ever on account of change in diameter of bars will be entertained.

1.1.7. The concrete work to be used for RCC works shall be made of the graded machine crushed trap stone metal, and it should be from approved quarry. Mechanical appliances such as concrete mixer, vibrator etc. shall be used for mixing, consolidation etc of the concrete.

1.1.8. Concrete cover block with binding wire shall be used in all RCC works of standard size as directed by the Engineer-in-charge, c.c. cover block should be well cured for atleast seven days before use- No extra cement, labour, binding wire will be paid for casting of c.c. cover block – No stones or kapchi will be allowed for covering out concrete.

1.1.9. Though the drawings to be supplied will be exhaustive the decision of the Engineer-in-charge regarding any change in the drawings shall be final and binding to contractor and no dispute / claim regarding extra payment shall be allowed on account of such changes.

1.1.10. The contractor has to provide sufficient barricades to site of work so that traffic plying nearby should not damage the recently concreted work. In case of any damage on account of above, the entire responsibility will remain with contractor and nothing extra will be paid on this account.

1.1.11. The stone metal 20 to 40 mm, 40 to 60mm, crush metal and sand shall be from approved quarries.

1.1.12. The mixing of concrete shall be done in a mixer of approved type which will ensure a uniform distribution of material throughout the mass so that mix is uniform in colour and homogenous.

1.1.13. The strength of concrete shall be determined by compressive strength test. For this purpose during the progress of the work cube samples shall be cast for testing at 7 days and 28 days.

1.1.14. Stripping of Form work shall be done as per relevant clause in IS 456-2000. No dispute/claims shall be entertained on account of this.

1.1.15. On completion of RCC works, no persons shall be allowed to move on green concrete surface. As such contractor shall have to make a special arrangement for finishing the concrete in such a way so as not to disturb the green concrete.

1.1.16. The form work shall be jointed neatly and shall be set exactly to the required grade and alignment.

1.1.17. The form work shall be made up from either MS plate or water proof plywood of good quality. The rate shall include the cost of materials and labour for the operations involved such as

1.1.18. Splayed edges, notching allowances for over laps and passing at angles, battens, Centering, shuttering, strutting, propping, bolting, nailing, wedging, easing, striking and stripping of the same.

1.1.19. Filleting to form stop-chamfered edges or splayed external angles not exceeding 20 mm width.

1.1.20. Dressing with oil to prevent adhesion of concrete with shuttering.

1.1.21. Raking or circular cutting.

1.1.22. All the form work shall be inspected by the Engineer-in-charge and their suitability ascertained the form shall be thoroughly scraped, cleaned before reusing the same.

1.1.23. Water used for mixing and curing shall be clear and free from injurious amount of oil, acids, alkalies, salts sugar, organic materials or other substances that may be deleterious for concrete and steel.

1.1.24. Unpurified potable water is generally considered suitable for mixing and curing. Mixing and curing with sea water shall not be permitted in any cost.

1.1.25. Periodically samples of water shall be tested as per IS-3025.

1.1.26. In case of Volumetric batching if aggregates are moist then allowance shall be made for bulking of fine aggregates. Allowance for bulking shall be made as per IS-2386(part-3).

1.1.27. All the flooring works are to be finished with neeru (cement slurry) without any extra cost. However the bonafide use of cement used for the purpose shall be taken into consideration while calculating theoretical consumption of cement.

1.1.28. Acrylic distemper / Acrylic Exterior Paint will be of Asian paint, Nerolac or equivalent make as approved by Engineer-in-charge.

1.1.29. Prospective bidder(s) may raise query relating to bidding conditions, bidding process and/or rejection of its bid. The reasons for rejecting a tender or non-issuing a tender to prospective bidder will be disclosed where written enquires are made by the concerned bidder.

1.1.30. Materials arranged by the contractor

1.1.31. The contractor shall submit original bills for the cement, steel, asphalt etc., brought to site. In all contracts where issue of cement and steel is not stipulated, special conditions shall be incorporated as below:

1.1.32. All the materials to be used on the works shall have BIS certification mark if so available, unless otherwise specified elsewhere or shall be of approved brand with

equivalent material as approved by the Engineer-in-Charge.

1.1.33. All materials supplied shall be stored appropriately to prevent deterioration/ damage from any cause what so ever and to the entire satisfaction of the Engineer-in Charge.

1.1.34. The materials required for the work shall be brought to the site and stacked at places shown by the Engineer-in-Charge and the same shall be got approved for use in work sufficiently in advance so that the progress of the work is not affected by the supply of materials.

1.1.35. Workmanship shall be the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. If the laws of the local Government/Municipal of other authority require the employment of licensed or registered workmen for various trades, the contractor shall arrange to have the work done by such licensed/registered personnel.

1.2. Aggregates for Concrete

1.2.1. Aggregates (fine and coarse) for concrete shall comply with the requirements of IS: 383 – Specifications for coarse and fine aggregate from natural sources for concrete'. Aggregate shall be obtained from sources approved by the Engineer-in-Charge. Aggregates, which are not perfectly clean, shall be washed in clean water to the entire satisfaction of the Engineer-in-Charge.

1.2.2. The fine aggregate shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or other deleterious substances.

1.2.3. Each type of aggregate shall be stored separately for the approval of Engineer- in-Charge. Wet aggregate delivered at the site shall be kept in storage for at least 24 hours to ensure adequate drainage before being used for concreting.

1.2.4. Contractor shall maintain at site at all times such quantities of each type of aggregate as are considered by the Engineer-in-Charge to be sufficient to ensure continuity of work.

1.2.5. The contractor shall arrange to supply samples of coarse aggregate and fine aggregate etc. to the Port Laboratory for mix design for concreting works. Mixing of cement concrete works shall be on weigh batching basis as per IS. Requirement. The charges shall be borne by the contractor.

1.2.6. All the royalties of the materials, quarry fees, octroi, charges, sales tax etc. are payable by the contractor directly to the authorities concerned and the rates tendered shall be deemed to be inclusive of all such charges.

1.2.7. On completion of work, a copy of the final bill letter intimating the quantities of quarried material consumed by the contractor concerned in the work shall be furnished to the Geologist, Department of Geology & Mines, GOG, Bhuj with the specific intimation to furnish the details of outstanding against the concerned contractor on account of payment of royalty if any, within 45 days, failing which action for release of balance security deposit will be initiated.

1.3. CEMENT

1.3.1. Quality of cement used for the work shall be 53 grade ordinary Portland cement conforming to IS:12269 or Pozzolona cement conforming to I.S. 1489 unless otherwise approved by the Engineer-in-Charge.

1.3.2. The cement required for the work will have to be procured by the contractor and shall comply with the relevant IS. As far as possible, the cement required for the work will have to be procured from the government agencies. The cement shall, if required by the Chief Engineer / Engineer-in-Charge, be tested and analyzed by an independent analyst at the Contractor‘s cost and result produced to the Engineer-in-Charge. For verification of such purchase all the bills of manufacturer / supplier / dealer will have to be furnished to the Nodal officer or his nominee and every delivery of cement shall be accompanied by a manufacturers test certificate confirming that the supplied cement conforms to relevant specifications.

1.3.3. Supply of cement shall be taken in 50kg bags bearing manufacture‘s name and BIS marking. Samples of cement arranged by the contractor shall be taken by the Engineer-in-Charge and got tested in accordance with provisions of relevant BIS codes. In case, test results indicate that the cement arranged by the Contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the contractor at his own cost within a week‘s time of written order from the Engineer-in-Charge to do so. Every consignment of cement must have identification marks on packages indicating date of manufacture and grade and type of cement, cement brought to works shall not be more than 6 weeks old from the date of manufacture

1.3.4. A cement godown of adequate capacity as directed by the Engineer-in-Charge shall be constructed by the contractors at the site of the work for which no extra payment shall be made. Double lock provision shall be made to the door of the cement godown. The key of one lock shall remain with the Engineer-in- Charge or his authorized representative and the key of the other lock shall remain with the contractor. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge.

1.3.5. The cement brought to the site and cement remaining unused after completion of work shall not be removed from the site without written permission from /of theEngineer-in-Charge.

1.3.6. The contractor shall maintain a cement register showing dates of receipt and issue, quantities used daily and balance which shall be accessible to the Engineer-in-Charge.

1.3.7. Nodal officer or his nominee shall be at his liberty to carry out testing of cement at his discretion from Port laboratory or Government approved laboratory as per relevant before / during use. The contractor shall make all the necessary arrangements for the same and all the charges to be borne by the contractor.

1.3.8. Each consignment shall be stored separately so that it can be readily identified and

inspected. The arrangement of cement shall be such as to ensure the utilization of cement in the order of its arrival at the stores.

1.3.9. Cement brought to site and cement remaining unused shall not be removed from site without the permission of the Nodal officer or his nominee.

1.3.10. For cement stored in silo, clauses 1.3.3 and 1.3.4 are not applicable.

1.4. Steel Reinforcement

1.4.1. The reinforcement steel used for the work will have to be procured by the contractor and shall be TMT bars of Fe 500 grade conforming to IS:1786 unless otherwise approved by the Engineer-in-Charge.

1.4.2. The structural steel viz. MS plates, channels, joists, flats and angles, etc., shall conform to IS: 2062 latest revision. The steel shall be brought to the site in bulk supply of 10 tonnes or as directed by the Engineer-in-Charge.

1.4.3. As far as possible, the reinforcement steel required for the work shall be procured from Steel Authority of India or RashtriyaIsbat Nigam Ltd. The reinforcement steel can also be procured from the firms TATA Iron & Steel, for use in the work subject to production of valid license certificate from BIS. In case steel is not available from the above sources, the contractor shall obtain specific approval from the Engineer-in-Charge well in advance for purchase of steel from other sources. In any circumstances, steel reinforcement produced by re-rolling mills shall not be allowed to use in the work.

1.4.4. The contractor shall have to obtain and furnish test certificates to the Engineer-in-Charge in respect of all supplies of steel brought by him to the site of work. For verifications of such purchase all the bills of manufacturer / supplier/dealer will have to be furnished to the Nodal officer or his nominee.

1.4.5. Samples shall also be taken and got tested by the Engineer-in-Charge as per provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the Contractor does not conform to BIS codes, the same shall stand rejected and shall be removed from the site of work by the Contractor at his cost within a week‘s time of written orders from the Engineer-in-Charge to do so.

1.4.6. The contractor shall have to procure the steel reinforcement of various sizes/diameters as per the working drawings, which shall be supplied only during execution of the work. No claims/disputes arising about details of steel reinforcement so provided shall be entertained. In case, if particular size(s) of steel reinforcement is not available with the approved manufacturers, the contractors shall have to intimate the Nodal officer or his nominee in writing along with documentary proof in this regard. Nodal officer or his nominee, at his discretion, may allow to use alternate diameter of reinforcement bars provided that no claims/disputes arising out in respect of payment for difference in rate of steel shall be entertained.

1.4.7. The steel reinforcement shall be brought to the site in bulk supply of 10 tonnes or

more or as decided by the Engineer-in-Charge.

1.4.8. The steel reinforcement shall be stored by the contractor at site of work in such a way as to prevent distortion and corrosion and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting andchecking.

1.4.9. For checking nominal mass, tensile strength, bend test etc., specimen of sufficient length as per IS:432/ IS:1608/ IS:1599 / IS: 1786 or as specified by the Engineer-in-Charge shall be cut from each size of the bar at random at frequency not less than the specified below. If any test piece selected from a lot fails, no re-testing shall be done and the lot shall be rejected.

Manufacturer's test certificate regarding compliances with Indian Standards for eachlot of steel shall be obtained and submitted to the Engineer.

Size of bar	For consignment below 100 tonnes	For consignment over 100 tonnes
Under 10 mm dia	One sample for each 25 tonnes or part thereof	One sample for each 40 tonnes or part thereof
10 mm to 16 mm dia	One sample for each 35 tonnes or part thereof	One sample for each 45 tonnes or part thereof
Over 16 mm dia	One sample for each 45 tonnes or part thereof	One sample for each 50 tonnes or part thereof

1.4.10. The contractor shall supply free of charge the steel required for testing. The cost of tests shall be borne by the Contractor.

1.4.11. Steel brought to site and steel remaining unused shall not be removed from site without the written permission of the Engineer-in-Charge. The contractor shall procure the steel reinforcement bars of standard length as per relevant I.S.

1.4.12. Nodal officer or his nominee shall be at liberty to carry out independent testing of steel reinforcement at his discretion from any of Government Approved laboratory as per relevant I.S. specifications before use. The contractor shall make all the necessary arrangements for same and all the charges to be borne by the contractor.

1.4.13. payment for steel reinforcement shall be made on the basis of lengths of bars actually placed & measured in the work multiplied by the standard weight per unit length as given in the relevant IS code. The rates shall include for cutting & wastage, straightening, short & long length, & weight tolerance as per relevant IS codes & placing in position. Authorized laps, chair /separators, lifting hooks stiffening ring shall be measured and paid.

1.5. WATER

1.5.1. Clean fresh water free from oils, acids, alkalies, salt, sugar, organic materials or other harmful materials shall be used for washing aggregates, mixing and curing of concrete. The water used shall comply with clause 5.4 of IS:456- 2000. Potable water

is generally considered good for mixing concrete.

1.5.2. Deendayal Port Authority will not provide/ supply water for the work. Water has to be arranged by the contractor himself for the construction works including curing work and for labour at his own risk and cost.

1.5.3. Samples of water arranged by the contractor shall be taken by the Engineer in Charge and got tested in accordance with the provisions of relevant BIS codes. In case test results indicate that the water arranged by the contractor does not conform to the relevant BIS codes, the same shall not be used for any works. The cost of tests shall be borne by the contractor.

1.6. Admixtures in Concrete

1.6.1. Admixture in concrete will be allowed only with prior approval of the Engineer–in–Charge. The contractor shall produce test certificates from recognized laboratories before use, if so desired by the Engineer–in–Charge.

1.6.2. Admixture for corrosion protection- Wherever specified in BoQ, concrete used shall be mixed with —Bipolar Concrete Penetrating Corrosion inhibiting Admixture — approved by RDSO (RDSO specification No. M&C /PCN/126- 2008) or any fourth generation polydentate bipolar concrete penetrating corrosion inhibiting admixture approved by IRC, to protect the reinforcement bars against corrosion.

1.7. Structural Steel

1.7.1. The mild steel flats / plates/ angles/ channels/ I-sections used for the work shall conform to IS:2062. The material shall be free from visible as well as hidden defects such as pitting cracks, laminations, twists etc. and excessive rusting.

1.7.2. It is not necessary for the Contractor to obtain separate approval in case mild steel plate is purchased from Steel Authority of India Ltd or TATA Iron & Steel or Jindal Steel & Power Ltd. (JSPL) In case of purchase from Tata Iron & Steel & JSPL, valid license certificate from BIS shall be produced. For purchase from other sources, the contractor shall apply sufficiently in advance and obtain written permission of the Engineer-in-Charge for making purchase from suchsources.

1.8. Bentonite Slurry

1.8.1. The bentonite slurry used as a drilling mud during boring and casting of piles shall conform to the specifications given in Appendix-A of IS:2911 (Part I/Sec.2). Polymer solutions may also be used to stabilize sides of bore holes in conjunction with bentonite or used as standalone support fluid as per EN1536.

1.8.2. Periodical inspection and testing of the bentonite slurry shall be carried out to ensure the quality of the slurry.

1.9. Sand for making Mortar for Masonry Work / Plastering Work

Sand used for masonry mortar shall conform to IS:2116. Sand used for plastering shall conform to IS:1542.

1.10. Materials not specified

All materials not herein detailed and fully specified but which may be required for

use on works, shall be subjected to the approval of the Engineer-in-Charge without which they shall not be used anywhere in the permanent works.

1.11. Sampling and Testing of Materials

1.11.1. Sampling and testing of the material supplied by the contractor for use on the work shall be done as per the provisions of the relevant BIS codes/specifications. In the absence of BIS specification in a particular case, the sampling and testing shall be done as directed by the Engineer-in-Charge as sound engineering practice. Material conforming to the specifications and approved by the Engineer-in-Charge shall only be used by the contractor.

1.11.2. All the sampling and testing shall be done at the contractor‘s cost.

1.12. Detailed Specifications of Items for Civil works

1.12.1. General

Except where otherwise specified or 32pecialize by the Engineer-in-Charge all items of works executed by the Contractor must conform to the latest edition of the Bureau of Indian Standard (BIS) Specifications, I.RC., MORT&H‘s specifications and Code of practices published by BIS. Where no such specifications or code of adoption. The tenderer while indicating such specifications shall practice exists the latest BSS codes of practice shall also be considered for enclose the full set of the publication so referred and not in extracts. Photostat / Xerox copies in duplicate shall be forwarded which shall not be returned to the Contractor. In absence of any specification the department reserves the right to adopt trade specifications and /or sound engineering practices for the 32pecialized work as may be decided by the Engineer-in-Charge which shall be final, conclusive and binding on the contractor.

1.12.2. Work is to be carried out as per detailed specification laid down in IS specification. MOST specification for road works, Latest IRC standard, and CPWD manual however the provisions made in contract documents and KPT SOR shall prevail.

1.12.3. In case of items where no specifications is defined under IS, MOST or CPWD manual or DPA SOR or tender document superior quality of material available in market shall be applicable.

1.12.4. Detailed specifications of items of works are described below:

1.12.5. Dismantling Works

i The tenderers shall inspect the site and carry out the required investigation by himself about the present position and condition of the existing structures and assess the difficulties and the work involved in its dismantling and removal. It will be deemed that the tenderer has inspected the site and satisfied himself the condition of the structure and the nature of the work involved for the dismantling and removal and that the tenderer has estimated its cost accordingly and port will be in no way responsible for the lack of such knowledge and also consequences thereof to the tenderer. The dismantling shall be done carefully without causing any damage to the remaining portions / structure.

ii Usable materials after dismantling the structures, if any, shall be the property of the contractor and the unusable dismantled materials/debris shall be suitably disposed off as directed by the Engineer-in-Charge. No debris shall be deposited at the Project Site or in Backwaters.

iii The retrieved steel reinforcement bars of piles, beams and slabs obtained from dismantling shall become the property of the Contractor and can be taken over and removed by him free of cost.

iv All protective measure and care shall be taken to avoid falling of concrete pieces in the back waters during the course of dismantling and fallen materials if any, shall be removed from the back waters by the contractor.

v The debris shall be cleared on completing each day's work, if so directed by the Engineer-in-Charge.

vi All possible measures shall be taken to pull out the piles without breaking. In case any pile is broken during pulling out, the same shall be cut at bed level and removed.

1.12.6. Plain and Reinforced Cement Concrete

a. General

The concrete used for all works, concreting procedure etc. shall be in accordance with IS:456-2000.

b. Concrete Mix

Mix used for R.C.C. shall be of minimum M30 grade unless otherwise specified. Design mix shall be used for M30 and higher grade of concrete unless otherwise specified in the schedule.

c. Nominal Mix

For nominal mix concrete, proportion of fine aggregate to coarse aggregate shall be 1:2 by volume. The minimum cement content per cubic meter of nominal mix concrete shall be as given below.

Sl. No	Type of concrete	Cement content per Cu.M
1	Cement concrete 1:4:8 (1 cement: 4 sand: 8, 40 mm size graded metal)	170 Kg.
2	M-10 grade with 40 mm size graded metal	220 Kg.
3	M-15 grade with 20 mm size graded metal	320 Kg.

d. Design Mix

i For design mix concrete of following grades of concrete the minimum cement content per cubic metre and maximum water cement ratio are as given below.

Sl. No	Grade of Concrete	Minimum cement content in Kg / m^3	Maximum free Water cement ratio
1	M40 (for pile foundation and other structures)	450	0.40
3.	M30	400	0.50
4.	M25	375	0.50
5.	M20	350	0.55

ii The contractor shall arrange to supply samples of cement , coarse aggregate and fine aggregate etc. to the Port Laboratory for mix design for concreting works. Mixing of cement concrete works shall be on weigh batching basis as per IS. Requirement. The testing charges shall be borne by the contractor.

iii For design mix concrete, the contractor shall carryout all necessary tests at contractor's cost to determine the proportion by weight of cement, aggregates (coarse and fine), admixture if required and water necessary to produce concrete of required grade having the desired workability and, water cement ratio not exceeding the allowable limit, prior to commencement of work. The contractor shall submit the following for the approval of Engineer-in-Charge.

The proportion of cement, coarse aggregate, fine aggregate and water so determined.

1. The sieve analysis of aggregates which he proposes to use in the works.
2. Full details of the tests conducted.
3. All calculations relevant to mix design.

iv When the proportions are submitted to the Engineer-in-Charge which he considers will produce concrete having the required properties, it shall become the declared proportions to be used for the work. The agreement by the Engineer-in-Charge to such declared proportions shall not relieve the contractor of any of his responsibilities to use in the work at all times concrete having the required properties. No deviation from the declared proportions shall be allowed unless and until the Engineer-in-Charge shall have given his written authorization for the adoption of revised proportions for the concrete.

v Sampling, testing and acceptance criteria for designed mix concrete shall be as per clause 15, 16 & 17 of IS:456-2000 unless otherwise specified. Sampling and testing shall be done at contractor's own cost.

vi The Contractor shall develop a well-equipped laboratory at the site, so that necessary testing of concrete materials shall be done at site of work in presence of DPA Officials.

vii The cubes casted at site shall be tested at Port Laboratory or Government approved laboratory and test results conform to IS 456: 2000 (latest edition). Testing charges of the cubes shall be born by the contractor. If the result is not satisfactory the concrete work will have to be dismantled and redone by the

contractor at his own cost.

viii For casting of c c cubes, the contractor has to arrange his own moulds. The Nodal Officer reserves the right to ask contractor to cast additional c c cubes at the different stages and works for testing, if required at 3/7 days period. No separate payment shall be made to the contractor on account of the cost of the labour and materials required for casting of the cubes required for 3/7 days testing. The testing charges for theses cubes shall be borne by contractor. The contractor may set up cube testing facilities at the site of work for testing 3/7 days cube. Three test specimen shall be made from each sample for testing at 28 days.

ix The minimum frequency of sampling of concrete of each grade shall be in accordance with Table below;

Quantity of Concrete in Works, m^3	No. of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional 50 m^3 or part thereof

e. Concrete Below Specified Crushing Strengths

if the test cubes fail to meet the minimum specified crushing strength for each class of concrete, the Nodal Officer may take one of the following decisions.

i. Instruct the contractor to carry out additional tests at his own cost.
ii. Accept the work at his discretion and in such a case may make a reduction in the rate of the appropriate item.
iii. Reject the work in which case the contractor shall pull down and rebuild at his own cost the relevant section of work.

f. Size of Coarse Aggregate

For all concrete, plain or reinforced of M20 and higher grades, 20 mm size graded aggregate conforming to IS:383 shall be used unless otherwise specified. If 20 mm graded aggregates as per IS:383 are not readily available, graded 20mm aggregate shall be obtained by blending 20mm and 12.5/10mm aggregates in the proportion arrived based on the combined sieving of aggregates.

g. Batching and Mixing

i For production of concrete, fully automatic batching and mixing plant as approved by the Engineer-in-Charge shall be installed by the contractor at an approved location.

All measuring equipments should be maintained in a clean serviceable condition, and their accuracy shall be periodically checked as directed by the Engineer-in-Charge.

ii In proportioning concrete, the quantity of both cement and aggregate should be determined by weight. Where the weight of cement is determined on the basis of weight of cement per bag, a reasonable number of bags should be weighed periodically to check the net weight. Where the cement is weighed on the site and not in bags, it should be weighed separately from the aggregates. Water should be either measured by volume in calibrated tanks or weighed. Any solid admixture that may be added may be measured by weight; liquid and paste admixture by volume or weight.

iii Except where it can be shown to the satisfaction of the Engineer that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportion when required, different sizes being stacked in separate stock piles. The grading of coarse and fine aggregate should be checked frequently for a given job being determined by the Engineer-in-Charge to ensure that the specified grading is maintained.

1.13. Providing Reinforced Cement Concrete for Pile muffs, Slabs, Pedastals & Beams, Kerb, Handrail Etc.

1.13.1. General

i. The concrete used for all works, concreting procedure etc. shall be in accordance with IS:456-2000.

ii. Designed concrete mix shall be used for the work. For this purpose, the contractor shall carry out all the tests at his cost to determine the proportion by weight of cement, aggregates, admixtures and water necessary to produce concrete having required strength, prior to commencement of works. The contractor shall submit all the particulars of the design mix to be used for the work to the Engineer-in-Charge for approval as per clause 1.2.3.4 above. The quality of concrete shall be assured by conducting the required tests so as to meet the requirements as per BIS.

iii. The concrete for beams shall be of combination of pre-cast and cast-in-situ. Slabs shall be of cast-in-situ construction. Shuttering for deck slab shall be preferably with sacrificial GI troughed shuttering sheets. In case, the contractor requires to use pre cast slab planks as shuttering, it shall be permitted subject to the condition that the pre cast slab planks shall not form the part of the structural slab and its cost shall be borne by the contractor.

iv. <u>FAULTY WORK</u>

Faulty work due to any reason shall be demolished and re-constructed by the Contractor at his own cost.

1.14. Assembly of Reinforcement for Reinforced Cement Concrete

1.14.1. The contractor shall, when ordered, submit to the Engineer-in-Charge the detailed

bar bending schedule for his scrutiny and approval sufficiently in advance (about four weeks) of the due date of commencement of the relevant items of works. While working out the bar bending schedule, the contractor shall ascertain the length of bars likely to be made available to him and the schedule shall be so made, keeping the wastage/ cut bits of bars to bare minimum without hampering technical requirements. If the size of the steel bars specified in the drawing or schedule is not available, the nearest size available shall be used. Revised drawing shall be issued to thecontractor substituting the new size of reinforcement and bar bending schedule shall be prepared by the contractor accordingly. No extra payment shall be made to the contractor for making this substitution. The fabrication of reinforcement shall commence only after the bar bending schedule is approved by the Engineer-in-Charge.

1.14.2. Reinforcement shall be cut to the exact length and made truly straight and then bent to the exact shape and dimensions as indicated in the drawings. The bending and fixing of bars shall be done in accordance with IS:2502 unless otherwise specified.

1.14.3. All cut bits of steel are the property of the contractor. However, the contractor can dispose them off only with the permission in writing of the Engineer-in- Charge. Ifthe department requires the cut lengths, they are to be handed over to the department and will be paid for at the rates at which they were purchased by the contractor.

1.14.4. The reinforcement shall be cleaned by wire brush etc. to remove oil, grease, loose mill scale, loose rust or other deleterious matter that may reduce or destroy bond etc. before tying in position and also immediately before placing the concrete.

1.14.5. All reinforcement shall be placed and maintained in accordance with the drawings. Tolerance on placing of reinforcement shall be in accordance with clause 12.3 of IS:456-2000. Bolts, nuts, washers and rivets etc. required for complete erection of reinforcement and keeping in position shall be supplied by the contractor at his own cost.

1.14.6. All types of reinforcement shall be correctly placed and fixed in position entirely to the satisfaction of the Nodal Officer or his nominee. The cost of providing tying wire as well as space blocks rods shall be deemed to be covered in the rate for reinforcement steel.

1.15. Form work

The steel/ marine plywood formwork shall be used for concrete work. However, for precast units, steel form work shall only be used. The form work shall be designed and constructed to the shape, lines and dimensions shown in the drawings within the tolerance limit and specified in clause 11.1 of IS:456- 2000. Joints of the form works shall be made water tight by providing suitable beadings /gasket as approved by the Engineer-in-Charge. All rubbish, particularly chippings, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept

out of contact with the reinforcement. Before re-used, all forms shall be thoroughly scraped, cleaned, nails removed, holes that may be suitably plugged and joints examined and when necessary repaired and the inside retreated to prevent adhesion, to the satisfaction of Engineer-in-Charge. Contractor shall equip with himself with enough shuttering material to complete the job in the stipulated time. GI troughed shuttering (sacrificial) may also be used for deck slab at contractors own cost as per the directions of Engineer-in-Charge.

1.16. Forms or shuttering shall not be disturbed until the concrete has sufficiently hardened. The proper time for removal of form work shall be in accordance with IS-456-2000 or as directed by Nodal Officer or his nominee

1.17. Cover to Reinforcement

Cover as specified in drawing shall be provided by using precast cement concrete block made from concrete of same grade as that of main work unless otherwise directed by the Engineer-in-Charge.

1.18. Transporting, placing, compacting and curing of concrete

1.18.1. Transporting placing, compacting and curing of concrete shall be as per clause 13 of IS:456-2000. Placement of concrete shall be done with concrete pumps and pipelinesunless otherwise approved by the Engineer-in-Charge in special cases.

1.18.2. All concrete shall be protected during hardening from the harmful effects of sunshine, and drying winds. All exposed faces of concrete shall be kept continuously moist with clean fresh water for a period as laid down in Indian Standard Specifications. However in lieu thereof the contractor may use curing compound of approved quality free of cost in conformity to IS 9103 with prior approval of the Nodal Officer or his nominee. The contractor shall remain extremely vigilant and employ proper equipment and workmen for curing.

1.18.3. The decision of the Nodal Officer or his nominee regarding the adequacy of curing is final. In case any lapse on the part of the Contractor is noticed by the Nodal Officeror his nominee, he will inform the Contractor or his supervisor verbally, or in writing to correct the deficiency in curing. If no satisfactory action is taken by the Contractor,the Nodal Officer or his nominee will be at liberty either to employ sufficient means through any agency to make good the deficiency and recover the cost thereof from the Contractor.

1.18.4. All the surfaces of slabs or other members not requiring to shuttering are to be screened with cement sand mortar approved by the Nodal Officer and to be laid inan approved manner and within a tolerance of plus minus 3 mm of true level and grade.

1.18.5. Concrete shall be transported from the mixer to the worksite as rapidly as possible which will prevent the segregation or loss of any ingredient, and for maintaining the workability.

1.18.6. The concrete shall be placed and compacted before setting commences and

should not be subsequently disturbed. Care should be taken to avoid displacement of reinforcement or movement of formwork.

1.18.7. The concrete shall be transported from the mixer to its place of the works as rapidly as possible and in such a manner that there shall be no separation or loss of its ingredients. In no circumstances shall more than half an hour elapse between the time water is added to the mix and the time when the concrete shall be permitted to be used in the works after initial set has taken place. The use of concrete distributing chutes at an angle of more than 45 degrees from the horizontal will not be permitted without the approval of the Nodal Officer or his nominee.

1.18.8. All concrete shall be vibrated unless otherwise specified or approved by the Engineer-in-Charge and such vibrating shall be as required by the Engineer- in-Charge. The mechanical vibrators complying with IS:2505, IS:2506 or IS:4656 shall be used for compacting concrete. All vibrations shall be carried out to a plan approved by the Engineer-in-Charge. No workman shall be allowed to operate the vibrator without having received instructions and training in its use. Care must be taken to avoid segregation and excessive vibration.

1.18.9. Concreting shall be carried out continuously upto construction joints, the positions and arrangement of which shall be as directed by the Engineer-in- Charge. When the work has to be resumed the construction joints shall be prepared in accordance with clause 13.4 of IS:456-2000.

1.18.10. Unless otherwise specified, all concrete shall be kept continuously in a damp condition by ponding or by covering with a layer of sacking, canvas, hessian or similarmaterials with fresh water for not less than 7 days after laying the concrete. If curing is not done properly the department will be at liberty to engage labour for curing and the expenditure incurred will be recovered from the contractor‘s bill. The decision of the Engineer-in-Charge will be final on this. Stripping time for the form work shall be as stipulated in clause 11.3 of IS:456- 2000. Any impression, fins etc. that may occur from the form work shall be removed and treated with cement mortar 1:1.5 (1 cement: 1.5sand).

1.18.11. Contractor shall arrange to fix any fixtures wherever necessary while doing concreting work without any extra cost.

1.18.12. The unit rate quoted by the tenderer shall be for the finished work and deemed to include cost of all materials and labour, form work, provision of holes, recess, other contingent items etc. required for the completion of work as specified etc.

1.18.13. No concrete shall be deposited until all shuttering, concrete and reinforcement have been inspected and approved by the Nodal Officer or his nominee. On each concreting gang, a competent steel fitter shall be available who shall ensure that the reinforcement and other embedded fittings are kept in position during placing and compaction of the concrete.

1.19. Precast Concrete

1.19.1. Specification contained in clauses above regarding concrete, formwork and reinforcement shall apply in addition to the clauses laid as under. Contractor shall get the pre-casting bed approved by the Engineer-in-Charge.

1.19.2. Necessary lifting hooks shall be provided for handling as indicated in drawings or as directed by Engineer-in-Charge. Lifting Hooks shall be as in the drawings but not less than 12mm dia. M.S. rounds. Care shall be taken to prevent damage to the edges of the precast member during handling.

1.19.3. Unless otherwise specified, the visible surfaces of precast members shall be finished smooth. The exposed edges and corners should be rounded to a radius of 20mm, if it is not directly butting against any structure. Where required, specified coloured finish shall be given by adding approved pigments to the finishing mortar.

1.19.4. The precast concrete units shall be marked clearly on top and shall be stored clear of ground until required for erection. The precast units shall be handled and erected by methods approved by the Engineer-in-Charge to protect them from damage.

1.19.5. The designed loads on the units shall not be exceeded in any way during the course of erection, eg. Temporary loads of materials or equipment. The contractor shall replace at his own expense all such units, which are damaged on account of the above if he is responsible for such loadings. Cement used for a damaged/ rejected pre-cast elements shall not be taken into account for material reconciliation.

1.19.6. Upon completion of casting of the precast members, 75% of the payment for the item of providing RCC for precast members shall be made, if requested by the contractor in writing. The balance 25% payment shall be made after transporting the precast members and placing them in position to lines and levels. It is clarified that payment for providing reinforcement in precast members will be made separately as per Bill of Quantities.

1.20. Installation of Bored Cast-in-Situ piles

1.20.1. General

i. These specification shall be read in conjunction with the detailed specifications for materials to be used on the works and detailed specifications of items of work and if these specifications contradict with the provisions under detailed specification for materials and detailed specifications of items of works, the former shall prevail.

ii. The bored cast-in-situ piles shall be installed in accordance with the specifications under IS:2911 (Part I/Sec.2) and the specifications given under shall supplement to the above said BIS. In case the specifications given hereunder are found contradictory with BIS, the former shall prevail. The founding levels of the piles as shown in the drawing are only approximate and may vary based on the actual soil conditions.

iii. The contractor shall make all necessary arrangements for providing and erecting the equipments in position for facilitating the installation work of RCC bored cast-in-situ

piles. No separate payment shall be made for mobilization/ demobilization of equipment brought at site.

iv. The Contractor shall ensure that during the course of the work, displacement or damage does not occur to the completed piles which would impair either the performance or durability of the structure.

v. The sequence and timing for installation of piles submitted to the Engineer for approval shall be prepared in such a way that the damage to adjacent piles is avoided.

vi. Concrete shall be placed and compacted until green concrete is obtained above the cut-off level of pile. The reinforcement rods of the pile should project out of the top by a minimum length of 1000 mm or as specified. Concreting of each pile shall be done in one continuous operation. Concrete shall be placed by means of a tremie pipe of not less than 200mm dia. The piles to be braced with existing pile till fixing of pre-cast beams.

vii. Piling installation shall generally be in accordance with IS 2911. To avoid deflection of piles during construction stage, the contractor has to provide at his own cost temporary bracing of structural steel immediately after casting of bored in-situ piles till the piles are interconnected by R.C.C. deck beams. The design and provision of temporary bracings shall be contractors' responsibility entirely.

viii. Piles shall be installed in such a sequence that the carrying capacity of previously installed piles is not reduced nor is there an appreciable upheaval of ground causing unusual soil resistance to rest of the pile driving. The Contractor shall submit the sequence order and programme chart to the Nodal Officer or his nominee.

ix. For bored piles, the Contractor shall have the Engineer inspect the bore hole of proper plumb, location and other requisites. The depth of the bore hole shall be measured by means of a chain to which a plumb weighing not less than 1000 gm. Is attached. The contractor shall provide all the equipment required for the above inspection and he shall co-ordinate this work with the engineer. Concreting shall start only after the approval of the Nodal Officer or his nominee for the pile. All facilities, equipment and labour required for inspection by the Nodal Officer or his nominee mentioned above shall be provided by the Contractor promptly and free of cost.

x. In addition to relevant section of IS 2911 the following tolerances shall apply: The permissible positional deviation should not be greater than 75 mm or D/10 whichever is more in case of piles having diameter more than 600 mm from the designed position at the working level of the piling rig. The piles shall not deviate more than 1.5% Piles deviating from these tolerances will be liable to rejection. The Contractor shall take such remedial measures as may be ordered by the Nodal Officer or his nominee, even during the stage of boring. The cost of the remedial measures will have to be borne in all respects by the Contractor. No payment will be made for or in connection with any pile so rejected.

xi. In case of piles deviating beyond the tolerance limits specified and to such an extent that the resulting eccentricity cannot be taken care of by a redesign of the pile cap, the piles shall be rejected and replaced or supplemented by one or more additional piles at the expenses of the Contractor, as directed by the Nodal Officer or his nominee. In such cases, it shall be the responsibility of the Contractor to submit design calculations for the stability of the substructure and the superstructure at his own cost. Further, nothing extra shall be paid to the Contractor for whatsoever extra work involved in the substructure and superstructure on this account. Any pile considered defective by the Nodal Officer or his nominee shall be removed or left in place as directed by the Nodal Officer or his nominee. Additional piles shall be provided to replace them as directed by, the Nodal Officer or his nominee. Payment shall be made for the defective piles and superstructure as per original design instead of additional work.

xii. A record shall be maintained by the Contractor in a Performa approved by the Nodal Officer or his nominee, of the entire penetration for every pile and the behavior of such pile during its entire process of construction. Such records shall be submitted to the Nodal Officer or his nominee regularly as the job progresses. Any sudden change in the rate of penetration which cannot be described to the nature of the ground or any deviation from the designed location, alignment or load carrying capacity of any pile or any upheaval or subsidence noticed on any pile driven under this contract or already existing, during construction of the piles, shall be promptly reported to the Nodal Officer and adequate corrective measures shall be taken free of any Charge as decided by the Nodal Officer or his nominee. Upon completion of the pile driving all records together with the records of such additional boring or other subsurface information that were obtained during the process of installation shall also be filed with the Nodal Officer or his nominee.

xiii. After the concrete in the piles has hardened completely, the engineer may direct if required, to take cores of the concrete. The cores shall be taken with a diamond core cutter, size AWX and AWM of the Diamond Core Drill Manufacturer Association. This core cutter will give a core of 30 mm dia. The contractor will not be paid separately for the cores ordered to be taken, if required. If these cores reveal defects in the concreting of the pile, the Engineer may order that the Contractor shall take at his own cost, remedial measures. The core so taken has to be filled in with cement grout and the cost of such filling shall be borne by the contractor.

xiv. Payment of the boring and concrete shall be paid up to founding level and beyond the founding level the contractor shall done the concreting at his own cost.

xv. The tremie pipes and funnel shall be filled and lifted just 15 cm above bottom before releasing the concrete pile to facilitate smooth flushing of concrete. The concrete levels in the pile shall be checked every few meter in order to note the difference, if any, between the theoretical built up and actual built up in pipe. This is to locate the position of over-cut or caving in during boring. In addition to the normal precautions to be taken in tremie concreting as per relevant section of IS 2911 the following

specifications shall be particularly applicable for the use of tremie concrete in piles.

a. The concrete shall be coherent, rich in cement content and of slump as approved by the Nodal Officer or his nominee.

b. The tremie shall be large enough with due regard to the size of the aggregate. For 20 mm aggregate the tremie pipe shall be not less than 200 mm diameter, aggregate more than 20 mm shall not be used.

c. The hopper and tremie shall be closed system embedded in the placed concrete, through which water cannot pass.

d. The first charge of concrete shall be placed with a sliding plug pushed down the tube ahead of it or with a steel plate of adequate charge to prevent mixing to concrete and water. However, the plug shall not be left in the concrete as a lump.

e. The tremie pipe shall always remain penetrated well into the concrete with an adequate margin of safety against withdrawal of the pipe when surged to discharge the concrete.

f. The pile shall be concreted wholly by tremie and the method of deposition shall not be changed part way up the pile, to prevent the laitance from being entrapped within the pile.

g. All tremie tubes shall be scrupulously cleaned after use.

1.20.2. LINER

i The liner which is required temporarily for keeping the drilling mud level and retaining the concrete shall be provided upto a minimum of 90 cm above cut off level and removed by the contractors at their own cost. The cost of providing this portion of liner temporarily and removing the same shall be covered in the rate quoted for boring.

ii The liner should be driven to depth as upto depth of 2.50m. The boring within the liner shall be continued by chiseling, bailer grabbing etc. to a level to be approved by the Nodal Officer or his nominee. The embedment's indicated in the drawing are in the strata to be approved by the Nodal Officer. The walls of the piles shall be stabilized by use of casing of M.S. liner upto depth 2.50m and by bentonite slurry below liner as directed by the Nodal Officer or his nominee. Jetting shall not be done except when permitted by the Nodal Officer.

The portion of the pile without liner shall be stabilized by drilling bentonite mud/fluid. The density and composition of the fluid shall be such as to suit the requirements of ground conditions and to maintain the fine materials from the boring in suspension. At the last stage of boring or in intermediate hard layers, chisel or a chopper shall be used. The drilling mud to be used for stabilization shall confirm to the specifications given to Appendix A of IS 2911 (Part I/Sec 2) of latest edition.

iii The liner shall be of 6mm thick mild steel plate with stiffening at the ends.

iv The liner shall be installed in position by driving with a hammer. For lowering the

liner boring with bailers shall not be permitted.

1.20.3. BORING

i Boring shall be done using direct mud circulation or reverse mud circulation methods. Drilling mud liquid shall be used for stabilizing sides of bore hole and the level of the liquid shall be maintained upto the top of temporary liner. Polymer solutions may also be used to stabilize the bore holes in conjunction with bentonite or used as standalone support fluid mud as per EN 1536. The concreting operations should not be taken up when the specific gravity of the of the bottom slurry is more than 1.12 and the slurry should be maintained at 1.5m above the ground water level.

ii Settling tanks of adequate capacity shall be provided for the collection of discharge from the piles and the recovery and re-use of the liquid after allowing settlement of soil particles. The contractor shall furnish his detailed scheme for the mud circulations for approval by Engineer-in-Charge.

iii Pumps used for boring by direct mud circulation shall have adequate capacity to maintain vertical flow velocity of 2cm/sec. inside the pile while boring is carried out.

iv Immediately after the completion of boring, flushing of the borehole shall be done with the chisel in position for a period not less than one hour. After removing the chisel, the bore hole shall be further cleaned with a suitable bailer having adequate weight. After lowering and placing in position the reinforcement, final cleaning of the bore hole shall be done with fresh drilling mud liquid for a period not less than 2 hours. In case, the recovered liquid is less contaminated, it can be used for continuing the flushing with the approval of the Engineer-in-Charge. Finally the full depth shall be filled with fresh drilling mud liquid(Bentonite)using sweet potable water. The pump system used for final cleaning shall have sufficient capacity for ensuring complete removal of loose materials. Characteristics of bentonite suspension for re-use‘ shall be as per IS:2911 (Part1/ Section 2)

v The bored materials shall be disposed off as indicated in the schedule of items or as directed by the Engineer-in-Charge of the work.

vi The rate quoted for boring shall cover the cost of all operations including cleaning the bore hole, providing and removing temporary liner etc. complete.

1.20.4. Reinforcement Work

i The plant and equipment mobilized by the contractors shall have adequate capacity to provide cages made from bars upto 11.50 m length.

ii Reinforcement shall be fabricated in cages and splicing of bars shall be done by laps. The rings and helicals shall be tack welded to the main reinforcement. The joint of the cages shall be made by lap welding sufficient for carrying the weight of successive cages and for keeping the main bars in position.

iii Roller type cover blocks shall be provided for ensuring a clear cover as per drawing for the main reinforcement. The cover block shall have minimum 50mm thickness and shall be made from the same concrete mix approved for the pile concrete. The

cover block shall be attached to the cages in between main reinforcement with 16 mm dia bars welded to the main bars. The bars used for attaching the cover blocks shall be measured and paid for as a part of reinforcement. The blocks shall be provided at 3 metre intervals in sets of 3 numbers placed at equal intervals along the periphery.

1.20.5. CONCRETE

i Concrete mix used for the work shall generally conform to IS:456-2000.

ii Concrete mix shall be of M40 grade using 20mm size graded granite metal with a cement content not less than 450 kg/ cubic metre and water cement ratio not exceeding 0.40. The slump of concrete shall neither be less than 150 mm nor greater than 180mm.

iii Designed concrete mix shall be carry out and all the tests at his cost to determine the proportion by weight of cement, aggregates, admixtures and water necessary to produce concrete having required strength, prior to commencement of works. The contractor shall submit all the particulars of the design mix to be used for the work to the Engineer-in-Charge for approval as per clause above. The quality of concrete shall be assured by conducting the required tests so as to meet the requirements as per BIS.

iv The cement procured by the contractor for the work shall be 53 grade ordinary Portland cement confirming to IS:12269 or Pozzolona cement conforming to IS:1489 unless otherwise approved by the Engineer-in-Charge. If any admixtures are found necessary for retarding the setting time / improving the strength and workability of concrete using the above cement and keeping the water cement ratio within 0.40, it shall be provided by the contractor at his own cost. The admixtures used shall conform to relevant Bureau of Indian Standards Specifications.

v Concrete shall be placed in the pile using tremie method and tremie pipe shall be of diameter not less than 200mm. The concrete placing shall not proceed if specific gravity of fluid near about the bottom of bore hole exceeds 1.12. The penetration of the tremie into the concrete shall not be less than 2 metres nor greater than 5 metres at any time. For ascertaining proper formation of the pile, contractor shall device a system for measuring the volume of concrete poured into the pile. A concreting record in the approved Performa giving all the details shall be submitted to the Engineer-in-Charge immediately on completion of concreting in each pile. Pouring of concrete through the tremie shall be continued till the concrete mixed with bottom material is completely over flown and good concrete is reached on the top of the liner. The concrete formed above the cut off level shall be removed only after 7 days of completion of concreting as specified in clause 8.5.3 of IS 2911. The payment for removing the concrete above cut off level will be made under separate item. Measurement for the concrete in pile shall be made only from 0.90 m above cut off level to the bottom level as shown in the approved drawing.

vi As the concreting work progresses, not less than 2 samples shall be collected from

the concrete of each pile at representative locations as directed by the Engineer-in-Charge. Three test cubes shall be made from each sample and arranged for testing for crushing strength at 28 days in a laboratory approved by the Engineer-in-Charge and test certificate shall be made available. The cost of sampling, making cubes, transporting, testing and making available the certificate whatsoever shall be borne by the contractor.

vii In case the above certificates reveals that the samples tested fails to give the minimum specified crushing strength laid down in IS:456-2000 for the specified grade of concrete, the Chief Engineer may take one of the following decisions.

a. Instruct contractor to carry out additional test at his own cost.
b. Accept the work at his discretion and such a case may make a reduction in the rate of appropriate item.
c. Reject the pile in which case the contractor shall install alternative pile at no extra cost.

viii The pile shall be terminated in dense sandy layer. To ensure that the bearing stratum is not weaker than considered in design for pile termination, SPT test at termination depth shall be conducted. Contractor shall get the termination level verified by Engineer-in-Charge based on the above.

ix A competent supervisor shall be present to record the necessary information when the pile is being installed. The contractor shall supply in triplicate complete records of all pile works in the form and manner approved by the Engineer-in-Charge. The record shall invariably contain:

a. Dimensions of the piles, including reinforcement details and the mark of the pile.
b. Type of boring employed.
c. Depth of boring.
d. Type of strata in which pile is terminated with SPT value.
e. Sequence of construction.
f. Depth of water table in vicinity.
g. Time taken for concreting.
h. Quantity of concrete poured etc
i. Consumption of cement.
j. Any other important observations
k. Typical data sheet of recording piling data shall be as given in Appendix – D ofIS:2911 (Part 1/ Section-2)

1.21. LIST OF APPROVED MATERIALS/MAKES

Specification/brand names of materials (Refer materials, whichever are applicable for the scope of work) and finishes approved are listed below. However, approved equivalent material and finishes of any other specialized firms may be used with the approval of the alternate brand by the Engineer-in-Charge.

Sr.No	Materials	Approved Make
1.	**Civil Works**	
1-1.	Cement	Ultratech, Birla, Ambuja, Sanghi J K Laxmi
1-2.	Reinforcement Bars	TATA, SAIL, RINL, JSW, JSPL,
1-3.	Structural Steel	TATA, SAIL, RINL, JSW, JSPL
1-4.	Mechanical Splicing – Couplers	Dextra, Bartec or equivalent
1-5.	Admixtures for Concrete	BASF, FOSROC, SUNANDA, CEARA, SIKA or its equivalent
1-6.	Concrete Penetrating Corrosion Inhibiting Admixture	POLYALK CP-293, PCO KP-200 or equivalent
1-7.	Protective coat for Concrete Surface - Exposed to UV	Licensed suppliers of Interpenetrating Polymer Network Coating System (IPNet)

Note:

1. For all other materials where the make is not specified, the samples shall be got approved by the Engineer-in-charge before procurement.
2. In the cases where products of specified manufacturers are approved, their standard accessories are also acceptable, subject to obtaining prior sanction from the Engineer-in-charge.

Technical Specification No. 13:

The contractor shall supply at site required quantity of 470-500W (±5%) LED flood light fittings to achieve an average illumination level of not less than 50 Lux on ground level in a grid of 10m × 10m with uniformity ratio (Emin/Eavg)of 0.60 and maintenance factor of 0.70. The measured average illumination level at the time of Field Test shall not be less than 71.42 lux, following area.

a). For 50 Hector area total 38 Nos. HM Towers.

The required quantity of 470-500W (±5%) LED flood lightfittings for 50 Hectare Area with 38 Nos. High Masts. The Bidder shall submit their detailed design (At the time of e- tender On Line Bidding) report showing the illumination level, quantity of LED fittings on each high masts, total quantity of LED fittings for 50 Hectare area with maintenance factor & uniformity ratio (Emin/Eavg) in a grid of 10m×10m along with their bid document. Deendayal Port Authority reserves the right to reject the alternative design/offer of the bidder at DPA's sole discretion.

The bidder shall submit LM79 report(s) (At the time of e- tender On Line Bidding) of the offered 470-500W (±5%) LED flood light fitting issued by ERDA, Vadodara (NABL accredited laboratory) only for calculation of power consumption of the design for required quantities

of 470-500W (±5%) LED flood light fittings for 34 Hectare Areas by DPA along with the bid document.

The technical specification of 470-500 (±5%) Watt energy efficient LED flood light (with optical lens) suitable for 30m High Mast tower is as below:

SR.NO.	DESCRIPTION	SPECIFICATION
1	Input Power	**470W-500 W ±5%**
2	Input voltage AC	120-270 V AC
3	Input Frequency	50 Hz +/-1 Hz
4	Life	50,000 burning hours @ L70B50, Ta 35°C Outdoor
5	Inter-changeability	Suitable for mounting on Lattice Tower/ Lantern carriage of High Mast.
6	Total Harmonic Distortion	<10% maximum
7	Working Temperature	-10°C to +45°C
8	Working Humidity	10% to 90% RH
9	Temperature	3000 K
10	Colour rendering index	>70
11	Lumens / Watt	≥ 110 Lum/W at System Level
12	Finishing	Corrosion resistant powder coating
13	Power factor	Not less than 0.95
14	Forward current	The forward current of LED shall be ≤ 70% of the rated forward current of LED.
15	Warranty	5 Years from the date of receipt of full material byDPA in good condition. It is clarified that during Warranty Period, if the material is found to be defective or has poor performance or has lumen depreciation beyond permissible limit as per LM80 report, the Supplier shall promptly, Replace the material against manufacturing defects /Rectify the material, on receiving the instruction from Engineer-in-Charge at contractor's cost. The contractor shall have final & total single point responsibility for performance of the LED light fitting supplied.

16	Construction	The housing should be of single piece non-corrosive Matt gray powder coated pressure die-cast aluminum frame with heat resistant toughened clear glass fixed with SS screw. Optical and control gear compartments shall be maintainable/replaceable without impacting the LED units. The access to the optical and the gear compartment should be separate. While accessing the gear compartment, the optical compartment should not be accessible. The weight of the fitting shall not be more than 18.0 kg.
		The LED Flood Light shall have its make embossed/engraved on the Fitting.
17	Surge Protection	The Luminaire should have a 20kV SPD duly bolted inside the Luminaire. The SPD should be able to sustain a minimum 15 hits of 10kA rating i.e. Total of 45 hits across all the three modes as per IEC 61000.
18	Electrical Protection	The Luminaire should be capable of withstanding voltage stress of 440V phase to phase for 8 hrs at 50 degree Celsius and should have low voltage protection as 100V for 48 hours & high voltage cut-off above 325 VAC and should have an auto restart feature.
19	Impact Resistance	IK08
20	Driver Construction	The Driver shall be single / double with 50000 Burning hour. The Drivers should be a potted driver not a printed circuit board without casing, mounted inside the luminaire. The Driver shall be of constant current type and shall have Over voltage, Over current, Over temperature & Short circuit Protection. The driver efficiency shall be more than 85%. List of make of Driver: PHILLIPS Xitanium/ MEANWELL/ OSRAM/ BAG/ SOSEN/ INVENTRONICS. Manufacturers can use their own make LED driver and the LED Driver shall be BIS certified and shall meet the specifications and comply with Safety requirements (IEC 61347-1, IEC 61347-2-13), EMC requirements (CISPR 15/ EN 55015, IEC/EN 61547, IEC/EN 61000-3-2, IEC/EN 61000-3-3).

21	Driver IP protection	IP 66 or more
22	Driver shall safety compliance	As per IEC 61347-1/ IS 15885 (Part2/ SEC13)/BIS certified
23	Ingress Protection Level of LED Light Fitting	IP 66 or more
24	Optics	As per the design
25	Material of optics	PC lens with toughened glass cover. The LEDs should be provided with UV resistant lens/glass cover for avoiding yellowing of the lense/glass cover. Or Exposed lensed PC Lens plate, the LEDs should be provided with anti-dust, UV resistant exposed lens for avoiding any dust & dirt accumulation on the fixtures and yellowing of the lenses.
26	Makes of LEDs	Osram, Cree, Lumileds, Nichia, Seoul.
27	Specification of LED	SMD type with wattage of each LED should be > 1 Watt and ≤ 5 Watt. Only high power Single LED chip with ceramic based suitable for outdoor use is allowed. Multi Chip, array multi die, mid power, Integrated arrays and COB's are not permitted.
28	Supporting Clamp	The supporting clamp of fitting should be of minimum 4mm thick with 360 degree rotatable.
29	Certificate/Report	(1) Type test reports for LED Flood Light Fitting & LED Driver. (2) The luminaire should be tested as per IEC 60598 standards and following test reports should be submitted: Thermal Test, Ingress Protection Test, Electrical / Insulation Resistance Test, Endurance Test, Humidity Test. The luminaire should be tested for 'Drop test' as per IEC 60068-2-31/IS9000 Part 7 / Sec 3 standards. The luminaire should be tested for 'Vibration test' as per ANSI/IEC 68-2-6 standards. (3) Should comply to IESNA LM-79 (Approved method for the Electrical and Photometric Measurements of Solid-State Lighting Products). LM79 report from any NABL accreditedlaboratory. (4) The LEDs used should comply to LM-80 standards (IESNA: Approved Method for Measuring Lumen Maintenance of LED Light Sources and LED lumen depreciation time to L70

		based on LM-80 data). (5) The LEDs shall comply with photo biological safety norms as per IEC 62471/EN 62471/IS: 16108 under Risk Group 1 (Low Risk). (6) BIS Certificate for LED Driver. (7) BIS Certificate for LED Luminaire. Contractor shall submit all the above certificate/report including BIS certificate for the Luminaire at the time of supply of fitting (The bidder shall submit LM79 report(s) of the offered LED flood light fitting issued by ERDA, Vadodara).

List of make of LED luminaire: Bajaj/ Philips/ CG/ C&S/ Syska/ Wipro/ Pyrotech/ Surya/Nessa/ Panasonic/ Havells / Halonix/ Orient Electric/ WMEL/.

It is clarified that this list of make of LED luminaire is Provisional for this tender for use in 30 meter High Mast Tower only.

The rate shall be inclusive of all taxes (excluding GST), insurance, transportation, unloading at site as directed by Engineer in-charge.

Field Test for 470-500 (±5%) Watt LED flood light fittings:

a). For 50 Hector area total 38 (Thirty- eight) HM Towers.

The preparation for field test shall be in the scope of the contractor. The Contractor shall carry out field test for the illumination level provided for 50-Hectare area in the presence of Engineer-in-Charge & TPIA. The lux level measurement shall be done by Third Party Inspection Agency (TPIA) (to be engaged & payment shall be made by DPA). The contractor shall prepare grid of 10m × 10m and mark the measuring points for measurement of lux level by the TPIA as directed by Engineer in charge.

The contractor shall arrange the Lux meter with valid calibration & test report, same should be submit to EIC. The contractor shall demonstrate in the Field Test that their design achieves the illuminationlevel as below:

Illumination Level at 50 Hectare area:

An average illumination level of not less than 50 Lux on ground level in a grid of 10m × 10m with uniformity ratio (Emin/Eavg) of 0.60 and maintenance factor of 0.70 at (any area/sector of 50 Hector, a decided by EIC). It is clarified that the measured average illumination level at the time of Field Test shall not be less than 71.45 lux.

The illumination level shall be measured by making a grid of a 10m × 10m (Any sector area of 50 & 60 Hector as decided by EIC) covering theentire area at ground level.

In the event of illumination level not found as per the requirement at 50 Hectare Area, the contractor shall have to carry out the work by increasing the number of quantity of 470-500W (±5%) LED flood light fittings at his own cost to complete the work within the

stipulated time and as per the requirement. Also, the contractor shall pay compensation to the Deendayal Port Authority for the assessed additional power consumption at the tariff @ ₹5.91 per Unit. Deendayal Port Authority shall not pay anything extra to contractor to achieve the required illumination level. The compensation on account of extra energy consumption shall be calculated as below:

Compensation on account of extra energy consumption = Additional Power of LED flood light fitting (kW)× 12 hours × 365 days × 10 years × ₹5.91 (Prevailing tariff at DPA).

Technical Specification No. 14:

This item includes installation, testing and commissioning of 470-500 (±5%) Watt LED Light Fitting on the arm of Lantern Carriage of the High Mast Lighting Tower. Connections from top junction box to the LED luminaire shall be made by providing 3 Core, 2.5 Sq. mm flexible copper conductor PVC insulated cable. The mounting angle shall be such that the light on the desired area shall be optimum to meet the lux level requirement. This item also includes supply & fixing of required number of counterweight for LED Flood Lights of the High Mast lighting towers at 50 & 60 Hectare area. The work includes material, labour, tools & tackles as directed by Engineer in charge.

Technical Specification No. 15:

This item includes providing of protection guard fencing to high mast, Main Load Point Panel, Load point panel. consisting of suitable size of GI angle of not less than 75 x 75 x 10 mm and including cross bracing angle of size not less than 50 x 50 x 6 mm. The height of fencing shall be not less than 1.5 m from the ground level. The foundation of the angles shall be provided with cement concreting including providing muffing not less than 45 cm above the ground level. The work shall be carried out to the entire satisfaction of Engineer in charge. The vertical main members ofthe guarding shall be cement concreted to depth of 0.45 m below the ground level. All the members of guard fencing shall be pretreated and then painted with two coats of primer and two coats of finish paint.

The protection guard shall be designed and approved by Engineer-In-Charge prior to manufacturing and execution of work. The protected area surrounding the high mast shall not be less than 4.5 m x 4.5 m.

This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

Technical Specification No. 16:

(a) This item includes preparation of maintenance free earth station by providing 80mm diameter, 3 meter, 100-micron hot dipped GI chemical electrode with back fill compound including accessories & masonry work. A cement concrete (ratio 1:4:8) chamber of at least 300 mm × 300 mm shall be prepared and a RCC/CI cover of suitable size shall be provided for the chamber. The work shall be carried out to entire satisfaction of Engineer in charge. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

(b) This item includes preparation of maintenance free earth station by providing 50mm diameter, 3 meter, 100-micron hot dipped GI chemical electrode with back fill compound including accessories & masonry work. A cement concrete (ratio 1:4:8) chamber of at least 300 mm × 300 mm shall be prepared and a RCC/CI cover of suitable

size shall be provided for the chamber. The work shall be carried out to entire satisfaction of Engineer in charge. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

Technical Specification No. 17:

This item includes preparation of maintenance free earth station by providing 80mm diameter, 3 meter, 250-micron Copper bonded chemical electrode with back fill compound including accessories & masonry work. A cement concrete (ratio 1:4:8) chamber of at least 300 mm × 300 mm shall be prepared and a RCC/CI cover of suitable size shall be provided for the chamber. The work shall be carried out to entire satisfaction of Engineer in charge. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

Technical Specification No. 18:

This item includes supply at site, laying, fixing and connecting of copper strip of size 50x6 mm from earth station to Distribution Transformer as directed. The copper strip shall be laid from earth station to Distribution and shall be clamped suitably on wall/floor or buried in the ground/ trench as directed. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

Technical Specification No. 19:

(a) This item includes supply at site, laying, fixing and connection of GI strip of size 25x6 mm from earth station to Feeder Pillar as directed. The GI strip shall be laid and clamped suitably on wall/floor/structure or buried in the ground as directed. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

(b) This item includes supply at site, laying, fixing and connection of GI strip of size 50x6 mm from earth station to CSS / MDB/ LT Distribution Panel/ Load point panel as directed. The GI strip shall be laid and clamped suitably on wall/floor/structure or buried in the ground as directed. This work includes all material, labour, tools & tackles as directed by Engineer-In-Charge.

PART C

Scope of Work for Comprehensive Annual Maintenance Contract

The scope of work will cover 05 (five) years comprehensive annual maintenance services from the date of completion of the project, after completion of one-year warranty of entire project.

The contract shall be comprehensive in nature wherein preventive as well as breakdown maintenance of entire HM lighting system and its accessories along with power supply (HT & LT) at different location in the to be attended by the contractor including the arrangement of spares, tools, consumables, technical expertise and manpower. The replaced consumables, tools, items will be contractor's property. The respective firm shall submit the maintenance schedule as per the OEM recommendations to the DPA Engineer-in- Charge for approval and all maintenance activity shall be carried out as per the schedule approved by DPA.

1.0 Maintenance Support Services (MSS):

The services provided by the contractor during AMC period will comprise but not limited to the

following:

- Preventive Maintenance: Preventive maintenance would be carried on quarterly basis as per the checklist.
- Breakdown Maintenance: Breakdown maintenance is to be carried out as and when required
- Coordinate with OEM's for support in case of breakdown, or any other issue in any particular equipment to manage spares for smooth functioning of the entire system.
- Repair of HM poles, lighting fixture, assemblies, sub-assemblies, spares, up gradation of system if any etc. to make the system operational.
- Lowering & rising the HM in regular interval as per OEM recommendation.

1.0.1 Maintenance shall cover both preventive and breakdown maintenance of the entire lighting system as per the "Schedule B"-Part-C. The service through the AMC envisages diagnosis of problem & rectification of fault including repair/replacement of faulty /subsystems/circuits/ accessories etc. Further suggestions regarding the cause of problem and measures, if any for avoiding such problems in future shall also be indicated.

1.0.2 The comprehensive maintenance and servicing of the HM lighting system & its connected accessories shall be carried out by the contractor during normal working hours. Breakdown Services should be provided within the stipulated period even at any time to avoid inconvenience.

1.0.3 Once the fault is reported, the contractor shall rectify the fault / malfunctioning within the stipulated time (mentioned under breakdown maintenance) and make the system fully operational.

1.0.4 After repair/maintenance of the HM lighting system & its accessories, the maintenance engineer of the contractor shall submit the detail report on the repair carried out on the lighting system. The engineer shall give details of the parts repaired /replaced along analysis for making the history sheets of faults / problems of the lighting system. DPA would also like the reasons of failure and suggestions to avoid such problems in future. Engineer should maintain the history book from day one after completion of project & handing over the entire system to DPA.

1.0.5 Contractor has to maintain spares at site. However, during repair if it is found that any part of the equipment required to be taken out of DPA premises, the same shall be taken out with the permission of station in charge at the risk and cost of the contractor including packing, insurance and transportation etc.

1.0.6 The comprehensive AMC work is to be carried out on 24 x 7 basis with both adequate skilled & semi-skilled manpower as per the site requirement, manpower deputed by the contractor for carrying out the maintenance / repair job as part of the contract shall be skilled electricians having trade in ITI electrician with 5 yrs. Experience in electrical field & helpers should have qualification of at least SSC pass having Knowledge of electrical maintenance work and trained in maintenance of HM lighting towers & lighting fixtures and its connected accessories along with 30 Mtr HM tower & its lighting accessories along with connected power supply.

1.0.7 The contractor at site office should maintain the profile of the staff, while appointing the manpower the contractor should obtain Police verification certificate form the local Police station, while submitting the Bio-data the contractor should issue appointment letter along with attested certificate & Qualification along with copy of addhar card. Also, along with this Complain register, Attendance register, Site order Book, Material Book, Requisition Book, Job Card and other statuary register as ALC guide line is to be maintained and submitted for time to time verification from Engineer-in-charge.

1.1 Preventive maintenance

During the Preventive maintenance, the contractor's maintenance engineer should visit the area at least once in every months to take up the preventive maintenance of all equipment's covered in the contract such as testing and checking the various functions/performance of the equipment and reconfiguration if required to ensure optimum performance of the system, cleaning of HM Panels, cables, connectors etc,. During the visit, he will co-ordinate with the maintenance in charge DPA and discuss in details operational problem and advise accordingly. Detailed report for the checking/testing carried out and witnesses the by the DPA representative during each preventive maintenance visit, should be submitted to DPA Site-Engineer.

1.2 Breakdown maintenance

During any breakdown in any lighting system, the contractor shall attend unlimited emergency breakdown calls. There shall be no restriction on number of breakdown maintenance per month/year. It is the responsibility of the contractor to maintain the availability of HM lighting system.

Contractor's maintenance engineer is required to respond and report to DPA designated Engineer-in-charge within 2 hours from the time of fault reported. The allowable resolution time will be 06 hrs. From the time of fault reported including Saturdays, Sundays and closed holidays.

The defective components, accessories etc. The transportation of man and materials to the site shall be in the scope of contractor.

The engineer should carry the required test equipment and spares required for diagnosis the fault and make the system operation. After the breakdown maintenance of the system / equipment, the maintenance engineer of the contractor shall submit the detailed report on the repair carried out on the system/equipment's. The engineer shall give details of the parts repaired/replaced along with fault analysis for making the history sheets of faults/problems of each equipment. DPA would also like to know the reasons of failure and suggestion to avoid such problems in future.

1.3 DOCUMENTATION

a) All the Equipment's parameters should be recorded in daily logbooks. Detailed inventory records like Consumables, materials movement, material consumption; materials disposed etc. also should be maintained. In all documents, for each work, contractor should get signature from Engineer In-charge (Electrical) or his nominees.

b) Detailed inventory records like materials movement, material consumption, materials disposed etc. also should be maintained. In all documents, for each work, contractor should get signature from Engineer In-charge (Electrical) or his nominees.

- Following Register is to be strictly maintained by AMC Contractor during AMC period as the Contract Labour (Regulation & Abolition) Central Rules, 1971
- Muster Roll Register Form No:-16.
- Register of Wages i.e. Form No:-17.
- Register of overtime i.e. Form No: - 23.
- Register of advance pay i.e. Form No:-22.
- Register of accident, major accident & dangerous occurrence i.e. Form No:-29
- Register of Workman employed by Contractor i.e. Form No:-13.

A. Profile of staff personnel for posted staff during CAMC period.
B. Consumable register & Store Requisition.
C. Tools and Plants.

D. Entry Permit of Staff & Vehicle (Gate Pass).
E. Maintenance Register of High Mast Pole and its accessories
F. Earthing value register to be maintained every month as per EIC.
G. Duty Roaster 3 copies duly signed and approved by EIC.
H Power failure register

All the documents prepared by the contractor will be the property of DPA. The contractor will not share the information contained in the above said log books registers with any outside person without written permission of EIC.

The contractor will hand over the logs and registers to DPA at the time of completion of contract period.

4.0 Test and Measuring Equipments/Tools

The contractor will be responsible for arranging all tools /test and measuring equipment's that may be required for carrying out the maintenance job. The maintenance team should ensure that while visiting the sites, they should carry the required tools/test and measuring equipment along with the spares. The testing instruments used should be yearly tested by Lab and necessary certificate should be available.

5.0 Spares

Contractor shall provide all required all spare part all types cables required at site, HT & L. T joint kit, Lugs & gland, required length 3Cx1.5 sq.mm flexible copper cable , 3 /4 pole MCB/MCCB, 1 pole MCB, timer, contractor, indicator, Ammeter, voltmeter, selector switch, change over switch, fuse connectors, LED Light fittings, HM wire Rope, Motor, Double Drum Winch, Carriage, Cradle, Trailing cables , Male Female Sockets Gear Box , Lubricants & all HM accessories etc. and DPA would not provide any spare in this regard. Contractor shall stock the spares at Local office for minimizing downtime. Contractor shall co-ordinate with all the OEM'S involved for the system.

6.0 Transportation

It will be the responsibility of the contractor to arrange for the free transportation of the engineers / Electrician / helper as well as materials (test equipment's and spares) to the site within the stipulated time period to avoid penalty for downtime period during breakdown.

7.0 Co-ordinations with OEM'S:

The contractor will co-ordinate with OEM(s) system/equipment and its sub system and resolve maintenance/repair related issues.

8.0 Contract duration:

The duration of the services offered through this proposal will be for a period of five (05)years from the date of completion of the project for the supplied and installed system.

9.0 Compliance with Security Requirements:

It shall be responsibility of contractor to fully comply the following with Security provisions:

9.1 Entry/Access to the Premises is governed by rules & regulations formulated from time to time, which are binding by DPA and its contractors. All such rules & regulationsare to be complied.

9.2 Contractor is to ensure that all the personnel engaged by them abide by the Security and discipline rules prescribed from time to time by the Security Section of DPA.

9.3 Contractor is to comply with any directive, as may be prescribed by/given by DPA from time to time in respect of security matters.

9.4 Contractor shall provide Insurance cover to all its employee for any accidents in the work place as per the Indian Labour Laws.

Sd/-

Signature & Seal of Contractor

Executive Engineer Deendayal Port Authority

Bill of Quantity

Name of Work: Supply, installation, testing and commissioning of High Mast Lighting Tower at extended newly custom bounded area along with CAMC for the period of 5 Years.

Sr. No.	Description	Qty.	Unit	Rate	Amount
Part A: Electrical Item					
1	Supply at Site 11/0.433 KV outdoor type Compact Substation having dry type transformer of 630 KVA and as per Tech. Specification No. 1	02	No.		
2	Providing foundation as per CSS design & complete Installation, testing & Commissioning of 11/0.433 KV, 630 KVA Compact Substation as per Tech. Specification No. 2	02	No.		
3	Supply at site 3 core, 150 Sq. mm (U/E) HT armoured aluminum conductor XLPE cable of 11kV grade as per IS: 7098 (Part – II) 1988 & as per Technical Specification No. 3	5100	m		
4	Supply at site 4 Core, LT armoured aluminum conductor XLPE cable of 1.1kV grade of following type & size as per Technical Specification No. 4				
a	300 Sq.mm	3500	m		
b	50 Sq.mm	8500	m		
5	Laying single/double run 3 core 150sq.mm HT XLPE cable at various route as under as per Technical Specification No. 5.				
a	Through HDD by providing & laying cable in HDPE pipe (I.D. 6" & wall thickness 12mm) in Railway / road /RCC/culvert etc.	1500	m		
b	Providing & laying HDPE pipe (I.D. 6" & wall thickness 12mm) in hard & soft soil through excavation.	3000	m		
c	RCC Trench	600	m		
6	Laying of LT armored aluminum conductor XLPE cable of 1.1kV grade 4 core, 300 Sq.mm (single / double run) through following type as per Technical Specification No. 6				
a	Through HDD by providing & laying cable in HDPE (I.D. 6" & wall thickness 12mm) pipe in	1000	m		

	Railway / road /RCC/culvert etc.				
b	Providing & laying HDPE pipe (I.D. 6" & wall thickness 12mm) in hard & soft soil through excavation.	2500	m		
7	Laying of LT armored aluminum conductor XLPE cable of 1.1kV grade 4 core, 50 Sq.mm (single/ double run) through following type as per Technical Specification No. 7				
a	Through HDD by providing & laying cable in HDPE pipe (I.D. 6" & wall thickness 12mm) in Railway / road /RCC	1000	m		
b	Providing & laying HDPE pipe (I.D. 6" & wall thickness 12mm) in hard & soft soil through excavation.	7500	m		
8	Supply at site following type of LT panel as per Technical Specification No. 8				
a	Main Load Point Panel	2	No.		
b	Sub Load Point Panel	8	No.		
c	Feeder Pillar for High Mast	38	No.		
9	Installation, Testing & Commissioning of following type of LT panel as per Technical Specification No. 9				
a	Main Load Point Panel	2	No.		
b	Sub Load Point Panel	8	No.		
c	Feeder Pillar for High Mast	38	No.		
10	Supply & Fixing the HT indoor type end termination heat shrinkable kit suitable for cable size 3C x 150 sq.mm HT XLPE cable as per the Technical specification No:-10	10	No.		
11	Supply & Fixing the HT Heat Shrinkable Straight Joint kit suitable for cable size 3C x 150 sq.mm HT XLPE cable as per the Technical specification No:-11	10	No.		
12	Supply at site, installation, testing and commissioning of polygonal galvanized high mast tower of 30 m height with raising and lowering arrangement for lantern suitable for mounting 24 nos. LED luminaires of 470-500W symmetrically and complete with all relevant accessories and suitable civil foundation as per technical specification no. 12				
a	Supply of High Mast at site	38	No.		

b	Erection, testing and commissioning of High Mast	38	No.		
13	Supply at site 470-500 Watt LED Light fitting (Optical lens) for 38 HM towers as per Technical Specification No. 13	Comple te job	Lump sum		
14	Installation, testing and commissioning of 470-500 Watt LED Light fitting for 38 nos. HM towers as per Technical Specification No. 14	Comple te job	Lump sum		
15	Supply and Erection of protection guard (For High Mast , Main Load Point Panel & Sub Load Point panel)having the height of 1.5 m above ground level fabricated from main horizontal and vertical members of GI angle of size 75×75×10 mm with cross bracing of GI angle of size not less than 50×50×6 mm including necessary foundation work as per technical specification no. 15	38	No.		
16	Preparation of earthing system with chemical electrode & back fill compound as per Technical Specification No. 16				
a	GI 80mm diameter, 3m electrode	20	Nos.		
b	GI 50mm diameter, 3m electrode	40	Nos.		
17	Preparation of earthing system with copper chemical electrode & back fill compound for CSS earthing as per Technical Specification No. 17	4	Nos.		
18	Supply, Laying, connecting of continue Copper Strip of 50×6 mm size between earth station to neutral of Transformer as per Technical Specification No. 18	40	Mtr		
19	Supply, Laying, connecting of GI Strip of following size connecting earth station to the equipment as per Technical Specification No. 19				
a	25 x 6 mm	1125	m		
b	50 x 6 mm	500	m		
Total of Part A:					
<u>Part B</u>: <u>Civil Items</u>					
1	Providing Civil Foundation for High Mast as per the technical specification No. 12 (c)	38	No.		
2	Providing, laying and fixing in position design mix reinforced cement controlled concrete for	1000	No.		

	RCC Precast chamber of design mix M-30 grade, using cement content as per approved design mix, including placing of pre-cast chamber to site of laying including the cost of centering, shuttering, finishing , admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. (Rate is inclusive of cost of necessary reinforcement) (A) Pre-cast RCC M-30 chamber of inner size 900 X 750 X 1200 mm with wall thickness 150 mm and top cover of 100 mm thick with 10mm dia reinforcement at 150 mm c/c single jalli in both direction including providing necessary openings/ hole for passing cables. (As per drawing attached)				
	Total of Part B:				

<u>Part C</u>: **Comprehensive annual maintenance for the period five (05) year from the date of expiry of 01 (one) years free warrantee services**.

Sr. No.	Description	Qty.	Unit	Rate(In Rs. Per Month)	Amount (In Rs. Per Year)
1	First Year	12	Month		
2	Second Year	12	Month		
3	Third Year	12	Month		
4	Four Year	12	Month		
5	Fifth Year	12	Month		
Total of Part C:					
Total of Part (A+B+C)					

(In words Rupees_____ only)

(NOTE: The rates should be inclusive of all taxes, duties, fees, cess etc. and all incidental charges; but exclusive of GST).

<u>Sd/-</u>

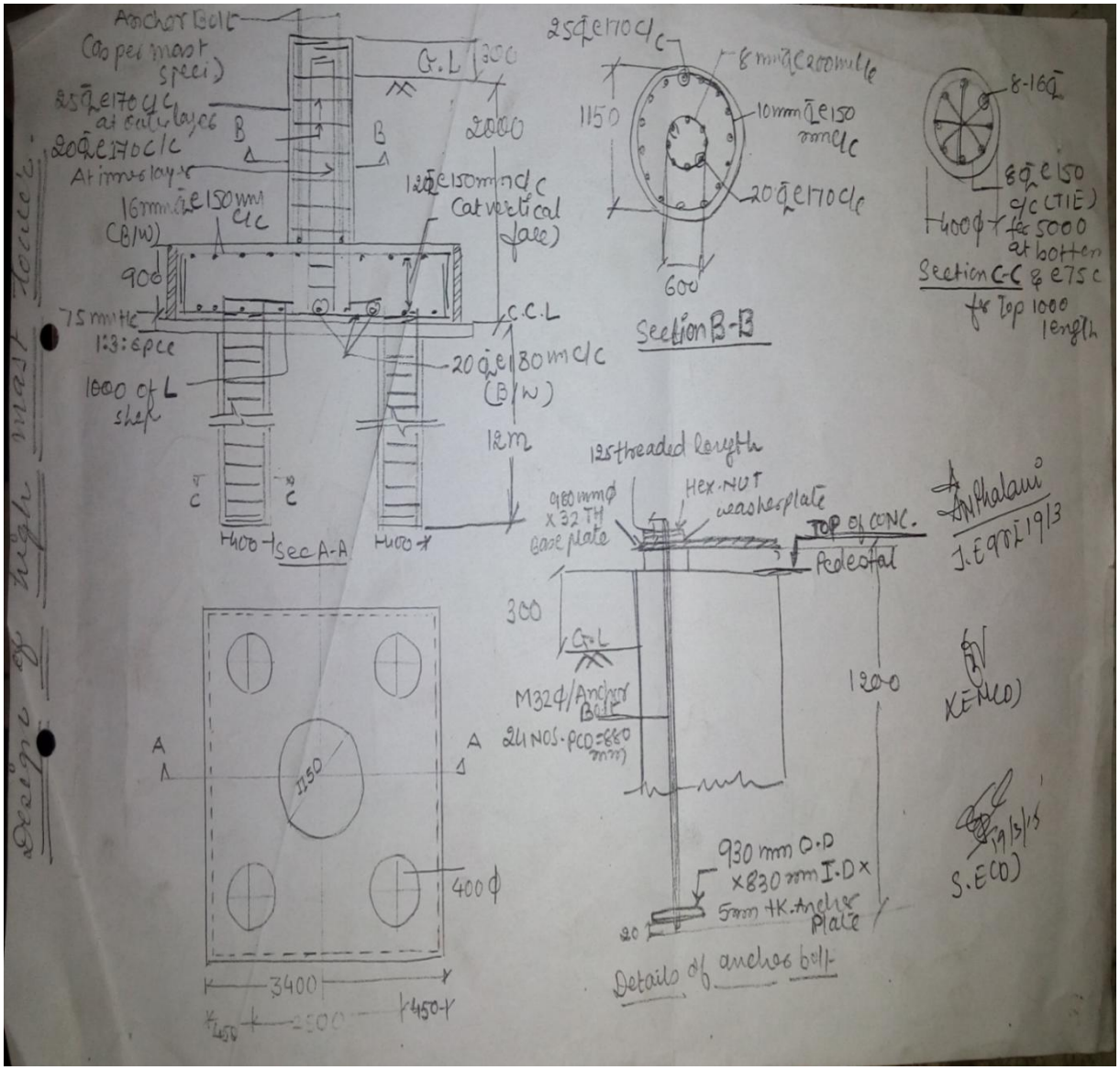
Signature & Seal of Contractor

Executive Engineer (E)
DeendayalPort Authority

Approved Make List of Electrical Items		
Sr. No.	**Description**	**Recommended Makes**
1	HV VCB	Siemens/ Crompton Greaves/ ABB/ Schneider
2	HV Gas Insulated Breaker	Siemens/ Schneider/ ABB
3	Power Transformer	Voltamp/ Crompton Greaves/ Bharat Bijlee/ BHEL/ Siemens/ ABB/ Schneider/ T&R
4	Distribution Transformer	EMCO/ Kirloskar/ Patson/ Voltamp/ ABB/ Schneider/ T&R
5	Resin Cast Transformer	Voltamp/ Kirloskar/ EMCO
6	Dry Cast Transformer	Voltamp/ Kirloskar/ EMCO
7	HT XLPE Cable	Polycab/ Torrent/ RPG Asian/ Gloster/ Unistar
8	LT XLPE Cable	Polycab/ Torrent/ RPG Asian/ Rallison/ Primecab/ Havells/ Unistar/ Avocab/ Allcab/ Adcab
9	LT ACB	Siemens/ L&T/ Schneider Electric/ C&S
10	Protection Relay	Areva/ L&T/ Siemens/ ABB/ C&S
11	LT Panel	CPRI Approved
12	Changeover Switch	Siemens/ L&T/ ABB/ C&S/ Schneider Electric/ Legrand/ Indoasian
13	SFU for Main LT Distribution Panel	Siemens/ L&T/ ABB/ C&S
14	SFU for Distribution Panel & Feeder Pillar	Siemens/ L&T/ ABB/ C&S/ Schneider Electric/ Legrand/ Indoasian/ Havells
15	MCCB for Main LT Distribution Panel	Siemens/ L&T/ ABB
16	MCCB for Distribution Panel & Feeder Pillar	Siemens/ L&T/ ABB/ C&S/ Schneider Electric/ Legrand/ Indoasian/ Havells
17	MCB/ELCB/RCCB/RCCBO for Main LT Distribution Panel	Siemens/ Hager/ L&T/ ABB
18	MCB for Distribution Panel & Feeder Pillar	Siemens/ L&T/ ABB/ C&S/ Schneider Electric/ Legrand/ Indoasian/ Havells/ Standard
19	Distribution Board	Standard/ Hensel/ Legrand/ Indoasian/ Havells
20	Multi-Function Digital Meter for Main LT Distribution Panel/ Digital kWh Meter	L&T/ Enercon/ Secure/ L&G/ Rishabh
21	Analog Volt/Ampere Meter for Distribution Panel & Feeder Pillar	Rishabh/ AE/ Enercon/ L&T
22	Selector Switch for Voltmeter/Ampere Meter	L&T/ Siemens/ C&S
23	Power Contactor & Overload Relay	L&T/ Siemens/ ABB
24	Quartz Time Clock Switch	L&T/ Indoasian/ Siemens
25	PVC Wire with Copper Conductor	RR Kabel/ KEI/ Polycab/ Milex/ Gujcab/ Standard/ Finolex/ Anchor

26	Flush type Switch, Socket, Holder, Ceiling Rose & Electronic Regulator	Anchor/ MK/ Northwest/ Vinay/ Panama/ Havells
27	Bells/ Call Bells	Anchor/ Legend/ MK/ Northwest
28	Modular Switch, Socket, Plate & Box	Anchor/ MK/ Northwest/ Legrand/ Havells/ Indoasian/ Siemens
29	PVC Conduit/ Oval Conduit & Casing Capping and Accessories	Precision/ Vulcan/ Finolex/ Garware/ Restoplast/ Swastik/ BPI
30	Lamp & Fluorescent Lamps	Philips/ Bajaj/ Wipro/ Crompton/ Osram/ Surya Roshni/ GE
31	HPMV & Metal Halide Lamps	Philips/ Bajaj/ Wipro/ Crompton/ Osram/ Surya Roshni/ GE
32	Ignitor for HPSV & Metal Halide Lamps	Philips/ Bajaj/ Wipro/ Crompton/ Osram/ Surya Roshni/ GE
33	Luminaries	Philips/ Bajaj/ Wipro/ Crompton/ Osram/ Surya Roshni/ GE
33	LED Luminaries	Philips/ Bajaj/ Wipro/ Crompton/ Surya/ Pyrotech/Neri Syska/ Nessa having Surge Protection ≥ 10kV for Fittings & Internal Surge Protection for Driver of ≥ 4kV, LED Chip of only OSRAM/ CREE/ Philips Lumileds/ Citizen/ Nicia, with LM79 & LM80 Certification
34	Ceiling Fan	Bajaj/ Orient/ Usha/ Crompton/ Almonard/ GEC
35	Wall mounting Fan	Bajaj/ Orient/ Usha/ Crompton/ Almonard/ GEC
36	Exhaust Fan	Bajaj/ Orient/ Usha/ Crompton/ Almonard/ GEC
37	Heavy duty Industrial Wall mounting Fan	Bajaj/ Orient/ Usha/ Crompton/ Almonard/ GEC
38	Water Cooler	Voltas/ Usha/ Blue Star
39	Air Conditioner	Voltas/ Carrier/ Blue Star/ Usha/ Hitachi/ LG/ Samsung/ Onida
40	Refrigerator	Voltas/ Carrier/ Blue Star/ Usha/ Hitachi/ LG/ Samsung/ Whirlpool
41	Voltage Stabilizer	Veeline/ Capri
42	Inverter	Sukam/ Microtek
43	Engine for D.G. Set	Cummins/ Greaves/ Kirloskar/ Caterpillar/ Ashok Leyland/ Volvo
44	Alternator for D.G. Set	Stamford/ Crompton Greaves/ Jyoti/ Kirloskar Electric
45	Electric Motor	Alstom/ Crompton Greaves/ Siemens/ Kirloskar/ ABB
46	Water Pump	Swastik/ KSB
47	Water Geyser	Bajaj/ Usha/ Crompton Greaves/ Spherehot/ Racold
48	Lug & Cable Glands	Dowells/ Jainson/ Braco

(1) HIGH MAST FOUNDATION DRAWING

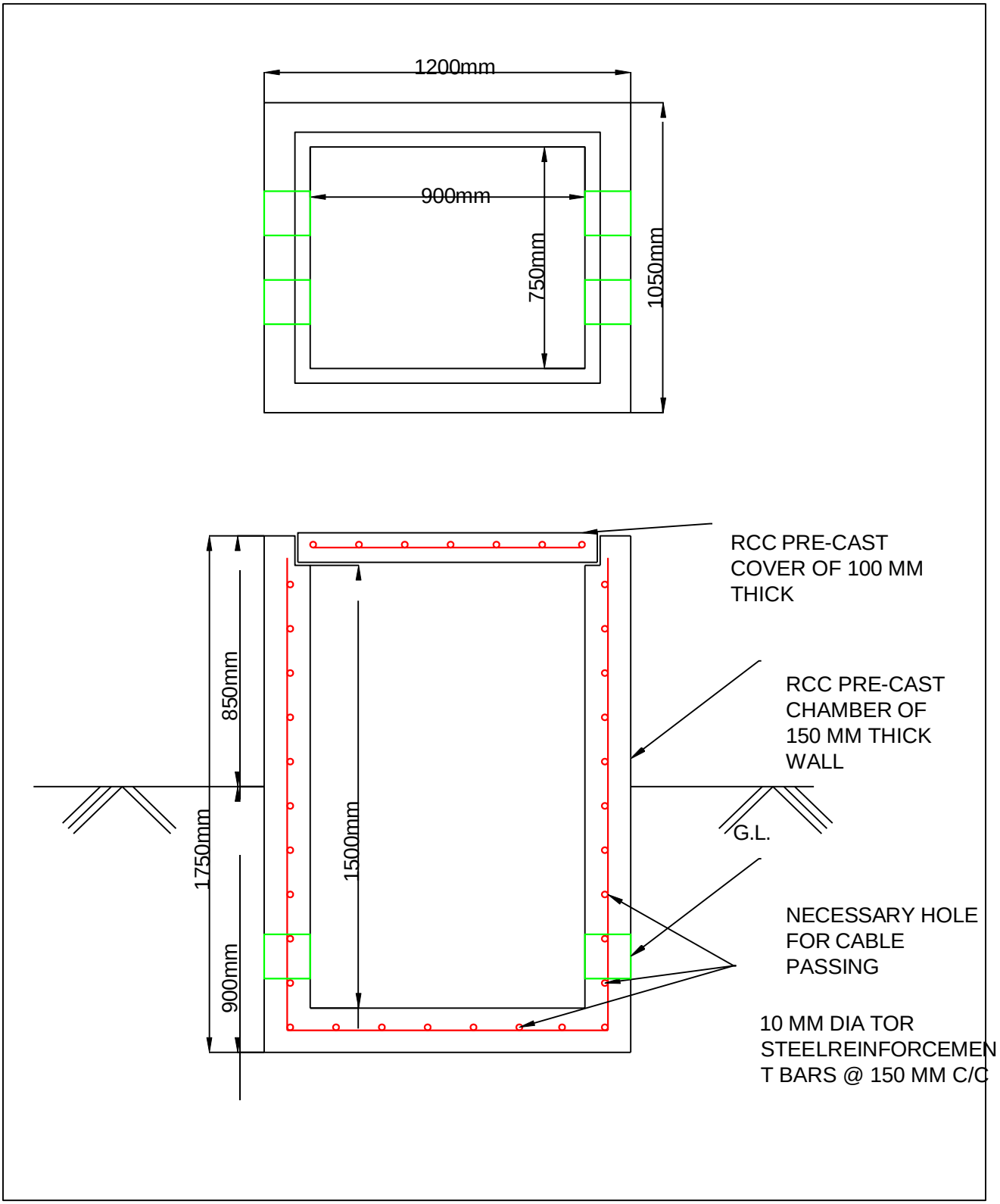


Sd/-

Signature & Seal of Contractor

Executive Engineer (E)
Deendayal Port Authority

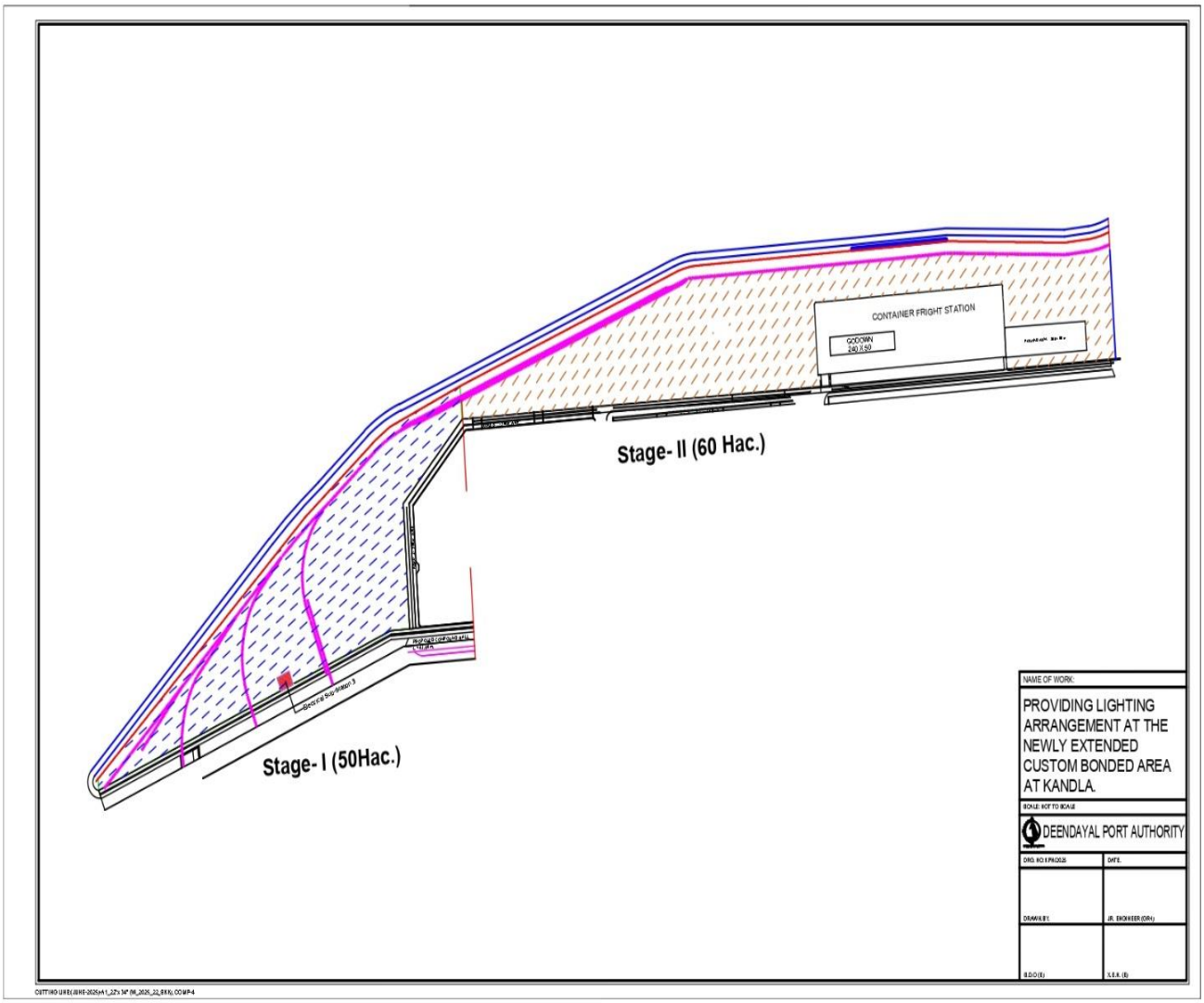
(2) PRE-CAST RCC CHAMBER DRAWING



Signature & Seal
of Contractor

-Sd-
Executive Engineer (E)
Deendayal Port Authority

(3) HIGH MAST AREA LOCATION AT STAGE-I (50 HECTOR) DRAWING



Signature & Seal
of Contractor

Sd/-
Executive Engineer (E)
Deendayal Port Authority