



**KOLKATA PORT TRUST
HALDIA DOCK COMPLEX**

AN ISO-9001: 2015 ORGANISATION
Office of Plant & Equipment Division
Operational Administrative Building (1st Floor),
P.O.Haldia , Dist. Purba Medinipur,
West Bengal, Pin: 721 604



No. SDM (P&E)/674/1169

Dated: 09.01.2019

.....
.....
.....

Sub: Enquiry for obtaining **budgetary quotation** for the work of “Supply, Installation, Testing and Commissioning of 09nos. 20 M high Hot Dip Galvanized High Mast Tower with LED fitting at Common user siding-I of HDC, KoPT”.

Haldia Dock Complex (HDC), Kolkata Port Trust (KoPT) intends to engage reputed firms to undertake work of “Supply, Installation, Testing and Commissioning of 09nos. 20 M high Hot Dip Galvanized High Mast Tower with LED fitting at Common user siding -I of HDC, KoPT”.

A technical estimate, in this regard, is enclosed herewith for ready reference, Please.

Budgetary offers, along with comments / suggestions (if felt necessary), are invited from experienced / reputed firms, for the subject work, with in Jan.23, 2019.

(R.N.Roy)
Sr. Dy. Manager (P&E)

Supply, Installation, Testing and Commissioning of 09nos. 20 M high Hot Dip Galvanized High Mast Tower with LED fitting at Common user siding-I of HDC, KoPT

SL.NO	DESCRIPTION	UNIT	QTY	RATE PER UNIT (IN Rs.)	AMOUNT (in RS.)	REMARKS
				Excluding GST		
PART A- Illumination						
1	<u>20 Mtrs.High Mast:</u>					
	Design, Supply, Installation, Testing and Commissioning of 20 Mtrs. high High mast type lighting tower complete with all relevant accessories as per Technical Specification.					
(i)	Supply	No.	9			
(ii)	Installation, Testing and Commissioning	No.	9			
2	<u>Load Point Panel:</u>					
	Design, Supply, Installation, Testing and Commissioning of Load Point Panel for Outdoor type, dust, vermin weather proof fabricated from SS316 grade sheet of 2mm thick, suitable angled and flat etc. and as per Technical Specification.					
(i)	Supply	No.	3			
(ii)	Installation, Testing and Commissioning	No.	3			
3	<u>Feedar Pillar:</u>					
	Design, Supply, Installation, Testing and Commissioning of Feeder Pillar for 20 Mtr. High Masts for Outdoor type, dust, vermin weather proof fabricated from SS316 grade sheet of 2mm thick, suitable angled and flat etc. and as per Technical Specification.					
(i)	Supply	No.	9			
(ii)	Foundation,Installation, Testing, and Commissioning	No.	9			
4	<u>Luminaries & Lamps:</u>					
	Supply, Installation, testing and commissioning of following LED luminaries with complete accessories as per Technical Specification.					
(i)	Supply of 350 W LED Luminaire	No.	81			
(ii)	Installation, Testing and Commissioning 350 W LED Luminaire	No.	81			
5	<u>LT Cable:</u> Supply of LT Cable, 1.1KV grade, XLPE U.G. Alu. Cable as per Technical Specification.					
(i)	Supply of 3.5 C X 150 Sq.mm.	M	1700			
(ii)	Supply of 3.5 C X 25 Sq.mm.	M	1100			

SL.NO	DESCRIPTION	UNIT	QTY	RATE PER UNIT (IN Rs.)	AMOUNT (in RS.)	REMARKS
				Excluding GST		
6	Laying, testing and commissioning of LT Cables including termination of cable at Outdoor feeder pillar,load point panel and Sub-station. Job includes supply and installation of Hume and GI pipe.					
(i)	By existing RCC trench/Hume pipe/GI Pipe.	Mtrs.	10			
(ii)	By excavating trench.	Mtrs.	2200			
(iii)	By removal of paver blocks, excavating trench and refixing of the same after laying.	Mtrs.	250			
(iv)	By 150mm dia. Hume pipe through excavating.	Mtrs.	160			
(v)	By 150NB GI Pipe through excavating(open cut)	Mtrs.	60			
(vi)	By 150NB GI Pipe through Boring (by HDD method)	Mtrs.	120			
7	Aviation Light:					
	Supply, Installation, Testing and Commissioning of Twin Dome LED type Aviation Obstruction Luminary.					
(i)	Supply	Sets	9			
(ii)	Installation, Testing and Commissioning	Sets	9			
8	Earthing System:					
	Supply Installation, termination, interconnection between earthing station and High Mast, Load panel, Feeder pillar as per Technical Specification.	No	24			
9	Supply, laying and termination of size of 50 X6 MM GI strip as per Technical Specification					
(i)	Supply	Mtr.	100			
(ii)	Laying, termination,commissioning and interconnection between earthing station.	Mtr.	100			
10	Protection Guard:					
	Design, supply, Fabrication and erection of protection guard from used rail having the height of 1.5 Mtr. above the Ground Level .Used rail will have to collected from HDC's store /Yard,Job includes transportation, cutting, erection including necessary foundation work as per Technical Specification.	LS	9			
Total Part A =					0.00	

SL.NO	DESCRIPTION	UNIT	QTY	RATE PER UNIT (IN Rs.)	AMOUNT (in RS.)	REMARKS
				Excluding GST		
PART B- Civil Foundation						
1	<u>20 Mtr. High Mast:</u> Design and construction of RCC Foundation for 20Mtrs. Long High Mast considering soil bearing capacity at site as 5Ton/Sq.Mtrs. At 2.5Mtrs. Depth from existing ground level, including excavation of earth(after strengthening of soil condition by removing slushy materials and replacing by silver sand and compacting there after to make the base suitable for High Mast foundation), Double Layer brick soiling,PCC,Supply of foundation accessories consisitng required numbers of foundation bolts ,Nuts, Washers,Anchor Plates,Template etc. in complete and PVC pipe of suitable size for cable entry; ,supply of foundation accessories like cement,reinforcement steel bars,bricks,sand,stone chips,shuttering materials labour required for RCC foundation,refilling of earth up to the existing ground level after curing.The design foundation of High Mast shall be based on IS:875 &IS:456.	Nos.	4			
2	<u>20 Mtr. High Mast:</u> Design and construction of RCC Foundation for 20Mtrs. Long High Mast considering soil bearing capacity at site as 5Ton/Sq.Mtrs. At 2.5Mtrs. Depth from existing ground level, including excavation of earth after removing Paver Block & replacing Brown sand and compacting there after to make the base suitable for High Mast foundation), Double Layer brick soiling,PCC,Supply of foundation accessories consisitng required numbers of foundation bolts ,Nuts, Washers,Anchor Plates,Template etc. in complete and PVC pipe of suitable size for cable entry; ,supply of foundation accessories like cement,reinforcement steel bars,bricks,sand,stone chips,shuttering materials labour required for RCC foundation,refilling of earth up to the existing ground level after curing. The Job also includes supply of additional Brown sand required for mending good exisitng paver Block. The design foundation of High Mast shall be based on IS:875 &IS:456.	Nos.	5			
3	<u>Load Point Panel:</u> Construction of RCC foundation of Load point Panel including earth excavation,supply of foundation accessories like cement,reinforcement steel bars,bricks,sand,stone chips,shuttering materials labour required for RCC foundation,refilling of earth up to the existing ground level after curing.	Nos.	3			
Total Part B =					-	
Total (Part A + Part B) =					-	
Estimated Value=						With out GST
Estimated Value=					-	With 18% GST

TECHNICAL SPECIFICATION

1

GENERAL CONDITIONS

- a. The works will be executed to comply with the General Specifications for Electrical works and conforming to the Indian Electricity Act & rules, BIS & direction of Engineer-in-charge.
- b. The items of work shall be executed as per detailed technical specifications and scheme. In case of contradiction between schedule of work with its Additional Specification and the General Specification, the former shall prevail.
- c. The work will be executed as per general arrangement drawing and detailed fabrication drawings duly approved by the Engineer-in-charge. The various items of equipment will be ordered only after the drawings are approved and quantities in detail of various items are ascertained as per actual requirements. Therefore the actual quantities / measurement may vary from the stipulated quantities, which are only estimate.
- d. The contractor/agency will engage suitable qualified/experienced/ licensed engineering supervisor for the work and suitable skilled personnel with required license for doing the erection work. Required special tools to be operated in the execution of the job.
- e. The work will be performed as per the day to day instruction and approval of the engineer-in-charge. All materials/ equipment will be used after taking approval of the Engineer-in-charge.
- f. Equipment will be duly inspected in the manufacturer's works / premises **by TPI** before dispatch to the site.
- g. The rates are to be firm and inclusive of all taxes, levies, insurance, freight, octroi, Work Contract Tax, Service Tax etc. Service tax will be reimbursed by the department, in full, on presentation of receipted original deposit slip, against the work. Nothing extra will be paid.
- h. The work will be executed as per the programme of completion of the project. The delivery & erection schedule of various materials/ equipment will be as per approval of Engineer-in-charge.
- i. This contract holds the contractor responsible for the entire job as per relevant specifications. If any item is left out within the schedule of work but if it is considered essential for the completion of the job, the contractor has to carry out the items as extra substituted item.
- j. The contractor shall have to make arrangements, at his own risk and cost, for transportation of materials from the point of issue of stores to site of work, if any.
- k. The contractor shall ensure that the staff employed by him for execution of the electrical work, possess the valid electrical license issued by competent authority. Consequences arising due to the default of the contractor in not complying with the above condition shall be the entire responsibility of the contractor.
- l. All concealed work and earthing shall be done in the presence of the Engineer-in-charge or his authorized representative.
- m. The schematic diagram/dimensional drawings of the various electrical cubical panels shall be got approved from the Engineer-in-charge before fabrication and shall comply with specifications and Indian Electricity Rules. The panels shall conform to IS: 8623/1993.
- n. All panels/DB shall be suitable for 45°C ambient temperature.

- o. The MCB shall be of the same make as that of MCB DB's. Contractor shall obtain approval of the Engineer-in-charge before procurement of MCB DB's. All DB's shall be double door type conforming to minimum IP-43 degree of protection.
- p. Miniature Circuit Breaker shall comply with IS -8828-1996 / IEC 898. Miniature Circuit Breakers shall be quick make and break type for 230 / 415 V A.C., 50Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10KA at 415V A.C. The MCB shall be DIN mounted. The MCB shall be current limiting type (Class - 3).
- q. MCB shall be as per their tripping characteristics curves defined by the manufacturer. The MCB shall have the minimum power loss (watts) per pole defined as per the IS / IEC and the manufacturer shall publish the values.
- r. The MCB housing shall be heat resistant and having high impact strength. The terminal shall be protected against finger contact to IP20 degree of protection.
- s. All model of modular accessories required for the work shall be got approved from the Engineer-in-charge among the approved makes. The base plate shall be preferably in sheet steel or otherwise in unbreakable polycarbonate. The cover plates shall be screw less type in shade approved by the Engineer-in-charge. The GI box shall be of the same make as the modular accessories.
- t. Contractor shall have to check the site order Book for any instructions of Engineer-in-charge or his authorized representative and sign the site order book. He shall be bound to ensure compliance with the instructions recorded there in.
- u. All the MCCB's shall have microprocessor based trip unit for reliable protection and accurate measurement. The rated Service breaking capacity (kArms) shall be 100% of Ultimate breaking capacity (kArms). All MCCB's shall be current limiting type with features as per relevant IS codes and specification. All MCCB's shall be rated for minimum operating voltage of 690 V and minimum insulation voltage of 750 V. There has to be total discrimination between the incoming and outgoing MCCB's and MCB's, as required, at the MDB's and DB's level.
- v. MCCB's shall be used with rotary handle and terminal spreaders and all terminals shall be shrouded to avoid direct contact.
- w. All measuring CT's, unless otherwise specified shall be cast resin CT's with class 0.5 accuracy. All digital measuring meter shall be with class 0.5 accuracy unless specified otherwise.
- x. Mechanical Castle key interlock shall be provided among the incomer MCCB's, wherever, as applicable, two different incomer sources are provided in the panel as per the directions of the Engineer in charge. The same is deemed included in the scope of work.
- y. All measuring and indicating instruments shall be protected through MCB's of 0.5 Amps rating.
- z. Conduit layout as per switching arrangement shall be prepared by contractor and got approved from the Engineer-in-Charge before slab casting. At all expansion joints in the building suitable arrangement shall be ensured during conduiting.
- aa. Ratings, sizes and quantities shall be checked and considered for satisfactory operation of electrical system complete in all respect.
- bb. Conduits, Switchboards, Sockets to be provided on walls shall be open type unless specifically approved by Engineer-In-Charge.
- cc. Conduits on ceiling in existing system may be provided on surface and in new construction shall be open type.

- dd. All measuring and indicating instruments shall be protected through MCB's and isolating switches.
- ee. Cables, Load Point Panels and High Masts will be inspected in the respective manufacturer works before dispatch and routine test as applicable as per BIS standards will be provided for each equipment by **Third Party Inspection (TPI)** Agency. **The TPI is appointed by the port and cost of TPI is borne by the Port.**
- ff. The firm shall deploy only licensed personnel as required under IE Rules, for execution of the electrical works. The firm shall be liable to submit the list of such personnel along with the attested copy of the licenses at the time of execution.
- gg. It is important that every equipment is tested fully before dispatch.
- hh. All materials for the work shall be supplied from approved list of manufacturer and any item, not covered in approved list, shall be supplied after getting approval from Engineer- in-charge or his authorized representative.
- ii. Any materials brought for work which is not matching with specification will be rejected and the rejected materials shall be removed from site on the same day.
- jj. All fees payable to concerned authorities and other local bodies if any shall be paid by the contractors.
- kk. Any part or whole of the system which requires approval of the Central Electricity Authority, or any other statutory body, should be arranged by the Contractor at his cost. It is the responsibility of the Contractor to submit the system drawings with all details to the Electrical Inspectorate and obtain their approval.
- ll. Contractor shall obtain permit/approval from concerned authorities before commencement of work. All documents/drawings required for such permit/approval shall be prepared by the contractor.
- mm. Contractor shall have a valid "A" class contract licence with HT installation issued by appropriate authorities.
- nn. Test certificates both type test and routine tests wherever required shall be furnished along with supply for all Electrical/Mechanical items.
- oo. No Cable Joints shall be permitted.
- pp. Inspection / acceptance, in no way shall absolve the contractor from supplying material as per standards / codes and warranty or other obligations under the contract.
- qq. The agency shall have the following testing/measuring equipment in addition to standard tools.
 - 1. Insulation Tester, 500V.
 - 2. Earth tester with kit, 0, 10,100 ohms with selector switch
 - 3. Tong tester with (1) Ammeter 0-800 A with different ranges and selector switch.
 - 4. Voltmeter 0/300V/600V with different ranges and selector switches.
 - 5. Phase sequence tester
 - 6. Multimeter / Avometer: - Digital to measure 0/10/100 mV, mA, ohm, Kilo ohm resistance.
 - 7. Frequency meter 45 to 55 Hz.
 - 8. Portable PF meter (0.5 lag-unity-0.5 lead).
 - 9. Lux meter to measure upto 2000 lux with selector switches.
 - 10. Micrometer(digital)
 - 11. Vernier Caliper(digital)

- rr. All electrical works shall be tested by the contractor in the presence **of TPI** and to the entire satisfaction as per IE Rules.
- ss. Data to be furnished by the bidder after award of order
 - I. The contractor shall submit detail shop/fabrication/layout drawings for cables, trench, High Mast, Feeder Pillar Boxes, Load Point Panels, Luminaire etc.
 - II. **Five** Set of copies of installation, operation and maintenance manuals, descriptive bulletins etc, shall be furnished prior to / at the time of despatch of all materials. Manuals shall include the following aspects:
 - a. Outline dimension drawing showing relevant cross sectional views, earthing details and constructional features including foundation drawing.
 - b. Rated voltage, current, duty cycle and all other technical information which may be necessary for correct operation of the switchgear.
 - c. Storage details for prolonged duration.
 - d. Unpacking.
 - e. Handling at site.
 - f. Erection
 - g. Pre-commissioning test.
 - h. Operating procedure.
 - i. Maintenance procedures.
 - j. Precaution to be taken during operation and maintenance work.
 - III. Test Certificates
 - a. **The Manufacturer's type test certificate on relevant equipment of similar rating be submitted.**
 - IV. On completion of work the contractor shall submit all drawings, manuals and test certificates, etc. for all equipment / materials ordered and as specified by the Engineer-in-Charge.

2 SCOPE OF WORK

"Design, Supply, Installation, Testing and Commissioning of 09 nos. 20 M high Hot Dip Galvanized High Mast type Lighting Tower with LED Luminaries at CUS-I Sidding of HDC, KoPT".

- (a) The illumination in the dock working area should be maintained minimum 25 Lux and passage for dock worker and other than working area 10Lux as per Dock safety regulation 1990.
- The illumination level shall be designed by maintaining minimum 25Lux on the semi circular periphery of each 20 Mtrs. High Mast at a radius of 45Mtrs.
- To provide 02 Nos. High Masts at a span of 90 Mtrs. and install LED luminaries at the rating of 350 Watt [Asymmetrical installation of fittings] and above to achieve above specified lux level.
- The location of 20 Mtrs. High Masts shown in the drawing is tentative; however, the High Mast shall be located with the span mentioned above.
- If the illumination level of 25 Lux is not achieved at a radius of 45 Mtrs. of each High Mast, the contractor would be required to provide additional fittings to meet above requirements. However, cost toward additional fittings will have to be borne by the

contractor and contractor shall pay energy charges for a period of 10 years for the additional fitting to HDC.

- Bidder to submit design drawing for evaluation of price bid.

(b) Electrical Works (Supply, Delivery, Installation, Testing & Commissioning)

- Laying of cables between Load Point to Load Point for interconnection. Cable **Joints not permitted**.
- Laying of cables between load point to Feeder pillar Box (located near the High Mast towers). Cable **Joints not permitted**.
- Laying of cables between existing Feeder pillar Boxes.
- Supply, Erection, Testing and commissioning of 09 Nos. High Mast type Lighting Towers with 350 Watt LED type Luminaire.
- Fabrication & erection of Protection Guard around High Mast and Load Point Panels by using second hand rail (to be supplied by HDC).
- Earthing of all Electrical Installations and Electrical Equipment.
- Ambient temp should be considered as 50° C for design purpose.

(c) Civil Works

- Design & Construction of **RCC** Foundation for placing high mast type lighting tower & load point Panels and work required for commissioning of Electrical Facilities.
- Carrying out soil bearing capacity tests and furnishing the report will be on Contractor's account.

3 L.T. CABLES

3.1 Scope

Supply, laying, inspection, testing, commissioning and making terminations of 1.1 kV grade XLPE insulated power cables.

3.2 Codes & Standards

The design, construction, manufacture and performance of cables shall comply with all currently applicable statutes, regulations and safety codes of the locality where cables shall be installed. Nothing in this specification shall be construed to relieve the successful BIDDER of his responsibility.

All the cables shall conform to the latest applicable IS/IEC standards.

3.3 Power Cable

Power cables should be multicore earthed 11 kV grade aluminium stranded conductor colour coded, extruded XLPE insulated, extruded semi-conducting screened over each core and insulation, extruded inner sheathed, common extruded inner sheathed for multi core cable, galvanised steel strip armoured and overall extruded black sheath conforming to IS-7098 Part I & Part II. Armouring of multicore cable shall be of single layer, galvanised steel round wire or flat strip. Wire armour should be used for cable dia. over inner sheath upto 13 mm and strip armour to be used for higher dia. The Cables shall be suitably designed for variation in power supply as follows:

The voltage variation $\pm 10\%$

Freq. variation $\pm 5\%$

Following cable sizes shall be supplied by the bidder:

- i.) 3.5Core, 150Sqmm LT Cable, 1.1KV grade, XLPE U.G. Alu. Cable, PVC inner sheathed and PVC ST2 type outer sheathed, armoured, FR cables.
- ii.) 3.5Core, 25Sqmm LT Cable, 1.1KV grade, XLPE U.G. Alu. Cable, PVC inner sheathed and PVC ST2 type outer sheathed, armoured, FR cables.

3.4 **Quality of Cables**

Each cable length shall have relevant ISI certification mark as stipulated by Bureau of Indian Standards.

3.5 **Laying of Cables.**

For laying cables along building steel structures and technological structures the cable shall be taken by clamping with **Aluminium** saddles screwed to the GI flats welded to the structure. **The** flats are of **hot** dip galvanised after fabrication.

For laying cables along concrete walls, ceilings etc. the cables shall be taken by clamping with **Aluminium** saddles screwed to the **hot dip GI** flat welded on to the inserts. Where inserts are not available the saddles shall be directly fixed in the walls using metallic anchor fasteners and **GI** flat spacers of minimum 6 mm thick.

The **Aluminium** saddles shall be placed at an interval of not less than 500 mm both for horizontal and vertical runs. However, at the bends it shall be placed within 300 mm and where terminating to the equipment/junction box the cable shall be clamped immediately before such termination.

Cable Net Work shall include Power Cables, which shall be laid in buried trenches/ cable trays / through G.I. Pipes & Hume Pipes, rising main etc. whichever is applicable.

Cable routing shall be checked in the field to avoid interference with structures, heat sources, drains, piping etc. as far as possible and minor adjustments shall be done to suit the field conditions, wherever deemed necessary without any extra cost.

The HT cables while laying will have to be separated from existing HT, LT, Telecommunication, OFC Cables by adequate spacing or running through independent pipes, trenches or cable trays, as applicable.

All cable routes shall be carefully measured and cables cut to the required lengths leaving sufficient lengths for the final connections of the cables to the terminal of the equipments.

The various cable lengths cut-off from the cable reels shall be carefully selected to prevent undue wastage of cables. The quantity indicated in the Bill of Quantity is only approximate. The Contractor shall ascertain the exact requirement of cable for a particular feeder by measuring at site and avoiding interference with structure, foundation, pipelines or any other works as far as possible. Before starting Cable Laying, Cable Drum Schedule shall be prepared by contractor and get that approved by Engineer or his authorized representative.

Cable as far as possible shall be laid in complete, uncut lengths from one termination to other. Cable shall be neatly arranged in the trenches/ trays/ pipes in such a manner so that crisscrossing is avoided and final take- off to the equipment/switch gears is facilitated.

Arrangement of cables within the trenches/ trays/ pipes shall be the responsibility of the contractor.

Removal of concrete covers for purposes of cable laying and reinstalling them in their proper positions after the cables are laid shall be done by the contractor at no extra cost. Cable shall be handled carefully during installation to prevent mechanical injury to the cables. During laying of cables, Cable Drum Lifting Jacks, sufficient numbers of

Cable Rollers and other materials etc. as necessary must be used to avoid any mechanical injury to the cables. Directly buried cable shall be laid underground in Cable Trenches duly excavated by the contractor as shown in the enclosed Drawing No.: SK-334.

The width of the trench shall vary depending upon the number of cables and diameter of each cable. Width of the Cable Trench should be such that all cables should be correctly spaced and arranged. The cables shall be laid in trenches as shown in the enclosed sketch. Before cables are placed, the bottom of the trench shall be leveled and filled with a layer of silver sand as shown in the Drawing No.: SK- 334. This sand shall be leveled and the cables shall be laid over it. Bricks are to be placed at both sides of the cable. Then the cable inside the brick walls to be covered with sand up to the height of walls and sand shall be pressed lightly. A protective covering of Bricks shall be placed on top of protective Bricks placed at both sides of Cable. The remainder of the trench shall then be back filled with soil rammed and leveled. After laying of the cables in the trench and before placement of protective covering by brick, every cable shall be given an insulation test in presence of site engineer/ authorized representative of Engineer. Also after back filling the trench with soil, rammed and leveled, insulation test of the cable shall be carried out in presence of Site Engineer/Authorized representative of Engineer.

All wall openings/Pipe Sleeves shall be effectively sealed after installation of cables to avoid seepage of water inside buildings/lined trench. At road/drain/pavements crossing, suitable sizes of G.I. Pipes are to be used. After the cables are installed and all testing is complete, the conduit/pipe sleeve ends shall be plugged with a suitable weatherproof plastic compound/ PUTTI, for sealing purpose. The cost of the same shall be deemed to have been included in the installation of cable laying through pipe sleeves/conduits and no separate payment shall be made. When cables pass through foundation walls, or other underground structures, if necessary, ducts or opening shall have to be provided by the contractor.

However, shall it become necessary to cut holes in the existing foundations or structures, the contractor shall determine their locations and obtain approval from Engineer or his authorized representative before cutting is done. Cutting, if necessary and mending good of any cut portion should be done by contractor without any extra cost. At Road Crossing and other places where cables enter pipe sleeves, adequate bed of sand shall be given so that the cables do not stack and get damaged by pipe ends. Drum number of each cable from which it is taken shall be recorded against the cable number in the cable schedule. All G.I. Pipes shall be laid as per site requirements. The open ends of the pipes shall be suitably plugged after they are laid in final position. Laying of the cable will be as per the enclosed Drawing No. SK- 334. The contractor will have to submit the detailed cable route diagram, with detailing of the Hume Pipes & G.I. Pipes used, position of the straight through cable joints etc. for checking at our end and subsequent approval of the same. As built drawing (in triplicate) of the above cable route will have to be submitted after completion of the above work.

MEASUREMENT: Cable length should be measured jointly prior to giving clearance for earth back filling etc. Distance between Socket of one end and Socket of other end of the laid cable to be considered for payment against both supply & laying of cable.

3.5.1

Laying of Cables in Exposed/Embedded GI Pipes/Hume pipe

GI Pipes /Hume pipe for drawing cables in plant buildings shall be of **Heavy Duty**, galvanised, electric resistance welded, screwed type conforming to IS: 1239 (Part-I). GI Pipe/Hume pipe of the following sizes shall be used:

- a) 150 mm nominal bore GI pipe
- b) 150 mm dia. Heavy duty NP-4 Hume pipe.

For installation of cables in GI Pipe /Hume pipe. Complete system shall be installed first without cables but having suitable pull wires laid in the pipes to facilitate cable pulling.

Insulated type end bushings shall be used where conductors enter or leave GI pipe.

Ends of GI pipe shall be cut square and the threads out in the field shall have the same effective length and the same dimensions and taper as specified for factory out threads.

Ends of pipe shall be reamed to remove burrs and sharp edge after threads are cut.

Exposed GI pipes shall run parallel or perpendicular to column lines or building lines so as to match with the architectural arrangement of the building. Concealed GI pipes shall run in direct lines with minimum bends.

Laying of Reinforced Concrete Pipe and Galvanized Mild Steel Tubes should be done wherever necessary, such as at Road Crossing, Railway Crossing, Drains, Culverts or any similar concrete structure etc. The scope includes cutting of road, Railway Crossing, Excavating of Trenches, etc. including mending good work. The depth of laying of the pipes should have to be matched with the underground cable trench, as far as possible and practicable. Making jointing between collars and pipes, with cement mortar (1 cement: 2 medium sand) and cutting the Reinforced Concrete Pipe to the required length, if necessary, to be done by the contractor at their own cost and arrangement. Cutting of Galvanized Pipe to required length and threading, bending, jointing by Socket as required, supply and fixing of support clamps/ brackets should be under the scope of contractor. Re-filling of the trench after laying the reinforced concrete pipes and galvanized mild steel tubes are also to be done by the contractor.

Rates are to be quoted accordingly.

3.5.2

Depth of laying

Sl. No.	Cable	Laying Type	Depth of Laying
1.	LT Cable	Open cut excavation with brick protection	750mm
		Boring through GI pipe	2000mm
		Open cut excavation through Hume / GI pipe.	1000mm
		Through existing RCC trench / Hume pipe / GI Pipe.	As per available depth.

Note: Road level to be considered as reference level.

3.6

Bricks

Crushing strength, efflorescence shall conform to class designation 10 (as per IS 1077, 1986) and as per the specification, given below:

i) The brick shall have clear ringing sound.

ii) The average size of the bricks shall be in the range of 250 mm (± 4 mm) x 125 mm (± 2 mm) x 75 mm (± 2 mm).

3.7

Tray Specification

Pre-fabricated perforated type trays made of FRP shall be used for laying cables. The trays shall have vertical edge of height not less than 50 mm on both sides. The control/power cable shall be clamped by means of suitable PVC straps both for horizontal to vertical direction and vice-versa and further these straps shall be clamped with Aluminium clamp with stainless steel bolts for every one meter.

Insert plates of suitable sizes shall be fixed in trench / wall for fixing of cable trays, at an interval of 1000 mm apart in horizontal run and 500 mm apart in vertical run and also at each bend /turning.

Suitable covers shall be provided on cable trays to be fixed outside trenches.

3.8

Cable Termination

Termination and jointing of aluminium conductor power cables shall be by means of compression method using compression type copper lugs. Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment. Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.

The **End** termination for use on the cables shall be suitable for the type of cables offered.

The accessories shall be supplied in kit form and each component of the kit shall carry manufacturer's mark of origin.

The kit shall include all stress grading, insulating and sealing materials apart from conductor fittings and consumable items. The instruction pamphlet shall also be included in each kit.

The contents of the kits shall be suitable for storage without deterioration under the climatic conditions given in the specification with shelf life exceeding 5 yrs.

The termination kit shall be suitable for termination of cables to indoor switchgear.

Cable Accessories		11 kV Cable		LT Cables
Type	i)	Heat Shrinkable Termination	i)	Suitable double compression Glands & Lugs.

3.9

Cable Jointing

All Cables shall be of Single length only. No Joints are allowed. However in extreme cases based on approval from Engineer or his authorized representative straight through joint may be taken up by the contractor.

Additional length (Loop) of 5mtrs. (approx.) cable should be kept at each end of the cables near the straight through cable joints.

It is required to measure the insulation resistances of the cables before and after straight through cable jointing. This scope includes supply of all required materials including complete straight through cable jointing kits, with ferrules and all other accessories.

Heat Shrinkable type straight through Cable Jointing Kits, suitable for XLPE insulated 11 KV (Earth) grade HT cables, are to be used.

3.10

Cable Tags

All cables will be identified close to their termination points by cable nos. Cable numbers will be punched on Aluminium strip/ PVC Strip {2mm. thick (approx.)} securely fastened to the cable and wrapped around it. Alternatively Cable Tags shall be circular in construction to which cable number can be conveniently punched.

Cable designations are to be punched with letter/number punches and the tags are to be tied to cables with piano wires of approved quality and size. Tags shall be tied inside the panels beyond the glanding as well as below the glands at cable entries. Along trays tags are to be tied at all bends.

Each underground cable shall be provided with Identification Tags (made of PVC) securely fastened at every 30 Mtrs. distance if the continuous length is more than 50 Mtrs. of its underground length. At least one tag at each end before the cable enters the ground will have to be provided. In unpaved areas, Cable Trenches shall be identified (by means of cable markers). These shall be placed at location of changes in the direction of cables and at intervals of not more than 30 Mtrs. and at Cable Joint Locations.

3.11

Packing and Markings

The cable shall be wound on a drum conforming to relevant BIS standard and packed. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

Cables to be supplied in returnable steel drums only.

The cable drum shall carry the following information stencilled on the drum:

- i) Manufacturer's Name and Trademark
- ii) Type of cable and voltage grade.
- iii) No. of cores
- iv) Nominal cross-sectional areas of conductor
- v) Cable code
- vi) Length of cable on drum
- vii) No. of lengths on the drum if more than one
- viii) Direction of rotation of Drum
- ix) Gross weight
- x) Weight of Drum with Ballens (if any)
- xi) Weight of cable
- xii) Reference of any Indian standard
- xiii). ISI Marking on the drum
- xiv) Year of Manufacturing

3.12 Cable Schedules

The Contractor shall furnish the Cable Schedules (including Control Cables) indicating type, Size, Amps, length (from & to), Runs, Impedance, Terminations, etc.

3.13 Tests & Test Reports

Type test certificate for similar type & Rating of Cables be submitted by successful bidder.

The Routine and acceptance tests specified in the applicable standards shall be arranged by the Contractor and carried out on **Cables** as per latest relevant IS Standards in presence of **Third Party Inspection Agency appointed by HDC at the manufacturer's works & at site respectively. The cost of the TPI is borne by Port.** The Certified copies of test certificates shall be submitted before despatch.

4 20 M High Mast

4.1.1 Mast Design Criteria

The mast shall be designed in such a manner that it is capable of withstanding external forces exerted by wind speed as per relevant standards and should have a minimum wind load factor of 1.25.

Applicable Standards

The following shall be the reference standards for manufacture and design compliance of High Mast:

Sl.No.	Code No.	Title
a)	I.S.875 (PART III) -1987	Code and Practice for wind loads.
b)	BS code of practice CP-3 chapter V part -II	Gradient of wind speed related to height above ground
c)	I.L.E.TR-7, Latest Edition	Specification For Mast /Foundation
d)	BS5649, PART-7	Structural Design
e)	BSEN 100025/100027, BS 4360 /DIN 17100	Mast Sections
f)	IS 2062.	Base plate, Top plate and Accessories
g)	BS 5135 or IS 9595	Welding

h)	BS 729 / IS 2629/ BS ISO 1461	Galvanizing
i)	BIS 10947-1984	Lighting for ports and Harbours
j)	BIS 3043-1987	Earthing

4.1.2

Structure

The high mast structure shall be of continuously tapered polygonal cross section [at least 20 sided for 16 M and above]. The Mast structure should be designed for suitable wind loads as per IS 875.

4.1.3

Construction

The mast sections shall be manufactured from special steel sheets conforming to BSEN 100025/100027/ DIN 17100/ BS 4360 or equivalent cut and folded to form a continuously tapered polygonal section having a single longitudinal weld by MIG welding process. The welding shall comply BS 5135 or IS 9595. Masts shall be delivered in multiple sections which shall be assembled at site by slip-stress-fit method. The minimum overlap distance shall be 1.5 times the diameter at penetration. There shall be no circumferential welding in any section. No site welding or bolted joints in the mast sections shall be allowed. The dimensions of the mast sections shall be decided based on sound and established design norms as per BS 5649 & ILE TR7.

The Base and Top plates without any laminations shall be welded to the bottom and top sections respectively. The welded joints shall be fully penetrated and developed to the strengths of the respective sections. The Base and Top plates shall be provided with supplementary gussets between the bolt holes to ensure elimination of helical stress development.

Mast base section will have a lockable door of size 1400mm X 300mm for easy access to winch and power tool operations. Bottom of door shall be 600mm above the top of the base plate. The door design shall be done in accordance with relevant standard and practices and adequately reinforced for prevention against buckling.

Provisions for fixing safety wires shall be made in the bottom section.

All sections shall be hot dip galvanized as per BS 729/IS 2629. The galvanization shall be done by single dip method for uniform thickness and better aesthetic appearance.

4.1.4

Dynamic Loading

The Mast sections should be designed based on basic wind speed data as mentioned at 10m level as per IS:875, Part-III, 1987. The structural design of the mast shall comply with BS 5649 part VII and ILE TR 7 guidelines.

The foundation design shall be made by taking into considerations the following:

1. Dynamic loading on the mast as per ILE TR 7 and IS 875 and
2. Static load of the total mast structure
3. **RCC Foundations and Soil conditions:** Testing the soil Bearing capacity and furnishing the reports at Contractor's cost. However, for design purpose 5T/sqmtrs has been considered.

The High Mast Towers along with base plate shall be erected on the concrete foundation as per firms design approved by Haldia Dock Complex. The firms shall furnish necessary **RCC** foundation drawing for approval based on the soil bearing capacity Test results. The foundation shall be designed to meet the soil conditions. The foundation provided shall have adequate bolts of adequate diameter and height for anchoring the base plate of the mast. The contractor shall ensure correct vertical and horizontal alignment of the foundation bolts while carryout the foundation works by using suitable steel template. **The height of the foundation shall be 500 mm above the nearby plinth level of building.**

Raising and Lowering Mechanism

The high-mast shall have an optimally balanced system for raising and lowering of the Luminaries and control gear boxes for regular maintenance work. The same shall be provided by means of a double drum winch **with double gear** fixed at the base, 3 wire suspension wire ropes along with compensating disc and safety wires, a specially designed 6 pulley head frame assembly. The winch mechanism shall be suitably connected to "fixed 3 phase, 415 V Electric Motor" and is operated through forward and Reverse Contactor with push button control to raise/lower the lantern carriage.

Accessories

Head Frame

M.S. fabricated hot dip galvanized housing using IS2062 grade steel accommodating 6 CA pulleys with stainless steel pins for the suspension wire ropes and upto 3 such smaller pulleys for the electrical cables. Pulleys are grooved suitably to ensure that the wire ropes/cables do not get dislodged from their positions while raising / lowering. Self-lubricating bearings and stainless steel shaft shall be provided for smooth and maintenance free operation throughout the mast life.

The head-frame shall be made in three compartments placed 120 degree apart for most optimum balancing of lantern carriage. Head frame shall have top canopy in tripod shape to protect the mast from entry of water / solid particles etc from the top.

Top canopy shall have provision for fixing lightning arrestor of suitable design.

Lantern Carriage

A fabricated MS hot dip galvanized lantern carriage shall be provided for mounting of luminaire arm assemblies. The lantern carriage shall be made of specially designed square steel tube having a three-piece construction. The flanges shall be jointed at site by stainless steel bolts and nuts. Inner side of the lantern carriage shall be provided with a separate guide ring with rubber padding to protect the mast surface while raising and lowering of the lantern carriage.

Luminaire Arm Assembly & Flood Light Fixtures

Luminaire arm assembly shall be fabricated MS hot dip galvanized to be fixed on the lantern carriage for mounting of luminaries. Each arm shall be suitable for accommodating up to 2nos LED lighting luminaries. The length of the luminaire arm assembly shall be 300mm in case of integral luminaries.

<u>LED luminaires :</u>		
The LED luminaires should have following technical details :		
Housing	::	Die-cast aluminium housing with epoxy powder coating and having cooling fins for effective heat dissipation. Separate cavity for driver & LED lamp.
Glass cover	::	Heat resistance toughened clear glass cover.
Light source	::	High power , high efficiency LED
Driver	::	Drivers should have in-built protection against high voltage surge, open circuit & short circuit.
Operating temperature	::	Minimum 50°C
Input Voltage	::	110 V - 270 V , 50 Hz
IP Rating	::	IP 65
Wattage	::	350Watt

Lumen Maintenance factor	::	0.7
<u>System Lumen Efficacy</u>	::	≥110 Lumen/watt.
Mounting	::	Base mounting. Cable entry through bottom/side.

Suspension Wires

Three-wire suspension assembly from compensating disc to the lantern carriage shall be made of 8 mm dia stainless steel wire rope as per AISI 316 or better Grade. No joints shall be allowed in any length of the wires. The ends of the wire rope shall be suitably secured in the winch block with thimbles.

The wires from compensating disc to the double drum winch shall be made of 8 mm dia stainless steel wire rope of the same grade as above.

Breaking load capacity of each wire rope shall not be less than 2100kg with a factor of safety not less than 5.0. The Manufacturer Test certificate for the rope shall be produced.

Compensating Disc

A separator of MS Construction hot dip galvanized having provision for fixing 3 nos suspension wires on upper deck at 120 degree apart and provision of fixing two nos. wires from double drum winch. It will also have the provision to connect two nos. safety wires from both side of the base of the mast.

Shape/size of the compensating disc shall be designed for its free movement up to top of the mast. When the lantern carriage is at mast top, the compensating disc position shall be at door level.

Compensating Disc is mandatory as per I.L.E., TR-7. Compensating disc enables dismantling of D/D (Double Drum) winch which is essential during the design life of the mast, by way of the safety wires.

Double Drum Winch

The double drum winch with double gear shall be completely self sustaining type without the need for brake shoe, springs and clutches. The winch shall have self lubrication mechanism by means of an oil bath. **The winch assembly shall have simultaneous and reversible operation of double drum winch with double gear.** The gear assembly shall be essentially made of phosphor bronze for optimum design life.

The gear ratio shall be 53:1 and safe working load capacity shall not be less than 750 kg. for masts of height 16m and above.

The winch drums shall be grooved to ensure perfect seat for stable and tidy rope lay with no chances of slipping of ropes. The rope termination in the winch shall be such that distortion or twisting is eliminated and at least 5 to 6 turns of rope remain on the drum even when the lantern carriage is at fully lowered position. 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 winch after dismantling it from its mounted position and re-fix it through the door opening.

Type test certificate for similar type of Winch manufactured be submitted by the successful bidder.

Electrical Hoist Cables

The electric cable shall be 2x5 core X 4.0 sq.mm. round type made of strands of plain copper wires ATC conductor, EPR insulated, Cotton braided and PCP outer sheathed

black cable and flame retardant to get flexibility and endurance with Rodent proof coating, core identification in accordance with VDE 0293 or equivalent.

The cable shall be highly flexible for optimum design life and the bending radius shall be not more than 60mm and VDE (or equivalent) approved for hoist applications.

Base end of the cable shall be connected with a 5 pin male *metal clad* plug which can move easily with the cables during raising/lowering. A 5 pin *metal clad* socket shall be provided at the bottom of the mast for cable termination.

The trailing cable to the high mast shall be rodent proof.

Junction Box

One or more Weather proof **junction box IP 55** made of Cast Aluminium shall be provided on the lantern carriage for connecting the luminaries, control gears and the cable. The number of ways is decided by the no. of luminaries to be connected. The connectors shall be CBT type Terminals.

Power Tool and Control Panel

A suitable high powered, electrically driven and electrically controlled, portable, internally mounted power tool with manual over ride shall be provided for the raising and lowering of the lantern carriage.

The power tool mounting shall be so designed that it will not only self supporting type but also it shall align itself perfectly with respect to the winch spindle during the operations. A handle for manual operations shall be provided as per standard practices.

Power tool shall consist of 3-phase 415volts, 50c/s motor and a gear box to match winch gear ratio duly coupled with each other. It shall be of reversible speed type. A controlling unit for rotation changes of motor with provision of torque limiter by way of using electric circuits for electrical protection shall be provided.

A cable of 4 Core x 2.5 sq.mm. copper conductor, unarmoured, sheathed cable for motor supply (max. 10 Mtrs.) shall be provided from control panel to feeder pillar at the base of the high mast. **Five Nos.** Control Panel (with forward and Reverse Contactor) and pendent switch (forward and Reverse push button control to raise/lower the lantern carriage.) for the geared motor shall be included in the High mast price and no separate item / qty. is considered.

Electrical Distribution Board/Outdoor Feeder Pillar at The Base of Mast

A suitable board of non-hygroscopic material shall be provided at the base of the mast at door level. This will have Single pole MCBs of suitable rating for the lighting load of the mast for each circuit and CBT Connectors for cable Termination. The MCBs will terminate the in-coming supply and can be used as a local isolator during maintenance work. The system shall have in-built facilities for testing the luminaries while in lowered position.

One or more 5 pin socket(s) shall be mounted for the electric cable(s). A 5-pin power socket shall be provided for 3-phase power tool operation.

The outdoor Feeder Pillar for High Mast shall be pedestal type (with top canopy), IP 65 compliant and dust, damp, vermin & weather proof, fabricated from SS316 grade sheet (2 mm thick), angle & flat. It shall be provided with double shutter, handle with lock and key system. The Feeder Pillar shall be designed in such a way that it should be spacious for easy maintenance. The design & drawing of the Feeder Pillar should be got approved from the Engineer-in-charge, prior to manufacture.

The Feeder Pillar shall be provided with PVC sleeved (with colour code) electrolytic grade tinned copper connection bus bar (for 3 Phases and Neutral) of suitable size and following items:

Feeder pillar will have following components:-

- i) TPN, 40 A , 415 V, MCB (10kA breaking capacity) incomer :: 01 No.
 - ii) TPN, 32 A , 415 V, MCB (10kA breaking capacity) Out going :: 02 Nos.
 - iii) Connecting terminals (stud type), suitable for terminating 02 no. 5C X 4 mm², 1.1 kV grade, Copper Conductor EPR insulated PCP sheathed cable. :: 01 Set.
 - iv) Connecting terminals (stud type), suitable for terminating 01 no. 3 ½ C X 25 mm², 1.1 kV grade, Aluminium Conductor armoured XLPE cable. :: 01 Set.
 - v) Industrial Socket terminal for driving winch motor, 63A :: 01 Nos.
- Earthbus

Aviation Obstruction

Suitable Aviation Obstruction Lights of reliable design and reputed manufacturer shall be provided on top of each mast. The Aviation fitting shall be Heavy duty & weather proof and yellow painted die-cast aluminium alloy suitable for housing two nos. LED based aviation obstruction lamps. The Omni directional red colour light shall be ES lamp holders & prewired upto the terminal block. The unbreakable red coloured polycarbonate dome shall be provided and secured to housing by 3 nos. screws. The Aviation obstruction light shall be Degree of protection: IP 43 and Electrical safety - Class I and also 38 mm dia. threaded stem with lock nuts for mounting on the pipe above the high mast structure to be provided.

4.2 Earthing & Lightning Protection

The earthing and lightning protective system shall comply with all currently applicable standards, regulations and safety codes of the locality where the installation shall be carried out. The installation work shall conform to the latest IE rules, standards (IS:3043 for earthing / IS:2309 for lightning protection) and other relevant code of practices.

One number heavy duty hot dip galvanized lightning 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. Lightning protection system down conductor shall not be connected to other earthing conductors above ground level. Also no intermediate earthing connection shall be made to the lightning arrester which shall be directly connected to the electrode. GI strip of size 50x6 mm for control panel and for lightning 50x6 mm shall be used.

4.3 INSPECTION & TESTS

The TPI shall have right to inspect the work being carried out under this Contract and to test the system to confirm conformity with the specifications.

The Routine and Field test shall be arranged by the Contractor and carried out as per latest relevant BIS / IS Standards in presence of **Third Party Inspection Agency appointed by the Port at the manufacturer's works & at site respectively. The cost of the TPI is borne by Port.** The Certified copies of test certificates shall be submitted before despatch.

Should any tested systems fail to conform to the specification, the Employer may reject them, and the Contractor shall make suitable alterations with prior approval of Employer

to meet the requirements of the specifications, without any effect on cost of delivery times / project schedules.

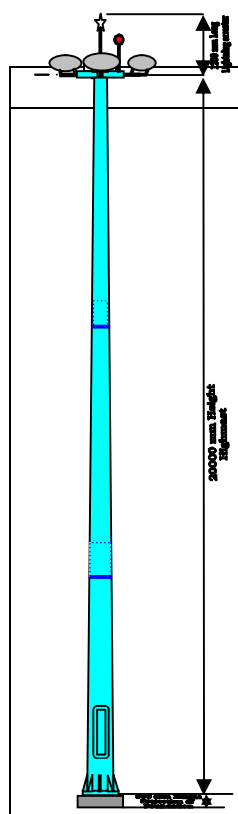
The Employer's right to inspect, test and where necessary, reject the system shall be in no way limited or waived by reason of the systems having previously been tested and passed by the Employer or its representatives prior to dispatch of the system.

4.4

Back to Back Support of Manufacturer:

The Contractor shall have back to back Support from Manufacturer for installation, testing, Commissioning of High Mast including Civil Foundation.

DATA SHEET FOR HIGH MAST



Sl.No	Description Lighting Mast	Specification
1.0	High mast Height incl. Luminaires Carriage	20 m
1.1	Material Construction[BSEN100025 Equiv]	Gr S355
1.2	Welding	As per IS
1.3	No. Of Sides	As per manufacturer
2.0	Mast Section Details	
2.1	Top Diameter [In mm]	150
2.2	Base Diameter[In mm]	460
2.3	Number of Sections[Nos]	2 (max 1 longitudinal welds per section)
2.4	Top Sections length[mm]xthickness[mm]	10650X3
2.5	Bottom Section Length[mm]xthickness[mm]	10600X4
2.6	over lapping[between Sections]	1000/900
2.7	Base Flange Diameter[mm]	670
2.8	Base Flange Thickness[mm]	25
2.9	P.C.D [mm]xHole Dimensions[mm]	As per manufacturer
2.10	No.Of Bolts[Qty]	As per manufacturer
2.11	Foundation bolts Details	As per manufacturer
2.12	Metal Treatment protection for Mast	Galvanised
2.13	Thickness of Galvanisation(min.)	86 Microns (min.)
2.14	Size of opening and door at base	As per manufacturer
2.15	Type of locking arrangement	Anti-Vandalism
2.16	Size of anchor plate & thickness	As per manufacturer
2.17	Details of template	As per manufacturer
2.18	Weight in Kgs of .mast incl.base	As per manufacturer
2.19	plate, door, head frame [In Kgs.appx]	As per manufacturer
2.20	headframe weight (Kg)	60
2.21	LRing/Luminaires loading on Mast Head[kgs]	Approx 600 Kg (depends on lum configuration)
2.22	Total Load for Foundation/ Crane arrangement[kgs]	2500 Kg(approx)
3.0	Foundation Details	
3.1	Type of Foundation	Open Raft Type
3.2	size of foundation	as per soil data, to be given by contractor

	Sl.No	Description Lighting Mast	Specification
	3.3	Designed load bearing capacity	To be given by contractor
	3.4	Design safety factor	>2
	4.0	HEAD FRAME	2-POINT
	4.1	Construction	MS. Fabricated
	4.2	Metal Treatment protection for HEAD FRAME	Galvanised
	4.3	PULLEY ARRANGEMENTS[FOR STEEL WIRES]	3SETS OF PULLEYS
	4.4	PULLEY ARRANGEMENTS[FOR ELECTRICAL CABLES]	1 set OF PULLEY
	5.0	LANTERN CARRIAGE	
	5.1	Material of Construction	IS2062
	5.2	Diameter of Carriage Ring(mm)-1NO	1200/1600
	5.3	Construction	M.S fabricated
	5.4	Number of joints	2
	5.5	Buffer arrangements between Carriage& MAST	To be provided
	6.0	COMPENSATING DISC BETWEEN L/RING & D/D WINCH	PROVIDED
	6.1	COMPENSATING DISC -MANDATORY REF. ILE-TR7[CI.3.6]	
	7.0	SAFETY LOCKING ON BOTH SIDES OF BASE OF MAST	PROVIDED
	8.0	Winch	D/Drum, 750 Kg cap
	9.0	Stainless Steel wires diameter	
	9.1	Number of Ropes	3
	9.2	C/disc to D/d. Winch	two[8mm size]
	9.3	C/disc to Lantern Ring	Three[8mm size]
	9.4	Thimbles & Terminals	Provided.
	9.5	Factor Of Safety	>5
	10.0	POWER TOOL	Integral
	10.1	Model	As per manufacturer
	10.2	Input Supply	415v,50c/s;3-ph
	10.3	WATTAGE	1.5KW
	10.4	Num. Of Speeds	Single
	10.5	Reversible/Non-reversible	Reversible
	10.6	Operating Speed	1400 Rpm
	11.0	Lightning Arrestor [1.2m Length]	To be provided
	12.0	Aviation Obstruction light - LED	To be provided
	13.0	Earthing with two earth pits	To be provided

5

Load Point Panel:-

The outdoor Load Point Panel for High Mast shall be pedestal type (with top canopy), IP 65 compliant and dust, damp, vermin & weather proof, fabricated from SS316 grade sheet (2 mm thick), angle & flat. It shall be provided with double shutter, handle with lock and key system. The Load Point Panel shall be designed in such a way that it should be spacious

for easy maintenance. The design & drawing of the Load Point Panel should be got approved from the Engineer-in-charge, prior to manufacture.

The Load Point Panel shall be provided with PVC sleeved (with colour code) electrolytic grade tinned copper connection bus bar (for 3 Phases and Neutral) of suitable size and following items :

Load Point Panel will have following components:-

- | | | | |
|-------|--|----|---------|
| i) | TPN, 40 A , 415 V, MCB (10kA breaking capacity) Outgoing | :: | 06 No. |
| ii) | TPN, 200A, 415V, SDFU in sheet steel enclosure (fitted with HRC Fuse) Incomer and outgoing interlink. | :: | 02 Nos. |
| iii) | TPN, 40 A, 415 V, MCB (10kA breaking capacity) Outgoing for tapping power directly from incoming SDFU. | :: | 01 No. |
| iv) | 200/225Amps.TP contractor(AC-3duty) Coil voltage-230V | :: | 01 No. |
| v) | Electro-mechanical time switch(with rechargeable battery back up) | :: | 01No. |
| vi) | By Pass Switch | :: | 01 No. |
| vii) | Connecting terminals (stud type), suitable for terminating 06 nos. 3 ½ C X 25 mm ² , 1.1 kV grade, Aluminium Conductor armoured XLPE cable. | :: | 01 Set. |
| viii) | Provision for lighting inside Panel | :: | 01No. |

All the aforesaid component shall be mounted in the Load Point Panel by means of suitable cadmium passivated hardware. The Panel shall be complete in all respect with detachable gland plate, interconnection using necessary PVC insulated (1.1 kV grade), single core, flexible (stranded) copper wire. The Panel shall be provided with 02 nos. SS Terminal for earthing.

6 EARTHING SYSTEM

6.1 General

Only Plate Earthing shall be adopted. The earthing and lightning protective systems shall comply with all currently applicable standards, regulations and safety codes of the locality where the installation is to be carried out. Nothing in this specification shall be construed to relieve the Bidder of this responsibility. Wherever the word GI is used it means that hot Dip GI.

Earthing Strip shall be of **hot dip GI** of size **50mmx6mm for Body & of Copper 50mmx6mm for Neutral** protected against corrosion and readily accessible. The strip shall be connected to earthing terminals with Stainless Steel nut - bolts. **Separate Earthing for Body and Neutral shall be provided.**

The installation work shall confirm to the latest applicable Electricity Rules, standards (IS:3043) and codes of practices.

After award of the Contract, the Contractor shall, carry out soil resistivity measurements at the site. A detailed earthing design shall be submitted for approval based upon the results of these tests.

The total resistance of the earth grid shall be less than 1 ohm.

The earthing & lightning conductors and electrodes shall be supplied. Conductors shall be free from rust, scale and other electrical and mechanical defects and all materials used shall conform to relevant standards or approved by the Employer. The sizes, materials and quantity shall be as listed.

Copper earthing stranded conductors shall be annealed soft drawn type. Copper earthing rods and flats shall be hard drawn type. Lead coating shall be provided on copper conductors to prevent its corrosion in aggressive environments.

Steel earthing conductors above ground shall be hot-dip galvanized, unless otherwise stated, to prevent atmospheric corrosion. If painted steel conductors are required they shall be painted with two coats of approved anti-corrosive paint.

Flexible braids of sizes & materials shall be supplied for earthing of operating handles of isolators and earthing of equipment on moving platforms.

The links in suitable enclosures shall be supplied for connection between each lightning conductor down comer and earth electrode.

Cad welding type jointing equipment shall be supplied whenever specifically indicated.

6.2

Scope of Installation Work

The successful Bidder shall install bare/insulated, copper/aluminium conductors, braids, etc., required for system and individual equipment earthing. All work such as cutting, bending, supporting, painting/coating drilling, brazing/soldering/welding, clamping, bolting and connecting onto structures, equipment frames, terminals, rails or other devices shall be in the scope of work. All incidental hardware and consumable such as fixing cleats/clamps, anchor fasteners, lugs, bolts, nuts, washers, bitumastic compound, anti-corrosive paint as required for the complete work shall be deemed to be included as part of the installation work.

The scope of installation of earth conductors in outdoor areas, buried in ground shall include excavation in earth upto 600 mm deep and 450 mm wide, laying of conductor at 600 mm depth (unless stated otherwise), brazing/welding/ cadwelding as reburied of main grid conductor joints as well as risers of 500 mm length above ground at required locations and backfilling. Backfilling material to be placed over buried conductor shall be free from stones and other harmful mixtures. If the excavated soil is found unsuitable for backfilling, the Bidder shall arrange for suitable soil from outside.

The scope of installation of earth connection leads to equipment and risers on steel structures/walls shall include laying the conductors, welding/cleating at specified intervals, welding/brazing to the main earth grids' risers, bolting at equipment terminals and coating welded/brazed joints by bitumastic paint. Galvanized conductors shall be touched up with zinc rich paint where holds are drilled at site for bolting to equipment/structure.

The scope of installation of electrodes shall include installation of these electrodes such as (a) directly in earth, (b) in constructed earth pits, and connecting to main buried earth grid, as per enclosed drawings/relevant standards. The scope of work shall include excavation, construction of the earth pits including all materials required for construction of the earth pits and connecting to main earth grid conductors.

The scope of installation of lightning conductors on the roofs of buildings shall include laying, anchoring, fastening and cleating of horizontal conductors, grouting of vertical rods where necessary, laying, and fastening/cleating/welding of the down comers on the wall/columns of the building and connection to the test links above ground level.

Normally an earth electrode shall not be situated less than 2m from any building. Care shall be taken that the excavations for earth electrodes may not affect the column footing or foundation of the building. In such cases, electrodes may be further away from the building.

The location of the earth electrodes shall be such that the soil has reasonable chances of

remaining moist, as far as possible. Entrances, pavements and roadways are definitely avoided for locating the earth electrodes.

The scope of installation of the test links shall include mounting of the same at specified height on wall/column by suitable brackets and connections of the test link to the earth electrode.

6.3

Work Details

Earthing conductors along their run on walls and columns shall be supported by cleating/welding at intervals of 750 mm and 1000 mm respectively.

Wherever earthing conductors cross underground service ducts and pipes, it shall be laid 300 mm below; the earthing conductor shall be bounded to such service ducts/pipes.

Wherever main earthing conductor crosses cable trenches, they shall be buried below the trench floor.

Suitable earth risers approved by the Engineer-in-Charge shall be provided above finished floor/ground level, if the equipment is not available at time of laying of the main earth conductors. The minimum length of such riser inside the building shall be 200 mm and outdoors shall be 500 mm above ground level. The risers to be provided shall be marked in project drawings.

Earth leads and risers between equipment earthing terminals and the earthing grid shall follow as direct and short a path as possible.

Neutral connection shall never be used for the equipment earthing.

Each neutral point of a transformer shall be earthed to two separate earth electrodes for connection with earthing system.

Shield wire in sub-stations shall be connected to the earthing grid through test links at every alternate switchyard portal tower.

A separate earth electrode bed shall be provided adjacent to structures supporting lightning arrestors and coupling capacitors. Earth connections shall be as short and as straight as practicable. For arrestors mounted near transformers, earth conductors shall be located clear of the tank and coolers.

Wherever earthing conductor passes through walls, galvanized iron sleeves shall be provided for the passage of earthing conductor. The pipe ends shall be sealed by the Bidder by suitable water proof compound. Water stops shall be provided wherever earthing conductor enters the building from outside below grade level. Water stops and above mentioned sleeves shall be provided by the Bidder.

6.4

Earthing Connections

All connections in the main earth conductors buried in earth/concrete shall be welded/brazed type. Connection between main earthing conductor and earth leads shall also be of welded/brazed type. Cadwelding type connections shall be done if specifically indicated.

Connection between earth leads and equipment shall be of bolted type, unless specified otherwise or shown in the drawings. Equipment Bidders shall provide earthing terminals on their equipment.

Welding and brazing operations and fluxes/alloys shall be of approved standards.

All connections shall be of low resistance. Contact resistances also shall be minimum.

All bimetallic connections shall be treated with suitable compound to prevent moisture ingress.

Metallic conduits and pipes shall be connected to the earthing system unless specified otherwise.

6.5 Earth Electrode

Electrodes shall as far as practicable, be embedded below permanent moisture level.

Electrodes shall be housed in test pits with concrete covers for periodic testing of earth resistivity. Installation of rod/pipe/plate electrodes in test pits shall be convenient for inspection, testing and watering wherever required.

6.5.1 Plate Earth Electrode

For plate electrode minimum dimension of the electrode shall be as under:-

- i) GI plate electrode 60 cm x 60 cm x 10 mm thick

Heavy duty cast iron frame with cover shall be suitably embedded in the masonry.

Soil, salt and charcoal placed around the electrode shall be finely graded, free from stones and other harmful mixtures. Backfill shall be placed in the layers of 250 mm thick uniformly spread and compacted. If excavated soil is found unsuitable for backfilling, the Bidder shall arrange for a suitable soil from outside.

6.5.2 Method of Connecting Earthing Lead to Earth Electrode

In the case of plate earth electrodes, the earthing lead shall be securely bolted to the plate with two bolts, nuts, check-nuts and washers.

All materials used for connecting the earth lead with electrodes shall be GI in case of GI pipe and GI plate earth electrodes and of copper in case of copper pipe / plate electrodes.

The earthing lead shall be securely connected at the other end to the main board.

6.5.3 Size of Earthing Conductor

The earthing system shall be designed in such a way that over all earth resistance is less than one ohm. The soil resistivity shall be measured at site by the Bidder. If required, number of earth electrodes to be increased by the Bidder to achieve the required earth resistance.

7 LIST OF APPROVED MAKES

S.No.	ITEM	Name of Manufacturers
1	Volt meter and Ammeter	AE / MECO / YOKINS / NIPPEN
2	Selector switches, Push buttons, Emergency Switches	KAYCEE / L & T / GE / BCH / LEGRAND
3	HRC Fuses	L & T / GE / SIEMENS / ABB / INDO KOPP
4	Indicating light	AE / KAYCEE / VAISHNAV / L & T / SIEMENS
5	MCB	L & T / LEGRAND / SIEMENS / ABB / SCHNEIDER
6	Sub Distribution Board	L & T / LEGRAND / SIEMENS / SCHNEIDER / HENSEL
7	EL MCB	L & T / SCHNEIDER / LEGRAND / SIEMENS / ABB

S.No.	ITEM	Name of Manufacturers
8	FRLS PVC insulated copper conductor single/multi core stranded wires of 650/1100 volt grade	HAVELLS / FINOLEX / RPG /UNIFLEX /NICCO /RR Kables
9	Steel Conduit/PVC Conduit	BEC / AKG / NIC
10	Switches, TV & Telephone Socket outlets, Boxes	MK / CLIPSAL / LEGRAND / NORTH WEST /ANCHOR
11	Light Fixtures	PHILIPS / BAJAJ / WIPRO / CROMPTON
12	Lamps and Tubes	PHILIPS / WIPRO / BAJAJ / CROMPTON
13	Cable lug & Cable Gland	DOWELLS / JHONSON / RAYCHEM
14	Terminal Blocks	WAGO & CONTROLS / PHOENIX CONTACTS / OBO BETTERMANN
15	Lightning Protection	DUVAL MESSIEN / SOUTH ASIAN ENTERPRISE LTD. / OBO BETTERMANN
16	Multi-function Meter	ABB / SIEMENS / L&T / HPL SOCOMEC/CONZERVE (ENERCON)
17	DWC HDPE Pipe	DURA LINE / CARLON / EMTELLE
18	Contactors	L&T / SCHNEIDER / SIEMENS/ABB / BCH
19	MCCB	L&T / SIEMENS / SCHNEIDER / ABB
20	Push Buttons	SIEMENS / ABB / TELEMECANIQUE / L&T / SCHNEIDER
21	Relays	L&T / ABB / SIEMENS / SCHNEIDER/AREVA
22	Timers	L&T / SIEMENS / TELEMECANIQUE/ABB
23	Indicating Light	L&T / SIEMENS / TELEMECANIQUE / ABB / GE
24	Indicating Instruments	AE / MECO / CONZERVE / L&T
25	LT Cable (XLPE and FRLS)	UNISTAR / FINOLEX/ NICCO / HAVELLS / RPG / UNIFLEX
26	Termination Kit	3M / RAYCHEM /DENSON
27	CTs	L&T / AREVA / JYOTI / KAPPA / PRAGATHI
28	PTs	AREVA / KAPPA / PRAGATHI
29	LT Panels	SIEMENS / L&T / SCHNEIDER / ABB
30	Cable Trays (FRP)	LEGRAND / ERCON / NEEDO / SUMMIP
31	Selector Switch	KAYCEE / L&T / SIEMENS / BCH / GE / SALZAR
32	Trivector Meter (Digital)	L&T / SCHNEIDER / SIEMENS / HPL SOCOMEC
33	High Mast	PHILIPS / BAJAJ / CROMPTON /WIPRO

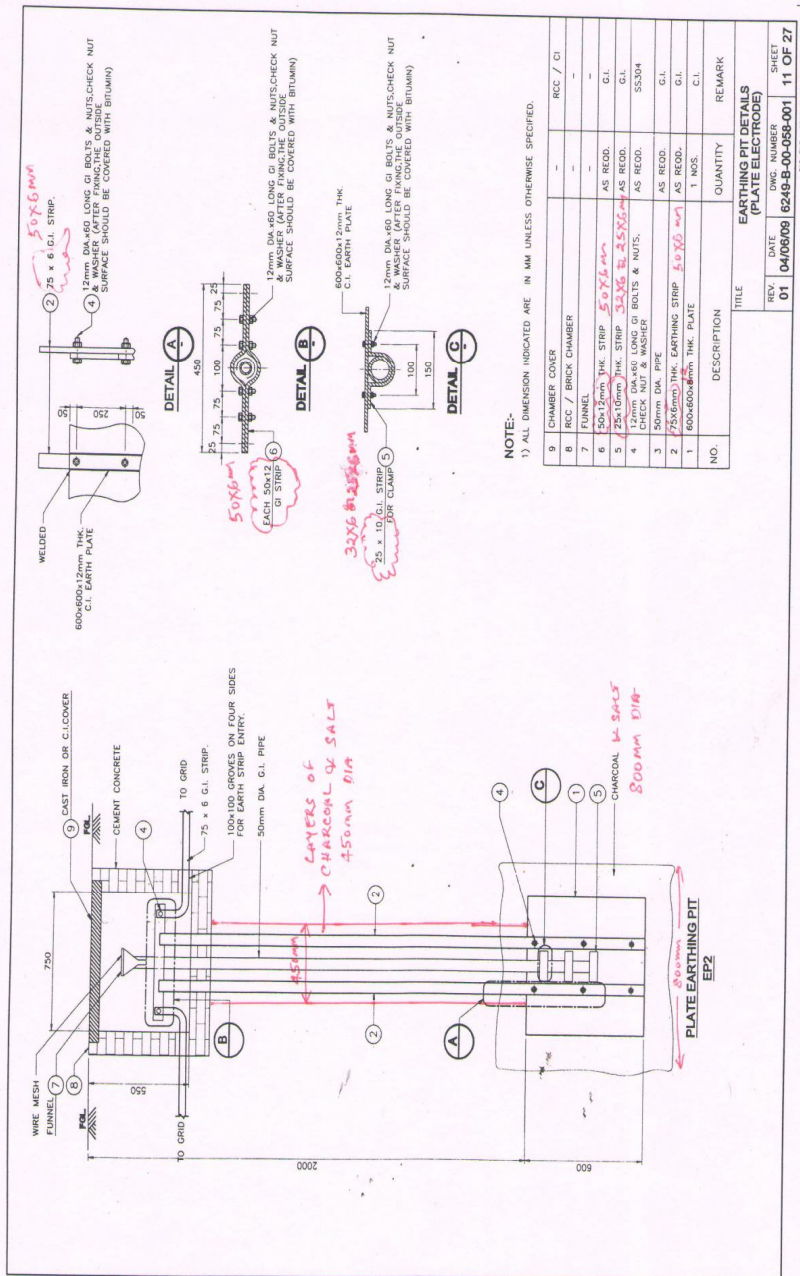
S.No.	ITEM	Name of Manufacturers
34	Items not covered above	As per samples approved

NOTE: The Contractor shall submit the details of Specification, make and model (Catalogue) of the Materials / Equipment to Engineer-In-Charge before Procurement.

8

INSPECTION AND TESTING

Sl. No.	Equipment	Factory Inspection		Site Inspection		Remarks
		TPI/HDC	Contractor	TPI/HDC	Contractor	
1.	LT Cables	yes	yes	yes	yes	
2.	High Mast Tower	yes	yes	yes	yes	
3.	Load Point	yes	yes	yes	yes	
4.	Outdoor Feeder Pillar	yes	yes	yes	yes	
5.	Earthing system	---	yes	yes	yes	



	Contact Person:	<p> Shri R. N. Roy, Sr. Dy. Manager (P&E), Haldia Dock Complex, Operational Administrative Building (1st floor), Chiranjibpur; P.O. Haldia; Dist. Purba Medinipur; PIN: 721 604; West Bengal, India. Telephone no. : + 91-3224-252526 Mobile no. : + 91 94340 74411 E. mail : rnroy.hdc@nic.in </p> <p> Sk. M.Rahman, Dy. Manager (P&E), Haldia Dock Complex, Operational Administrative Building (1st floor), Chiranjibpur; P.O. Haldia; Dist. Purba Medinipur; PIN: 721 604; West Bengal, India. Telephone no. : + 91-3224-252543 Mobile no. : + 91 94340 31203 E. mail : mrahaman.hdc@nic.in </p> <p> Shri. D.Dey Asst. Manager (P&E), Haldia Dock Complex, Chiranjibpur Power House Chiranjibpur; P.O. Haldia; Dist. Purba Medinipur; PIN: 721 604; West Bengal, India. Telephone no. : + 91-3224-252999 Mobile no. : + 91 94340 33492 E. mail : djdey.hdc@gov.in </p>
--	------------------------	--