

## **TENDER FOR HIGH MAST LIGHTING SYSTEM**

Tata Chemicals Magadi Ltd invites quotations for the design, supply, erection and installation of 2 20m-high mast lighting systems whose specifications are detailed below:

### **1. INTRODUCTION**

This specification covers the technical requirements of design and supply in well packed condition of high mast lighting structures and control gears for movement / maintenance of light fittings. The scope shall also include the erection including installation, testing and commissioning of the automatic lifting system.

### **2. INSTRUCTIONS TO BIDDER**

The supplier is to consider the followings for the purpose of design.

- Masts shall be of unipolar (single pole) structure. Special consideration shall be taken in respect of lamp replacement, operation and maintenance.
- Meteorological Data:

Elevation	m	596
Ambient pressure	kPa	94.9
Temperature max. (shade)	°C	41
	min. (shade)	16
Design dry bulb	°C	36
Design wet bulb	°C	22
Precipitation	mm/y	455
Days rainfall	d/y	73
Evaporation	mm/y	4105
Average design wind	km/h	3.6
Maximum wind	km/h	161
Seismic zone		2A

- 200W LED lamps shall be used.
- The environment is corrosive. Selection of all materials shall be suitable for the above environment.
- The height of mast shall be 20 M.
- Each mast will have 6 luminaires

### 3. SCOPE

The scope of this job covers the design, supply and erection of two 20M high mast flood lighting towers, including the installation, testing and commissioning of an automatic lifting system for raising and lowering the lights during maintenance. Installation of the solar PV system that will power the mast will be done by Tata Chemicals Magadi Ltd. TCML will also supply and install the floodlights and other electrical accessories.

### 4. APPLICABLE STANDARDS

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

- BS Code of Practice, CP-3, Gradient of wind related to height Chapter-V,
- BS 4360 Grades of MS Plates
- BS 5135 Welding
- BD 729 Galvanising
- Technical Report (TR) No.7 – 1996 Specification for Mast and Foundation.
- IS 875 (Pt-III) 1987 Code of Practice for Design Loads for structure

### 5. TECHNICAL SPECIFICATIONS

#### 5.1 HIGH MAST

##### a. Structure

The High mast shall be of continuously tapered, polygonal cross section, at least 8 sided, presenting a pleasing appearance and shall be based on proven In- Tension design conforming to standards, to give an assured performance and reliable service.

The mast height shall be 20 meters, with minimum diameters of 152mm at the top and 406 mm at the bottom. Minimum plate thickness of bottom section shall be 6mm and other sections 6mm. The PCD of the mast flange shall be minimum 740 mm. The structure shall be suitable for wind loading as per IS-875, pt-3, 1987.

##### b. Construction

The mast shall be capable of safely withstanding the strong winds prevailing at site. The deflection at the top during heavy storm periods shall therefore be considered in the design and the mast designed in such way that the above deflection during worst periods is kept to a minimum value.

The mast shall be fabricated from special steel plates, conforming to BS-EN10- 025, cut and folded to form a polygonal section as stated above and shall be telescopically jointed and fillets welded. The welding shall be in accordance with BS:5135.

The procedural weld geometry and the workmanship shall be exhaustively tested on the completed welds. The 20 meter size mast shall be delivered in sections, and shall be jointed

together by slip-stressed-fit method at site. 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 mast shall be provided with full 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. For the environmental protection of the mast, the entire fabricated mast shall be hot dip galvanized, internally and externally, having a uniform thickness of 65 microns.

#### c. 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, weather proof 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.

#### d. 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 a minimum of 35 years.

### 5.2 LANTERN CARRIAGE

#### a. Fabrication

A fabricated Lantern Carriage shall be provided for fixing and holding the flood light fitting and control gear boxes. 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 the required number of flood light fittings and the control gear boxes, and also to have a perfect self-balance.

The Lantern Carriage shall be fabricated in two halves and joined by bolted flanges with stainless steel bolts and plastic lock 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.

b. Junction Box

Weather proof junction box with IP55 enclosure, made of Cast Aluminium shall be provided on the Carriage Assembly as required, from which the inter-connections to the designed number of the flood light luminaries and associated control gear fixed on the carriage shall be made.

c. 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 winch fixed at the base of the mast and the specially designed head frame assembly the top.

d. 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. Individual drum also should be operated for fine adjustment of lantern carriage. The capacity, operating speed, safe working load of the recommended lubrication and serial number of the winch shall be clearly marked on each winch.

The gear ratio may be according to manufacturer's standard. However, the minimum working load shall be not less than 400Kg. 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 runs of rope remains on the drum even when lantern carriage is fully lowered and rested on the rest pads.

It should be possible to operate the winch manually by a suitable handle and / or by an external power tool. It shall be possible to remove the double drum after dismantling, through the door opening provided at the base of mast. Also a winch gear box for simultaneous and reversible operation of the double drum winch shall be provided as part of the contract.

e. Head Frame

The head frame which is to be designed as a capping unit of the mast, shall be of welded steel construction, galvanized both internally and externally after assembly.

The top pulley shall be 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-corrosive material, and shall be of diecast aluminium alloy (LM-6). Pulley made of synthetic material 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 galvanized externally and internally.

Close fittings guides and sleeves shall be provided to ensure that the ropes and cables do not dislodge 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.

f. **Stainless Steel Wire Ropes**

The suspension system shall be essentially be without intermediate joint and shall consist of any non-corrosive stainless steel of AISI 316 or better 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 6 mm. The breaking load of each rope shall not be less than 2350kg individually, giving factor of safety or over 5 for system at full load, the minimum recommended value as per the TR-7 referred to in the beginning of the specification. The end construction of rope to 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, either bolted or else is provided on the wire ropes between winch and lantern carriage.

**6. SUBMISSION**

Single Sealed bids marked "**TENDER FOR HIGH MAST LIGHTING SYSTEM**" should be dropped at our tender box located at the Administration Department Block at the Reception Office in Lake Magadi or at our collection center (Avon center, Enterprise road, Industrial area Nairobi on or before Friday 22<sup>nd</sup> February 2019.

<b>Item</b>	<b>Description</b>	<b>Requirements</b>
1.	Number of similar projects done	Attach list of similar projects undertaken, contacts of clients and copies of letter of awards or completion certificates
2.	Schedule of works per site	A statement of work methods (Methodology). Include Gantt Chart and brief description.
3.	Structural Mast Design	Attach Drawings
4.	Electrical Wiring Design Drawings	Attach Drawings
5.	Civil Works Design for Mast Base	Attach Drawings
6.	Mast Installation method	Indicate and attach installation schedule

7.	Technical specifications of the winch and power tool	Attach drawing and data sheet
8.	Lifespan of mast	Indicate the lifespan of the mast (Years >35 years)
9.	Warranty for the mast	Provide warranty for the mast (Years>1 year)
10.	Project Cost	The project cost format should be as shown below

### PROJECT COST

Item	Description	Qty	Unit	Unit Cost	Total Cost	VAT (if appl)	TOTAL COST VAT INCL.
1	Supply of 20 m high mast floodlight system with its accessories including high mast, galvanized Lantern carriage arrangement suitable for 6 luminaires symmetrically & its control gear boxes.	2	lot				
2	Automatic Lifting System for raising and lowering the floodlights for maintenance	2	lot				
3	Supply of foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates.	2	lot				
4	Erection of the high mast	2	lot				
5	Installation of the automatic lifting system	2	lot				
	<b><u>TOTAL COST</u></b>						

### SOLAR PV SYSTEM QUOTATION – MATERIALS QUOTE

ITEM	TECHNICAL SPECIFICATIONS	
INVERTER	Brand Name	
	Warranty	
	Hybrid	
	Output Power 4KVA/3.2kw	
	Input Voltage 48V	
	Output Voltage 230VAC	
	Frequency 50Hz	
	Battery Maximum Charge Current 30A	
	Surge Power 8KVA	

	Battery Low Alarm Voltage 42VDC	
	Battery Shutdown Voltage 40VDC	
	Battery Overcharge Protection 60VDC	
	<b>PRICE</b>	
	<b>QUANTITY</b>	<b>1</b>
	<b>TOTAL PRICE</b>	
	<b>VAT (IF APPLICABLE)</b>	
	<b>TOTAL PRICE VAT INCLUSIVE</b>	
BATTERIES	Brand Name	
	Warranty	
	12V	
	200AH	
	Totally Sealed	
	<b>PRICE</b>	
	<b>QUANTITY</b>	<b>24</b>
	<b>TOTAL PRICE</b>	
	<b>VAT (IF APPLICABLE)</b>	
	<b>TOTAL PRICE VAT INCLUSIVE</b>	
MODULES	Brand Name	
	Warranty	
	Type	
	Rated Power 250W	
	Peak Voltage 30.5V	
	Open Circuit Voltage 37.6V	
	Short Circuit Current 8.81A	
	<b>PRICE</b>	
	<b>QUANTITY</b>	<b>30</b>
	<b>TOTAL PRICE</b>	
	<b>VAT (IF APPLICABLE)</b>	
	<b>TOTAL PRICE VAT INCLUSIVE</b>	
CONTROLLER	Brand Name	
	Warranty	
	Type MPPT	
	3kw	
	Maximum input Voltage 145VDC	
	Nominal Battery Voltage 12/24/48V	
	Low Voltage Disconnect 11.5/22.4/44.8V	
	Reconnection Voltage 12.4/24.6/50.4V	
	<b>PRICE</b>	

	<b>QUANTITY</b>	<b>2</b>
	<b>TOTAL PRICE</b>	
	<b>VAT (IF APPLICABLE)</b>	
	<b>TOTAL PRICE VAT INCLUSIVE</b>	
FLOODLIGHTS	Brand Name	
	Warranty	
	Power 200W	
	Rated current 6.2A	
	Lighting effect grade 100LM/W	
	Input Voltage AC85V~265V	
	Frequency Range 50Hz~60Hz	
	Power Factor >0.95	
	Power Efficiency >92 %	
	Lifetime >50000 Hrs	
	<b>PRICE</b>	
	<b>QUANTITY</b>	<b>12</b>
	<b>TOTAL PRICE</b>	
	<b>VAT (IF APPLICABLE)</b>	
	<b>TOTAL PRICE VAT INCLUSIVE</b>	