SPECIFICATION FOR THE MAINTENANCE AND UPGRADE OF HIGHMAST LIGHTING STRUCTURES

REVISIONS		
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INTRODUCTION

This specification covers the maintenance of high mast structures.

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1.0 SCOPE

1.1 This specification covers Transnet National Ports Authority requirements for the design, manufacture and supply of all equipment and materials for maintenance, installation and testing on site of high mast lighting.

2.0 REFERENCES

2.1 The following publications and drawing (latest editions and amendments) are referred to herein.

2.1.1 South African Bureau of Standards

SANS 10142	- Code of practice for the wiring of premises.
SANS 1411	- PVC insulated electrical cables and flexible cords.
SANS 475	- Floodlighting luminaires.
SANS 1033	- Solid filler wires for gas-shielded metal arc welding of mild steel and medium-high tensile steel.
SANS 556-1	- Low-voltage switchgear part 1: circuit-breakers
SANS 556-2	- Low-voltage switchgear: earth leakage circuit breakers
SANS 10225	- The design and construction of lighting mast
SANS 10162	- Welding of structural Steel
SANS 455	- Covered electrodes for the manual arc welding of carbon and carbon manganese steels
SANS 121	- Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.
SANS 50025	- Hot rolled products of structural steel
SANS 60947-2	- Low-voltage switchgear and controlgear Part 2: Circuit-breakers
SANS 10389-1	- Artificial lighting of exterior areas for work and safety
SANS 10064	- The preparation of steel surfaces for coating
SABS CKS 42	- Straight mineral bearing and gear oil
SABS CKS 74	- Hypoid gear oil
SABS CKS 443	- Extreme pressure gear oil.

2.1.2 British Standards Institution

BS 7668	- Weldable structural steels Hot finished structural hollow sections in weather resistant steels
BS 5135	- Metal-arc welding of carbon and carbon manganese steel.
BS 721	- Worm gearing.

2.1.3 Transnet Ltd.

CME 35	- Specification for steel wire ropes.

Lubricants and petroleum fuels standing and advisory committee Circular No. 1

3.0 APPENDICES

The following appendices form part of this specification:

3.1 Appendix No. 1 – Painting specification.
3.2 Appendix No. 2 – Statement of Compliance.

4.0 METHOD OF TENDERING

4.1 Tendering shall be in accordance with Tender Form included in the tender documents.

4.2 Tenderers shall submit their main offers in accordance with the requirements of this specification. Deviations from the requirements of this specification, which are of a minor nature and do not depart materially, will be considered at the discretion of Transnet National Ports Authority. The acceptance of alternative tenders will be considered only if a main tender is submitted as part of the tender document.

4.3 The "Technical Data Sheet" of this specification shall be completed in detail, for each offer. Alternative offers shall be clearly marked "Alternative Offer No. _____".

4.4 All Technical Data Sheets shall be signed by the Tenderer and returned.

4.5 All documents forming part of the Tender shall be firmly bound. No loose documents will be considered.

4.6 Failure to comply with the above requirements may preclude a tender from consideration

4.7 The Tenderer shall submit complete and detailed information concerning their offers. This information shall include descriptions and drawings of the various items of equipment offered, as well as full photometric data issued by the South African Bureau of Standards, for the luminaires they propose using.

4.8 The Tenderer shall superimpose the number of luminaires per mast, vertical and azimuth aiming angles, as per existing.

4.9 The Tenderer shall allow for the supply, off-load, handling on site, erection, installation and testing of all items of equipment and material necessary for the complete lighting installation. This shall include the termination of the existing supply.

4.10 The Tenderer shall submit a lump sum price for the complete installation specified.

4.11 The total price tendered shall not include for a maintenance cage, power tool and winch.

5.0 SERVICE CONDITIONS

5.1 The lighting may be installed in areas where high humidity, high temperature, high wind, heavy rain, severe hail and high incidence of lightning are encountered and where corrosive conditions including the presence of sulphur dioxide, prevail.

5.1.1 Equipment installed shall be suitable for efficient operation under these conditions.

6.0 ELECTRICITY SUPPLY SYSTEM

6.1 The electricity supply system will be 3 phase, 4 wire, 50 Hz, alternating current with earthed neutral, at a nominal voltage of 400/230 V.

6.2 The voltage may vary within the range of 95% to 105% of the nominal and equipment installed shall be suitable for efficient operation at any voltage within this range.

7.0 STANDARD OF WORK, EQUIPMENT AND MATERIALS

7.1 All work shall be carried out in a neat and orderly manner to the satisfaction of Transnet National Ports Authority, and all equipment shall be easily accessible for maintenance purposes. Electrical work shall conform to the requirements of SANS 10142 and those laid down in this specification.

7.2 Equipment and materials used, shall be of high-quality design and manufacture, and shall comply with the relevant specifications and recommendations mentioned in this specification.

7.2.1 Where equipment and material does not comply with the relevant specifications it shall be submitted to Transnet National Ports Authority's Technical Officer for approval.

7.3 Every reasonable precaution and provision shall be incorporated in the design of the equipment for the safety and security of the system and of those concerned with its operation and maintenance.

8.0 OUTLINE OF SCHEME

As per attached drawings and detailed works instructions

9.0 MASTS

9.1 The mast shall be constructed in the form of a tapering enclosed column of polygonal or circular cross-section.

9.2 The design of the mast shall be adequate to resist a wind loading produced by a wind speed of 150km/h, measured at a height of 10 meters above ground level and acting on the projected area of the mast, luminaires and luminaire mounting carriage. The maximum permissible deflection at the top of the mast shall not exceed 2,5% of the height of the mast under wind loading produced by a wind speed of 100km/h. Provision shall be made in the mast design for minimising wind excited oscillation.

9.2.1 Tenderers shall submit with their offer, a full set of design calculations, as well as dimensioned drawings of the mast structure including door opening strengthening and base plate connection details, signed by a registered professional engineer.

9.3 The masts shall be designed for mounting on a reinforced concrete foundation by means of a base flange secured to a bolt cage into the foundation. The base flange shall be free from laminations and the welded connection to the mast, shall fully develop the strength of the section. Means shall be provided to enable masts to be adjusted from deviations from the vertical.

9.3.1 The space between the top of the concrete foundation and the underside of the base flange shall be filled with a suitable compound after provision of a vermin proof drainage hole. The cable entry pipes shall not be obstructed.

9.4 All steel used in the manufacture of the masts, luminaire mounting carriages, maintenance cages, etc., shall comply with the requirements of SANS 1431 grades 43A or 50. No steel section used in the construction of the mast shaft shall be less than 5mm in thickness.

9.5 Each mast shall be equipped with a suitable head frame accommodating mast top equipment associated with the raising and lowering gear. The head frame shall be designed to effectively seal the top of the mast against the ingress of water.

9.5.1 Problems are being experienced at certain locations with birds nesting in the vicinity of the shaft opening at the top of the mast, resulting in a build up of debris in the base of the mast. Tenderers shall describe with the aid of sketches/drawings, means adopted to avoid this problem in masts offered.

9.6 An opening shall be provided in the side of the mast to give easy access to a power distribution board, cable termination and the raising and lowering operating mechanism. The opening shall be protected by a lockable, close fitting, hinged door, incorporating a vermin proof ventilation opening and shall be effectively sealed against the weather. When the mast is installed, the opening shall face a direction parallel to adjacent tracks. Tenderers shall submit weatherproofing details with their tender documents.

9.6.1 The sides of the base compartment opening under 9.6 above shall be suitably reinforced with fully welded steel sections to restore the section modulus and prevent buckling.

9.7 Brackets or mounting plates, drilled to template shall be welded into the mast to support the winch and mast electrical equipment.

9.8 An M12 hex head stainless steel screw shall be welded to the main body of the mast in a readily position, directly adjacent to, and level with the underside of the distribution board within the base compartment, for earthing purposes.

9.9 Access shall be provided through the bottom of the mast and foundation for looping the supply cables into and out of the mast. Non-ferrous pipes shall be used for this purpose.

9.10 Welding shall be in accordance with BS 5135, general requirements for the metal-arc welding of mild or high tensile steel. It shall be carried out by qualified welders to the satisfaction of Transnet National Ports Authority's Structural Engineer. Site welding will not be allowed without the written approval of the Technical Officer.

10.0 FOUNDATIONS

10.1 Mast foundations shall be built by others.

11.0 RAISING AND LOWERING SYSTEM

11.1 Each mast shall be provided with a carriage for mounting of the luminaires. The carriage shall be in two halves joined by bolted flanges to permit removal from the erected mast. It shall be possible to raise the luminaire carriage to the top of the mast for normal operation and lower it to the base of the mast for maintenance purposes. This shall be achieved by means of three independent suspension ropes operated from a winch mounted in the base of the mast, the ropes being contained within the mast and passing over pulleys in the head frame to the carriage. The suspension ropes shall be permanently under tension and locking of the luminaire carriage in the raised position by means of a latching device at the top of the mast will not be acceptable.

11.1.1 The design of the carriage shall be such that the structure embodies as far as possible the necessary mountings and housings for individual luminaire, control gear units and terminal boxes. All mountings shall be of rigid construction and fixings for control gear units and terminal boxes shall be such that those units can be readily removed and are easily accessible for maintenance purposes without adjustment of floodlight aiming angles.

11.1.2 The carriage shall operate in conjunction with suitable guides located on the head frame, to ensure automatic and precise alignment of the carriage in the final stages of the raising operation and to guard against any fouling of suspension ropes and electrical cables.

11.1.3 The carriage shall be provided with a soft rubbing surface to prevent damage to the mast protection during raising and lowering.

11.1.4 The luminaires and control gear shall be mounted so as to balance the carriage as far as possible and the suspension system shall ensure that the luminaire carriage is supported in a horizontal position throughout the raising and lowering operation.

11.1.5 A visible means of indication that the luminaire carriage has reached the fully raised position shall be provided in the base compartment of each mast.

11.1.6 One specially designed bracket for clamping on to the mast directly above the door opening to support the luminaire carriage in the lowered position for maintenance purposes shall be supplied per contract.

11.2 The suspension rope pulley shall be fitted with self-lubricated, maintenance free bearings, protected against the ingress of moisture and dirt and designed for operation over the life of the mast without further attention.

11.2.1 The pulley shall be machine grooved to a depth of not less than 1, 5 times the diameter of the rope. The grooves shall be finished smoothly and be free from surface defects liable to damage the rope. The contour of the bottom of the groove shall be circular over an angle of approximately 120°. The radius of this part of the groove shall be larger than the radius of the rope by 0,8mm.

11.2.2 The diameter of the pulleys at the bottom of the groove shall not be less than 17 times the diameter of the rope.

11.2.3 The shafts on which the pulleys revolve shall be of large diameter to reduce the bearing loadings below normal design ratings. The shafts shall be positively secured in the head frame assembly to prevent rotation and shall be manufactured from stainless steel.

11.2.4 Pulleys carrying ropes or electric cables shall be provided with close fitting guards to retain the ropes or cables in the grooves when operating either loaded or slack. The guards shall be securely located against movement. Arrangements shall be made to ensure that the electric cables and steel wire ropes are separated before passing over their respective pulleys.

11.2.5 Pulleys shall be easily accessible to personnel standing on the floor of a maintenance cage in the fully raised position.

11.3 All pulleys, etc., at the top of the mast shall be protected against the ingress of water by means of a removable cover securely attached to the head frame and overlapping the equipment. The use of covers depending only on the security of gaskets for weatherproofing will not be acceptable.

11.4 Suspension and winch ropes shall be manufactured of AISI grade 316, flexible, stranded, stainless steel not less than 6mm diameter, in accordance with Specification No. CME 35 (rope detail as per table 39), with a factor of safety of not less than 10.

11.4.1 Thimbles shall, where possible, be secured by “Talurit” compression splices applied by means of a hydraulic tool. If this, for some reason, is not possible, three stainless steel “Crosby” type clamps per thimble may be used. “Crosby” clamps used shall be easily visible for inspection purposes.

NB: The saddle portion of the “Crosby” clamp must be placed against the wire under tension and not against the loose end.

11.4.2 Suspension ropes shall be easily removable and replaceable for inspection purposes. Tenderers shall provide clear instructions how this can be done.

11.5 All pulleys and bearings shall be manufactured from non-corrodible materials.

11.5.1 If non-metallic suspension rope pulleys are used, these shall be manufactured of glass filled nylon.

11.5.2 Each suspension rope pulley shall have a factor of safety of at least 10.

11.6 All equipment in contact with stainless steel wire ropes shall be entirely suitable for use in close contact with stainless steel, without the danger of electrolytic reaction occurring.

11.7 It shall be possible to fit a maintenance cage to the raising and lowering system, in place of the luminaire carriage, to enable two men to be hoisted to the top of the mast in complete safety for painting and maintenance purposes. The two halves of the maintenance cage shall be diametrically opposite one another. Use of the maintenance cage shall not necessitate the re-aiming of floodlighting luminaires.

11.7.1 Safety devices shall be incorporated in the construction of the maintenance cage to ensure it will not fall in the event of failure of the raising and lowering equipment. Tenderers shall submit drawings and describe fully; the type of equipment offered and include a separate price for the maintenance cage in their tender documents.

11.8 All bolts, nuts, pins, etc., associated with the luminaire carriage, maintenance cage and raising and lowering equipment shall be manufactured from stainless steel and locked by means of nylon inserts or spilt pins. Nylon inserts shall only be used in nuts that will not require removal in the normal course of maintenance. Pins shall be turned out of solid steel bar and wherever spring washers are used over elongated holes, a suitable flat washer shall be provided between the spring washer and the hole.

11.9 Special attention shall be given to the safety, reliability and protection against corrosion of the entire suspension system, including raising and lowering gear and ancillary equipment, all of which shall meet with the approval of Transnet National Ports Authority’s Supervisor before installation.

12.0 PROTECTION AGAINST CORROSION

12.1 Mast luminaire carriages, maintenance cage and all ferrous parts associated therewith, shall be hot dip galvanized in accordance with SANS 121. The mass of galvanized coating shall determine in accordance with the non-destructive method under clause 6,5 of the aforementioned specification.

12.2 All welding, drilling, punching, stamping, cutting and bending of parts shall be completed and all burns removed before the galvanizing process is carried out.

12.3 If specified, paint treatment shall be applied to all exterior galvanized surfaces in accordance with the requirements detailed in Appendix 1.

12.4 Stringent precautions shall be taken to protect finished surfaces from injury or damage during assembly.

13.0 **WINCH**

13.1 Provision shall be made in the base of the mast to accommodate a removable twin drum, totally enclosed, oil-bath type winch.

13.2 The winch shall be used for raising and lowering of the luminaire carriage and maintenance cage. The winch shall have a factor of safety of not less than 6.

13.3 The winch shall be of light weight construction and mounted on a suitable frame for easy transfer from one mast to another. It should also be easily coupled and uncoupled and removable through the door opening provided at the base of the mast. The design and mass of the unit shall allow easy handling and attachment to the mast by not more than two men. The total mass of the winch, including wire ropes and mounting frame shall not exceed 75kg.

13.4 Winches mounted outside the mast and connected to the suspension ropes through the door opening, will not be acceptable.

13.5 Each luminaire carriage suspension rope shall be secured independently in the base of the mast, prior to removal of the winch. The method of securing the ropes shall be such that there will be no deflection of the ropes from the vertical in any direction.

13.5.1 After fixing, the suspension ropes shall remain under tension to ensure that the luminaire carriage is retained in its fully raised position. This shall not be achieved by any kind of adjustment after the ropes have been secured.

13.5.2 This method of transferring the tension from each winch drum to the lock position must be safe. Pins used shall be of such a design that they lock automatically in position and cannot be removed while the hoist ropes are under tension

13.5.3 Single drum winch and compensating pulley arrangement will not be acceptable. The two suspension ropes shall be attached independently to each of the twin drum winch ropes.

13.5.4 Tenderers shall fully describe the method used for transferring the tension from the winch to the lock position and vice versa, prior to removal or replacement of the winch.

13.6 The winch shall be of the worm-gear type, self –sustaining at all loads and operating speeds, without the use of brakes or clutches. It shall have a gear ration of at least 50:1 and be suitable for both hand and power operation.

13.7 The winch shall be fitted with a safety device to ensure that the drum is locked positively when the cranking handle or power tool is removed from the drive shaft. The safety device shall be applied automatically.

13.8 Winch drums shall be machine grooved to ensure a tidy rope lay. The bottom of the groove shall be circular over an angle of approximately 120°. The radius of the groove shall be larger than the radius of the rope by not less than 0,8mm. The drum grooves shall be finished smoothly and be free from surface defects liable to damage the rope. The drum grooves shall be pitched so that there is a clearance between neighbouring turns of rope.

13.9 The rope anchorage on the drum shall be such that it is possible to inspect the termination of the rope in service without dismantling any part of the winch. It shall be so designed that the first and all successive rope lays are reeled on the drum in regular and tidy layers without any undue bending of the rope at the first turn.

13.10 The drum shall be so designed as to prevent the rope layers from stacking one on top of the other against the flange and also to prevent rope on any layer forcing its way down into lower layers.

13.11 The design of the winch and installation shall allow at least five turns of the rope to remain on the drum when the winch rope is fully extended under normal operating and maintenance conditions.

13.12 The winch shall incorporate a separate gearbox for each drum.

13.13 Worm gearing shall comply with the requirements of BS 721.

13.14 A test certificate. Stating the safe working load of the winch and issued by a recognised testing authority, shall be supplied with each winch.

13.15 Winches shall be fitted with a label and rating plate of a permanent nature in an easily visible position.

13.15.1 The label shall carry the Manufacturer’s or Supplier’s name and type number, serial number, test certificate number, safe working load, maximum allowable speed of

operation at the safe working load, recommended lubricant and year of manufacture or supply.

13.16 The lubricant for the winch shall be selected from Transnet's standard list, and Tenderer's recommendations are to be based on the "Lubricants and Petroleum Fuels Standing Advisory Committee Circular No. 1". (Failure to complete form CSS 80 correctly could disqualify an offer).

13.17 Tenderers shall quote separately for the twin drum winch.

13.18 Tenderers shall include a separate quotation for the supply of an electric power tool, incorporating a torque limiting device, for operation of the winch. The power tool shall be suitable for operation on a 230 volt, 50Hz, single phase supply.

13.18.1 The operational speed of, and torque developed by, the power tool shall match the requirements of the winch and suspension system. Should a multi-speed power tool, having speeds in excess of the aforementioned operational speed, be supplied, positive means shall be provided on the power tool to prohibit its use at any speed greater than that recommended.

13.18.2 It shall be possible to support the power tool accurately and securely in its operating position for remote control at a distance of 5 meters from the mast base. The remote control switch shall incorporate a push button requiring constant pressure for operation.

13.18.3 All the equipment shall be of robust construction, suitable for site use and shall be complete with interconnecting cables and plug.

13.19 An operating handle, incorporating a torque limiting device, shall be supplied for manual operation of the winch.

13.20 The torque limiting devices shall be adjusted according to their function up to a maximum value of 40 Nm. The adjustment shall be so arranged that it cannot readily be altered during normal use of the tools on site.

14.0 LUMINAIRES AND CONTROL GEAR

14.1 The tenderer shall supply and install luminaires as detailed in drawings.

15.0 DISTRIBUTION BOARD AND MAST CABLING

15.1 All terminal blocks and cabling shall be inspected for damage and replaced if necessary.

15.2 A totally enclosed power distribution board of flame retardant reinforced fibreglass construction shall be mounted in an easily accessible position in the compartment of the mast.

15.2.1 The board shall be provided with a front cover panel secured by captive type screws and allowing only operating toggles of switches/circuit breakers to protrude.

15.3 The distribution board shall be equipped as follows:

15.3.1 One adequately rated, triple pole, moulded case, main isolating switch.

15.3.2 Three adequately rated, single pole, moulded case circuit breakers for control of the luminaires.

15.3.3 One 15 amp, 3 pin, industrial type, switched socket outlet for control of the power tool.

15.3.4 One 15 amp, single pole neutral, moulded case circuit breaker with integral 20 mA earth leakage protection device for control of the switched socket outlet under clause 15.3.3. The earth leakage unit shall comply with the requirements of SANS 556-2.

15.3.5 One three phase, neutral and earth socket outlet for connection of the supply cable to the luminaires and protected by the circuit breakers under clause 15.3.2 above.

15.3.6 An adequate number of terminals of suitable size, allowing only one wire per terminal for looping of the incoming and outgoing supply cables. These terminals shall be provided with bridge pieces connecting any number of adjacent terminals together to form a busbar.

15.3.6.1 Terminals shall be of the rail mounted clip-on type, with flash-barriers between terminals.

15.3.7 An insulated neutral terminal block with sufficient ways for the number of circuits employed.

15.3.8 An adequately rated earthing bar.

15.3.9 Grommeted access holes in the bottom of the board for cable entry.

15.4 All wiring in the distribution board shall be neatly arranged to run horizontally and vertically and shall be supported and fixed at regular intervals.

15.5 All moulded case circuit breakers shall comply with the requirements of SANS 556 and SANS 60947-2. They shall be rated for 250 volts and have a breaking capacity of “6kA”.

15.6 The main switch under clause 15.3.1 shall be of the same manufacturers as the moulded case circuit breakers specified. The switch shall be capable of carrying a fault current of 1000 A for 1 second without welding of the contracts or other damage to the unit.

15.7 Each control unit on the distribution board shall be clearly labelled by means engraved or printed labels of metal or plastic or other approved material, firmly attached to the

board and indicating in both official languages the designation of each circuit controlled. Labels of embossed adhesive tape are not acceptable.

15.8 A flexible, multicore, heavy duty trailing cable shall be installed between the distribution board in the base of the mast and the luminaire carriage, for the power supply to the luminaires. The cable shall be entirely suitable for the bending and load carrying stresses involved.

15.9 Guiding pulleys in the head frame shall be of adequate diameter and shall have a cable retaining groove sized to match the cable diameter, to ensure that the cable is not subjected to abrasion or undue straining during raising and lowering operations.

15.10 The cable shall be securely clamped at the luminaire carriage, the other end being secured to the suspension cable in an approved manner, to ensure that the lower end returns to the mast base during the luminaire raising operation and does not become entangled with suspension ropes.

15.11 The cable shall be so installed that it can be replaced from ground level without lowering the mast or the use of special equipment. Tenderers shall provide clear instructions on how this can be done.

15.12 Both ends of the cable shall be fitted with adequately rated, 3 phase, neutral and earth, plug-in connectors to match the socket outlet under clause 15.3.5 and a socket outlet mounted in/on a weatherproof, corrosion resistant terminal box on the luminaire carriage.

15.13 The socket outlet, plug-in connector combinations on the distribution board and luminaire carriage shall be of the weatherproof type. When connected, the plug-in connectors shall be retained in position by suitable locking devices The equipment shall be Maréchal, or equal approved manufacture.

15.14 When in the lowered position, testing of the luminaires shall be effected via a three meter length of flexible cable, of equal manufacture and cross-sectional area to that supplying the luminaires, and fitted with plug-in connectors on both ends to suit the socket outlets on the distribution board and luminaire carriage. One such cable shall be provided per contract.

15.15 The terminal box on the luminaire carriage shall contain fixed terminal blocks of equal or similar approved to “KLIPPON”, for connection of the cabling to the luminaires. Cabling between the terminal box and control gear provided in the construction of the luminaire carriage, or galvanised steel conduits. Any cabling exposed to the effects of ultraviolet radiation, shall be silicon insulated.

15.16 All metalwork, including luminaires, control gear units and the luminaire carriage shall be bonded to the earth core of the luminaire supply cable.

15.17 The following label in both official languages shall be affixed to the distribution board in a prominent position:

"Luminaire socket outlet and plug to be isolated and disconnected before lowering the luminaire carriage".

16.0 CABLES

16.1 The contractor shall supply and install 4-core, ECC, PVC cables.

16.2 The contractor shall also supply and install a suitable earthing cable at each mast.
16.3 The cable shall be installed in cable ducts and sleeves provided by others.

17.0 CABLE LAYING

17.1 The cable shall be installed in cable ducts and sleeves.

18.0 EARTHING AND LIGHTNING PROTECTION

18.1 The contractor shall supply and install earthing and lightning protection to the masts as per SANS 10313.

18.2 The incoming and outgoing cable termination and earthing arrangement at each mast shall be as shown.

18.3 The earthing core of the cable supplying the luminaires (clause 15.8) shall be connected to the earthing bar in the distribution board.

18.4 Lighting protection is required at all masts.

18.4.1 Each mast shall be equipped with a lighting conductor in the form of a galvanised steel rod screwed into the top of the head frame, through the head frame cover.

18.4.1.1 The minimum dimensions of the conductor shall be 12mm diameter and 600mm long.

18.4.1.2 The actual length of the conductor shall be adequately to afford a zone of protection to the luminaire carriage and ancillary equipment by an imaginary line drawn from the top of the rod at an angle not exceeding 45° from the downward vertical.

18.4.2 Depending on the mast location the earth termination shall be effected either by an earth rod, or mast to rail bond, or both.

18.4.2.1 Each mast shall be equipped with a mast to rail bond and spark gap.

18.5 The gusset arrangement and 50mm diameter hole through the foundation shown shall be included in the tender price and provided at each mast.

18.6 The earth rod described in clauses 18.7 to 18.9 below, shall be included in the tendered price for installation at all masts.

18.6.1 Should earth rods for any reason not be required. Adjustment will be effected at the rates.

18.7 The earth rod shall be of the “Taper Lock Cad weld” type, consisting of a heavy copper exterior, molecularly bonded to a high strength steel core. The copper shall have a minimum thickness of 0,25mm

18.8 Rods shall be supplied in 1 meter lengths of 16mm diameter and joined together by the taper lock method to ensure that soil contact is maintained throughout the length of the coupled rods.

18.9 Tenderers shall allow a length of 3 meters of rod per mast. Should this length be insufficient to obtain the earth resistance specified, and then further lengths will be paid for at the relevant rate.

18.10 Rods shall be driven into the ground in a professional manner to ensure that no unnecessary vibration are set up. The manufacturer’s recommended rod driving practice shall be closely followed.

18.11 The resistance to earth, measured by an earth resistance tester shall not exceed 10 ohms. Salt or other corrosive substances shall not be used to reduce earth resistivity. Sanica Gel or other approved substances may be used.

19.0 LOWERING AND RAISING OF MAST:

19.1 Supply a suitable size crane and all rigging equipment as well as the qualified rigger to lower and raise the pole.

19.2 Ensure that no damage occurs on the neighbouring structures as well the lighting structure.

19.3 A nylon sling capable of carrying weight more than three tons shall be used for the lowering and the raising of the high mast structure.

20.0 CLEANING AND SURFACE PREPARATION OF ALL COMPONENTS:

20.1 All surface shall be detergent washed and fresh water rinsed to remove oil and grease.

20.2 Sharp edge shall be radiused and major roughness of welds shall be removed by grinding. Weld spatter and flux shall be removed.

20.3 All bolts, nuts, pins, etc., associated with the luminaire carriage, maintenance cage and raising and lowering equipment shall be manufactured from stainless steel and locked by

means of nylon inserts or split pins. Nylon inserts shall only be used in nuts that will not require removal in the normal course of maintenance.

21.0 REMOVAL & REPLACEMENT OF MOUNTING RING

21.1 Inspect and repair the mounting ring. The repairs on the ring shall be according to the SANS 10064, and SANS 121.

22.0 REMOVE AND REFURBISH EXISTING MOUNTING RING

22.1 Inspect and repair corrosion and treat rust spots on the mounting ring.

23.0 REMOVE, CLEAN, RE-LAMP AND RE INSTALL EXISTING LUMINARE

23.1 All surfaces shall be detergent washed and fresh water rinsed to remove oil and grease.

23.2 All the light fittings shall be re-lamped with appropriate lamps.

23.3 The contractor shall repair the light fitting and replace all the mounting bolts.

23.4 All removed lamps will store together and disposed appropriately. The contractor shall submit a certificate of disposal at the end of contract.

24.0 REMOVAL & REPLACEMENT OF LUMINARE COMPLETE WITH LAMPS

24.1 Remove and replace luminaries where the luminaries.

24.2 All the lamps of the removed luminaries shall be removed and disposed appropriately.

24.3 Disposal certificate shall be issued to the project manager at the end of construction or maintenance.

24.4 Replacement luminaires shall comply with requirement of SANS 475.

25.0 REFURBISHMENT OF HEADGEAR WINCH AND PULLEYS

25.1 Check oil level, winch drums as well as the pulleys.

26.0 REPAIR AND REFURBISH HIGH MAST DOOR

26.1 Clean, remove rust and paint the door.

27.0 LUBRICATION OF MOVING COMPONENTS AND FOUNDATION BOLTS.

27.1 Lubricate all the foundation bolts as well as the associated nuts.

28.0 REMOVAL & REPLACEMENT SPLITTER BOXES

28.1 Remove and replace the splitter box.

29.0 REMOVAL & REPLACEMENT OF HOIST CABLE

29.1 Inspect and replace the hoist cables. The replacement cable shall be of AISI grade 316 flexible, stranded and stainless steel not less than 6mm.

30.0 REPLACEMENT OF ALL SILICON CABLE FEEDS FROM SPLITTER BOXES INCLUDING THE PROVISION OF GLANDS

30.1 Replace all silicon cable from the splitter box.

31.0 PAINTING OF COMPLETE HIGH MAST STRUCTURE

31.1 All surfaces shall be detergent washed and fresh water rinsed to remove oil and grease.

31.2 Sharp edge shall be radiused and major roughness of welds shall be removed by grinding. Weld spatter and flux shall be removed.

31.3 The painting of the mast shall be in accordance with APPENDIX No.1

32.0 REMOVAL & REPLACEMENT OF EARTH SPIKES

32.1 Test and install new earth spikes.

33.0 REMOVAL & REPLACEMENT OF ELECTRICAL DISTRIBUTION BOARD

33.1 Remove and install an electrical distribution board.

33.2 A total enclosed power distribution board of flame retardant reinforced fibreglass.

34.0 ELECTRICAL COMPLIANCE CERTIFICATION

34.1 Contractor to test installation and issue a compliance certificate.

35.0 ISSUE OF RMD 9 CERTIFICATE

35.1 Contractor to test and issue RMD9 certificate.

APPENDIX 1

PAINTING SPECIFICATION FOR LIGHTING MASTS

1. PAINTING OF MASTS

1.1. The preparation and painting of masts shall comply with SANS 10064 and BS 5493 respectively. Colours shall be in accordance with SANS 1091.

1.2. The primer coating shall be equal or similar to Plascon “Plascoguard Gehophon” GW 5, Dulux “Sigmacover”’ or Chemrite Coatings “Carboline 193 HB”.

1.3. The two coats covering the primer surface shall be equal or similar to Plascon “Plascothane Recoatable Enamel” CPC series; Product data sheet U-8B, Dulux “Sigmadur Gloss HB”, or Chemrite Coatings” Caroboline 133 HB”. Colours shall be as specified in clause 1.8.

1.4. All paints shall be stirred and mixed to homogeneous condition incorporation the whole contents of the paint container. Mixed paint shall be kept mixed and in good condition throughout, stirring when necessary to keep the pigment in suspension. Thinning shall only be undertaken in accordance with manufacturer’s recommendations and directions. Partially used containers shall be resealed to prevent evaporation of solvent.

1.5. Galvanised surfaces shall be scrubbed with steel wool soaked in a cleaning solution to remove the protective film against formation of white rust and all other foreign matter and also to provide a key for adhesion of the primer. Protective clothing, gloves and masks must be used by workers during this cleaning process. Rinse the cleaned surface copiously with water.

1.6. All painted surfaces, prior to application of the following coat, shall be sound, dry and free from oil, grease and other contamination. Any unsound paint to be removed completely, the surface prepared as in clause 1.2 above and repainted coat for coat as specified below.

1.7. After preparation of the galvanised surfaces apply one coat of primer by spraying to give a dry film thickness of 80 microns to all surfaces with the exception of the mast interior which need not be painted. Allow to dry for a minimum period of 4 hours before overcoating.

1.8. The primed surface shall then be painted in accordance with clause 1.4. One coat of colour G12 (Dark Admiralty Grey), by suitable airless spray equipment to give a dry film thickness of 75 – 100 microns for this coat. An overall final coat colour H30 (French Grey), to give a dry film thickness of 25 – 35 microns shall be applied. The total dry film thickness of the primer and two successive coats shall be between 180 – 215 microns.

1.9. Paints shall be applied under suitable conditions of light, temperature, humidity and ventilation. At time of overcoating, the painted surface shall be clean, dry, sound and free of misses and defective paint. Each coat of paint shall be applied as a continuous, even film of uniform thickness.

1.10. Painted steel shall not be handled until the paint has dried except where necessary in turning for painting of stacking for drying. Paint damaged in handling shall be scraped off and touched up by replacing each coat of paint scraped off. Painted steel shall not be transported or packed for transport until paint is dry.

1.11. When loading at the manufacturer's premises and when off-loading at the erection site, components shall be handled with hessian covered slings in order to cause minimum damage to paintwork. During transportation, the components shall be placed on wooden dunning and securely fastened to prevent sliding and other movement.

1.12. Prior to erection of masts, damaged areas of paint shall be repaired by spot cleaning in a manner that will minimise damage to sound paint. Bared areas shall be spot primed and spot painted with the materials specified, to restore all coats.

1.13. During erection, mast shall be handled with hessian covered slings to minimise damage to paintwork. After erection, paintwork shall be repaired in the manner described above.

APPENDIX 2

STATEMENT OF COMPLIANCE
(TO BE COMPLETED BY TENDERER)

This tender complies with specification TPD: 010B-HIGHMASTSPEC-B in all respects.

SIGNATURE: _____ DATE: _____

This tender complies generally with specification TPD: 010B-HIGHMASTSPEC-B but differs from it on the following points.

_____

_____

_____

_____

SIGNATURE: _____ DATE:_____

Transnet National Ports Authority