

# **TRANSNET NATIONAL PORTS AUTHORITY**

## **SPECIFICATION FOR MAINTANANCE OF CRANES AND HOIST FOR USE ON PORTS EQUIPMENT**

### **TNPA-INFRA-ENG-SPEC-EEAM-Q-011**

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Note: Only the latest amendments and/or additions are reflected in italics in the body of the document.



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ANNEXURE	STANDARD SAPO SPECIFICATIONS
EEAM-Q-003	Steel wire ropes
EEAM-Q-004	Gearing, shafts, bearings, brakes, lubrication, vee-belts, keys and keyways
EEAM-Q-006	Structural steel work
EEAM-Q-008	Corrosion protection
EEAM-Q-016	General requirements and conditions
EEAM-Q-012	General electrical equipment
EEAM-Q-015	Electrical motors and generators
EEAM-Q-020	Testing of electrical equipment
EEAM-Q-021	Electronic equipment

When conflicting requirements occur between this specification and these other standard specifications, this specification shall have precedence in matters relating to maintenance cranes and hoists.

## 1. SCOPE

- 1.1 This specification covers the design, fabrication, delivery to site, erection, installation, testing and commissioning of all maintenance cranes and hoists supplied with port equipment.
- 1.2 The cranes and hoists will be used for lifting mechanical and electrical components on the equipment for doing maintenance and adjustments, lowering and lifting components and tools to and from the quay level.
- 1.3 All cranes and hoists supplied shall be complete, installed – including connecting up to an isolator box, tested and commissioned. They shall be of a modern design and built to good engineering practice.

## 2. GENERAL REQUIREMENTS

- 2.1 Only well-proven equipment will be considered for this tender.
- 2.2 Only cranes and hoists that are fully supported locally to the end location as part of the standard range of a supplier may be offered.
- 2.3 Cranes and hoists that will be stored and operated exclusively in a machine/electrical room may be designed for indoors operation, but all other cranes and hoists must be designed for outdoors coastal operation. All equipment offered must be designed for operation in the following conditions:
  - 2.3.1 Altitude: Sea level
  - 2.3.2 Ambient temperature: -5°C to 45°C
  - 2.3.3 Relative humidity: Frequently 100%
  - 2.3.4 Heavily saline atmosphere
- 2.4 All parts and components shall be adequately protected against corrosion during transit and storage.
- 2.5 Each crane/hoist shall be designed to prevent the accumulation of product or standing water on it.



- 2.6 The work shall be carried out in an efficient and workmanlike manner in accordance with this specification and to the satisfaction of the Engineer.
- 2.7 Tenderers shall submit with their tenders detailed information as called for in Appendix C of BS466 (or equivalent) for the crane offered.
- 2.8 All tenders are subject to the General Requirements and Conditions of Specification EEAM-Q-016. Full documentation for each crane/hoist must be provided in accordance with EEAM-Q-016 by the contractor.
- 2.8.1 As part of the construction documents, the successful tenderer will be required to present the technical characteristics in accordance with Appendix C of BS466
- 2.9 The equipment tendered for must comply with all the Standard Specifications listed on page 1.
- 2.10 Tenderers shall indicate clause by clause either that their offer complies in every respect with that clause of this specification, or if not, exactly how it differs.

### 3. SPECIFIC REQUIREMENTS

- 3.1 All cranes and hoists shall be designed and manufactured according to BS466 and BS2573 (latest) or FEM.
- 3.2 **Mechanical and structural requirements:**
- 3.2.1 The following information must be supplied for each crane hoist by the tenderer:
- 3.2.1.1 Span (centre to centre of rail)
  - 3.2.1.2 Capacity: SWL below hook
  - 3.2.1.3 Range of lift above and below floor level
  - 3.2.1.4 Length of travel
  - 3.2.1.5 Driving method for each motion
  - 3.2.1.6 Manufacturer and model of each drive unit
  - 3.2.1.7 Speeds of each motion (including creep speeds if relevant)
  - 3.2.1.8 Rail/beam type and size
  - 3.2.1.9 Type of rail clips used
  - 3.2.1.10 Type and size of each hoist wire/chain
  - 3.2.1.11 Reeving and winding arrangement
  - 3.2.1.12 Maximum wheel loads:
    - 3.2.1.12.1 Vertical kN per wheel
    - 3.2.1.12.2 Transverse kN per wheel
    - 3.2.1.12.3 Bending moment induced by wheels on crane rail: kNm



- 3.2.1.13 Distance between adjacent wheels
  - 3.2.1.14 Wheel diameters and material, in particular the wheel tread hardness
  - 3.2.1.15 Maximum longitudinal force (braking and buffer): kN
  - 3.2.1.16 Maximum power consumption: kW
  - 3.2.1.17 Clearance profile: horizontal from centre of rail, vertical from top of rail
  - 3.2.1.18 Height, floor to top of crane rails/hanging point and quay to top of crane rails/hanging point
  - 3.2.1.19 Rail alignment tolerances (not stricter than BS466 Appendix F or FEM para 8.2.3)
  - 3.2.1.20 Detail of hook
- 3.2.2 The design life for the maintenance cranes and hoists must be 30 years, taking due consideration of the effects of corrosion.
  - 3.2.3 All maintainable parts must be easily accessible for maintenance.
  - 3.2.4 For maintenance cranes the wheels, axles, gearboxes and motors of the bogies must be removable towards the inside of the crane,  
i.e. no access must be needed between the bogies and electrical/machine-house walls.
  - 3.2.5 Buffers capable of absorbing impact at maximum long travel speed against stops without structural damage to crane/hoist, and maximum longitudinal force as stated in 3.2.1.15, shall be fitted to the bogies.
  - 3.2.6 The group classification of the all maintenance cranes/hoists shall be A2 (Class of utilisation U2, State of loading Q2).
  - 3.2.7 Electric drive units: gear-motor-brake units where the brakes are disc type, spring applied, electrically released and self-adjusting.
  - 3.2.8 The hoist braking motion shall be capable of safely controlling the lowering of the load. Should an over-speed occur, the hoist brake shall automatically engage.
  - 3.2.9 All wire ropes/chains shall be of the galvanized type and fully lubricated.
  - 3.2.10 Chain baskets shall be made of 3CR12 or other stainless steel.
  - 3.2.11 All cranes/hoists shall be suitable for extended use in the highly corrosive wet saline atmosphere and shall comply in all respects with specification EEAM-Q-008 (Corrosion Protection).
  - 3.2.12 The hook assembly shall swivel, and the hook must be fitted with a latch. Both must be hot dip galvanized and painted.
  - 3.2.13 Where a hoist runs directly on a beam, this entire beam shall be hot dip galvanized and painted.
  - 3.2.14 A sturdy anchor point (for securing the crane/hoist during machine operation) shall be supplied on the main machine for each crane/hoist, together with a bracket for storing the pendant and cable in this position.
  - 3.2.15 All travel wheels shall be fully painted (excluding running surfaces).

### 3.3 **Electrical requirements:**



- 3.3.1 The power supply to all cranes/hoists shall be 400V three phase, 50Hz, with earthed neutral, by means of a highly corrosion resistant festoon cable system or energy chain fitted to the crane rail beam.
- 3.3.2 The supply voltage may vary within the range of 90% to 110% of the nominal, and all equipment shall be suitable for continuous operation in this range.
- 3.3.3 All supplies are to be taken between phases (i.e. the supply system shall be regarded as a 3 phase 3 wire system), and the fourth wire shall be used only for the earthing of the crane.
- 3.3.4 The isolator box must include a switch disconnecter.
- 3.3.5 Slip-ring motors or two speed squirrel cage motors will be preferred for all motions.
  - 3.3.5.1 All motions shall have two speeds: fast and slow.
    - 3.3.5.1.1 The fast speeds shall be stated:
      - a) Hoist: m/min
      - b) Cross travel: m/min
      - c) Long travel: m/min
    - 3.3.5.1.2 The slow speeds shall be approximately one quarter to one third of the fast speed and must be stated:
      - a) Hoist: m/min
      - b) Cross travel: m/min
      - c) Long travel: m/min
  - 3.3.5.2 On hoisting, the control system shall prevent the load from lowering in the case where a load may overpower the motor, particularly when the slow speed is selected.
- 3.3.6 All motors shall be totally enclosed with fan cooled induction motors specifically for heavy reversing crane duty, taking the height of lift from ground level into account.
  - 3.3.6.1 The contractor would be required to submit calculations during the contract showing how they arrive at their choice of motor for each motion of the crane.
  - 3.3.6.2 Tenderers must submit with their tender full information on the types of motors and control offered.
- 3.3.7 The cranes/hoists must be controlled from the floor or nearby walkway by using a robust push-button pendant controller suspended from the trolley.
  - 3.3.7.1 The pendant push-button controller shall be enclosed in, or manufactured from a material similar to PVC or polycarbonate.
  - 3.3.7.2 It shall have a degree of protection rating of at least IP65.
  - 3.3.7.3 The pendant controller shall be capable of withstanding rough handling.
  - 3.3.7.4 The push-buttons shall be spring loaded and shall return to the "OFF" position when thumb pressure is released. Separate push buttons shall be provided for each speed of each motion. The type of control whereby the further depression of the push button selects a higher speed for the motion being controlled, is not acceptable.



- 3.3.7.5 The electrical control circuits to the pendant control shall be supplied at 110 volt from a suitably rated 400/110-volt double wound step-down transformer with the midpoint of the secondary winding effectively earthed.
- 3.3.7.6 The motion controlled by each push-button shall be clearly engraved.
- 3.3.7.7 The weight of the pendant shall be supported independently from the flexible electric cable by a stainless-steel cable.
- 3.3.7.8 The controller shall also be provided with a latching red mushroom headed type emergency push button for tripping the main contactor.
- 3.3.8 An electronic overload safety device with audible indication must be provided.
- 3.3.9 Electric motion limiting is required on all motions.
- 3.3.10 All electrical equipment shall be suitable for operation under the conditions listed under clause 2.3 and shall be suitably treated for use in tropical climate where rapid changes in weather conditions can produce severe moisture condensation problems. The equipment shall also be capable of withstanding the highly corrosive effects of the moist saline atmosphere.
- 3.3.11 For cranes or hoists that will be used exclusively inside an electrical/machinery room, all enclosures of electrical equipment shall have a minimum degree of protection of IP45, and all motors of IP24.
- 3.3.12 For cranes or hoists that would at any time operate outside an electrical/machinery room, all enclosures of electrical equipment shall have a minimum degree of protection of IP65, and all motors of IP54. The entire crane/hoist shall be suitable for outdoor use and storage.

#### 4. TESTING, COMMISSIONING AND GUARANTEES

- 4.1 Each crane/hoist shall be tested according to BS466 or FEM
  - 4.1.1 A complete and detailed test and inspection protocol for the commissioning of the cranes/hoists shall be submitted by the Contractor to TPT for approval two weeks before the anticipated date for commissioning. The test and inspection protocol shall include all tests and inspections required in terms of BS466 (or FEM), and all other tests and inspections deemed necessary by the Contractor to prove to TPT's satisfaction that the cranes/hoists have been delivered according to the contract.
  - 4.1.2 The manufacturer shall carry out proof load tests at 125% the rated load on the cranes/hoists, at his workshop, to verify that the girder deflection is within the limits specified by BS466.
  - 4.1.3 After manufacture and erection, the Contractor shall satisfy himself that the equipment is complete and in accordance with the contract in all respects and shall carry out the necessary pre-commissioning tests on the equipment. During this period TPT's representatives will carry out visual inspections of the equipment.
  - 4.1.4 After approval of the commissioning test and inspection protocol by TPT, the Contractor shall fully test the crane according to the protocol in the presence of TPT's representatives.
  - 4.1.5 On completion of the tests, a report shall be prepared by the Contractor, listing the conclusions and findings of the tests. The report shall identify the crane/hoist tested and shall give the date and location of the tests and the name of the test supervisor. It shall be specific as to the loads, positions, configurations, procedures and findings in each case.
  - 4.1.6 The Contractor shall provide all initial lubrication and consumables required to carry out the tests.



- 4.1.7 All personnel, equipment, test devices and materials required for the approved tests shall be provided by the Contractor, at his cost.
- 4.2 If the crane/hoist fails any of the tests or inspections, these tests and inspections may be repeated on request by the Contractor -- at the discretion of TPT. If the Contractor wishes to make modifications to the equipment in an attempt to obtain the required performance, this must be approved by TPT. The failed tests shall then be repeated after the adjustments and a modification made by the Contractor has been completed. TPT may also require the repetition of other related tests that might have been affected by the adjustments or modifications.
- 4.3 Notwithstanding the successful completion of the commissioning tests and inspections, the Contractor shall remain liable for defects in the equipment during the defects liability period.
- 4.4 On completion of the commissioning tests the Contractor shall supply in triplicate complete test reports, certificates as necessary, and such statutory documents as are required certifying the class and safe working load of the crane and that the equipment is in complete working order and that all working parts are effectively lubricate Guarantee period:
- 4.4.1 Notwithstanding the guarantee period of the machine on which the maintenance cranes/hoists are fitted, the Contractor shall guarantee for a period of 12 months after the successful commissioning of the cranes/hoists that all components, plant, equipment and material are new and fit for the specified purpose which they are purchased, and are free from any defects in design, workmanship and material, and are in strict accordance with the Contract, unless otherwise agreed in writing by TPT.
- 4.4.2 The Contractor shall agree to replace at his cost any defective items discovered within the defects liability period, provided that the equipment has been operated and maintained substantially in accordance with the Contractor's written operating and maintenance instruction, normal wear and tear excluded.