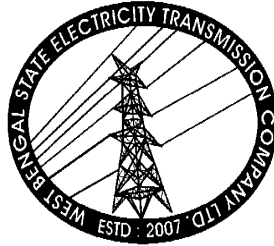


ELECTRICALLY OPERATED TRAVELLING CRANE



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Engineering Department

WEST BENGAL STATE ELECTRICITY TRANSMISSION COMPANY LIMITED

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TECHNICAL SPECIFICATION FOR ELECTRICALLY OPERATED TRAVELLING CRANE

1.0 Scope

This specification applies to the design, engineering, manufacturing/fabrication, assembly, inspection, testing before dispatch, packing, forwarding, supply and delivery at destination by suitable transport, unloading at site, installation and commissioning of indoor 5.0 Metric Ton EOT crane on Turnkey basis and as specified in the following sections of this document.

2.0 Reference Standards & Codes

The standards as laid down are applicable in the relevant parts to the individual components of the EOT Crane -

1.	IS:325-1978	3-Phase induction motors (fourth revision)
2.	IS:807-2006	Code of practice for design, manufacture, erection and testing (structural portion) of cranes and hoists.
3.	IS: 2062-1992	Specification for structural steel (fusion welding quality)
4.	IS:2266-1989	Steel wire ropes for general engineering purposes
5.	IS:3177- 1999	Code of practice for electric overhead travelling cranes and gantry cranes other than steel work cranes.
6.	IS:I3947(Part-1)-1993	Low voltage switches and control gear PI-general rules
7.	IS:I3947(Part-4, Section-1) -1993	Low voltage switchgear and control gear P-4 - contactors and indoor starters sec 1, electro- mechanical contactors and motor starters (superseding IS:2959 and IS:8544 – all parts)

3.0 I) COMPLIANCE TO SPECIFICATION & DEVIATION:

Normally the offer should be as per Technical Specification without any deviation.

II) MODIFICATION :

If any modification felt necessary to improve performance, efficiency and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidences and advantages. Such modifications suggested may or may not be accepted, but the

same must be submitted along with Pre-Bid Queries. The modifications not mentioned in Pre-bid queries will not be considered.

The successful bidder shall also submit the GTP covering all necessary information /parameters (electrical & mechanical) after placement of LOA duly signed with date & company seal for acceptance of WBSETCL for approval of manufacturing clearance.

4.0 General Consideration

- a) EOT Crane of suitable capacity shall be provided for erection & maintenance of largest GIS component /assembly. The crane shall consist of all special requirements for erection & maintenance of GIS equipment.
- b) The crane shall be of double girder type with required stiffeners; diaphragms, suitably designed to carry the load of the crane. The girder shall be so designed that the deflection of the same with full load at the center shall be maintained well below $L/900$ and the Slenderness Ratio of the compressive flange shall be within the value as per IS: 807 and IS: 800.
- c) Class of duty shall be class 2 for structural and class 4 for electricals. Control shall be through independently movable pendant push button station from operating floor level.
- d) Speed of the hoist shall be 3-4 meter per min and the creep speed through DCEM clutch and pony geared motor shall be maximum 0.5 meter per min.
- e) The height of lift and length of long travel shall be in accordance to the GIS room.
- f) The end carriage & Trolley frame shall be fabricated with MS Rolled channels and MS plates, suitable stiffeners and diaphragms shall also be provided.
- g) Antiskid skid chequered plate with suitable maintenance platform for Hoist Block and long travel drive shall be provided. Sufficiently wide full length walk way with hand railing should be provided on the girder. Drawing & all other related document are to be approved from the user Deptt.
- h) Totally enclosed helical splashed oil bath lubricated gear box shall be used for all motion. All gear & pinion shall be hardened and tempered alloy steel having metric module machine cut teeth. The housing shall be graded cast iron / cast steel or fabricated from steel plates. Fabricated housing shall be stress relieved before the machining. The gear box shall be oil tight and fitted with oil level indicator, breather plug, inspection cover and oil drain out plug. The internal surface of gearbox shall be painted with oil resistant type paint.
- i) Rope drum shall be fabricated from rolled steel plates or seamless tube. Fabricated rope drum shall be stress relieved before machining. The rope drum shall be designed for single layer of rope; the helical groove shall be smooth finished.
- j) Wire rope shall be regular right hand lay fiber core as per IS: 2266. The construction of wire rope shall be 6X36 constructions. The factor of safety shall be 6 minimum. Rope sheaves shall be graded cast iron. The rope sheaves shall be mounted on anti friction bearing.
- k) Lifting hook shall be single point with shank as per IS: 3815. The hook shall be mounted on anti friction thrust bearing which shall be enclosed by protective skirt for 360° smooth swivelling of the load on the hook. The block sheaves shall be fully encased in close fitting guards fabricated out of steel plate. Smooth opening shall be provided in the guard to allow free movement of rope. Hook block should be tested and certified with proof load from Govt. accredited testing authorities. Test certificates for lifting hook shall be furnished during the supply.

- l) Crane and trolley wheels shall be double flanged, parallel tread rotating axle type. Wheel shall be mounted on antifriction roller bearing housed on the fixed axle type wheel for easy removal during maintenance. Wheel shall be carbon steel and heat treated to 250 BHN minimum.
- m) Double braking system shall be provided with hoist motion. All breaks shall be fail safe type; the brake shall be applied automatically by spring when power supply to the brake is interrupted. The Hoist motion shall have one no electromagnetic shoe type brake and one electro hydraulic Thruster type brake. Cross & Long travel shall have also electromagnetic shoe/disc type brake.
- n) Spring loaded buffer shall be provided on all the 4 corner of the carriage & trolley for Cross & Long travel motion respectively
- o) Hoist, Cross travel and long travel motion shall have limit switches to limit travel. For hoist Rotary Gear type switch for over hoisting and over lowering shall be provided. For hoist motion, one additional back up gravity type limit switch over hoisting limit switch shall be provided. For Cross travel & long travel one additional roller lever type limit switch shall be provided for over travel.
- p) All electrical motors shall be totally enclosed fan cooled, S4 Duty, Squirrel Cage Induction Motor. The starting motion of all travel shall be jerking free. Suitable starting arrangement shall be provided for all LT motor to reduce the starting current to achieve smooth starting and thereby jerk free operation in all motions of the crane. Motor shaft shall be connected to the gear box through gear type flexible coupling.
- q) The Motors should be controlled by reversing contractor (AC-4 duty) switch from pendant push button station. All electrical Contractors for inching operation shall be of AC -4 Duties The effective control & protection of motor should be through a control system which comprises of heavy duty reversing air break contractor, O/L relay with single phase preventer, HRC fuses and control transformer. These shall be housed in easily removable, dust and vermin proof fabricated steel panel box.
- r) Pendant push button shall be suspended from crane by link chain so that no undue stress can come on the cables. The Push button station shall be independently movable. Separate cable track with cable trolley etc. shall be provided for the push button station. The unit shall comprise of push button marked as follows and 1no. Indication lamp for control of indication:
 - (1) Start (2) Emergency stop (3) Up (hoist) (4) Down (lower) (5) Slow down (6) Slow UP
 - (7) Left -CT (8) Right- CT (9) Forward - LT (10) Reverse -LT
- s) PVC shrouded Bus Bar DSL system with spring loaded copper- Carbon current collector shall be provided. The DSL system shall consist of 4 Nos. Galvanized M.S PVC Shrouded Bus bars, Inter Support Brackets Current Controller, indicating lamp and one no MCCB Unit on the bay to isolate the crane power in case of emergency.
- t) Suitable PVC unarmored copper cable shall be provided for the power supply to DSL line from LT Panel board. Cable shall be laid through the cable tray.
- u) For all equipment earth connection shall be provided by adequately sized suitable G.I Strip / Wire.
- v) The successful bidder shall have to provide MS step ladder suitably placed in the GIS room for access to the girder as per direction of the Department and manufacturer's recommendation.

5.0 Variable voltage and variable frequency converter

The hoist motion shall be provided with VVVF drive with squirrel cage motor.

- i) The unit shall be of pulse with modulation (PWM) type with the open loop frequency control to keep the ratio of voltage to frequency (v/f) constant through out the speed range to

maintain constant motor torque or vector control for closed speed with or without encoder feedback.

- ii) The unit shall comprise incoming ACB / MCCB with positive isolation contactor, line chock, three phase diode bridge rectifier acting as line converter and three phase inverter as load converter interconnected through DC link reactor and capacitor unit.
- iii) The PWM inverter shall have fully digital microprocessor based regulation and control system as well as field level instrument and signals as applicable. The microprocessor shall carry out all the functions required from the unit including triggering, protection, self-diagnostics and operation interface.
- iv) The unit shall be housed in enclosed, self-supporting dust and vermin proof cubicle and suitable for temperature, vibration etc prevailing in the crane.

6.0 INSPECTION & TESTING

The crane supplier shall put up the crane for inspection at his Works as well as at site and the following tests shall be carried out by him in the presence of the Purchaser or his authorised representatives:

a) Dimensional check: All the dimensions of the crane shall be checked as per the approved general arrangement drawings. Diagonal measurement of the crane and trolley shall also be carried out in the fabrication shops before despatch to site.

b) Deflection test: The deflection of the bridge girders shall not exceed 1/1000 of span with the fully loaded trolley stationed at mid-span with safe working load at rest. The measurement shall not be taken on the first application of the load. The datum line for measuring the deflection should be obtained by placing the unloaded trolley at the extreme end of the crane span.

c) Permanent set: The girders shall be tested for permanent set by applying 125% of the safe working load when the trolley is stationed at mid-span. At the end of the test there shall be no sign of permanent set of the girders.

d) Height of lift: Height of lift shall be checked by measuring the length of hook travel from its topmost position to the bottom-most position and this shall not be less than the lift specified.

e) Speed tests:

i) All the motions of the crane shall be tested with rated load and the rated speeds shall be attained within the tolerance limits.

ii) All the motions of the crane shall be tested with 25% overload in which case the rated speeds need not be attained but the crane shall show itself capable of dealing with the overload without difficulty.

f) Performance tests:

i) For checking the performance of the hoist motion the speed at each notch of the master controller with different loads both during hoisting and lowering shall be found out and the load/speed characteristics shall tally with the speed/torques graph submitted.

ii) For the performance of long travel and cross travel motions, the crane shall be tested with rated load and the running time for a particular distance shall be as per the acceleration values specified.

g) Brake tests:

- i) The hoist brakes shall be tested so as to enable to brake the movement under all conditions without any jerk on the load. The brakes shall also be tested with overload condition.
- ii) The long and cross travel brakes shall be capable of arresting the motion within a distance in metres equal to 10% of the rated speed in metres/minute.

h) Limit switch tests: Limit switches for all the motions shall be tested for their proper operation and shall be set right so as to obtain the required hook approaches and lifting height.

i) Insulation and other tests as per applicable codes shall be carried out.

7.0 DRAWINGS AND DOCUMENTS

Following drawings are to be submitted for scrutiny and approval:

- (a) The detailed general arrangement drawing containing all basic dimensions and vital particulars of the crane. These drawings should indicate the main specification, number and location of joints provided on the girder plates, CT rails etc. structural calculation, drawings of main load carrying members, if asked for by Purchaser.
- (b) General arrangement drawing of the trolley.
- (c) Motor power & brake selection calculation.
- (d) Cabin layout drawing showing location and mounting of all equipment.
- (e) Control equipment supplier's schematic control circuit diagrams for individual drives along with speed-torque characteristics and explanatory notes.
- (f) General arrangement drawing for control panel with sections.

8.0 TRANSPORT OF EQUIPMENT TO SITE.

The contractor shall be responsible for the loading, transport, handling and offloading of all equipment and materials from the place of manufacture or supply to site. The contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangement with the appropriate authorities as well as determining any transport restrictions and regulations imposed by the government and other local authorities.

9.0 PACKING, STORAGE AND UNPACKING.

All the equipment shall be carefully packed for transport in such a manner that it is protected against the climatic conditions and the variations in such conditions that will be encountered enroute from the manufacturer's works to the site.