

- i) Cost of Comprehensive AMC for five years after the warranty as per clause 17 of section-II.
- ii) Cost of preventive maintenance during 1st & 2nd year of Warranty Period
- iii) Cost of any additional concomitant accessories items suggested by Bidders.

6. DELIVERY SCHEDULE:

In the event of acceptance of the offer, the machine(s) shall be supplied as per the following conditions:

Name of Machine : Electric Overhead Travelling Crane of 30T Capacity.

Specification no. : **Sr.DME/SC/EOT-30/10T/CHZ/2024 Rev-1.**

Sl. No	Activity	Activity Code	Outer Limit of Time Schedule expected by Railways	Time Schedule- Offered by Bidder
1	Issue of PO by Railways	D1		
2	Submission of GA drawings to consignee by successful bidder/ supplier along with information on power & other utilities required for machine (to be governed by clause 11 of Section-II)	D2	D1 + 45 days (for the first four cranes under order thereafter subsequent cranes @ 2 cranes per week)	D1 + ___ days (for the first four cranes under order and thereafter subsequent cranes @ ____ cranes per week)
3	Approval of GA drawings by consignee. (to be governed by clause 11.2 of Section-II) *	D3	D2 + 45 days	D2 + 45 days
4	Handing over of crane site with gantry by consignee and joint note confirming readiness of site.	D4	By D3 (at the time of approval of GA drawing)	By D3

5	Delivery of crane at site by supplier	D5	D3 + 180 days for the first four cranes under order thereafter subsequent cranes @ 2 cranes per month	D3 + ____ days
6	Power connection for the machine and other on site requirement to be provided by Railway	D6	D5 + 7 Days	D5 + 7 Days
7	Railway to give call to supplier for the commissioning	D7	D5 + 7 days	D5 + 7 days
8	Installation and Commissioning and Prove out of Crane by supplier	D8	D5 + 120 days	D5 + ____ days
9	Issue of PTC by consignee	D9	D8 + 30 days	D8 + 30 days
10	Warranty	D10	D8 + 2 years	D8 + 2 years
11	Submission of performance appraisal report in form E by consignee	D11	D10 + 60 days	D10 + 60 days

* In case drawing is returned unapproved by consignee suggesting some changes, it shall be resubmitted within 30 days (refer clause 11.2.3 of section II)

NOTE: Notwithstanding the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as over ridding and final.

Section-II
TECHNICAL SPECIFICATION ABBREVIATIONS

A-1,A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
AMC	Annual Maintenance Contract
AT	Acceptance of Tender
BG	Bank Guarantee
CME	Chief Mechanical Engineer
CME/PCM	Chief Mechanical Engineer/Post Contract Management
CNC	Computer Numeric Control
COS	Controller of Stores
Db	Decibel
DC	Direct Current
FA&CAO	Financial Advisor & Chief Accounts Officer
GA (Drawing)	General Arrangement (Drawing)
HRC	Hardness Rockwell 'C' Scale (value)
Hz	Hertz
IEC-Pub	International Electro technical Commission - Publication
JCN	Joint Commissioning Note
JRI	Joint Receipt Inspection
kW	Kilo Watt
LC	Letter of Credit
LD	Liquidated Damages
LOA	Letter of Acceptance
NC	Numeric Control
NIT	Notice Inviting Tenders
PBG	Performance Bank Guarantee
PDF	Portable Document Format
PLC	Programmable Logic Controller
PTC	Proving Test Certificate
PU	Production Unit (Any of the six Railway Production Units e.g. RCF, ICF etc.)
RDSO	Research Design & Standards Organization
SS	Stainless Steel
WBG	Warranty Bank Guarantee
DG	Double Girder
VVVF	Variable Voltage Variable Frequency
LT	Long Travel
CT	Cross Traverse

Specification No. Sr.DME/SC/EOT-30/10T/CHZ/2024 Rev-1**NOTE:**

- i) These specifications cover double box girder EOT crane of 30/10T Capacity with VVVF drive.
- ii) The bidders are required to submit the quotations of cranes considering classifications and design wherever duty factors are involved as per IS-3177-1977. The mention of IS-3177-1999 (latest) elsewhere in technical specs. Should be considered for general mechanism and components as applicable where duty factor as per old classification are not involved.

1. BASIC DESIGN FEATURES:**1.1. GENERAL MECHANICAL DESIGN:**

1.1.1. The crane shall be designed, manufactured, erected and tested generally in accordance with the following specifications:

- i) IS: 3177-1999 (latest) - Indian Standard Code of Practice for electric overhead travelling cranes.
- ii) IS: 807-2006 (latest) - Indian Standard Code of Practice for design, manufacture, erection and testing (structural portion) of cranes and hoists.
- iii) IS: 800-2007 (latest) – Indian Standard code of practice for General Construction in steel.

The design of various components of the mechanism is dealt in detail in subsequent paragraphs.

1.1.2. The design of the crane structure as well as all the component parts of the crane mechanism shall conform to class of duty indicated in Schedule-I. The class of duty is based on design parameters stipulated in IS 807-2006 (latest).

1.1.3. The stipulations in these specifications are complementary to those set out in the Indian Standards Specifications IS: 3177, 807 & 3938 mentioned above. If any of the conditions mentioned in these specifications is at variance with that of the ISS, the technical specifications here under shall prevail.

1.1.4. The cranes shall be supplied complete in all respects. The tenderer shall furnish complete details regarding type, material of construction, specifications and special features, if any, for the main items. Any variations from the specifications shall be brought out with reasons for the same. Any variations involving lower standards of design, performance and rating are not acceptable.

1.1.5. Necessary information regarding the conditions under which the crane is to be used, together with other particulars necessary for manufacture and erection of the crane, are given in Schedule-I. The successful bidders should visit the actual site to assess local conditions that often affect manufacturer's programme for commissioning and installation and to ensure that various structural requirements are incorporated in the final design of the crane. Unfamiliarity with, or ignorance of, local conditions, will not be accepted later as adequate reason for delays in commissioning by successful bidder.

- 1.1.6. Manufacturer should supply with the offer, information regarding the construction of the crane according to the proforma laid down in Schedules-II & III. Separate Schedules II & III should be submitted for each crane.
- 1.1.7. The bidders should also submit details of structural calculations along with thickness of plate/sheet for girders, end carriage, crab and other load bearing structural members along with offer and get it duly approved by reputed organizations such as NPL, IIT, NIT or govt. approved engineering colleges or a Chartered Engineer along with breakup of weights of major assemblies/components before submission of GA drawings to consignee for approval.
- 1.1.8. Preferred number series should be used, as far as possible, at all stages of the design process. In particular, the hoisting and travel speeds as indicated at Schedule-I, if not already so indicated, should be rounded off while making the offer to the nearest figure in the R-10 Preferred Number Series, as given below for ready reference:
Approx. 1.00, 1.25, 1.60, 2.00, 3.15, 4.00, 5.00, 6.30, 8.00 and 10.00.

1.2. PURPOSE FOR WHICH REQUIRED:

1.2.1. Capability:

The crane should be capable of:

- i) Hoisting, i.e., lifting and lowering of all loads up to the maximum specified limits of load and distance at different specified speeds.
- ii) Traveling and traversing at specified speeds in both loaded and unloaded conditions.
- iii) Working in the hot, humid and dusty atmosphere of Railway Workshops, Sheds and Depots.

1.3. ATMOSPHERIC CONDITIONS:

- 1.3.1. The ambient temperature at the site at which the crane will be installed may vary from -5°C to $+50^{\circ}\text{C}$ over the year. The relative humidity may be as high as 100%. The atmosphere is expected to be dusty. The crane offered shall be suitably tropicalized to work under these ambient conditions without any adverse effect on its performance.

1.4. RIGIDITY, CONTROL AND SAFETY:

- 1.4.1. The crane should be rigid, robust and of sturdy construction.
- 1.4.2. Crane controls should be conveniently located. Various controls should be suitably interlocked to prevent accidental movement of the crane.
- 1.4.3. Suitable limit switches, one each for long and cross travel and two each for main and auxiliary hoists, should be provided to stop the crane and prevent over-travel of various moving parts of the crane.
- 1.4.4. A speed sensing switch set for 1.5 times the maximum lowering speeds shall be fitted along with a separate brake caliper disc type on the main hoist drum, in order to cater to the unlikely but fatal eventuality should it occur, of the load falling due to a mishap beyond the motor output shaft on which the regular hoist brake is fitted.

- 1.4.5. Electrical interlocks should be so provided that the two operations of traversing and traveling can be performed simultaneously, but while hoisting it is not possible to undertake either traversing or traveling.
- 1.4.6. Suitable buffers should be provided to prevent over travel of the crane mechanism in both longitudinal and cross traverse directions.
- 1.4.7. Suitable guards or enclosures should be provided on the crane to prevent inadvertent contact with down shop leads, or any other exposed electrical conductors and cables.
- 1.4.8. Suitable isolation switches and stop buttons should be provided to isolate the electric supply for maintenance, or in the event of an emergency. Dead man's handle must also be provided in cabin operated cranes.
- 1.4.9. A safety hand railing of tubular construction should be provided on bridge foot walks, end carriages, staircases, the landing in the cabin, trolley and at any other place where access has been provided. Railings should not be less than 1000 mm high with an intermediate member at a height of around 500mm.
- 1.4.10. Sheaves shall be provided with rigid guards to retain the wire ropes in the grooves. The guards shall fit close to the flange having a clearance not more than one-fourth of the diameter of the wire rope between the sheave and the inside of the guard. Bottom block sheaves shall be enclosed except for wire rope openings.
- 1.4.11. For outdoor cranes all electrical and mechanical equipment should be protected from the weather. All weather-proof covers should be easily removable. Details of protection provided should be indicated in the offer.
- 1.4.12. The fully commissioned crane should be rigid and robust to withstand the workshop environment of Indian Railway repair workshop with an ambient temperature ranging up to 50 degree centigrade and relative humidity of 100 %.

1.5. MAINTAINABILITY

- 1.5.1. Safe accesses for maintenance and easy removal of all mechanical, electrical and structural components to carry out repair and maintenance must be ensured. All parts requiring replacement, inspection and lubrication should be easily accessible without the need of dismantling other equipment or structures. Arrangements for access to important components must include a cradle for inspection and maintenance of DSL, such cradle being conveniently accessible from the cabin or, for pendant operated cranes, by step ladder attached to the gantry at one end of the bay.
- 1.5.2. All electrical cables should be so laid that they are not liable to damage and can be easily inspected and maintained. The cables should be weatherproof.
- 1.5.3. All components for cranes of identical capacity and duty shall be interchangeable unless otherwise required.
- 1.5.4. In order to have access to the operator's cabin (if provided), long travel drive, current collectors, trolleys, etc., full length chequered plate platforms should be provided alongside both bridge girders. Access to the cabin from the bridge girder platform should be via a staircase. Minimum width of such staircase

should be 600mm. Footwalks should be of sufficient width to give at least 500 mm clear passage at all points except between railing and bridge drive, where this clearance may be reduced to not less than 400 mm.

- 1.5.5. Materials used for equipment and structural members should be free from cracks, blow holes, laminations, pitting etc. Except for areas where a superior grade of materials is required, steel used throughout shall be conforming to IS: 2062 (latest) Grade E-250 BR or B0. The supplier should submit material test certificates for structural steel and mechanical component such as couplings, gears, gear boxes, rope drums, brake drums, shafts, wheels etc.
- 1.5.6. A tool box containing all tools required for the maintenance of the crane should be supplied with the crane as per enclosed list at Schedule-V.
- 1.5.7. Fasteners for pedestal blocks, gear boxes, etc., should be easily removable from the top of the platform.
- 1.5.8. Standardization and unification shall be carried out to the maximum extent for the various sub- assemblies constituting the mechanism of various cranes. Units shall be designed such that they can be dismantled quickly without disturbing the installation of the neighboring units with which they are connected. Units as a whole, such as wheel assembly gear box, brake, rope drum assembly, etc., shall be replaceable and interchangeable with other identical units. In design care shall be taken to see that spare parts inventory is kept low and up time of 95% will have to be guaranteed.

1.6. STRUCTURAL DETAILS:

- 1.6.1. The crane bridge should comprise of double girders of the plate box type.
- 1.6.2. In the main bridge girders, in addition to the required full-length diaphragms, short diaphragms should be inserted wherever required to transmit the trolley wheel load to the web plates and to limit the maximum stress in the trolley rail to safe permissible limits. All diaphragms must bear against the top flange. Steel plates used for bridge girders and diaphragms shall be conforming to IS: 2062 (latest) Grade E-250 BR or B0.
- 1.6.3. Connections in general should be as per Section 10 of IS: 800-2007 (latest). Black bolts should not be used in the main structure of the crane, only bright bolts with ground stems are permissible. Bolts used which are under shear forces should be fitted into reamed holes.
- 1.6.4. The bridge girders should be connected to the end carriages by large gusset plates. Ground tight fit bolts in reamed holes should be used for bolted connections.
- 1.6.5. The calculated strength of riveted joints, or joints made by High Strength Friction Grip (HSFG) bolts should not be less than calculated net strength of the member. The calculated strength of other bolted joints in structural members should not be less than the net strength of the member plus 25%.
- 1.6.6. The supplier should have sound infrastructural facilities, good working system and practice for fabrication and machining of various structural components of EOT cranes. Some of the important requirements are listed below:
 - 1.6.6.1. All welding shall be carried out under the overall supervision of a

welding Engineer/Supervisor specially trained in welding. The welding engineer/supervisor shall prepare the welding procedure in accordance with IS:9595-1996 (latest) "Recommendation for Metal Arc welding of Carbon and Carbon Manganese steels". In addition, the correct welding sequence should be followed for typical locations. The welding engineer/supervisor shall obtain design engineer's approval to the same. The welding Engineer/ Supervisor shall also be responsible for actual implementation of the above mentioned approved welding procedure.

- 1.6.6.2. Welding Supervisor shall have received formal training from recognized institutions having specialized courses for welding Supervisor.
- 1.6.6.3. Details of edge preparation for welding shall be in accordance with IS:9595-1996 (latest) "Recommendation for Metal Arc welding of carbon steel and carbon manganese steels.
- 1.6.6.4. Automatic/Semi Automatic submerged Arc/Gas shielding shall be carried out according to IS or other International Specification.
- 1.6.6.5. Welders engaged in fabrication should have passed welder approval tests in accordance with IS specification no.7318(part-I) "Approval tests for welders when welding procedure approval is not required-Part-I fusion welding of steel"
- 1.6.6.6. All welding equipment and accessories should meet the requirements of the corresponding Indian Standard specification (or International Specifications where IS specification do not exist). The contractor shall be responsible for satisfying the Inspecting officer that all welding equipment and accessories being used meet these requirements.
- 1.6.6.7. Electrodes and wire flux combination used for fabrication should be from reputed makes of ESAB, Advani Oerlikon, Philips and Modi.
- 1.6.6.8. Welding shall be performed in an approved and workman like manner. All welds shall be homogenous and show physical properties similar to those of parent metal. Finished welds shall be perfectly free from all defects such as porosity, burnt metal, inclusion etc. and shall present a smooth appearance.
- 1.6.6.9. When the welded joints are inspected no defects specially due to use of equipment and /or filler material shall be accepted. After welding the welded parts or assemblies should correspond to the dimensions required as mentioned in drawings.
- 1.6.6.10. All butt welds on structural members should be radiographically tested. All other welds should be subjected to Magnaflux or Dye Penetration Test.
- 1.6.6.11. The box girders should be so constructed as to eliminate any possibility of accumulation of water or oil inside them. Special care should be taken with cranes for outdoor use to eliminate depressed areas or openings where water may accumulate and lead to

corrosion.

1.7. END CARRIAGES

- 1.7.1. The crane bridge should be carried on end trolleys with double flanged solid forged wheels. The minimum end clearance on each side of the long travel wheels should be 10mm. The wheels should be mounted on fixed axle or suitable anti-friction spherical roller bearings which can be conveniently removed for maintenance.
- 1.7.2. End carriages should be designed to be strong enough to resist all stresses likely to be imposed upon them under varied service conditions, including collision with other cranes or stops. The length of the end carriages should be such that no other part of the crane is damaged in the event of a collision.
- 1.7.3. End carriages should be fabricated from rolled steel sections or plates, welded together to form a box. Suitable stiffening diaphragms should be provided wherever required. The material used shall be steel conforming to IS:2062(latest). Grade E-250 BR or B0. If more than two wheels are required, either compensating end carriage or suitable link and pin arrangement should be provided for connecting the two bogies.
- 1.7.4. Suitable jacking pads should be provided on each end carriage for jacking up the crane while changing track wheels. These jacking pads should not interfere with replacement of track wheels.
- 1.7.5. The end carriages should be fitted with suitable safety stops to prevent the crane from falling more than 25mm in the event of breakage of track wheel, bogie or axle. These safety stops should not interfere with the removal of track wheels.

1.8. BRIDGE RAILS (TROLLEY RUNWAY RAILS)

- 1.8.1. New standard rail shall be used as bridge rail and should be fastened by suitable clamps spaced not more than 1000mm apart, with welded alignment blocks between every two clamps such that the distance of a clamp from any adjacent alignment block is not more than 500mm. Rail stops riveted or bolted or welded should be provided to prevent creep in the longitudinal direction.
- 1.8.2. Solid square bar of appropriate steel which can be directly welded are also accepted as an alternative only for cranes up to 10T capacity. For higher capacity cranes only new standard rail should be used. Bidder should indicate size of standard rails in the offer.

1.9. TROLLEY FRAME

- 1.9.1. The trolley frame should be welded rolled steel box section, designed to transmit the load to the bridge rails without undue deflection. It should be made rigid by providing suitable diaphragms. The material used shall be conforming to steel IS: 2062 (latest) Grade E-250 BR or B0.
- 1.9.2. The drum bearings and supports for upper sheaves should be located so as to equalize the load on the trolley wheels as nearly as possible.
- 1.9.3. The trolley wheels should be double flanged. The axle bearings should be of spherical roller type. The bearing housing should be designed for easy removal of wheels and bearings for maintenance

- 1.9.4. The top of the trolley frame should be plated with chequered plate 5/6 mm thick all over, either at the top or bottom, except for opening(s) required for the ropes to pass through. The opening in the trolley frame should be such as to keep the ropes at a safe distance from any part of the trolley frame or equipment, to prevent damage at any position of the bottom block.
- 1.9.5. All the mechanical and electrical equipment should be placed above the trolley top plate as far as practicable. For any parts placed below the trolley top plate, access for maintenance, repairs and replacement should be provided. Where the clearance between bottom member of trolley frame and the CT rail is over 25mm. the trolley should be fitted with substantial safety stops to prevent the trolley from falling more than 25mm in the event of breakage of track wheel, bogie or axle.
- 1.9.6. These safety stops should not interfere with the removal of wheel. Details of the arrangement should be explained in the offer.

1.10. RAIL WHEELS

- 1.10.1. The rail wheels shall be double-flanged with straight tread. They shall be capable of taking misalignments in span as specified at clause 1.24 of these Specifications.
- 1.10.2. The wheels shall be of material C55Mn75, and shall be solid forged and heat treated to have minimum hardness of 300 to 350 BHN on the tread and flanges to minimum depth of 10mm. The method of heat treatment shall be described in the offer.
- 1.10.3. The wheels should be shrink-fit on the axles, rather than being keyed on.
- 1.10.4. Wheels diameter should be selected strictly as per IS: 3177-99 (latest).

1.11. OPERATOR'S CABIN:

- 1.11.1. The operator's cabin should be sufficiently rigid metal frame construction and should be connected to the bridge girder by means of bolts or rivets in shear.
- 1.11.2. The cabin should be fixed type, built from rolled steel angles, plates and M.S. Sheets welded together. Unless otherwise specified it should be fitted at one end of the crane opposite the down shop lead side, and shall be so placed that the operator has an unobstructed view of the load and surroundings.
- 1.11.3. The cabin should have sufficient space for easy movement of the operator, with minimum dimensions of 1.5 m x 1.5 m. Unless otherwise specified in Schedule-I, it should be of the open type.
- 1.11.4. The closed type cabin, where specified, should have hinged or sliding windows. Arrangements should be made to ensure that the whole exterior of the cab glazing can be of toughened plate glasses of at least 6mm thickness which should be installed from inside.
- 1.11.5. The cabin floor should be extended to form a landing platform with a steel stairway to provide access to the foot-walk above.
- 1.11.6. The layout of controls should be such that the crane can be operated from a