

**SOUTH CENTRAL RAILWAY**

**GUNTUR DIVISION (MECHANICAL)**

**15/5T Capacity EOT Crane Tender Specifications**

**Specification No.Sr.DME/GNT/EOT-**  
**15/5T/Pendent/Remote/2023 Rev-0.**

Bidders Should supply the crane as per following IS Standards i.e. IS:3177:2020 (or Latest), IS:807-2006 (upto amendment no.2 November 2020 or Latest), IS:800-2007 (upto amendment no.2 February 2024 or Latest).

Note: Bidders may please note that wherever IS specifications are suffixed with the phrase (latest / or latest) including those in the attachments enclosed to the tender document, the material shall be supplied strictly conforming to the latest IS specification only.

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**Section-I****IMPORTANT FEATURES OF THE TENDER****INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID:**

- 1.1. Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with international (CE/ISO/DIN/JIS) /National standards (IS) (wherever applicable).
- 1.2. Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase of any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion to be indicated in the offer. Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.
- 1.3. In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.
- 1.4. The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. In case, some other make is quoted, specific reasons for the same including its features/ advantages over specified makes should be submitted. Past performance of a same/similar machine from two or more end users may be submitted to evaluate performance of other items offered. Details of industries/entities/Customers/products using the offered brand, details of manufacturer, should be submitted to evaluate the market presence of the make quoted; in case details are not submitted alternate brand/ item will not be considered & offer will be evaluated accordingly.
- 1.5. In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement under Annexure A of Section III, the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.
- 1.6. Bidder or his authorized agent, in their own interest, should visit the consignees listed in clause 3 Section-I with prior appointment with Controlling Officer and acquaint themselves with existing process of manufacturing/remanufacturing, site conditions, availability of crane facility etc.
- 1.7. The tenderer shall provide satisfactory evidence, acceptable to the purchaser to show that he is a regular manufacturer and has adequate plant and manufacturing capacity and Quality Assurance Program. Information as per Annexure-L may please be furnished. The manufacturer shall have valid ISO-9001 certificate on the original date of closing of tender and a copy of same should be submitted along with bid (EOT Crane shall be in the scope of ISO certificate).
- 1.8. The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final. A copy of the alternative specifications offered should be sent along with the offer. The Tenderer should

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also furnish "Statement of Deviations" from tender specifications (as per Annexure A, Section-III) along with the offer.

# DELETED

Please see the Eligibility and Performance Condition in Tender Document

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## Annexure-A1 (Certificate of Performance)

Important Note: i) The certificate shall not be older than one year from the original date of closing of tender. The performance certificate issued after original date of closing of tender (in cases where tender closing date has been extended) are also acceptable however the machine must have completed one year of satisfactory working after date of commissioning as on original date of closing of tender.

ii) Performance certificate shall contain following information.

**Letter Head of issuing authority**

See Important Note above) Date of issuance:

## TO WHOMSOEVER IT MAY CONCERN

S. N	Head	Details
1	Name of the Supplier	
2	Name of End User	
3	Name of the machine / description of machine / Crane	
4	Purchase/Supply Order Number	
5	Date of Purchase/Supply Order	
6	Date of Supply of machine(s) /crane	
7	Quantity supplied	
8	Manufacturer's Serial Number(s) of machine(s)/ crane or Plant/system etc. number (or some mode to identify the machine/ Crane ) (Optional)	
9	Date of Commissioning (Give individual date for each machine /crane)	
10	Performance of the machine /Crane	Satisfactory / unsatisfactory
11	Any other information which user intends to append, for example a) aspects bringing out similar nature of machine, b) major / leading parameters of the machine /Crane.	

Name & Designation

Contact Number

Signature of the issuing authority

Email id

(Seal of the Organization)

**1. DESCRIPTION:**

Electric Overhead Traveling Crane of 15/5T capacity as per parameters specified in schedule-I conforming to specification no. **Sr.DME/GNT/EOT-15/5T/Pendent/Remote/2023 Rev-0** given in section-II. The crane shall be **Double girder** & with **VVVF Drive**.

**1.1. Leading parameters:**

1.1.1. Leading parameters and type of Crane have been specified in Schedule– I.

**1.2. Prove out at firm's premises:**

1.2.1. The crane shall be proved out at the firm's premises as per QAP enclosed as Annexure-I. The crane shall be inspected and tested during different stages of its manufacture, starting from raw-materials till the completion of the crane, by the Purchaser or his authorized representative at the supplier's or his sub-supplier's works. The Quality Assurance program will be as per Annexure-I. However, the purchaser or his authorized representative is free to institute any further checks also, if he so desires, and shall be in no way binding on the Purchaser.

**1.3. Prove out at consignee's works:**

1.3.1. Start up and trial Operations Test (Commissioning Test)

1.3.2. The contractor shall carry out the start-up and trial operation tests (commissioning test) on receipt of authorization from the Purchaser. In addition to tests indicated in IS: 3177(latest), the following shall also be shown:

- i) The earthing of the crane and control equipment, to be tested as per Indian Electricity Rules.
- ii) The operation of brakes on long travel, cross traverse and hoisting motions.
- iii) Inching control and creep speed as called for in technical specification.
- iv) There is no skewness in crane during long travel and cross travel motions, presence of vibrations and unusual noise in operation.

1.3.3. The trials shall be carried out initially under no load conditions and on satisfactory completion of these, trials shall be repeated for various loads until the full rated load and operating range are covered.

1.3.4. During the trial operation, all necessary adjustments shall be made so as to ensure compliance with the operating characteristics for the complete equipment as stipulated in the technical specifications.

**2. QUANTITY & CONSIGNEE:**

**2.1 Quantity and consignee as specified in Schedule-I.**

**3. SCOPE OF SUPPLY:**

3.1. The specifications cover the design, manufacture, supply, installation, testing and commissioning of Electric Overhead Traveling cranes of 15/5T Capacity as per parameters specified in Schedule-I.

3.1.1. The Scope of supply shall include but not be limited to the following along with necessary fittings, fixtures and ancillaries.

- i) Bridge structure with platform and hand railing
- ii) Track wheels for longitudinal and cross travel.

- iii) Travelling mechanism for longitudinal and cross travel
- iv) Hoisting mechanism.
- v) Brake Mechanism separately for long travel, cross traverse and hoisting.
- vi) Trolley.
- vii) Service Platform (both sides)
- viii) Cabin, Pendant and remote control
- ix) Electrical motors, control gear and equipment.
- x) Synchronized operation of cranes. (Refer clause 18 of Section-II)

3.1.2. Spares as per schedule-IV and other additional spares, Slings/Chains/ Lifting tackles as specified in schedule-I. Any other items of spares considered essential by the tenderer for two years normal maintenance, to cover the complete range of mechanical, hydraulic and electrical equipment, shall also be quoted for separately. Item-wise cost of spares as indicated in Schedule-IV shall be separately quoted.

3.1.3. 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.

### 3.2. CONCOMITANT ACCESSORIES:

**The crane shall be conforming to schedule-I.**

### 3.3. OPTIONAL ACCESSORIES:

3.3.1. Any other accessory/ equipment which in the opinion of the tenderer can contribute to better performance/operation shall be clearly indicated and quoted separately as optional accessory. The advantages should be clearly explained.

## 4. EVALUATION CRITERIA:

### 4.1. Total value of the offer will be calculated based on:

- i) The cost of basic EOT Crane.
- ii) Cost of DSL (type and length of DSL as specified in schedule-I).
- iii) Cost of spares as per schedule-IV and additional spares and items viz slings/lifting tackles as specified in schedule-I.
- iv) Cost of maintenance tools as per schedule-V
- v) Cost of any other accessory treated as concomitant accessory.
- vi) Cost of Installation & commissioning of crane and DSL (length of DSL as specified in schedule-I).
- vii) Duties, taxes, insurance, freight and packing charges.
- viii) Cost of preventive maintenance during 1st & 2nd year of Warranty Period

4.2. All related erection material required for inspection and commissioning of crane and connecting up to electrical equipment with cable laying and fixing accessories shall be included in the cost of basic EOT crane.

## 5. OTHER ITEMS TO BE QUOTED:

The following items will need to be quoted additionally though will not be part of commercial evaluation.

- i) Cost of Comprehensive AMC for five years after the warranty as per clause 17 of section-II.
- ii) Cost of any additional concomitant accessories items suggested by Bidders.
- iii) Break up of individual items as per Schedule-IV and additional spares and items viz sling/lifting tackles as specified in Schedule-I



**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 15/5T Capacity.

**Specification no.:** Sr.DME/GNT/EOT-15/5T/Pendent/Remote/2023 Rev-0.

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)

**Signature of Bidder**

**NOTE:** Notwithstanding the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as over riding 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/GNT/EOT-15/5T/Pendent/Remote/2023 Rev-0****NOTE:**

- i) These specifications cover double box girder EOT crane of 15/5T Capacity with VVVF drive.

**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: 3177-2020 (latest) - Indian Standard Code of Practice for electric overhead travelling cranes.
- ii) IS: 807-2014 (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 807-2014 (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 program 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 got 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  $-5^{\circ}\text{C}$  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. 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.

## 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: 3177-2020 (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 seated position. The controller handles should be conveniently located within easy reach of the operator.
- 1.11.7. Fully adjustable padded seat, rubber matting, suitable fan and lighting arrangement should be provided inside the driver's cabin. One fire extinguisher for extinguishing any electrical fire should be provided in the operator's cabin, or at a suitable location in the case of pendant control.

#### **1.12. ROPE DRUMS**

- 1.12.1. The rope drum shall be designed to withstand the compressive stresses caused by the wound on rope and the bending stress due to beam action of the drum.
- 1.12.2. Seamless Pipes will be an acceptable alternative. The steel used shall be to IS:2062-2011 (latest) The rope drum shall be stress relieved after fabrication. T-joints shall be radiographically checked.
- 1.12.3. The drum shall be designed to take the entire length of the rope in a single layer. Free extra turns as specified in IS:3177:2020 (latest) shall also be provided. The drum shall be flanged at both ends with adequate collar size as per IS to avoid slipping of wire rope outside the drum.

- 1.12.4. Cranes shall be designed with number of rope falls varying with lifting capacity as per details given below:

Up to 10.0 tonnes - 4 falls  
Up to 40.0 tonnes - 8 falls

Up to 75.0 tonnes - 12 falls  
Above 75.0 tonnes - 16 falls

### 1.13. WIRE ROPES

- 1.13.1. Hoisting ropes, if of the conventional type, should be of 6x36 construction and made out of the best plough steel having tensile strength of 180 Kg/sq. mm. Ropes should be parallel right hand lay as per IS:2266-2002 (latest). The wire rope shall comply to clause 8.3 of IS:3177-2020 (latest). **Tenderers should offer wire ropes of Usha Martin/Bombay wire rope/Mahadev makes.**

### 1.14. GEARING

- 1.14.1. The gear units in all motions should be light weight with silent running and made of case-carburizing low carbon alloy steels 20MnCr5/16MnCr5/ 17Mn1Cr95/EN353/SAE 8620 and should conform to relevant Indian/ International standards. They shall generally be in accordance with AGMA or IS:4460-1995 (latest). All gears and pinions must be made from forged blanks only. All gears should be hardened and profile ground for longer life and silent operation. The minimum surface hardness of pinions shall be between 50 to 60 HRC and shall be 2-3 HRC higher than hardness of gears.
- 1.14.2. Worm wheels and bevel gears must not be used. At all stages only helical gears should be used, except in planetary gearboxes, which can be spur type. Overhung or split gears and pinions should not be used.

### 1.15. GEAR BOXES

- 1.15.1. General: All gear boxes shall be compact, lightweight completely enclosed and of splash lubricated type. All gear boxes shall be oil tight and sealed with compound or gasket. All gear shafts shall be supported in antifriction bearings mounted in the gear boxes. Gear boxes shall be cast or forged from low/medium carbon alloy steel or cast iron and suitably heat treated or fabricated. The fabricated gear boxes shall be stress relieved before machining and the method of doing so shall be explained in details in the offer. The internal surfaces of the gear box shall be painted with oil and rust resisting paint. Gear boxes shall be provided with breather vents, easily accessible drain plugs, and a suitable oil level inspection glass or indicator such as a dip stick. Adequate radial clearances between the gear box inner surface and outside diameter of the gears shall be ensured and clearance proposed to be provided shall be indicated in the offer. The facial clearance between the inner surface of the gear box and the face of the nearest gear/pinions shall be at least 10mm.
- 1.15.2. **MH/AH LT and CT Gear boxes:** The motors shall be foot mounted. The foot mounted motors shall have split type gear boxes. These shall be of the conventional split type, designed to split horizontally at the shaft center line and fitted so that the top half can be removed for inspection and repair without disturbing the bottom half.

### 1.16. DRIVE MOTORS:

- 1.16.1. The wheels of each end carriage should be driven by independent synchronized drive motors

mounted near each end carriage.

- 1.16.2. A separate cross traverse motor should be used for cross traverse drive through a suitable gear box.

### **1.17. BRAKES:**

- 1.17.1. The hoisting, LT and CT motions shall be provided with fail safe Electro Hydraulic Thrustor brakes. For creep motion of hoist wherever this is specified as per schedule –I an independent brake must be provided.
- 1.17.2. The maximum braking torque to arrest long travel and cross traverse motions should not be less than 100% of full load torque for each brake. For hoist motion, two brakes should be used and the braking torque for each brake should not be less than 125% of full load torque. One of the two hoist brakes shall be applied with a time lag of 3 seconds in relation to the first.
- 1.17.3. Double shoe brakes should be used for each drive. Brakes should be mounted on the input pinion shaft of all gear boxes. The brake shoe should be of hinged type. Brake levers should be forged and hinge pins should be provided with steel bushes at the bearing points.
- 1.17.4. Brake drums should be of forged or cast steel and should be completely machined. Brake drum diameter should be selected from preferred number series. Width of brake drum should be about 10 mm more than the width of brake shoe on each side. The brake lining should be environmentally sound.
- 1.17.5. The cabin operated crane shall be provided with an additional foot operated brake for long travel wheels.

### **1.18. COUPLINGS**

- 1.18.1. Motor shafts for MH/AH shall be connected to gear box input extension shaft through flexible gear coupling of low GD<sup>2</sup> value. For driving the hoist drum gear type flexible coupling shall be used between the rope drum and hoist gear box, where the hub should not be integral with the output shaft, so as to avoid replacement of the whole shaft whenever there is wear and tear in the coupling.
- 1.18.2. All couplings shall be of medium carbon steel and shall be designed to suit the maximum torque that can be developed. Hardness of geared portion in the gear coupling shall be more than 250 BHN. Bolted connections shall be easily accessible for inspection and tightening.

### **1.19. ROPE SHEAVES**

- 1.19.1. All sheaves should be of cast/forged steel or Blackheart malleable iron castings. They should be identical, with the exception of the equaliser sheave. The equaliser sheave should be mounted above the trolley floor and should be easily accessible and removable from the trolley floor level. The equaliser sheave should be arranged to turn and swivel in order to maintain rope alignment under all circumstances. Sheave grooves should be smooth finished for getting increased rope life. The supplier should further ensure that wire ropes are parallel with each other.
- 1.19.2. A resilient low friction rope guide fixed around the grooves of the designed drum as an expanding ring to provide positive guidance to the rope may be provided to ensure correct rope lay.

## **1.20. BEARINGS**

- 1.20.1. Ball and roller anti-friction bearings shall be of reputed make. The acceptable makes will be NBC, SKF, FAG, NORMA, NRB, NTN and KOYO. In view of widespread use of spurious and reconditioned bearings, tenderers should explain in the offer how it is proposed to ensure that only new and genuine bearings of acceptable make are procured and fitted. Preferably, tenderers should confirm that they will submit, to the inspection agency, invoices from OEMs' or their authorized representative as proof of the use of genuine material.
- 1.20.2. For long and cross traverse wheels, spherical roller bearings shall be used. Bush bearings should not be used at any location.
- 1.20.3. Rated life of ball and roller bearings should not be less than the total life in working hours given in the IS Specification for a particular class of duty. Life of bearings should be calculated in accordance with manufacturer's recommendations.
- 1.20.4. Independent bearing housings on long shafts be split on the shaft center line to permit easy removal of the shaft. The bottom surface of all bearing pedestals should be machined, and should bear upon a machined surface.

## **1.21. LIFTING HOOK**

- 1.21.1. Standard plain shank type trapezoidal section hooks should be used unless otherwise specified. These hooks should conform to the relevant Indian Standard Specifications IS:15560 (latest), while the Ramshorn Hook (wherever specified) shall conform to the relevant Indian Standard Specification IS:5749 (latest).
- 1.21.2. Hooks should be mounted on grease lubricated anti-friction thrust bearings and a protective skirt should be fitted to prevent rotation of the hook. Proof load test as per Indian Standard Specification shall be conducted, either in-house or from a recognized test house. The certificate of proof load test shall be furnished. The bottom block should have protective edging around the wire rope openings.

## **1.22. BUFFERS**

- 1.22.1. Spring loaded or other suitable buffers should be fitted on the four corners of the crane also at the four ends of the bridge girders. Buffers should be rigidly bolted in place, preferably along the center line of the crane rail or trolley rail as the case may be. All buffers should have sufficient energy absorbing capacity to stop the bridge or trolley in either direction when traveling at a speed of at least 50% of the rated speed at full load. Bridge buffers should have a contact surface of not less than 125mm diameter.

## **1.23. LUBRICATION**

- 1.23.1. Grease nipples one for each of the end carriage and one for the trolley platform, should be provided for all grease lubricated bearings, parts of the hoist and wheels for cross traverse and long travel. The grease battery nipples should be located to facilitate regular greasing by the operator with standard equipment.
- 1.23.2. Bottom blocks and pedestal bearings should have independent greasing points. All lubricating nipples should be protected from damage, and be accessible throughout.

- 1.23.3. A lubricating chart should be provided in the manual, indicating all lubrication points, the type of lubricants required and the recommended frequency of lubrication. These details should be repeated, and amplified if necessary, in the Maintenance Manual, which is to be supplied as per requirement indicated elsewhere in the specification.

#### 1.24. DIMENSIONAL TOLERANCES

- 1.24.1. The contractor should ensure that the crane manufactured and erected to take the tolerances specified below:
- i) Variation in Span  $\pm 6\text{mm}$
  - ii) Diagonal on wheels  $\pm 5\text{mm}$
  - iii) Long travel wheel alignment  $\pm 1\text{mm}$
  - iv) Tilt of wheels or Balance Axle  $\pm 1\text{mm}/1000\text{mm}$  (Horizontal & Vertical)
  - v) Trolley wheel gauge  $\pm 3\text{mm}$
  - vi) Trolley track gauge  $\pm 3\text{mm}$
  - vii) Difference in height between trolley rails [H] for different trolley track gauges shall be within the following limits

'S' (mm)	'H' (mm)
Upto 2500	4
2500 to 4500	6
Above 4500	8

### 1A. GENERAL ELECTRICAL SPECIFICATIONS

#### 1.1. SCOPE OF SUPPLY

- 1.1.1. The scope of supply relating to electrical portion shall cover the following components
- 1.1.1.1. Down shop leads (wherever required see clause 11 of Schedule – I of technical specification)
  - 1.1.1.2. Main current Collection
  - 1.1.1.3. Power disconnecting switch on the crane bridge walk way, to be provided, immediately after the main current collection gears.
  - 1.1.1.4. Motors
  - 1.1.1.5. Protective Switch gears
  - 1.1.1.6. Motor control panels.
  - 1.1.1.7. Resistors (For slipping motors only)
  - 1.1.1.8. Brakes
  - 1.1.1.9. Limit Switches
  - 1.1.1.10. Socket outlets
  - 1.1.1.11. Power and control cables
  - 1.1.1.12. Lighting distribution panels.
  - 1.1.1.13. Lighting fixtures and lamps
  - 1.1.1.14. Cross traverse flexible trailing unarmored cables mounted on roller clamps travelling over bottom flange of R.S. Joist provided for the purpose. Alternatively, drag link cable system is also acceptable.



- 1.1.1.15. Indicating lamps
- 1.1.1.16. Push Buttons
- 1.1.1.17. Two step jockey switches or push button (ref clause 2.8.2.2) **(DG VVVF Drive Crane)**
- 1.1.1.18. Earth wire on crane portion.
- 1.1.1.19. Dead Man's Handle **(DG)**
- 1.1.1.20. Alarms

## 1.2. STANDARDS

- 1.2.1. All equipment and material shall comply with appropriate Indian standards (latest). The equipment shall also comply with latest Indian Electricity Rules, as regards safety requirement and other essential provisions of the act applicable to the installation and operation of EOT cranes. All latest standards indicated in Annexure-G of IS:3177-2020(latest) shall be applicable in general.
- 1.2.2. The equipment shall be designed and selected to facilitate inspection, cleaning replacement and repair and for use where continuity of operation and safety are important considerations.

## 1.3. ATMOSPHERIC CONDITIONS

- 1.3.1. The ambient temperature at the site at which the crane will be installed may vary from  $-5^{\circ}\text{C}$  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. POWER SUPPLY CONDITIONS

- 1.4.1. Power shall be available at 415 volts, 3 phase, 50 Hz
- 1.4.1.1. The following voltages shall be used in the crane
  - 1.  $415 \pm 10\%$  volts. 3 phase  $50 \pm 3\%$  Hz, A.C For drive motors.
  - 2.  $230 \pm 10\%$  volts. single phase  $50 \pm 3\%$  Hz, A.C For lighting
  - 3.  $24 \text{ volts} \pm 10\%$ , single phase 50 Hz  $\pm 3\%$  A.C For hand lamp socket outlets
  - 4.  $110 \text{ volts} \pm 10\%$  single phase 50Hz  $\pm 3\%$  A.C For control circuit and for floor operated crane as required by the consignee.

The voltage 2, 3 & 4 above shall be obtained through individual separate transformer units connected to 3 phase, 415 volts A.C. supply.

## 1.5. DOWN SHOP LEADS AND CURRENT COLLECTION GEAR

### SHROUDED BUS BAR CONDUCTOR

- 1.5.1. Insulated Shrouded Bus Bar Conductor shall be of M/s.INSUL-8 UK make or safe track brand of M/s.Sushil Engg. Corporation Mumbai or "Safeline" brand of M/s Stromag Engineers Limited, Mumbai or Silverline brand of M/s Sliver line Metal Engg. Pvt. Ltd., and shall conform to the following:
- 1.5.2. The conductor system shall be finger safe to IP-21 with necessary supporting technical evidence of same and the conductor and material shall be of suitable metal (Galvanized Iron