

SOUTH EAST CENTRAL RAILWAY

Electric Loco Shed Bilaspur

Schedule B

Specification for EOT Crane of Capacity 15 T


व.अनु अभियंता (क.व.स्टा.)
SSE / TRS

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Section-IV

IMPORTANT FEATURES OF THE TENDER

1 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 VI, the values as given in 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 consignee 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 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 also furnish "Statement of Deviations" from tender specifications (as per Annexure A, Section-VI) along with the offer.
- 1.8 The bidder who has not been placed with any order through COFMOW for the tendered machine (any capacity) shall be considered as New Vendor. Whenever, technically & commercially responsive bid is received from a New Vendor, a technical team from Sr. DEE/TRS/BSP/SECR shall carry out the Capability Assessment of the premises of the bidder to assess their capability to design and manufacture the tendered machine as per Specifications. Based on the report of Capability Assessment the bidder will be considered as Suitable/ Unsuitable for placement of any order through Store. The bidder shall submit the information on Annexure-H of Section-VI in the original offer.
- 1.9 Bidder shall furnish Clause wise comments and information asked for against various clauses, wherever specified.

2 DESCRIPTION:

2.1 Electric Overhead Traveling Crane as per parameters specified in schedule-I conforming to specification no. **COFMOW/IR/ EOTC-2022, Rev-2** given in **section V**. The crane shall be Double girder as specified in Schedule-I.

2.2.1 Leading parameters

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

2.2.2 Prove out at firm's premises:

2.2.2.1 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 Programme 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.

2.2.3 Prove out at consignee's works:

2.2.3.1 Start up and trial Operations Test (Commissioning Test)

2.2.3.2 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 skew ness in crane during long travel and cross travel motions, presence of vibrations and unusual noise in operation.

2.2.3.3 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.

2.2.3.4 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.

3 QUANTITY & CONSIGNEE

3.3.1 Quantity and consignee as follows :

<u>Sr. No.</u>	<u>Name of the Machine</u>	<u>Quantity</u>	<u>CONSIGNEE</u>
1	EOT Crane Capacity : 15 Ton	01 No.	Sr. Section Engineer / TRS Electric Loco Shed Bilaspur , S E C Railway Sirgitti , Bilaspur , Chhattisgarh Pin Code : 495004

4 SCOPE OF SUPPLY.

4.1 The specifications cover the design, manufacture, supply, installation, testing and commissioning of Electric Overhead Traveling cranes of Capacity as per parameters specified in Schedule-I

4.1.1 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 (DG)
- (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 (DG).
- (vii) Hoist with cross travel arrangement (SG).
- (viii) Service Platform (DG).
- (ix) Cabin/Pendant/Remote Control, all combination as per details at Schedule-I
- (x) Electrical motors, control gear and equipment.

4.1.2 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.

- 4.1.3 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.

4.2 CONCOMITANT ACCESSORIES:

The crane shall be conforming to schedule-I and Section – V , Sr. no. 18.0

4.3 OPTIONAL ACCESSORIES

- 4.3.1 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.

5 EVALUATION CRITERIA

5.1 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, DSL, Slings 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.

- 5.2 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.

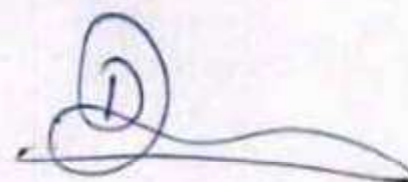
6.0 OTHER ITEMS TO BE QUOTED

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-V.
- (ii) Cost of preventive maintenance during 1st & 2nd year of Warranty Period.
- (iii) Break up of individual items as per Schedule-IV and additional spares and items viz sling/lifting tackles as specified in Schedule-I



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DELIVERY SCHEDULE CHART:

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

Name of Machine : Electric Overhead Travelling Crane
Specification no. : COFMOW/IR/EOTC/2022, Rev-2

S.No.	Activity	Activity Code	Outer Limit of Time Schedule
1.	Issue of LOA by SECR	D1	-
2.	Submission of PBG by successful bidder	D2	D1 + 30 days
3.	Issue of AT / Contract/PO by SECR (after verification of PBG)	D3	D2+7 days
4.	Visit the site i.e. Electric Loco Shed/Bilaspur and check all the major parameters before submission of GA Drawing	D4	D3+7 days
5.	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- V)	D4	D3 + 7 days
6.	Approval of GA drawings by consignee. (to be governed by clause 11.2 of Section-V) *	D5	D4 + 7 days
7.	Handing over of crane site with gantry by consignee and joint note confirming readiness of site.	D6	By D5 (at the time of approval of GA drawing)
8.	Delivery of crane at site by supplier	D7	D5 + 90 days
9.	Power connection for the machine and other on-site requirement to be provided by Railway	D8	D7 + 7 Days
10.	Railway to give call to supplier for the commissioning	D9	D7 + 7 days
11.	Installation and Commissioning and Prove out of Crane by supplier	D10	D7 + 30 days
12.	Issue of PTC by consignee	D11	D10 + 30 days
13.	Warranty	D12	D10 + 2 years
14.	Submission of performance appraisal report in form E by consignee	D13	D12 + 60 days

* In case drawing is returned unapproved by consignee, it shall be resubmitted within 7 days (refer clause 11.2.3 of section V)

Signature of Bidder

NOTE:

- Not with standing the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as over ridding and final.
- Firm should bring his own calibrated measuring instruments and trained person for proper measurement, while visiting ELS/BSP.

Section-V
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
COFMOW	Central Organization for Modernization of Workshops
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
SG	Single Girder
DG	Double Girder
VVVF	Variable Voltage Variable Frequency
LT	Long Travel
CT	Cross Traverse

Specification No. COFMOW/IR/EOTC-2022, Rev-2

NOTE

- (i) These specifications cover double box girder and single girder EOT cranes. The clauses pertaining to single girder either gantry or underslung have been marked as (SG) and double girder as (DG). Those common to both are unmarked. Tenderer should offer clause wise comments separately for single girder and double girder EOT cranes.
- (ii) The Specification also covers VVVF Drive Cranes.
- (iii) The bidders are required to submit the quotations of cranes considering classifications and design wherever duty factors are involved as per IS-3177-2020. The mention of IS-3177-2020(or 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 cranes shall be designed, manufactured, erected and tested generally in accordance with the following specifications:

- i) IS: 3177-2020(or latest) - Indian Standard Code of Practice for electric overhead travelling cranes.
- (ii) IS: 807-2006 (or latest) - Indian Standard Code of Practice for design, manufacture, erection and testing (structural portion) of cranes and hoists.
- (iii) IS: 3938-1983 (or latest)-Indian Standard specification for Electric wire rope hoists (SG).
- iv) IS: 800-2007 (or 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 IS807-2006 (or 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 $+55^{\circ}\text{C}$ 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. This would be required only in specially critical cases, such as cranes carrying molten metal, where additional safety is to be built into the crane apart from the twin hoist brakes referred to as at Clause 1.17.3.
- 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 (DG).
- 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 1250 mm high with an intermediate member at a height of around 250 mm and vertical member at a distance of 500 mm (max). It should be strong enough and rigid.(DG).
- 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 **LOAD GAUGE** : Each crane must be provided with load gauge / digital weight indicator system for each hoist. i.e. 02 nos. of Load Gauge / Weighing system for each crane. Load Gauge / Digital weight indicator system should be able to do the measurement of load lifted in Main Hoist and Aux. Hoist. One gauge for Main hoist and second gauge for Aux. Hoist. The digit of weighing machine should be minimum 12 inch height. It should give the reading in Ton with an accurate up to one digit after point. The digit should be red in colour with dual side display (both side) and should be placed near the operator cabin for easy readability. A separate buzzer and light system must be provided to indicate over load by audio visual system.
- 1.4.13 **Enhanced Safety feature** : All the safety features must be displayed in a Screen fitted in the cabin of the operator cabin. The screen should give the information about the proper working of all the limit switch, all Brake (Thruster) condition , All Motor condition , All VVVF drive condition should be displayed in the screen. The colour screen should be minimum 12 inch. Suitable Sensor for the

same must be provided for the same

- 1.4.14** 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. (DG).
- 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. Foot walks 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. (DG).
- 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. (DG).
- 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.(DG and for SG in case of box type girder).
- 1.6.3** Connections in general should be as per Section 10 of IS: 800-2007 (or latest). Black bolts should not be used in the main structure of the crane, only bright bolts with grade minimum 10.9 grade, 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 (or 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 recognised 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 (or 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 Orlikon, 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.
- 1.6.7 All butt welds on structural members should be radiographically tested. All other welds should be subjected to Magnaflux or Dye Penetration Test.
- 1.6.8 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 10 mm. 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 For higher capacity cranes only new standard rail should be used. Bidder should indicate size of