दिनांक एवं हस्ताक्षर SIGN & DATE

मागनी सूची संख्या को अधिक्रमित SUPERSEDES INVENTORY NO.

TECHNICAL SPECIFICATIONS OF 200^{T}/ 30^{T} DOUBLE GIRDER CLASS-IV EOT CRANE FOR FORGING & LIQUID METAL HANDLING APPLICATION IN HEAVY FORGE SHOP

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SNO.	DESCRIPTION	Acceptance by Vendor	Remarks by Vendor
1.0	**INTRODUCTION :** This Specification governs Technical Requirements of 200^{T}/ 30^{T} Electric Overhead Crane for handling of hot/ cold forgings from Reheating & Heat Treatment furnaces and liquid metal from Steel Melting Shop.		
1.1	**QUALIFICATION FOR BIDDERS :**		
	Only those vendors shall qualify for bidding of this crane who have successfully designed, manufactured, supplied, erected and commissioned the following equivalent EOT cranes (At least 2 nos.) in the past 5 years (from 2006 to 2010) and the commissioned cranes are successfully running from last 2 years • **175/ 30T EOT cranes confirming to class IV duty as per IS:4137, 807 OR** • **200/ 30T EOT Crane confirming to Crane Mechanism M8 as per IS: 3177, 807 OR** • **250/ 50T EOT Cranes confirming to Crane Mechanism M6 as per IS:3177, 807.** **Documentary proof and performance certificate from the customer must accompany along with the bids as Per Format -I.**		
1.1.1	Vendor has to confirm clause wise or put the deviation (if any) to all clauses of tender specifications page 2/ 55 to 33/ 55 in tabular forms. In case of space constraint vendor may used extra sheets.		
1.1.2	All details has to be provided in column "Remarks" of Annexure-II, III, IV & V page 34/55 to 53/55.		
1.1.3	Deviations, if any, must be clearly mentioned on page 54/55. **BHEL reserves the right to reject any offer in case of deviations from the specification & no justification shall be entertained.**		
1.1.4	A clearance diagram to be prepared by vendor as per page 34/55 shall be submitted along with their bids.		
1.1.5	Party/ supplier shall visit the Plant/ site for first hand appraisal prior to submit the technical offer for better understanding the requirement as well as the drawings of the existing location. Vendor may check the Rail Track on which crane will move.		

2.0	**SCOPE OF SUPPLY :** Scope of supply covers the design, manufacture, supply, erection and commissioning and job proving of an EOT Crane (200T/30T) confirming to Class IV as per IS-4137, IS-807, other relevant standards and this Specification , complete with all electricals, Radio Remote Control, Crane Weighing System (Load Cells of reputed make as Leebow, Sanc Jonson etc.) and standard accessories. The Crane is to be located in the existing Heavy Forge Shop and for handling of hot/ cold forgings from Reheating & Heat Treatment furnaces & Liquid metal Handling.		
3.0	**GENERAL :**		
3.1.	The Clearance Diagram is enclosed at Annexure-I ***(The details not mentioned in the Drawing shall be furnished by the Supplier)***		
3.2	**The following shall accompany the offer:**		
3.2.1	General Arrangement (GA) drawing to scale (showing elevation, cross section and plan of the crane) indicating clearances, hook approaches, lift, location and direction of view of operator, wheelbase, wheel loads with spacing etc.		
3.2.2	Information as per Annexure-II		
3.2.3	Design calculations for all motions, structure etc., and selection of bought out items for deciding the suitability of offer. ***In absence of this information, the offer may be ignored. Calculation should based on IS Standards only.***		
3.3	Successful Tenderer shall furnish the following prior to manufacture of the crane for approval by the purchaser:		
a	**The GA drawings containing all information as described in Clause 3.2.1**		
b	General layout drawing of the trolley.		
c	Assembly drawing -inclusive of gearbox details- of individual drives like hoist, long travel and cross travel.		
d	Layout of cabin showing location and fixing of all the equipment inside the cabin, such as Driver's seat, protective panel, isolating and control switches fire extinguishers etc.		
e	Circuit diagrams showing the wiring for the complete crane.		

f	Final Design calculations for all motions, structure etc., shall be submitted at the time of approval of GA drawings.		
g	***Only metric system to be followed.***		
3.4	**The following documents/ information are to be supplied prior to commissioning of the crane. A DVD/ CD containing the documents / information recorded on it shall also be supplied. The payment will be made after receipt of the information as mentioned**		
a	All the drawings approved by the purchaser along-with all workshop drawings for structural and mechanical items containing full information such as tolerance, heat treatment etc.		
b	Operation and Maintenance Manuals- 5 Sets, including Operating Instruction, Maintenance Schedule, Lubricating Charts, Electrical circuit diagrams, catalogues of all electrical equipment etc. along-with information on any other specific feature/s. ***All copies shall be hard-bound in high quality leather folders, encased in decent individual boxes.***		
3.5	A toolbox containing all necessary tools (e.g., torque wrench, Hydraulic Jack, hand grease gun, set of spanners, screwdrivers etc.) required for the maintenance of the crane shall be furnished along with the Crane (Annexure-V).		
3.6	The supplier shall furnish material test certificates for all electrical equipment, cables, and parts used in handling loads (e.g. wire ropes, chains, hooks etc.), structural steel, mechanical components such as couplings, gears boxes, rope drums, pulleys, shafts, wheels etc.		
3.7	The supplier shall ensure that the crane is manufactured as per tolerances specified below.		
a	Span over L.T. Wheels ±5 mm		
b	Diagonal on Wheels ±3 mm		
c	Long travel wheel ±1 mm		
d	Tilt of wheels or balance axle ±2mm/1000mm (Horizontal and vertical)		
e	Trolley wheel gauge ±3 mm		
f	Trolley track gauge ±3 mm		

g	Difference in height between trolley rails ±H depending upon trolley track gauge.		
h	**Speeds at full notch with rated load, Voltage, and frequency shall be as follows.**		
	Traveling and Traversing = +10% /-5%}		
	Hoisting = +10% /-5%} of specified speed		
	Lowering = +25% /-5%}		
3.8	Assembly at site is to be kept as minimum as possible to enable early commissioning of the crane. Welding at site is to be avoided as far as possible. The supplier shall satisfy himself about the site condition beforehand to avoid any difficulty during erection and commissioning of the crane including verification of Long Travel Span as per specification.		
3.9	**The supplier shall quote separately for spares as considered necessary for two years of normal operation of the crane. However, the purchaser may use his discretion in selecting the spares.**		
3.10	In addition to the tests specified in the IS tests as under shall also be done after erection.		
a	**Speed Test**		
i	**Rated load Test:** All the motions shall be tested with rated load and the rated speeds shall be attained within the tolerance limits indicated under clause 3.7(h)		
ii	**Overload Test :** All motions of the crane shall be tested with 25% overload in which case the geared speeds need not be attained but the crane shall show itself capable of dealing with the overload without any difficulty.		
b	**Brake Test :** The hoist brakes shall be capable of braking the movement under conditions a (I) & a (II) of speed tests.		

3.11	**Wheel load shall not vary amongst all wheels in ±3%. All tools and instruments to measure the wheel load to be arranged by the supplier.**		
4.0	**REQUIREMENTS :**		
4.1	**TECHNICAL:**		
4.1.1	The crane shall be designed in accordance with the latest editions of IS-807, IS-4137 and other relevant standards referred to therein and also in accordance with the requirements specified herein after.		
4.1.2	Safe access for maintenance and removal of all mechanical and electrical parts must be ensured without any additional scaffolding. All parts requiring periodic inspection/ lubrication/ replacement shall be easily accessible without the need for dismantling other equipment or structures. All electrical cables shall be so laid that they are not liable to be damaged and can be easily inspected and maintained.		
4.1.3	All machinery or equipment included in this specification must be provided with safety devices and clearances as per standards and purchaser's requirements. Covers should be provided to all moving/ rotating parts.		
4.1.4	No cast iron part shall be used on the crane except for electrical equipment. Similarly wood or combustible material and Bush Bearing shall not be used in any part of the crane. Open gears shall not be used in any drive/motion.		
4.1.5	Full length & full width chequered plate platforms shall be provided on the top for both the bridge girders in order to have access to operator's cabin, long travel drive, current collectors, trolley etc. Access to the cabin from the bridge girder platform shall be via a staircase unless specified otherwise. Minimum width of the staircase shall be 600 mm and inclined to the horizontal at an angle not more than 45°. Passage through staircase shall be fully protected to prevent any accident/ fear of accident/ fall from height.		

4.1.6	Foot-walk shall be of sufficient width to give at least 500 mm clear passage at all points, except between railings and bridge drive where this clearance may be reduced to not less than 400 mm.		
4.1.7	All openings in foot walk flooring for access to bottom chord platforms and inspection platform shall be provided with strong hinged covers. These covers in the maximum open position shall be inclined at an angle slightly more than 90° to the horizontal and shall be provided with a locking device both for the closed and fully opened position. They shall be so located that in their open position, they shall not foul with any moving part of the crane. Minimum size of hatch opening shall be 600 × 600 mm. Any other opening in foot-walk or end carriage shall be provided with bolted removable plate covers.		
4.1.8	Suitable Guards to push away any object lying on the rails shall be provided at the ends of the end carriages.		
4.1.9	All wheels, couplings etc. shall be provided with covers opening on strong hinges. These covers shall be preferably be made of minimum 5mm thick plates. All heavy covers shall be provided with inspection windows. The wheels shall be forged and not cast. Necessary bottom trays of sufficient size and strength must be provided below all the rotating shafts, couplings etc. to prevent it falling in the shop floor area and to damage the human life and equipments.		
.1.10	Guards shall be provided on the crane to prevent the hoist ropes from coming into contact with the down-shop leads.		
4.1.11	All bolts except those with nylon nuts shall be provided with grip lock nuts or spring washers.		
4.1.11.1	Proper arrangement should be provided to motors for side alignment. Party should submit the details. However for IEC frame size motors this is not considered necessary.		
4.1.11.2	Welded lugs shall be fitted against the feet of all pedestals, gearboxes etc. except motors.		

4.1.11.3	Fasteners for pedestal blocks, motors, gear boxes etc. shall be easily removable from the top of platform. Studs or body bound bolts shall not be used as fasteners for mechanical items except for fixing covers.		
4.1.12	All cables shall be clamped individually. All trailing cables shall be clamped with PVC. Deviations are permissible only with purchaser's specific approval.		
4.1.13	Safety hand railings preferably of tubular construction shall be provided on bridge foot-walks, end carriages, stair cases, landing in cabin, trolley and in any other place where access has been provided. Railings shall not be less than 1000 mm high with an intermediate member at a height of 500 mm. All edges or openings shall be provided with toe guards, toe angles or bent plates wherever required and shall be of height 100 mm (minimum).		
4.1.14	Parts of steel frames carrying machinery shall be provided with doubling plates of adequate thickness riveted or welded and machined to true surface.		
4.1.15	Defects in materials like fractures, cracks, blowholes, laminations, pitting etc. are not allowed. Rectification of any such flaw is permissible only with the approval of the purchaser.		
4.2	**STRUCTURAL:**		
4.2.1	**GENERAL:** In addition to the latest edition of IS-807, following additions/ deviations are applicable.		
4.2.1.1	Welded joints shall be used unless otherwise specified.		
4.2.1.2	Not less than four turned, fitted bolts or equivalent length of welding at each joint shall be used for connections.		
4.2.1.3	Black bolts shall not be used in the main structures of the crane and high tensile steel bolts shall not be used unless approved by the purchaser. Machined bolts shall be used wherever not mentioned. (Bolts should be used as per IS 807-Annexure A)		
4.2.1.4	Bolts used in shear shall be fitted into reamed holes. Such Bolts shall be machined from En8 or equivalent material.		

4.2.1.5	Transverse fillet welding on load carrying members shall be avoided.		
4.2.1.6	100% of top & bottom flange, 40% of web plate of box girder and 25% of circular joints shall be radio-graphed to ensure freedom from defects. Rest of the weld joints of Girder and Hoist Drum shall be tested ultrasonically.		
4.2.1.7	Plates, bars, angles and where practicable other rolled sections used in the load bearing members of the structure shall be not less than 8 mm thick. Minimum thickness of chequered plates for platforms shall be 6 mm over plain. Chequered plates shall not be considered in computing strength of load carrying members.		
4.2.2	**BRIDGE GIRDERS:**		
4.2.2.1	**The crane shall be Double Girdered.** The bridge girder shall be of box construction and in one piece. Each girder shall have double web plate. Girder shall be sufficiently strong and rigid to withstand the most severe combination of loads that may develop under different working conditions. Top flange of the girder shall not be considered as giving support to the rail, in computing the rail size. The Girder may also be designed in such a way that electrical accessories like, Control panel Resistance Boxes, LT Motor may be accommodated inside the Girder, however in such case adequate lighting & space should be provided for maintenance. Girder should be made from Structural steel as per IS:2026 Gr B		
4.2.2.2	**Trolley rail section shall not be considered in the design of the bridge girders.**		
4.2.2.3	Full length wearing plate shall be provided under the trolley rails. The wearing plates shall be 10mm thick and welded in place to the flange with minimum 5mm continuous welds. The wear plates shall be 10 to 12mm lesser in width than the rail base such that the welds of the wear plates do not project beyond the rail base. Wearing plate shall not be considered in the strength calculations of the bridge girders.		

4.2.2.4	Box girders shall be so constructed as to eliminate accumulation of water or oil inside them. Squaring marks shall be provided on each girder to facilitate erection and squaring of the bridge.		
4.2.3	**END CARRIAGES:** End carriages shall be fabricated from plates welded together to form a box except for essential openings, which shall be reinforced. If more than two wheels are required in end carriage on one side of crane then one equalizer bogie shall be provided to accommodate 2 wheels only. Wherever possible, the end carriages shall be in one piece only and shall be fitted to the bridge girder in the fabrication shop with proper reamed holes and machined fitted bolts. End carriages shall be of ample strength to resist all stresses likely to be imposed on them under service conditions including collision with the cranes or stops. The length of end carriages shall be such that no other part of the crane is damaged in collision. ***End carriages as far as possible shall be in one piece on one end of griders and not in the multipieces connected with small arm to maintain distances.*** On the end carriages with more than two wheels, the wheelbase shall be taken as the distance between the centers of the outside wheels. The end carriages shall be fitted with substantial safety stops to prevent the crane from falling more than 25mm in event of breakage of a track wheel, bogies or axle. These safety stops shall not interfere with the removal of wheels. Suitable jacking pads at a height of 300mm from rail level shall be provided on each end carriage for jacking up the crane when changing track wheels. Jacking pads shall not interfere with the replacement of wheels.		

4.2.4	**TROLLEY FRAME:** Trolley frame shall be produced in one piece (Approval from the CFFP-BHEL is essential otherwise). Drum bearings and supports for upper sheaves shall be located so as to equalize the load on the trolley wheels as nearly as possible. The trolley frame shall be built up of rolled sections and plates to form a rigid structure capable of withstanding all stresses that will develop during the working of the crane and shall be arranged to afford maximum accessibility to mechanical and electrical parts placed on it. It shall be designed such that at the highest position of hook there shall be clear distance of 700mm between the lowest points of bottom block. Deviation shall be made only with specific approval of purchaser. The top of trolley frame shall be covered with plates all over except for openings required for the ropes and flexible cable for bottom block etc, to pass. The openings in the trolley frame shall be such as to keep the ropes or cables at least 125mm away from any part of the trolley frame. The equipment shall be placed above the trolley top plates as far as practicable. For any parts placed below the trolley top plate, access for maintenance, repair and replacement shall be provided. Hand rails shall be provided on all the four sides of the trolley (except in case where protective guard is fitted on the trolley conductor side, hand rails on the three sides only shall be provided) with openings on the platform side opposite to the trolley conductor side. The trolley shall be fitted with substantial safety stops to prevent the trolley from falling more than 25mm in the event of breakage of a tack wheel, bogies or an axle. This safety stops shall not interfere with removal of wheels. The trolley shall be provided with lifting pads for jacking up the trolley on all Four Corners for wheel removal. The jacking pads shall be at a height of about 300mm from the rail level and shall not interfere with the removal of wheels.		

4.2.5	**TROLLEY RAIL:** Trolley track rails made of rail steel shall be clamped to the girders with double bolt clamping plates spaced not more than 900mm apart with welded alignment blocks between every 2 clamps such that the distance of a clamp from any adjacent alignment block shall not be more than 450mm. Rails shall be prevented from creeping in the longitudinal direction by rail stops, riveted or welded. Rails shall be made continuous by welding standard lengths. At splice joints, rails may be welded at site and as such, edge preparation of the rails shall be done in the supplier's work. Standard crane rail as per IS 3443 only should be used		
4.2.6	**REPAIR CAGES:** Repair cage shall be provided on the inside of the end carriage for attending to the current collectors. Repair cage shall also be provided at the corners of the crane to facilitate removal of Long Travel wheels. The repair cages shall be minimum 1000 mm wide and shall be such that two persons can work comfortably in the space provided. The floor of Repair cage shall be about 1500mm below the LT wheel centers. The cages shall be of structural steel and shall be made substantially rigid by gusset plates and brace welded or riveted. Repair cages shall be provided with railings on all sides except for the repair cages on the down shop lead, which shall be provided with easily removable type protection guards on three sides for safety reasons.		
.2.7	**OPERATOR'S CABIN:** Cabin shall be totally enclosed with sliding windows. Following provisions shall be made in the Cabin:		
a	Cabin floor shall be covered with heat and electric insulating carpet, made of material which can be cleaned easily.		
b	Heat Convector or heater 1000 W , Fan, Light, 15Amp & 5Amp power point		
c	Glasses shall be toughened. Two Sets of glasses to be provided as spares.		
d	5-mm thick bright steel to be used as heat reflector 150 mm below the cabin floor.		

e	Siren operated by Footswitch and also from a Push Button of Radio Remote Control, audible from a distance of 100-M minimum.		
4.3	**MECHANICAL:** The following features are required in addition to those specified in relevant standards.		
4.3.1	**DRIVE MECHANISM:**		
4.3.1.1	***Long Travel- Speed: 40M/min,*** One Brake for each drive. Total no of wheels shall not be more than EIGHT (4 on each side). *However, if it is necessary that number is wheels required are more than 8 then vendor should give the full justification.* LT Drive shall be 4 corner drive, driving not less than 50% of wheels provided. If any one corner motor fails, the other corner motor on the same girder shall also trip to avoid skewing of the crane and the two other motors shall be capable of driving the crane at rated speed. All parts of the long travel drive shall preferably be located above the top platform. Long travel drive, if located below the top platform, shall be easily accessible for inspection, maintenance and removal from top. Shaft couplings shall be as near as possible to the bearings. LT drive shall be provided with floating shaft.		
..3.1.2	***CT Drive - Speed: 15M/min,*** One Brake for each drive. Total no of wheels shall not be more than **four.** However, if it is necessary that number is wheels required are more than 8 then vendor should give the full justification CT Drive shall be 2 corner drive. No part of cross travel drive shall be located below the trolley platform. Either of the drives shall be capable of operating the trolley movement in case of failure of the other drive. C.T Drive shall be provided with floating shaft.		

4.3.1.3	***Main Hoist - Speed: 4 M/min*** Main hoist shall have twin motor drive through planetary gearbox and four brakes (two for each motor). Either of the motors shall be capable of lifting the load at 50% rated speed in case of failure of the other motor. Plain Shank C hook shall be suspended from a Balancing Beam. The Balancing Beam shall be suspended from two separate Rope Drums driven through the planetary gearbox by two motors of identical capacity. The Balancing Beam shall be suspended from each Rope Drum in 2 piece rope lengths with Bar equalizer, so that in case of failure of one wire rope other should be cable of lifting the rated load at half of factor of safety. The Balancing Beam shall be of box construction to offset heat radiation from liquid metal. ***No. of falls shall not be more than 16 in total (i.e.8 falls on each drum with double reeving system***		
4.3.1.4	***Auxiliary Hoist - Speed: 6 M/min.*** Two brakes shall be provided. Total No of falls shall be restricted to 4 (max).		
4.3.2	**GEARING:** Straight and helical spur gearing shall normally be used for all motions. Worm and bevel gears shall not be used. First and high speed reductions shall be through helical gears. All first reduction pinions and also the other pinions if feasible shall be integral with the shafts. All gears shall be of hardened and tempered alloy or carbon steel with machine cut teeth. Gear tooth shall be cut in metric module system. Surface hardening of teeth is not allowed. All gears and pinions shall be machined from forgings only. All gears must be of forged alloy steel of Grade En18 or equivalent.		

4.3.3	**GEARBOX:** Totally enclosed gear boxes with splash or automatic lubrication system shall be used. The gearboxes shall be fabricated using steel plate of thickness 8 mm (min) duly stress relieved. Covers shall be spilt horizontally at each shaft center line and fastened so that the top half can be removed for inspection and repair without disturbing the bottom half. Lubrication of gears in Vertical Gear Boxes shall be provided with separate pump (mechanical or electrical driven) and piping etc.		
4.3.4	**BEARINGS:** Ball and roller anti-friction bearings of FAG, SKF make only shall be used throughout except where specified otherwise. Grouped grease lubrication system for bearings may be provided wherever possible. Automatic centralized lubrication is preferred.		
4.3.5	**COUPLINGS:** Motor shafts shall be connected to gear extension shafts through Bibby couplings. Geared couplings shall be used between gear box output shaft and intermediate shaft and wheel axle. Any other special coupling which can give better and more reliable service may be used after obtaining specific approval of the purchaser.		
4.3.6	**LIFTING HOOKS:** **Point hook with shank for both** Main Hoist and Auxiliary Hoist shall be used. The hook must be forged and properly heat treated. The Hook shall conform to the latest edition of IS:15560 or any other relevant Indian / International Standard.		

4.3.7	**BRAKES:** Double shoe brakes shall be provided for each drive (Main & Aux. Hoist -2 nos. 48 Kg thruster Type on each motor, Others 1 nos. each 18 kg or more Thruster Type). Brakes shall be mounted on the input pinion shaft of the gear train. The brake shoes shall be of hinged type. Brake levers shall be of steel. Hinge pins shall be of hardened alloy steel and shall be lubricated. These hinge pins shall be provided with steel bushes at bearing points. Brake drums shall be of forged or cast steel. Drums shall be completely machined and dynamically balanced. Width of the brake drum shall be 5 to 10 mm more than the width of the brake shoes. Hardness of brake drum shall be 38-43 RC.		
4.3.8	**Wheels:** All wheels shall be of forged alloy steel and heat treated to have surface hardness of 300-350BHN at tread to a depth of not less than 10mm. Wheel dia must be in accordance to relevant IS specification. The rail installed in Forge Shop where Crane has to installed is of CR120 size. In order to provide required top clearance as per clearance diagram, FEM standard may be followed for design calculations of wheel only.		
4.3.9	**Wire Rope:** Only standard wire rope as per **IS:2266, 6×36** construction, Steel Core, special improved Plough steel wire (**1770N/mm²**) should be used.		
4.4	**ELECTRICAL:**		
4.4.1	**SCOPE OF SUPPLY:** Scope of supply covers all items of electrical equipment commencing from and inclusive of the main current collector gear on the crane. The crane electrics include, power disconnecting switch on the crane bridge walkway immediately after the main current collector gear,		

	protective switch gear, motor control panels, resistors, Electro Hydraulic thruster operated brakes, limit switches, power and control cables, socket outlets, lighting distribution panel and lighting fixture with lamps, Bridge current collector system, joystick controllers, indication lamps, push buttons and equipment earthing material. All sundry erection materials required for installation and connection of electrical equipment with cable lying and fixing accessories should be in the scope of supply. All contactors are to be Siemens make. All timers are to be Electronic type. No fuses are to be used in any of the power/ control circuits except for protection of electronic devices. Every where else, Motor Protection Circuit Breakers/ MCCBs/ ACBs are to be used. No bolted or diased fuses are to be used. All overloads to be magnetic type All indicators to be LED type. All equipment should be of robust construction. Supply will also include 5 Sets of all electrical drawings and manuals. All drawings to be approved by BHEL prior to commencement of work..		
4.4.2	**CLIMATIC CONDITIONS:** The equipment offered shall be suitable for tropical and humid climate. For the purpose of equipment selection and specially for derating the capacities of drive motors and power cables, the ambient temperature 55°C shall be taken as the basis. The equipment on the crane shall be suitably protected against damage from radiant heat and shall be rendered proof against ingress of dust and vermin		

4.4.3	**STANDARDS:** The equipment shall be selected, assembled and tested as per guide lines provided in the latest edition of Indian Standard Specification Nos. IS: 4137 for Class-4 duty. The equipment shall also conform to the latest Indian Electricity Rules and regulations as regards Safety requirements, earthing and other essential provisions specified therein. The equipment shall be designed and selected to facilitate inspection, cleaning, replacement and repair and for use where continuity of operation and safety are first considerations. Wherever power cables having aluminum conductors are used for connecting up the electrical equipment on cranes, ample internal space for easy termination of these cables in the terminal boxes of the machines shall be ensured.		
4.4.4	**POWER SUPPLY CONDITIONS:** The power available at existing down shop leads is 500V, 3 phase, 3 wire, 50hz. The equipment selected should be suitable for operation on 500V 10% The following voltages shall be used in the cranes.		
a	500 ± 10% , 3 ph, 50hz, AC : For motors and electro-hydraulic thrusters		
b	220V, through individual single phase Isolating Transformer :For control circuit, lighting and fan		
c	220V,single phase, 50hz, AC :For hand lamp socket outlets		
d	220V, AC :For control circuits as applicable		
e	±24V/ ±15V DC regulated :For electronic circuits as per need		
	The different voltages mentioned above other than 500V, 3 ph, 50hz, AC should be obtained through individual separate transformer and transformer rectifier units connected to 500 V, AC. Each transformer should be provided with tapping at 2 .5% of p rimary v oltage a t primary side and 5% of secondary voltage at secondary side.		

4.4.5	**CURRENT COLLECTION:** The supplier shall arrange for main current collector system. Clearance diagram at Annexure-I may be referred for details.		
4.4.5.1	**BRIDGE CONDUCTORS:** The bridge conductors should be accessible for service. Bare copper wires should not be used as bridge conductors. Flexible trailing cable system mounted on retracting supporting system should be used. The conductors should consist of insulated multi conductor (or several single conductors) flexible cables with permanent termination on the bridge and on the trolley. The flexible trailing cables should have ample length and should be supported by means of propely designed movable clamps. These clamps should be fitted with rollers and should run freely on guide rails allowing relative movement of bridge and trolley without undue stress on the suspended cables. Consideration should be given to the inclusion of spare conductors to make provision for the later requirements of additional conductors. The crane handles Hot Steel Ingots and Forgings for which the festoon cables should be selected accordingly and should be of reputed manufacturer.		
4.4.5.2	**COLLECTOR SHOES:** The main current collectors shall be of copper carbon pad type and double collectors shall be provided for all the three phases. Each collector shall have adequate current carrying capacity. The design of collector shall be such as to minimize the chance of sticking up at the hinge points due to dust or corrosion.		
4.4.5.3	**COLLECTOR SHUNTS:** Current carrying shunts on all the collectors shall be designed so that there is no danger of contact with adjacent collectors. The shunts shall be easily replaceable.		

4.4.5.4	**MOUNTING:** All the collectors shall be mounted on rigid steel shafts and suitably insulated there from. Electrical clearance between live parts of adjacent shoes shall be at least 75mm. Flexible shunts in their least favorable position shall not reduce this clearance. Collectors shall be designed for ease of maintenance and so mounted that they are readily accessible for this purpose.		
4.4.6	**MOTORS:**		
4.4.6.1	**GENERAL:** The crane shall be provided with crane duty TEFC Slipring induction motors. The operation of each motion shall be done from crane operator's cabin through Master Controller, Resistances, Timers, Contactors etc. individually installed in each motion from near zero to maximum speed. All interlocks shall be monitored through contactors. Zero interlock of joysticks and gravity limit switches to be incorporated with line contactors. The crane is to be installed in a very dusty Forge atmosphere and the dust contains an appreciable quantity of conducting and magnetic dust. Adequate protection is to be provided from ingress of dust into electrical panels and equipment. The supplier shall furnish test certificates at the specified duty cycle for the individual motor. All the motors offered shall be suitable for 40% heavy-duty reversible crane service with minimum 50% overload capacity. The supplier will be responsible for selecting ratings that will meet the specified duty with the type of control specified. Ambient correction factors depending upon ambient temperature shall be applied to derate the motor. Motors shall be of NGEF, Siemens, Bharat Bijlee, Alstom or ABB make only.		
4.4.6.2	**TORQUE:** The pull out torque of the motors at rated voltage and frequency shall be not less than 2.75 times of the nominal torque.		

4.4.6.3	**CLASS OF INSULATION:** All motors shall preferably be class 'H' insulated and the maximum permissible temperature measured by contact thermometer shall not exceed 1600 C. In the event of non-availability of class 'H' insulated motors, class F insulated motors with maximum permissible temperature measured by contact thermometer not exceeding 1150 C and 1300 C for stator and rotor respectively may be offered.		
4.4.6.4	**OTHER FEATURES:** The terminal boxes shall be large enough to accommodate aluminum conductor cables which may have derating factor as low as 0.4 on account of high ambient temperature and grouping factor. The motors shall be in IEC frame sizes. The terminal boxes shall be located on top of the motor with facility to be rotated by 90° and 180° in horizontal plane.		
4.4.7	**MASTER CONTROLLERS:** Cam type Master controllers with joystick type levers shall be used for all motions. Each controller shall be provided 'OFF' position interlock. Each controller shall bear an indication of the motion controlled and of direction of movement. A minimum of four notches in either direction shall be provided. The operating lever of the controller shall move freely between the notches, shall locate definitely, and shall remain in position at each notch unless pushed to the other position. For motions like long/cross travel etc. double master controllers with universal joint shall be offered to facilitate operation. In case double master controllers of dependable make are not available, single master controllers may be offered.		

4.4.8	**CONTROL PANELS:**		
	All switchgear components, power and auxiliary contactors, thermal overload relays, MPCBs, time relays etc. shall be mounted in sheet steel cubicles with lockable hinged doors. The door hinges shall be such that during repair works inside the panel, the entire door can be lifted out and placed away enabling better access inside the panel. Each motion shall preferably have its individual panel. All ventilating openings shall have screen protection. Interior of the panel shall be dust and vermin proof. Panels shall be front wired with readily accessible terminal blocks for making connection to the external equipment. All equipment is to be mounted in the front of the panel. Rear panel mounting is not permitted. All cable entry shall be from bottom only. Cable entry shall be through suitable cable glands. Removable gland plate is to be provided at the bottom of the panels for marking holes, providing cable gland for cables. Panels shall be pre-wired up to terminal strip. All contactors etc. shall be mounted securely in a vertical arrangement with due consideration to the vibration encountered in the operation of the crane. The bottom most row of equipment mounted inside the panel excepting terminal strip shall be at least 350mm above the panel bottom cover to facilitate inspection and repair. Terminal strip shall be fixed inside the panel preferably in horizontal manner leaving enough space underneath the panel for termination of cables in a convenient manner. Power and control terminals shall be segregated. Power terminal blocks shall be separated from each other by means of replaceable insulated spacers. Terminal blocks shall have enough clearance to avoid tracking. All equipment inside the panel shall have permanent identification labels in accordance with circuit diagram as also the power and control terminals. Terminal blocks shall be robust and of such construction as to preclude possibility of cable connections getting loose due to vibration on crane.		

	Sheet steel used for fabrication of panel shall have minimum thickness of 2.0 mm. Panels shall be mounted such that bottom of panel is at least 200 mm above the floor. Clearance and creepage distance for the control gear shall be 10mm and 12mm respectively. The electrical clearance in air between all live parts of different polarity and voltage and between live parts and earth shall be not less than 75mm. Contactor panels shall be well braced to the crane structure and each panel shall be provided with adequate number of lifting lugs.		
4.4.9	**CONTACTORS:** All contractors are to be of Siemens or L&T make only. The current rating of all contactors shall be at least 50% higher than the respective motor full load current at the specified duty cycle. The minimum size of contactors on the power circuit shall be as given for high currents that may be encountered on account of single-phase brake lowering, plugging and DC injection as per the control scheme chosen.		
4.4.10	**RESISTORS:** The resistors shall be air-cooled, robust, heavy duty, punched stainless steel grid type. Wire wound resistors shall not be used on any motion of the crane except for attaining creep speeds through frequency converters and on magnet circuit. Notwithstanding ventilation requirement, resistor housing on cranes working in open yards shall be weather proof and on all cranes they shall be adequately protected with cover to prevent accidental contact. The electrical clearance in air between resistors and earthed metal shall not be less than 100mm. Cable entry to the resistor banks shall be from underside and terminal arrangement shall be such that cable cores do not get loose due to vibration. The value chosen shall ensure smooth and uniform acceleration and allow for plugging and dynamic breaking without overheating. The resistors shall be rated for minimum of 10-minute duty.		

4.4.11	**CIRCUIT PROTECTIVE SWITCH GEAR:** The protective switchgear shall consist of following:		
4.4.11.1	One triple- pole air circuit breaker, serving as main incoming protective switch fitted with automatic reset bimetal overload releases for protection against sustained overload and magnetic type instantaneous releases for protection under short circuit conditions, on all three phases. The breaker shall have adequate rupturing capacity to withstand and clear fault current of the order of 40KA. Further, the circuit breaker shall have rating to carry combined full load current of two motions of the crane having largest horsepower. The setting of the over current release shall be such as to trip the breaker instantaneously when current raises to 250% of the normal value. The incoming circuit breaker will be located inside driver cabin or nearby in such a way that enough clearance is provided as per IE rules. To indicate whether power and control sources are ON, pilot LED indication lamps shall be provided inside the driver's cabin.		
4.4.11.2	In addition to incoming circuit breaker, following protective equipment shall be provided inside the Driver's cabin.		
a	Moulded case circuit breakers (MCCBs) Miniature Circuit Brreakers for isolation and protection of lighting and power socket outlet circuits. This shall isolate all circuits except the crane lighting circuit, magnetic circuits, and the circuit of transformer for portable lighting socket outlet.		
b	Moulded case circuit breakers (MCCBs) for isolation and protection of control circuit.		

4.4.12	**AUXILIARY SWITCH GEAR:** A main iron clad 3-pole isolating switch shall be provided on the long travel bridge walkway as close as possible to the main current collectors. This switch shall be without any fuse and of load isolating type. This shall isolate all circuit excepts the lighting circuit, magnet circuits and the circuit to the transformer supplying the portable lighting socket outlets. Each of the above mentioned main isolating switches shall be rated to carry at least combined full load current of two motions of crane having the largest horse powers and shall be provided with means of locking the switch operating handle in the 'OFF' position. The switch cover shall be interlocked with operating handle so that it can not be removed or opened unless the operating handle is turned to the 'OFF' position. The live contacts inside the switch shall be shielded to prevent accidental contact. Fuses wherever essential, are to of knife-edge type only. No bolted or diased fuses are to be used.		
4.4.13	**LIMIT SWITCHES:** All hoist motions shall be provided with rotary and extra Counterweight Limit Switch for over hoisting. For CT and LT, Cam operated limit switches shall be provided. The limit switches shall be provided for prope back up protection. The first limit switch to act in the event of over hoisting and over lowering, shall be rotary type with self resetting feature, and be incorporated in the control circuit of the respective drive motor and the second one shall be gravity operated switch (Push button bypass) connected in the trip circuit of the Line Contactor. Limit switch incorporated in the motor control circuit shall act first, but in case this limit switch fails to operate the second limit switch shall operate and trip the line contactor.		

4.4.14	**EMERGENCY STOP PUSH BUTTONS:** Safety switches of sustained contact type shall be provided at the entrances to the crane bridge so that under any emergency conditions, operating any one of the switches, the incoming circuit breaker is tripped thus cutting off power to all the motions. Cabin door-interlocking switch, interlocked with the main incoming ACB shall be provided. A pilot lamp incorporated in the control circuit will glow up when any of these switches is operated. Further a mushroom headed type OFF push button shall be provided in the operator's cabin so that the main incoming breaker can be tripped under any emergency condition, by pressing the operating head.		
4.4.15	**CONTROL CHARACTERISTICS:** The hoist control gear shall be designed so as to limit/ control the accelerating torque/ current for hoisting with 185% of full load torque/current for changing the controller from one notch position to another higher notch position. Similarly peak decelerating torque/current shall be limited to 200% of full load value for changing the controller from highest position to the first lowering position. Bridge and trolley of the crane shall have revising plugging control circuit for rapid deceleration and stopping. The control circuit shall be designed such that the brakes provided shall not come into action simultaneously with plugging. The control circuit shall be designed such that the brakes provided shall come into action immediately on controller coming to zero position.		
4.4.16	**BRAKES:** All motions of the crane shall be provided with electrically operated brakes to arrest the motion safely. For all motions, Electro hydraulic Thruster Brakes of reputed make shall be offered. All brakes rating shall be selected on installed kW rating of motors and not mechanical kW rating.		

4.4.17	**DISPOSITION OF ELECTRICAL EQUIPMENTS:** In case of fixed cabin cranes, the electric panels shall be located as follows. For box girder cranes within the box if possible or on the walkway. In case equipment is located inside the box adequate lighting and ventilation shall be provided.		
4.4.18	**LIGHTING:** Lighting shall be provided in the driver's cabin, staircases, and areas where control panels, resistors and transformers are installed. Bulkhead fitting with dust proof covers shall only be used for the above areas. Four numbers under bridge lights of 250W, HPSV on shock absorbing and anti swing suspension shall be provided for uniform floor illumination. Screw cap type holders and lamps shall be used for crane lighting. Lighting transformers shall have 50% reserve capacity. The lighting distribution board and metal clad switches incorporating cartridge fuses in every line of each circuit shall be provided in the driver's cabin for the Crane lighting including under bridge lighting and Air conditioning or fans.		
4.4.19	**SOCKET OUTLETS:** Minimum of four socket outlets for hand lamps shall be provided each at driver's cabin, long travel Side Bridge and in the area where control panels, resistors and transformers are installed. Hand lamps shall operate at 240V AC supply. Industrial type metal clad plug and sockets shall be provided.		
4.4.20	**CABLING:** All wiring for power, control, lighting etc shall be carried out with 1.1KV grade PVC armored cables except flexible cables where armor shall not be provided. All control cables shall be minimum 2.5mm2 Copper. All flexible cables shall be multistranded copper. Single strand cables shall not be used anywhere inside the crane. All cables exposed to direct heat radiation shall be of special insulation or shall be run in formed steel channels provided with heat resistant material. Cables laid on open racks shall be adequately clamped.		

	Cable selection and routing on the crane shall form part of the crane design. Conduits and conduit fittings if used on crane for running cables shall be of standard design and shall be supplied with complete accessories. Each motor shall be wired through separate conduits. All cables, remaining live in open position of isolator shall be installed separately.		
4.4.21	**IDENTIFICATION OF CIRCUITS/CABLES ETC:.** Labels of permanent nature shall be provided on supports of all switches, fuses, contactors, relays etc. to facilitate identification of circuits and replacement. All panels, controllers, resistors etc. are to be propely marked for each motion. All power control cables, lighting, and other cables are to be tagged at both ends as per cable number indicated in the supplier's drawing. All equipment terminals are also to be marked likewise.		
4.4.22	**SAFETY SCREEN:** Safety screen shall be provided with crane near the Down Shop Leads.		
4.4.23	**EARTHING:** Earthing to the crane shall be effected through track rails and crane structure. As such, all the electrical equipment mounted on crane shall be connected to the crane structure by means of earthing links. The crane structure in turn shall be made electrically continuous by providing jumpers over riveted or bolted joints. Equipment fed by flexible cables shall be earthed by means of spare core provided in the flexible cable.		
4.5	**RADIO REMOTE CONTROL & OPERATORS INDICATING TORCH:**		
4.5.1	Radio Remote Control conforming to IS-3177 along with the following features shall be provided. Multicolored 2 nos. operator Torch shall be provided for operator. SNT Control Make is Preferred (As well RRC of SNT make)		

4.5.2	**Technical Requirement:**		
4.5.2.1	**The transmitter shall be hand held Push Button type.** The crane shall be operative either through Radio Remote Control or through Cabin Control. Cabin Control and Radio Remote Control shall be interlocked and change over system shall be manual located at the entry of the cabin. Push Button for main motions to have minimum 2-steps.		
4.5.2.2	There shall be a common push button for siren and START and separate push buttons for under-bridge lights and STOP/ OFF. The PPC shall take care of operation of coupling system installed.		
4.5.2.3	**Operating range shall be 100 meters approx. for Radio Remote. If crane is beyond this distance w.r.t. RRC all motions must stop.**		
4.5.2.4	Isolation transformer and surge suppressor for the receiver supply to be provided.		
4.5.2.5	Limit Switches shall be provided & wired by the party for avoiding collision of two adjacent cranes.		
4.5.2.6	The wiring shall be connected to terminals/ equipment with prope size copper cable, wire lugs.		
4.5.2.7	Supplier must give circuit diagrams of the entire RRC. All panel wires, cables shall be ferruled, numbered and the same shall appear on electrical drawings.		
4.5.2.8	The transmitter of RRC must be provided with Ni-Cd rechargeable batteries of appropriate rating. Three sets of long life Nickel Cadmium batteries for the transmitter along with a battery charger are to be provided.		

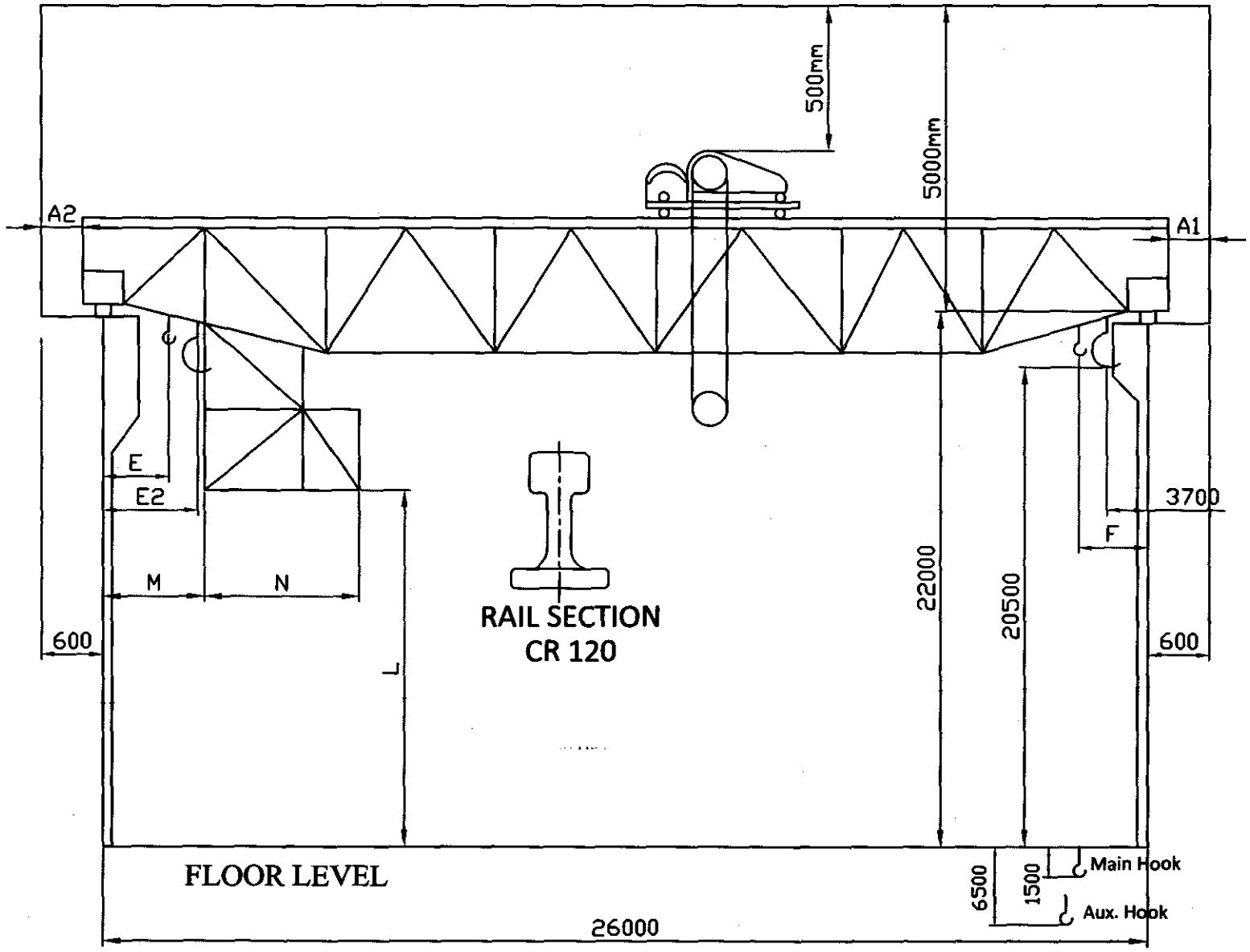
4.5.3	Supplier shall obtain frequency allocation letter for the RRC system from the Dept. of Telecommunication, Govt. of India, New Delhi on behalf of CFFP, Haridwar free of cost. For this purpose frequency allocation forms shall be sent to CFFP after receipt of the purchase order for filling. These forms along with an authority letter from the Factory Manager shall be sent back to the supplier for further necessary action. After the system is dispatched, necessary operating license/permission for the RRC system on the crane shall be arranged by the supplier from statutory bodies as per the detail given in the frequency allocation letter. License fee, if any, shall be borne by the supplier for the first time on behalf of CFFP, Haridwar.		
4.5.4	Five copies of Operation & Maintenance Manual, safety provisions, photographs, schematic diagram, and details of PCBs etc. shall be provided. A CD containing the documents / information recorded on it shall also be provided.		
4.6	**CRANE WEIGHING SYSTEM:**		
4.6.1	The Crane weighing System (Load Cells) of Capacity 300T shall be provided along-with the crane, conforming to IS-3177 along-with the following features. Preferred make: M/s Leebow, M/s IPA. The Load cell shall be installed on the Equalizer Pulley of the EOT crane. There shall be 4 nos. of Load Cells of 75Ton each (Total 300 Tons)		
4.6.2	**Technical Requirements:**		
6.2.1	Resolution shall be 10 Kg. or better.		
4.6.2.2	An additional display of 300mm character height shall be provided, opposite to the main current collector at a suitable site from maintenance point of view on the crane. The control panel with display unit shall be housed in the operator cabin.		
4.6.2.3	Accuracy ±1% or better.		
4.6.2.4	The system shall have Tare zero facility. Provision shall be made for setting ON/OFF, Zero and Tare through the Radio Remote Control (Refer Clause 4.5)		
4.6.2.5	The supply voltage shall be 220 V ±10%, single phase for which a separate step-down transformer shall be used.		

4.6.2.6	There shall be overload indication (OL).		
4.6.2.7	The supplier shall calibrate the load cell, to the satisfaction of the Purchaser. Potentiometer shall be identified in the panel to calibrate after commissioning, if needed. CFFP will provide weights for calibration.		
4.6.3	Supplier shall get Mechanical / Electrical assembly drawings approved by CFFP prior to commencement of manufacturing.		
4.6.4	The following shall be provided. A DVD/ CD containing the documents / information recorded on it shall also be supplied.		
.6.4.1	Operation and maintenance manual - 5 Sets.		
4.6.4.2	Electrical circuit diagrams. And wiring schedule/ plan.		
4.6.4.3	Assembly drawings/diagram showing the placement of components/parts along with make rating and specification.		
4.6.4.4	Complete list of spares required for the smooth operation of the Crane Weighing System for 2 years along-with prices and identification number.		
4.6.4.5	Details of all bought out items with their specification, addresses of Vendors.		
4.6.4.6	Test certificate and guarantee certificate for the Crane Weighing System as a whole and test certificates of individual bought out components.		
4.6.5	Tool kit and spares required for smooth operation of the system for 2 years of trouble free operation shall be supplied.		
4.6.6	**ERECTION: The space/ site will be provided for 15 days for erection. For the erection of the Crane production has to stop hence the party shall intimate the schedule of Erection prior to start of Erection Work.**		
4.6.7	**The supplier shall commission and demonstrate the satisfactory performance of the Crane at CFFP/ BHEL, Hardwar.**		
4.6.8	Offer shall be clear in the all respects and accompanied by technical details of Crane, description of working of equipment, power consumption etc.		
4.6.9	Offer shall include the names and addresses of customers to whom similar systems have been supplied by the supplier.		

4.6.10	All accessories and spares parts shall be quoted with price breakup.		
4.6.11	**Guarantee: Supplier must furnish the Guarantee for 18 months from the date of Commissioning for trouble free operation.**		
5.0	**Other Requirements :**		
	The crane must of a robust design capable of performing following duties:		
5.1	**Handling of Hot Ingots & forgings having temperatures upto 1300°C max.**		
5.2	**Liquid metal from Steel Melting Shop having liquid steel temperature up to 1650°C**		
6.0	**Safety Requirements :** In design of Crane, all safety regulations as applicable with Factory Acts, Indian Electricity rules etc. as prevailing in the country and the site of installation shall be taken into consideration and provided for.		
7.0	**Spares**		
7.1	**Commissioning Spares :**		
	One set of erection & commissioning spares shall be provided which may required till satisfactory completion and commissioning. A list of these spares shall be submitted with the bid. Any of the spare, if required, by the contractor during the Erection and Commissioning activity, shall be arranged promptly free of cost.		
7.2	**Mandatory Spares :**		
	The spares parts Referred in Annexure -III shall be supplied. Manufacturer shall submit the routine test certificates in respect of all the spares. The spares parts shall comply with the requirement of specifications for the complete equipment. If any spare is not applicable, same shall be mentioned in the offer. Unit price and total price shall also be mentioned in the offer for each of the applicable spares. The price of mandatory spares shall be included in the bid.		

7.3	**General Spares :** General spares shall also be supplied as per Annexure-III		
7.4	**Recommended Additional Spares for five years:** List of hereunder the spares which are recommended by the Tenderer for purchase in addition to the specified spare parts. The purchase of any or all of the recommended spare parts will be at the option of the Owner. The prices for recommended additional spare parts for five (5) years shall therefore not be included in the tender prices. The additional sheets may be added if required.		
8.0	**Schedule Deviations :** A schedule of Deviations (Annexure- VI) is to be submitted along with the bid. All the deviations related to the requirements mentioned in these particular technical specifications including those specifications/ standards mentioned shall be declared with the bid submission. In case, there are no deviations, a nil report shall be submitted. Except the deviations, mentioned in Annexure –VI all other requirements covered under these specifications/ standards will be assumed and treated as fully agreed and compiled by the bidder/ contractor.		

ANNEXURE-II



CRANE CLERANCE DIAGRAM

ANNEXURE-II
DETIALS OF CRANE TO FURNISHED WITH THE TENDER

NOTE: To obtain a soft copy of this datasheet through email, you may send your request to anuragkk@bhelhwr.co.in. Vendors should submit also the soft copy of datasheet (in MS-Word) on a DVD/ CD along with technical offer. Vendor has to submit data of crane under column **"Remarks"** and put their initial & seal as the bottom of each sheet

SNo.	Item Description	Unit	Value	Remarks
'A) GUARANTEED TECHNICAL PARTICULARS :				
01	Capacity			
	a. Main Hoist	Ton	200	
	b. Aux. Hoist	Ton	30	
02	**Span**	**m**	**26**	
03	Duty / Class of Cranes	Class IV, IS:4137		
04	Normal Operating Speed			
	a. Main Hoist (Hoisting & Lowering)	m/ min.	4	
	b. Aux. Hoist (Hoisting & Lowering)	m/ min.	6	
	c. Trolley Travel	m/min.	15	
	d. Bridge Travel	m/ min.	40	
05	Hook total Vertical Lift			
	a. Main Hoist	m	22m	
	b. Aux. Hoist	m	28m	
06	Number of Wheels for			
	a. Bridge	Nos.		
	b. Trolley	Nos.		
07	Minimum Factors of Safety for			
	a. Structural Part			
	b. Wire ropes		≥ 8	
08	Unit Stresses for			
	a. Structural Part	Kg/ mm^2		
	b. Wire ropes	Kg/ mm^2	180	
09	No. of motors for Long Travel	Nos.		
10	No. of Motors for Cross Travel	Nos.		
11	No. of motors for Hoisting			
	a. Main Hoist	Nos.		

	b. Aux. Hoist	Nos.		
12	Lifting Beam			
	a. Capacity	Ton		
	b. Weight of Lifting Beam	Ton		
13	Deflection			
14	Dead Wt. of Crane	Ton		

SNo.	Item Description	Unit	Value	Remarks
[illegible]. INFORMATIVE DATA				
1	Name of Manufacturer			
2	Type and Class of Cranes			
3	Standards to which crane conform			
4	Effective Span	m		
5	Weight of Crane			
	a. Total Weight of Crane including electrical Equipment	Ton		
	b. Weight of each Bridge Girder assembled and ready for erection	Ton		
	c. Total weight of trolleys including electrical equipment	Ton		
	d. Weight of each end carriage (Trucks) as assembled and ready for erection	Ton		
6.	Normal Speed for			
	a. Bridge Travel at full load	m/ min,		
	b. Trolley travel at full load	m/ min.		
	c. Hook Hoisting / Lowering at full load for	m/min.		
	i. Main Hoist	m/ min.	4	
	ii. Aux. Hoist	m/ min.	6	
	d. Hook Hoisting / Lowering at half load for			
	i. Main Hoist	m/ min.	4	
	ii. Aux. Hoist	m/ min.	6	
7	Minimum Possible Travel (after breaking) of			
	a. Bridge Drive	mm		
	b. Trolley Drive	mm		
	c. Main Lifting Hoist	mm		

	d. Auxiliary Lifting Hoist	mm		
8	Distance from forge shop floor to top of crane rail.	mm	22000	
9	Minimum working clearance provided			
	a. Between centre of crane rail and the nearest side obstruction in the	mm		
	i. Upstream side of power house	mm		
	ii. Downstream side of power house	mm		
	b. Between the top of crane & lowest overhead obstruction (Top Clearance)	mm		
0.	Operator's cabin (on downstream side)			
	a. Distance between centers of LT rail to the cabin back side wall.	m		
	b. Cabin depth at the base (across the rails).	m		
	c. Bottom of cabin from top of LT rails.	m		
	d. Size of cabin (L×B×H)	m		
	e. Emergency monkey ladder provided.	Yes/No		
	f. No. of CO_2 cylinders (4.5kg capacity) provided	Yes/No		
11	Crane Bridge			
	a. Type of Main Girders			
	b. Material of construction			
	c. Details of Construction			
12	End Carriage (Bridge Travel)			
	a. Type & Number			
	b. Material of construction			
	c. Details of Construction			
	d. Number of Wheels per truck			
	e. Total No. of Wheels in Bridge			
	f. Center to Center distance of Outer Wheel.	mm		
	g. Maximum load excluding impact on traveling wheels	Ton		
	h. Type of drive System			
	i. Wheel Stopper in addition to end stopper provided			
	j. Track sweeper Provided			
13	Trolley			
	a. Type			

	b. Material of construction			
	c. Details of Construction			
	d. Number of Wheels			
	f. Center to Center distance of Wheel.	mm		
	g. Maximum load excluding impact on traveling wheels	Ton		
	h. Type of drive System			
	i. Wheel Stopper in addition to end stopper provided			
	j. Track sweeper Provided			
14	Double Flanged Wheels for Bridge			
	a. Type			
	b. Total Number			
	c. Number of Drive Wheels			
	d. Diameter	mm		
	e. Width	mm		
	f. Material with specifications			
	g. Make of bearings.	SKF/ FAG		
	h. Design Service life of Bearing	Hours	≥40000	
	i. Name of Manufacturer			
	j. Tread Diameter	mm		
	k. Hardness of Wheel	BHN		
	l. Maximum load per wheel	Ton		
	m. Are bearings flanged at both end of wheel			
15	Wheels of Trolley			
	a. Type			
	b. Total Number			
	c. Number of Drive Wheels			
	d. Diameter	mm		
	e. Width	mm		
	f. Material with specifications			
	g. Make of Bearings.	SKF/ FAG		
	h. Design Service life of Bearing	Hours	≥40000	
	i. Name of Manufacturer			
	j. Tread Diameter	mm		
	k. Hardness of steel	BHN		

	l. Maximum load per wheel	Ton		
	m. Are bearings flanged at both end of wheel			
16	Rails of Trolley Runway (As per IS :3443)			
	a. Section			
	b. Length	mm		
	c. Weight/ meter	Kg/M		
	d. Name of manufacturer			
	e. Specification No.			
17	Winding Drum for Main Hoist			
	a. Material and type of Construction			
	b. Diameter and Length	mm		
	c. Depth of Groove	mm		
	d. Pitch diameter of rope grooves	mm		
	e. Thickness of Drum at bottom of grooves	mm		
	f. Crushing and bending stresses for hoist drums.			
	g. Name of manufacturer			
	h. Whether stress relieved, yes/ no.			
	i. Make of Bearings	SKF/ FAG		
18	Winding Drum for Aux. Hoist			
	a. Material and type of Construction			
	b. Diameter and Length	mm		
	c. Depth of Groove	mm		
	d. Pitch diameter of rope grooves	mm		
	e. Thickness of Drum at bottom of grooves	mm		
	f. Crushing and bending stresses for hoist drums.			
	g. Name of manufacturer			
	h. Whether stress relieved yes/ no.			
	i. Make of Bearings	SKF/ FAG		
19	Hoisting Ropes for main Hoists			
	a. Construction (6×36, IWRC, 180Kg/mm²)			
	b. Diameter	mm		
	c. Number of Falls			
	d. Minimum factor of Safety		8	
	e. Quality of Steel			
	f. Name of Manufacturer			

20	Hoisting Ropes for Aux. Hoists			
	a. Construction (6×36, IWRC, 180Kg/mm²)			
	b. Diameter	mm		
	c. Number of Falls			
	d. Minimum factor of Safety		8	
	e. Quality of Steel			
	f. Name of Manufacturer			
21	Crane hooks and bottom blocks for main hoists			
	a. Type			
	b. Lifting capacity	Ton		
	c. Material			
	d. Make of Bearing	SKF/ FAG		
	e. Name of Manufacturer			
	f. Specification No.			
22	Gears for Bridge Travel mechanism			
	a. Type of Drive			
	b. Material			
	c. Type of Lubrication			
	d. Type of Enclosure			
	e. Name of Manufacturer			
	f. Type of Gear			
23	Gears for Trolley drive mechanism			
	a. Type of Drive			
	b. Material			
	c. Type of Lubrication			
	d. Type of Enclosure			
	e. Name of Manufacturer			
	f. Type of Gear			
24	Gears for Main hoist Mechanism			
	a. Type of Drive			
	b. Material			
	c. Type of Lubrication			
	d. Type of Enclosure			
	e. Name of Manufacturer			
	f. Type of Gear			

25	Gears for Aux. Hoist Mechanism			
	a. Type of Drive			
	b. Material			
	c. Type of Lubrication			
	d. Type of Enclosure			
	e. Name of Manufacturer			
	f. Type of Gear			
26	Make and Type of Coupling			
	a. Between motor Shaft and gear box extension shaft - LT			
	b. Between motor Shaft and gear box extension shaft - CT			
	c. Between motor Shaft and gear box extension shaft - MH			
	d. Between motor Shaft and gear box extension shaft - AH			
	e. Between gear box and hoist drum -MH			
	f. Between gear box and hoist drum -AH			
27a	Motors for Long Travel (LT)			
	a. Number			
	b. Type and manufacturer			
	c. Voltage, phases & frequency			
	d. Full Load Rating in kW			
	e. kW required corresponding to SWL (=200T) of Crane			
	f. Space heaters provided			
	g. Class of Insulation			
	h. Rating in minutes of continuous operation.			
	i. Speed in rpm			
	j. Over-speed withstand capacity			
	k. Torque corresponding to max. load			
	l. Rated torque corresponding to Rated Load of Motor.			
	m. Starting Torque			
	n. Breakdown torque			
	o. Breakdown torque.			

	p. Pull out Torque			
	q. Locked rotor Current.			
	r. Max. Temp. rise			
	s. Type of Enclosures			
	t. Size			
	u. Speed Regulation			
27b	Motors for Cross Travel (C.T.)			
	a. Numbers			
	b. Type and manufacturer			
	c. Voltage, phases & frequency			
	d. Full Load Rating in kW			
	e. kW required corresponding to SWL (=200T) of Crane			
	f. Space heaters provided			
	g. Class of Insulation			
	h. Rating in minutes of continuous operation.			
	i. Speed in rpm			
	j. Over-speed withstand capacity			
	k. Torque corresponding to max. load			
	l. Rated torque corresponding to Rated Load of Motor.			
	m. Starting Torque			
	n. Breakdown torque			
	o. Breakdown torque.			
	p. Pull out Torque			
	q. Locked rotor Current.			
	r. Max. Temp. rise			
	s. Type of Enclosures			
	t. Size			
28	Motors for Main Hook (M.H.)			
	a. Number			
	b. Type and manufacturer			
	c. Voltage, phases & frequency			
	d. Full Load Rating in kW			
	e. kW required corresponding to SWL (=200T) of Crane			

	f. Space heaters provided			
	g. Class of Insulation			
	h. Rating in minutes of continuous operation.			
	i. Speed in rpm			
	j. Over-speed withstand capacity			
	k. Torque corresponding to max. load			
	l. Rated torque corresponding to Rated Load of Motor.			
	m. Starting Torque			
	n. Breakdown torque			
	o. Breakdown torque.			
	p. Pull out Torque			
	q. Locked rotor Current.			
	r. Max. Temp. rise			
	s. Type of Enclosures			
	t. Size			
29	Motors for Aux. Hook (A.H.)			
	a. Number			
	b. Type and manufacturer			
	c. Voltage, phases & frequency			
	d. Full Load Rating in kW			
	e. kW required corresponding to SWL (=30T) of Crane			
	f. Space heaters provided			
	g. Class of Insulation			
	h. Rating in minutes of continuous operation.			
	i. Speed in rpm			
	j. Over-speed withstand capacity			
	k. Torque corresponding to max. load			
	l. Rated torque corresponding to Rated Load of Motor.			
	m. Starting Torque			
	n. Breakdown torque			
30	Brakes for Bridge Travel			
	a. Type of brakes used			
	b. Total Number of brakes provided & their			

	locations			
	c. Rated Torque			
	d. Braking Torque			
	e. Name of Manufacturer			
31	Brakes for Trolley Travel			
	a. Type of brakes used			
	b. Total Number of brakes provided & their locations			
	c. Rated Torque			
	d. Braking Torque			
	e. Name of Manufacturer			
32	Brakes for Main Hoist Travel			
	a. Type of brakes used			
	b. Total Number of brakes provided & their locations			
	c. Rated Torque			
	d. Braking Torque			
	e. Name of Manufacturer			
	f. Dynamic braking for lowering motion			
33	Brakes for Aux. Hoist Travel			
	a. Type of brakes used			
	b. Total Number of brakes provided & their locations			
	c. Rated Torque			
	d. Braking Torque			
	e. Name of Manufacturer			
	f. Dynamic braking for lowering motion			
34	Limit Switches for Main Hoist			
	a. Number			
	b. Type & Size			
	c. Material of Contact			
	d. Current and Voltage rating			
	e. Name of Manufacturer			
35.	Limit Switches for Aux. Hoist			
	a. Number			
	b. Type & Size			

	c. Material of Contact			
	d. Current and Voltage rating			
	e. Name of Manufacturer			
36.	Limit Switches for Long Travel			
	a. Number			
	b. Type & Size			
	c. Material of Contact			
	d. Current and Voltage rating			
	e. Name of Manufacturer			
37.	Limit Switches for Cross Travel			
	a. Number			
	b. Type & Size			
	c. Material of Contact			
	d. Current and Voltage rating			
	e. Name of Manufacturer			
38	Controller & Resistor for Main Hoist			
	a. Type of Controller			
	b. Number of Steps			
	c. Type of Resistors			
	d. Continuous rating of resistors			
	e. Ohmic value			
	f. Name of Manufacturer			
39	Controller & Resistor for Aux. Hoist			
	a. Type of Controller			
	b. Number of Steps			
	c. Type of Resistors			
	d. Continuous rating of resistors			
	e. Ohmic value			
	f. Name of Manufacturer			
40	Controller & Resistor for Long Travel			
	a. Type of Controller			
	b. Number of Steps			
	c. Type of Resistors			
	d. Continuous rating of resistors			
	e. Ohmic value			

	f. Name of Manufacturer			
41	Controller & Resistor for Cross Travel			
	a. Type of Controller			
	b. Number of Steps			
	c. Type of Resistors			
	d. Continuous rating of resistors			
	e. Ohmic value			
	f. Name of Manufacturer			
42	Conductors/ Collectors for Main Runway			
	a. Type of Conductors			
	b. Size			
	c. Current Carrying capacity			
	d. Voltage Drop			
	e. Type of Collectors			
43	Conductors/ Collectors for Trolley Runway			
	a. Type of Conductors			
	b. Size			
	c. Current Carrying capacity			
	d. Voltage Drop			
	e. Type of Collectors			
44	Bearing Details for different bearings			
45	Power Supply requirements			
	a. Total load of one crane			
	b. Voltage			
46	Protective Panel			
	a. Main Conductor			
	1. Type			
	2. Location			
	3. Standard to which conforms			
	4. Low Voltage protection provided			
	b. Overload Protection			
	1. Type			
	2. Manufacturer			
	3. Range of Settings			
	c. Emergency Push Button			

	1. Manufacturer			
	2. Location			
47	Illumination			
	a. Illumination in cabin			
	1. Manufacturer			
	2. Number and type of Fixtures			
	3. Voltage			
	b. Illumination at Bridge			
	1. Manufacturer			
	2. Number and type of Fixtures			
	3. Voltage			
	c. Portable hand lamp with wiring furnished	Yes/ No		
	d. Supply transformer and all other accessories required included.	Yes/ No		
48	Wiring			
	a. Type and size of cables used for power wiring			
	b. Type and size of cables used for control and aux. circuit wiring.			
	c. Method of wiring			
49	Particular of safety devices			
50	Standards adopted for			
	a. Structural			
	1. Structural Steel			
	2. Steel Plate			
	3. Cold finished steel			
	4. Cast Steel			
	5. Forged Steel			
	6. Bronze			
	7. Brass			
	8. Bolts, nuts and stud			
	9. Other miscellaneous items.			
	b. Equipment			
	1. Rope Drum			
	2. Sheaves			
	3. Hooks			
	4. Bearings			

	5. Couplings			
	6. Gears			
	7. Shaft			
	8. Wheels			
	9. Wire ropes			
	10. Keys and keyways			
	11. Motors			
	12. Resistors			
	13. Brakes			
	14. Switch gear			
51	Minimum factor of safety for each major component.			
52	Tools and accessories supplied (Provide separate list)			
53.	List of bought out items & components with makes/ name of suppliers.			
54	List of castings & Forgings and other important materials of construction of various components mentioning the standards numbers.			

ANNEXURE-III
LIST OF MANDATORY SPARES

NOTE:

1. Following mandatory spares shall be supplied as per clause.
2. Set means one no. quantity of each spare item of each type in one assembly.
3. The details of complete set shall be furnished with price offer.
4. All bearings offered must be of SKF/ FAG make only acceptable.

S.No	Item Description	Unit	Quantity	Unit Price	Total Price
01	Bearing for bridge travel wheels	No	4		
02	Bearing for trolley wheels	No	2		
03	Bearing for LT motor	Set	2		
04	Bearing for CT motor	Set	2		
05	Bearing for MH motor	Set	2		
06	Bearing for AH motor	Set	2		
07	Timers	No	3		
08	Bearing for rope drums	Set	1		
09	Bearing for pulleys for MH	Set	1		
10	Bearing for pulleys AH	Set	1		
11	Brake coil for EM brakes for LT motion	Set	2		
12	Brake coil for EM brakes for CT motion	Set	2		
13	Brake coil for EM brakes for MH	Set	2		
14	Brake coil for EM brakes for AH	Set	2		
15	Brake shoe with lining for EM brakes for LT motion	Set	2		
16	Brake shoe with lining for EM brakes for CT motion	Set	2		
17	Brake shoe with lining for EM brakes for MH	Set	2		
18	Brake shoe with lining for EM brakes for AH	Set	2		
19	Brake spring for each EM brake for LT motion	Set	1		
20	Brake spring for each EM brake for CT motion	Set	1		
21	Brake spring for each EM brake for MH	Set	1		

22	Brake spring for each EM brake for AH	Set	1		
23	Brake Shoe with lining for thrusters operated brakes for MH	Set	2		
24	Brake Shoe with lining for thrusters operated brakes for AH	Set	2		
25	Brake Shoe with lining for foot operated hydraulic brake for LT Motion	Set	2		
26	Brushes for LT motor	Set	2		
27	Brushes for CT motor	Set	2		
28	Brushes for MH motor	Set	2		
29	Brushes for AH motor	Set	2		
30	Brush holder assembly complete with brushes and springs for CT motor	Set	1		
31	Brush holder assembly complete with brushes and springs for LT motor	Set	1		
32	Brush holder assembly complete with brushes and springs for MH motor	Set	1		
33	Brush holder assembly complete with brushes and springs for AH motor	Set	1		
34	3-Phase overload relay (one for each motor)	Set	1		
35	Coils for Contactor for LT	Set	2		
36	Coils for Contactor for CT	Set	2		
37	Coils for Contactor for MH	Set	2		
38	Coils for Contactor for AH	Set	2		
39	Current Collectors for DS leads	No	6		
40	Insulators for conductors supports assembly	No	12		
41	Limit Switches (one for each type)	Set	1		
42	Resistors element of each size and type	Set	1		
43	All type of fuses	Set	1		
44	All type of indicating lamp	Set	1		
45	Printed circuit of each type and size	Set	1		
46	Pair of Oil seals for each gearbox used	Set	1		
47	Contactor of each type used	Set	1		
48	Fixed & moving contacts of each type of contactors used	Set	1		

ANNEXURE – IV

TO BE FURNISHED WITH THE TENDER

A. Mechanical Items

S.No	Item Description	Make
1	Steel	
2	Steel Castings	
3	Steel Forgings	
4	Hooks	
5	Gear Couplings	
6	Wire Rope	
7	Bearings	SKF/ FAG
8	Gear Boxes	
9	Wheels	
10	Rope Drums	
11	Snatch Blocks	
12	Equalizer Beam bearing	
13		
14		
15		
16		

B. Electrical Items

S.No	Item Description	Make
1	Motors	
2	Contactors	
3	Over load relay	
4	HRC Fuse	
5	Timers	
6	Isolators	
7	EHT Brakes	
8	Transformers	
9	Cables	
10	Push Buttons	
11	Limit Switches	
12	Thyristor Control	
13	Magnetic Clutches	
14	Master Controller	
15	Resistors	
16		

ANNEXURE –V

LIST OF TOOLS AND TACKLES

NOTE:

Following tools are to be supplied with EOT Crane. The below mentioned tools from one complete set of Tools.

SNo	Item Description	Unit	Quantity	Unit Price	Total Price
01	Box Spanners	Set	02		
02	Open Spanners	Set	02		
03	Screw Driver Large 12" Long	No.	02		
04	Screw Driver Large 6" Long	No.	02		
05	Line Tester	No.	02		
06	Two Lbs Hammer	No.	02		
07	Chisel 4" Long	No.	02		
08	Hydraulic Jack (12-15T)	No.	02		
09	Oil Can	No.	02		
10	Grease Gun (Hand Lever Type)	No.	02		
11	Insulated Plier 8"	No.	02		
12	Nose Plier	No.	02		
13	Allen Keys	Set	02		
14	Pipe Wrench	No.	02		
15	Torque Wrench 550kN/ 1100kN	No.	02		
16	Steel Tool Box with hinged cover, lock and key	Set	02		
17	Towing equipment for EOT cranes (Common)	Set	02		

ANNEXURE -VI

SCHEDULE OF DEVIATIONS

SNo.	Specification No./ Page No./ Clause No.	Details as per Tender Document	Reason for Deviation

(Signature)
(Tenderer/ Supplier)

FORMAT-I

PAST PERFORMANCE DETIALS.

NAME OF MANUFACTURER :
OFFER NO. :
TENDER ENQUIRY NO. :

o.	Customer Name	Name of contact person/ phone no./ mobile no./ fax no./ email address	Purchase order no. & date	Capacity of Crane	Span	Class of Crane	Dead Wt. of Crane	Year of Commissioning (In ascending order)
01								
02								

Sign and stamp of Vendor