

TECHNICAL SPECIFICATIONS FOR 30T/5T -20m SPAN GANTRY CRANE WITH DOUBLE GIRDER

SR. NO.	PARTICULARS	SPECIFICATIONS	Specifications to be confirmed by the vendor and deviation if any, to be marked
1.0	APPLICATION	a) The subject crane is meant for handling radioactive packages & casks. b) The crane will be put to use for continuous duty with CT, LT and Hoist movements, which may occur simultaneously. c) The environment will be open out door, coastal area having salty atmosphere and ambient temperature going up to 50°C.	
2.0	SCOPE OF SUPPLY	a) Detailed design, submission of design calculations, drawings & manufacture of 01 No. of 30Tonne/5Tonne of 20 Meter span, Gantry Crane with double girder confirming to IS code - 807/ 2006 & IS-3177/ 1999 and as per tender Specification b) Complete assembly and testing before dispatch. c) Supply in modules/ sub-assemblies, unloading of all crane parts & materials at the erection site i.e., at NRB, BARC Tarapur, Palghar (Dist.), Maharashtra. d) Cable drag chain system for CT travel with accessories. e) Erection /installation, wiring /cabling for the crane at site, Commissioning, Performance Prove-Out and load testing. f) Submission of three copies of all relevant documents including operating & service manual. g) Performance Guarantee for 12 months, from the date of commissioning. Note:- Supply/erection of crane LT runway (including LT rail), DSL and support structure for DSL is not in the scope of supplier.	
2.1	SPARES TO BE SUPPLIED ALONG-WITH THE CRANE	Supply of following spares for the crane is also included in supplier's scope:-	

S.No.	Description	Quantity	
1.	LT wheel Bearing	1 set	
2.	LT couplings (DSL End)	1 set	
3.	LT couplings (Operator's cabin End)	1 set	
4.	CT couplings	1 set	
5.	MH gear box input shaft	1 No.	
6.	AH gear box input shaft	1 No.	
7.	CT gear box input shaft	1 No.	
8.	LT gear box input shaft	1 No.	
9.	Bearing for MH gear box	1 set	
10.	Bearing for AH gear box	1 set	
11.	Bearing for CT gear box	1 set	
12.	Bearing for LT gear box	1 set	
13.	Oil seal for MH	1 set	
14.	Oil seal for AH	1 set	
15.	Oil seal for CT	1 set	
16.	Oil seal for LT	1 set	
17.	MH couplings	1 set	
18.	AH couplings	1 set	

		19.	CT rail clamps	10 sets	
		20.	Wire ropes with end clamps for MH and AH		
		21	DC EM Brake assembly for AH	1Nos.	
		22	Electro hydraulic Thruster brake assembly for AH	1Nos.	
		23	DC EM Brake assembly for MH	1Nos.	
		24	Electro hydraulic Thruster brake assembly for MH	1Nos.	
		25	Electro hydraulic Thruster brake assembly for LT	2Nos.	
		26	Electro hydraulic Thruster brake assembly for CT	1Nos.	
		27	Full wave bridge rectifier unit for DC EM brake	1Nos.	
		28	Brake shoe for LT	1 set	
		29	Brake shoe for CT	1 set	
		30	Brake shoe for Hoist	1 set	
		31	Rotary geared limit switches for MH	1 set	
		32	Rotary geared limit switches for AH	1 set	

		33	Gravity limit switches for MH	1 set	
		34	Gravity limit switches for AH	1 set	
		35	Limit switches for LT	1 set	
		36	Limit switches for CT	1 set	
		37	Push button with element	1 set	
		38	Fuses	1 set	
		39	VVFD for MH	1 set	
		40	VVFD for AH	1 set	
		41	VVFD for LT	1 set	
		42	VVFD for CT	1 set	
		43	Semiconductor Fuse for MH VVFD	10 Nos.	
		44	Semiconductor Fuse for AH VVFD	10 Nos.	
		45	Semiconductor Fuse for LT VVFD	10 Nos.	
		46	Semiconductor Fuse for CT VVFD	10 Nos.	
		47	CT gear box	01 no.	
		48	LT gear box	01 no.	
		49	CT drive motor	01 no.	
		50	LT drive motor	01 no.	
2.2	ITEMS NOT COVERED IN THE SCOPE OF SUPPLIER	The crane is to be installed on a runway girder which is already in use for another gantry crane and therefore following items are not covered in the scope of supplier:-			

		<p>a) Construction of concrete foundations for runway girder (LT girder) and DSL supports.</p> <p>b) Supply/erection of runway girder (LT girder) and LT rails.</p> <p>c) Supply/erection of DSL for LT motion and its support structure.</p> <p>Details of above items is indicated in enclosed sketch no. TWMP/2018/GC/01. However, supplier will have to take measurements of above items at purchaser's site prior to finalizing the crane's design.</p>	
3.0	DESIGN REQUIREMENTS	<p>Design Load: Design load will include Dead Load, Imposed Load (Live Loads), Wind loads & Earthquake Load. The design life span of all structures shall be taken as 25 years.</p> <p>Seismic data: Structure to be designed for site specific response spectra of Tarapur, corresponding to OBE level of earthquake, i.e., 0.1g ground motion.</p> <p>Wind load:- The crane is meant for installation in open yard where high wind velocity up to 160 km/hr is expected and the atmosphere is corrosive. However if the recommended value as per code specified at 3.8 of this specification for this region is higher the same should be followed for design purpose.</p>	
3.1	SAFE WORKING LOAD		
3.1.1	Main Hoist Safe Working Load	30 Metric Ton	
3.1.2	Auxiliary Hoist Safe Working Load	5 Metric Ton	
3.2	SPAN	Wheel center to wheel center dimension :- 20000 mm	
3.3	MECHANISM CLASS	M5 as per IS-13834 (Part-1)	
3.4	LIFT AND TRANSVERSE REACH OF HOIST	Refer sketch no. TWMP/2018/GC/01	
3.4.1	LIFT OF HOIST	Lifts for both main and auxiliary hoist will be as mentioned below:-	
3.4.1.1	Lift above LT rail (MH1 & AH1)	6 m	
3.4.1.2	Lift below LT rail (MH2 & AH2)	5 m	

		Note:- Lifts specified above are as required during operation; while finalizing total lift sufficient margin is to be added for providing limit switches for over hoisting as specified at 3.6.20 of this specification	
3.4.2	TRANSVERSE DISTANCE BETWEEN MAIN AND AUXILIARY HOIST (C)	800 to 1000 mm	
3.4.3	DISTANCE OF TRANSVERSE (CT) REACH OF HOIST FROM LT RAIL AT EAST END (Operator's cabin end)		
3.4.3.1	Main Hoist (C1)	1400 mm or less	
3.4.3.2	Auxiliary Hoist (C2)	=C1+C	
3.4.4	DISTANCE OF TRANSVERSE (CT) REACH OF HOIST FROM LT RAIL AT WEST END (DSL end)		
3.4.4.1	Main Hoist (C3)	=C4+C	
3.4.4.2	Auxiliary Hoist (C4)	1400 mm or less	
3.4.5	DISTANCE OF LT REACH OF HOIST AT NORTH AND SOUTH ENDS (L1 & L2)	4000 mm or less	
3.5	SPEED	The operational speed in fast motion should be as follows:- (Variation from specified speeds should be within ±10%)	
3.5.1	Main Hoist	5 m/min	
3.5.2	Auxiliary hoist	5 m/min	
3.5.3	Long Travel	20 m/min	
3.5.4	Cross travel	10 m/min	
3.5.5	Micro Motion	Speed in micro motion for all the above travels will be through VFD and will be set at 10% of the corresponding speed in fast motion. For Long Travel 3 speed setting should be there @ 10%, 50% and 100% of the Full speed.	

3.6	Design Requirements for Components		
3.6.1	Hook	<p>The hook block shall be designed to lift without twisting. The hook shall be capable of swiveling and designed to turn easily on roller thrust bearings. The hook shall be capable of being readily removed and replaced and fixed rigidly.</p> <p>The main hook of the crane shall be of 30 Ton S.W.L long shank Trapezoidal 'C' shank hook.</p> <p>The auxiliary hook of the crane shall be of 5 Ton S.W.L long shank Trapezoidal 'C' shank hook.</p> <p>Hook geometry shall comply with the requirements of IS-15560 or IPSS.</p> <p>Length of hook shank and other dimensions of the hook to be suitable as per purchaser's site requirement.</p> <p>The hook shall be of proof load tested marked and duly certified by competent authority. The material of construction of hook shall conform to IS-1875 Class 3A (high tensile forged steel) or 20Mn2 for IPSS.</p> <p>Hook material shall be tested for chemical and mechanical properties and test certificate shall be submitted. NDTs like MPT and UT in addition to dimensional checks and visual examinations to be performed on hook after machining of the shank.</p>	
3.6.2	Sheave	<p>a)Material: The sheaves shall be of carbon steel casting/ forged steel having chemical and mechanical properties as per grade I of IS: 2707-1996.</p> <p>b)Grooves: Sheaves shall be machine grooved to a depth not less than 1.5 times the diameter of rope. The grooves shall be finished smoothly and free from surface defects liable to injure the rope. The contour at bottom of the groove shall be circular over an angle of approximately 130° ±5°. The radius of this part of grooves shall be larger than the radius of rope by an appropriate amount as per table 2 of IS: 3177.</p> <p>c) Diameter of Sheaves: The diameter of the sheaves at the bottom of the groove shall not be less than that of the drums as specified in clause 5.4 of IS: 3177.</p>	

		<p>d) Sheave Guards: Sheaves shall be provided with guards to retain the rope in the grooves if necessary.</p>	
3.6.3	Wire Rope	<p>The wire ropes shall be of suitable diameter as per supplier's design of crane. The rope shall conform to IS: 2266. The factor of safety based on nominal breaking strength and safe working load of rope shall not be less than 6. The rope must be of Construction 6X36 or 6x37, IWRC, RHO, 1770 N/mm² UTS (min.) galvanized. No. of falls should be 4 for both main and auxiliary hoists.</p>	
3.6.4	Rope Drum	<p>The drum shall be preferably machined from seamless pipe (ASTM A 106 Gr A or Gr B) without any pipe to pipe joint otherwise the drum shall be fabricated from structural steel plate to IS:2062 Gr B with butt joint along longitude without any circumferential joint . Butt welds shall be subjected to 100% radiography. Drum with welded construction should be suitably stress relieved. The pipe/plate shall be tested for physical and chemical properties by NABL accredited laboratory and test certificates shall be submitted. Pipe/plate for rope drum will also be examined by ultrasonic test.</p> <p>a) The rope drum should be sufficiently wide to accommodate in one layer, the entire length of rope required for the specified lift and in addition not fewer than two dead turns at each anchored end and one spare grove at opposite end.</p> <p>b) The drum shall be flanged at both ends and flanges shall project to a distance not less than two rope diameters above rope. A spur or other wheel secured to the drum may be regarded as forming one of the flanges.</p> <p>c) Rope anchorage shall be readily accessible.</p> <p>d) Strength of the drum: Drums shall be designed to withstand the compressive stress caused by wound on rope and the local bending stress caused in the drum at the groove when rope is wound on. The bending stress due to the beam action of the drum shall also be taken into consideration.</p> <p>e) Diameter: The drum diameter measured at the bottom of the groove shall not be less than the appropriate value specified the IS: 3177</p>	

		<p>f) Drum grooves: The lead angle of rope shall not exceed 5° (1 in 12) on either side of the helix angle of groove in the drum. Rope drums shall be machine grooved and the contour at the bottom of groove shall be circular over an angle of 120°. The radius of the groove shall be larger than the radius of rope as per IS:3177. The depth of groove shall not be less than 0.35 times diameter of rope. The clearance between the adjacent turns of ropes shall be as per IS:3177.</p>	
3.6.5	Bearings	<p>The type of bearings for various parts shall be as per IS : 3177. Provision shall be made for service lubrication of all bearings. Bearing enclosures shall be designed as far as practicable to exclude dirt and prevent leakage of oil or grease. Suitable drip pans shall be provided as required to collect oil and grease, which may drop, from operating parts. All drip pans shall be accessible for draining and cleaning. All bearings of gearing shall be antifriction type. Angular contact ball or taper & roller bearings shall be used wherever necessary. The bearings shall correctly locate the shafts while allowing for internal expansion of the shafts. Bearings shall be enclosed in suitable housing with proper plugs to provide grease and holes to permit easy lubrication.</p>	
3.6.6	Coupling	<p>All couplings shall be of cast, wrought or from forged steel tooth portion to be heat treated to hardness HB 241-280 and also shall be and designed to suit the maximum torque that may be developed. Alignment of all solid couplings be made accurately. Flexible coupling shall be initially aligned with the same accuracy as solid couplings. Hoist drums shall be connected to gear box output shaft by means-of flexible drum couplings or barrel couplings to cater for misalignment, frame distortions, etc. and also to facilitate removal of hoist drum. Shaft couplings shall be as near as practicable to the bearings.</p>	
3.6.7	Shafts & Axles	<p>Shafts shall be made from solid rolled or forged steel bars as per relevant IS standards. Shafts & axles shall be of EN8 and EN9 respectively. Shafts and axles shall have ample strength and rigidity, adequate bearing surface for their purposes. Suitable heat treatment should be provided to shafts to ensure desired mechanical properties. They shall wherever necessary, be finished smoothly and if shouldered, shall be provided with fillets of as large</p>	

		<p>a radius as possible and/ or tapered to suit. Keys, keyways, splines and serrations shall conform to relevant Indian standards. Shafts are required to be tested chemically and mechanically and test certificate from NABL accredited laboratory shall be submitted. Shafts should also be tested by Ultrasonic test.</p>	
<p>3.6.8</p>	<p>Gear Boxes</p>	<p>All Gear boxes shall be of totally enclosed, oil splash lubricated dust proof construction. The gears shall be readily removable and boxes shall be oil tight. They should be of rigid construction and fitted with inspection covers and lifting lugs wherever necessary.</p> <p>The HP rating of gearbox for individual motion shall be greater than mechanical HP rating of the motor selected for that motion. The design calculation for HP rating of gearbox shall be provided as per IS 4460. It is also desired that the design calculation of gearbox shall consist of selection of gears, shafts and bearings.</p> <p>Facilities for oil filling, adequate breathing, drainage and means of indicating clearly the correct oil levels shall be provided.</p> <p>Gear box feet shall be machined and shall be seated and positively located on appropriate level surface preferably machined except where integral or shaft mounted. All the gearboxes must be stress relieved to remove any residual stresses induced during fabrication.</p> <p>The housing shall be of sufficient design not to permit a temperature in excess of 90° of the oil bath and shall be adequately supported and readily removable without disturbing the gear assembly.</p> <p>Internal of gearbox shall be sand blasted and painted with 2 coats of oil resisting enamel paint.</p> <p>Noise level of gearbox shall be within 80 db at 1 meter distance from gearbox.</p> <p>Quality Assurance: Plates must be tested for chemical, mechanical properties and shall meet that required grade and valid test certificate from approved laboratory shall be submitted.</p> <p>Make of the gear box shall be subject to approval by purchaser. Shafting shall be turned from solid rolled or forged steel bar. Gear boxes for all motions</p>	

		<p>will be connected to their loads through flexible geared couplings, on floating shafts principle, and to their drivers through flexible coupling.</p> <p>Gears:- Gears shall comply with relevant Indian standard and shall be machine cut. The gears shall be of forged steel with teeth cut from the solid blanks, Pinions shall be of Steel forging. All shafts and axles shall be turned from forged steel bars. Material of construction of gears and pinions shall be EN 19 and EN 24 respectively or better. Shaft and axles shall be of EN 8 and EN 9 respectively or better. The rating of gears shall be established as per IS: 4460. Gears and pinions teeth including shafts and axles shall be treated for resistance to wear and improving strength. Gears shall have tooth form and modules as recommended in IS 3681 and they shall be adequately designed to stand shock load and vibration. They shall not be excessively noisy in operation. Gear blanks are to be tested chemically and mechanically and test certificate from approved laboratory shall be submitted. Ultrasonic Testing has to be in proof machined condition.</p>	
3.6.9	Crane wheels	<p>Wheels for bridge and trolley shall be of double flange type. Wheels shall be mounted on axles rotating in L type bearing housing. Spherical roller bearing shall be provided for wheel and rope drum pedestal. 8 Nos. of wheels are recommended for the LT motion. The wheels shall be mounted in such a manner as to facilitate removal and replacement easily. Jacking pad shall be provided on web plates of bogie on both sides directly below the pin center for removal of LT & CT wheel.</p> <p>Materials for wheels shall be forged EN9 steel with a hardness of minimum 300 BHN. The dimension of flanges of track wheels shall be as per IS: 3177-1999. Wheel material shall be tested chemically, mechanically. Wheels shall be tested ultrasonically and test certificates shall be submitted.</p>	
3.6.10	Storm anchor/ Parking lock	<p>Mechanical Swing lock and screw arrangement for locking with rail for LT motion at any location of LT runway.</p>	
3.6.11	Seismic arrestor	<p>Seismic arresters to be fixed for complete crane as well as for the crab.</p>	
3.6.12	Mechanical Stopper and Hydraulic Buffer	<p>Mechanical stopper and Hydraulic buffer shall be provided for each end of crab and LT carriage. Stoppers should be designed for Kinetic Energy generated for the maximum speeds of Crane.</p>	

		<p>Mechanical buffer for LT should be aligned with end stoppers of the existing crane at purchaser's site.</p>	
<p>3.6.13</p>	<p>Control Panel at operator's cabin</p>	<p>Electric power supply 415V, 3ϕ connection will be provided by the department up to and including LT DSL. Beyond this point, supply and installation of all the electrical items shall be in the scope of supplier.</p> <p>The following minimum equipment shall be provided in control panel:</p> <ol style="list-style-type: none"> 1. Main line connecting/disconnecting switch, TPN, SFU, rated operational current, minimum 250A current rating, AC-23A utilization category A, Conformance to IS 13947 (Part 3) and IEC: 60947. 2. One triple pole air break type main contactor with thermal overload relay. Hoisting duty Power Contactors minimum 200A current rating, coil voltage 48V AC, 2NO + 2NC Built in auxiliary contacts, Utilization category 3ph, 415V, 50Hz AC4, Conformance to IS 13947 (Part 4/Sec.1) and IEC: 60947-4-1. 3. Emergency push button at convenient height for the operation for interruption of the entire power. 4. Portable lighting transformer 1ϕ,415/240V, 1.0 KVA, fitted with MCB, DP, Curve –D, Breaking Capacity - 10 kA, Current rating-10A, in the incoming and outgoing circuit of transformer. 5. Control transformer 1ϕ, 2.0KVA, 380-400-415/42-48-52V, fitted with MCB, DP, Curve –D, Breaking Capacity - 10 kA, Current rating-10A, in the incoming and outgoing circuit of transformer. 6. Current transformers wound coil type, 200/5A, class of accuracy - 0.5, Rated Burden- 15VA. 7. Ammeter analog type cut out 92 x 92 mm, 270$^{\circ}$ Span, range: 0-200A, fitted with, Isolating CT secondary terminals, selector switch 5A, 4 position, 360$^{\circ}$ angle of rotation. 8. Main supply on/off lamps on the door of the protective panel. 9. Electrical interlock shall be provided to prevent the main contactor being closed unless all controllers are in OFF position. 	

		<ol style="list-style-type: none"> 10. All internal wiring shall be identified with numbering rules at both ends. 11. Panel shall have internal illumination with LED lamp. 12. Power for lighting circuit shall be tapped from the incoming side of isolators. 13. A socket 2 pin + earth, 230V, 10A with a switch and MCB protection shall be provided. 14. Cabin lamp bulk head fitting 12W LED, 230V AC fitted with wire guard. 15. Foot switch for bell 10A, 230V, SP. 16. Bell 6" 60W, 230V AC. 17. Fan 12" sweep, 60W, 230V AC 18. Individual MCB protection of suitable rating shall be provided for control circuit supply, fan supply and lighting supply. 19. The crane shall be operated from either the master controller or radio remote control unit. 20. Selection between the master controller and the RRC unit shall be by means of rotary selector switch placed in the cabin. 	
<p>3.6.14</p>	<p>Enclosure and general specification of VVFD panel</p>	<ol style="list-style-type: none"> 1. A separate panel shall be provided for Crane protective panel -1No. Main hoist panel -1No. Auxiliary Hoist panel -1No. CT Panel -1No. LT Panel -1No. 2. Each panel enclosure shall be suitable for outdoor installation, weatherproof, rainproof (using single walled double door enclosure and rain canopy all around roof), vermin proof, fixed type self-supporting, floor/trench mounting, double door type fitted with internal lock. 3. Body and Doors of the panel shall be fabricated with 2mm thick CRCA sheet steel. 4. Partitions of the panel shall be fabricated with 1.6mm thick CRCA sheet steel. 	

		<ol style="list-style-type: none"> 5. The panel shall be painted with a minimum of two coats of powder coating of 631 light grey Shade after 7 Tanks Hot Pretreatment Process. 6. Each panel shall have a separate incomer MCCB. 7. Neoprene Gaskets with minimum 6mm thickness shall be provided on the inside of each door. 8. Control supply shall be of 48V AC tapped from Power bus through auxiliary/control transformer. 9. Incomer feeders shall consists of R, Y, B indication lamps (LED type), Voltmeters (analog type) to measure phase & line voltage, Ammeters (analog type). 10. All the VVVF Drive feeders shall consist of 6inch cooling fan with filter unit for cooling purpose. 11. Design Ambient Temperature: 40°C for the MCC panel. The temperature in VVVF DRIVE compartment shall not be more than 45°C or the maximum limit that the drive can withstand. 12. Each compartment shall be provided with a LED and door limit switches. Suitable power points shall be provided inside the panel for maintenance. 13. All the switchgears shall be mounted in the mounting plate. 14. All Panels shall be designed for cable entry from the bottom of panel. Sufficient space shall be provided for easy of termination and connection. Necessary removable type Gland plates shall be provided on the bottom of the panel. 15. A tinned copper ground bus bar of 25mm x 3mm size shall be extended full length of the each panel. The ground bus shall be provided with two-bolt drilling with G.I. bolts and nuts at each end to receive 50 x 6 mm G.I. flat. 16. Minimum breaking capacity of switchgear used in the panel shall be of 50kA. 17. The ratings of all powers cables, SFUs, MCCBs, and Contactors shall be one size higher than the rating/ size suggested in respective IS codes. And Fuses rating shall be of same as suggested in IS code. 	
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		<ol style="list-style-type: none"> 18. VFD Ready, Run, Forward, Reverse and TRIP indications shall be provided on the panel. 19. Intelligent operating panel of each VFD shall be installed on inner front door of panel. 20. All Switchgear in the panel shall be easily accessible for easy maintenance and replacement of components. 	
<p>3.6.15</p>	<p>General specifications for VVVF drives</p>	<ol style="list-style-type: none"> 1. A Separate VFD shall be provided for AH, MH, CT and LT motions. MH and AH control is through feedback encoder for closed loop control. 2. The Variable Frequency Drives shall be suitable for continuous operation for ambient temperature 50°C and of crane duty. 3. All Drives shall achieve the maximum speed of respective motion at 50Hz frequency. 4. The Variable Frequency Drives (VVVF DRIVE) proposed to be used shall be microprocessor controlled Digital AC Drive. 5. Transient over torque shall be 220% of nominal motor torque for 2 seconds and 170% for 60 Seconds for every 10 min. 6. The Drives shall be suitable to vary the motor speed from zero to rated RPM. The model shall be selected to suit the application and heavy duty rating and shall conforms to the latest edition of IEC / IS and also meet the requirements of IEEE. 7. The Drives shall have minimum IP-21 degree of protection. 8. The AC drive shall display at least FIVE running parameters in plain text and all faults in plain text and help screens shall be available to guide the user in the troubleshooting. The AC drive shall have a detachable keypad with a back lit 8-line, with a minimum of 23-character alphanumeric operating display for programming and controlling purposes. Remote mounting shall be possible at a distance of 10m. The programming shall be able to operate in a multi-point connection. The displayed messages shall be in user friendly, descriptive text in English. Coded messages are not acceptable. 	

		<ol style="list-style-type: none"> 9. Dynamic breaking resistor of suitable rating shall be installed for each VFD. 10. An input choke shall be provided for each VFD. 11. The VFD Shall consists of minimum protections of Over current, short circuit between phase, short circuit between phase and ground, motor stalled, high DC bus Voltage, impendent short circuit, input phase loss, output phase loss, motor over load, over voltage, under voltage, over speed, IGBT, over temperature, heat sink over temperature, other internal faults. 12. Max Harmonic Distortion shall comply with IEC 61800-3-12. 13. Routine test certificates shall be provided for each VFD. 14. All VVFD drives shall be protected by semiconductor fuses. 	
3.6.16	Contactors	<ol style="list-style-type: none"> 1. Contactors shall be of crane duty and suitable for frequent operation. The contactors shall be silver-plated. The contactors shall be capable of making and breaking duty (AC-4). 2. Contactor coil shall be of impregnated type and temperature rise of coil for repeated operation should not exceed the permissible limit of class insulation. 3. Contactor's current rating shall be at least 25% higher than the maximum current rating of motors being controlled. 4. Separate microprocessor based over load relay shall be provided for each motor of long travel and cross travel. 	
3.6.17	Drive unit	<p>Equal driving efforts shall be applied at each drive wheel of the bridge and crab to prevent one end traveling faster than the other. All machineries for the drive unit shall be properly aligned. Self-aligning type gear couplings shall be used between connecting shafts to take care of transverse as well as axial movement wherever necessary. Wherever components of considerable amount of inertia are directly mounted on the high-speed shaft they shall be balanced statically as well as dynamically to minimize vibration.</p>	
3.6.18	Drive motors	<ol style="list-style-type: none"> 1. All motors shall be squirrel cage totally enclosed. 2. 3 Phase, 415V \pm 10% 3. 50Hz \pm 3% fan cooled (IP55) 4. S4 duty with 40% CDF 150 nos. of starts per hour. 	

		<ol style="list-style-type: none"> 5. Ambient Temperature: 50°C. 6. Class F insulation with maximum permissible temperature rise limited to class B. 7. Suitable for VFD operation and of inverter duty(Vacuum Pressure Impregnation type insulation) 8. The motors shall be suitable for reversing, and frequent acceleration and mechanical brake. 9. The starting and pull out torque shall be above 250% of rated torque for hoisting application. 10. All motors shall conform to latest IS 325 & IS 12615. 11. The main hoist motor shall be offered for routine and type tests at manufacturer's works. 12. Routine and Type test certificates shall be provided for all remaining motors. 	
<p>3.6.19</p>	<p>Brakes and rectifiers</p>	<ol style="list-style-type: none"> 1. The brakes shall be capable of performing satisfactorily under all design and test load conditions. 2. The main and auxiliary hoist shall be provided with two brakes (one is hydraulic thruster operated and other is DCEM) 3. CT and LT motions shall be provided with hydraulic thruster operated brakes. 4. All brakes shall be rated for half an hour continuous rating and for 150% load capacities. 5. All brakes shall be fail safe type. 6. All brakes shall be rated to hold load in off position for infinite time without slippage. 7. Each brake shall carry a suitable and permanently marked plate which shall describe the adjustments to be made to obtain the correct brake setting. 8. Rectifier unit (DC Supply) shall be of full wave with silicon rectifiers with 415, 50Hz as incoming supply. 9. These units shall be of 30 min rating and shall be provided with class F insulation. 	

<p>3.6.20</p>	<p>Limit Switches</p>	<ol style="list-style-type: none"> 1. Each of main and auxiliary hoist shall be provided with two limit switches for over hoisting and these shall be of following type 2. The first limit switch to act in case of over hoisting shall be rotary type with self-resetting feature and included in the respective motor control circuit. 3. The second limit switch shall be gravity operated hand reset type connected in the main contactor control. 4. The rotary type limit switch should also act in case of over lowering. 5. Long travel and Cross travel shall be provided with cross bar type limit switches to prevent OVER TRAVELLING and OVER-TRAVERSING respectively. The limit switches shall operate the respective motor control circuits. 6. The heavy-duty limit switches with IP-55 enclosure with properly designed actuators (metallic) shall be provided and shall be readily accessible for adjustment and repair. 	
<p>3.6.21</p>	<p>Cables</p>	<ol style="list-style-type: none"> 1. Power and control cables shall be segregated. 2. Power terminal blocks shall be separated from each other by means of insulated terminal spacers. 3. All power cables shall be selected as of a minimum size of 6 Sq.mm or one size higher than as per IS 4. All control cables of a minimum size of 2.5 Sq.mm. 5. Both power and control cables shall be of copper conductors and multi stranded. 6. Cable drag chain system shall be provided for Crab including mounting brackets, vertical separators, support plates, installation kit, extra glide nut and bolts, base channels, tie wrap plates, holding trays, chain flex, etc. to accommodate all cables. Power supply for Crab shall be given through flexible trailing cable systems mounted on retracting support system shall be used. The system shall consist of insulated multi-conductor or several single conductor cable with permanent termination on the bridge and on the trolley. The flexible trailing cables shall have ample length and shall be supported by 	

		<p>means of properly designed movable clamps. These clamps shall be fitted with rollers and shall run freely on a guide rail allowing relative movement of bridge and trolley without undue stress or wear on the suspended cable. The flexible trailing cable shall be of class 6 as per IS: 8130-1984, silicon rubber insulated (IE5) and silicon rubber sheathed conforming to IS: 9968 (Part-I) – 1988.</p>	
3.6.22	Grounding	<ol style="list-style-type: none"> 1. The crane structure motor frame and metal cases of all electrical equipment including metal conduits or cable guards shall be effectively connected to earth complying with Indian Electricity Rules. 2. Each motor shall be grounded at two points with bare copper conductor wire of size not less than 14 SWG. 3. All other non- current carrying metal surfaces shall be earthed with one no. of 14 SWG bare copper conductor wire. 4. When any equipment will be connected to the supply by flexible cables, the particular equipment shall be connected to earth by means of an earthing conductor enclosed with the current carrying conductors within the flexible cable. 5. The crane wheel, flexible conduits and other metal parts shall not be used for earthing purpose. 	
3.6.23	Illumination, Buzzer & load cell	<ol style="list-style-type: none"> 1. The lighting system shall be suitable for 240 volts±10% single phase, 50 Hz 2. Supply fed from the live side of the disconnect switch located in the protective panel. 3. The illumination system shall be controlled by separate isolating switches. 4. Lighting fixtures shall be suitable for outdoor applications. 5. Suitable No. of floodlights are to be fitted to the main bridge on both sides of the crane. 6. A suitable buzzer should be provided which should be clearly audible in the operational area of the crane which is located outdoor. 	

		<p>7. Load cells should be provided for each of the hoists with display visible from operating floor and there should be audio alarm for hoisting overload.</p>	
3.6.24	Wiring	<ol style="list-style-type: none"> 1. The supplier shall furnish and install all power, control and auxiliary circuit wiring of the equipment and panels located in the trolley, bridge. 2. The wiring shall be complete in all respects to ensure the proper functioning of the equipment. 3. All wiring to any motor shall be done with 1100 V grade FRLS PVC/XLPE insulated copper conductor cable for armored cables and HR FRLS PVC cables for unarmored cables of suitable sizes. 4. Minimum size of cable for power wiring shall not be less than 6 mm² sizes. 5. For selecting the rating of the cables for power wiring, consideration shall be given to the duty of the motor, ambient temperature, grouting of disposition cables, voltage drop etc. 6. All cables shall be adequately protected against mechanical damage, if unarmored cables are used, the same shall be mechanically protected by running through heavy duty electrical conduits. 7. However, no conduits are required for wiring in case armored cables are used. Each motor shall be wired up independently. 8. Power and control wiring shall be effectively separated. For control panel wiring, each wire shall be identified at both ends in accordance with supplier's wiring system diagram. 9. All wiring termination to the panel shall be made with clamp type connection block. Screw type terminals with screw directly impinging on conductor are not acceptable. 10. All electrical panels shall be chemically treated, thickness of component mounting plates shall be 3 mm. 11. All wiring shall be done with 1.5 / 2.5 sq.mm HFFR wires. 	
3.6.25	Radio-remote pendent and associated panel	<p>Radio remote pendent and associated panel: Radio Remote Control with min 12 nos. of Push Buttons conforming to IS: 3177 for 3 Motion EOT Crane along with the following features should be provided.</p>	

		<ol style="list-style-type: none"> 1. Main Power : Start/Stop 2. Main line contactor : ON 3. Main Hoist& Aux. Hoist : Up/down 4. Cross travel : Left/Right 5. Long Travel : Forward/Reverse 6. Alarm/Hooter : Required 7. Emergency stop : Required 8. Under bridge light : Required 9. Main/Micro speed selection : Required 10. Or increment/decrement in speed : Required 11. Lock/key for functioning of remote: Required 12. Operating range should be 100 meters approx. or more for Radio Remote. 13. Isolation transformer and surge suppressor for the receiver supply to be provided. 14. For Long-travel provision for 3 speed selection should be there 15. The wiring should be connected to terminals/ equipment with proper size copper cable, wire lugs. 16. Supplier must give circuit diagrams of the entire RRC. All panel wires, cables should be ferruled, numbered and the same should appear on electrical drawings. 17. Common push button for horn and start. 18. Emergency Mushroom type PB with lock and Key on top panel of RRC Transmitter, 4 line LCD display for battery status, RRC fault, RF field strength etc. 	
<p>3.6.26</p>	<p>STRUCTURAL Components</p>		
<p>3.6.26.1</p>	<p>Bridge Girder (Main Girder) and A-frame (vertical support structure)</p>	<p>Bridge girder shall be of standard manufacturing design i.e. welded plate, box type double girder construction with internal diaphragms and external web stiffeners. Members of A-frames shall also be welded plate, box type construction. The material of construction to be M.S plates conforming to IS: 2062 Grade B. The minimum thickness of load bearing plates shall not be less than 10 mm and that of non-load bearing plates not to be less than</p>	

		<p>6mm. The ratio of the length of girder to depth at any place shall not be greater than 18.</p> <p>The ratio of the effective length of the compression flange of the girder to the breadth of flange of the girder shall not exceed 60. The joints between individual members of A-frames and that between the A-frames and bridge girders shall be bolted with high tensile steel fasteners.</p> <p>Lifting points: To enable handling of crane girder without any damage during erection, due care should be given to provide handling points and mark the same clearly on girders.</p> <p>Cambers:- Girders shall be cambered to an amount approximately equal to the dead load deflection plus one-half the live load deflection.</p> <p>Limiting deflection:- The deflection of member or the structure as a whole (without taking into consideration impact factor) should not be such as would impair the strength or efficiency of structure or lead to damage to finishing. Girder shall be designed so that the vertical deflection caused by the 125 % of safe working load and the weight of crab in central position shall not exceed 1/900 of the span.</p> <p>Quality Assurance: Plates must be tested for chemical, mechanical properties and shall meet that required grade and valid test certificate from NABL accredited laboratories shall be submitted. Fabrication shall be done by qualified welder using qualified welding procedure. All the butt welds shall be 100% radiographed.</p>	
<p>3.6.26.2</p>	<p>End carriage and Crab structure</p>	<p>The design shall be such that the load from the crab is divided equally between supporting box girders. End carriage and crab frame shall be manufactured using rolled sections/plates and shall be all welded rigid construction. All quality control and finishing procedure adopted for main girder shall be applied to end carriage and crab frame also. Appropriately positioned jacking pads shall be provided for easy removal of individual wheels. End carriage and crab structures shall be provided with derailing</p>	

		<p>stiffeners at all four corners to prevent fall of structure by no more than 25 mm in the unlikely event of wheel axle failure.</p> <p>Monsoon protection cover:-</p> <p>End carriage (LT trollies) and Crab (CT trollies) should be of closed type providing suitable cover for protecting them from rain water however, it should be convenient for maintenance of components inside these covers. The cover should be made of 20 SWG or thicker aluminum sheet with supporting frame made of 32 NB or higher size heavy duty steel pipes or rolled steel sections with minimum thickness 5 mm or more. The cover for crab should be cabin type covering the crab from top as well as from all four sides, should have minimum height of 2500 mm, should be bolted with the crab frame and should have proper lifting hook for its easy removal using mobile crane. A hinged door (height 2000 mm & width 800 mm) with bolt with provision of locking should be provided to the crab cabin and it should have access ladder from main' bridge platform. This ladder should be movable with the crab and it should be provided with proper man guard. The crab cabin should have louvered/sliding windows at-least three side for proper ventilation during maintenance works inside the crab cabin. The crab cabin should be equipped with suitable support structures for installing chain-pulley blocks or other lifting tackles for handling & maintenance of gear boxes, drive motors etc. inside the crab.</p>	
<p>3.6.26.3</p>	<p>Platforms, ladders and railings</p>	<p>Safe means of access shall be provided to every place where any person engaged Examination or maintenance of the crane has to work. Adequate hand holds and footholds shall be provided wherever necessary. Platforms should be provided along both the main bridge girders, these bridge girder platforms should be interconnected with another platforms at both ends of the bridge girders.</p> <p>Every platform shall be securely fenced with double tired guard rail and toe guards, unless parts of the crane structure provide equal safety and platforms shall be of sufficient width to enable normal maintenance work to be undertaken safely. On bridge platforms, which shall not be less, than 800 mm, facing shall extend along the full length of the outer edge.</p>	

		<p>All the platforms should be connected to main girder by a bolted joint to enable easy transport of girders and platforms as separate parts. Platforms should be of chequered/non slip surface Aluminum plates of thickness 6 mm or more bolted to supports made of rolled MS sections. Side rails to ladder shall extend to a reasonable distance beyond platforms, or some other reliable handhold shall be provided. Ladders shall if possible slope forwards and shall be provided with proper man guards. Ladders should have clear width of 450 mm or more. Steps should be made of 25NB Heavy duty seamless/welded ground smooth steel pipes spaced 300 mm apart. Platform railings should be made of 25NB Heavy duty seamless/welded ground steel pipes placed in tiers 500 mm apart, top rail at 1000mm from platform/walkway level and vertical posts made of MS rolled section of thickness not less than 6 mm and spaced not more than 1.75 meters apart. Pipes used for making hand railings/ladders should be heavy duty carbon steel pipes of size 25NB or more. Support structures for these hand railings/ladders should be MS rolled section of thickness not less than 6 mm.</p>	
<p>3.6.26.4</p>	<p>Operator's cabin</p>	<p>The operator's cabin shall be of closed type giving proper visibility to the operational area of the crane (i.e. unrestricted aerial and floor view) and large enough (height 2000 mm or more) to provide ample space for mounting of all control panels/equipment except the main control panels and associated resistors which may be located outside the cabin. Platforms should be of chequered/ non slip surface Aluminum plates of thickness 6 mm or more bolted to supports made of rolled MS sections. Cabin shall be made of 20 SWG or thicker aluminum sheet with supporting frame made of 32 NB or higher size heavy duty steel pipes or rolled steel sections with minimum thickness 5 mm or more. A full height hinged door of width 600 mm or more with bolt with provision of locking should be provided to the crab cabin and it should have access ladder with proper man guard from floor (working area of crane) as well as from bridge platform. The viewing windows should be made of 6mm thick toughened glass with proper sealing to avoid rain water ingress. At least two sliding/flap type</p>	

		<p>windows should also be provided. Cabin should be adequately illuminated and ventilated.</p> <p>Complete instructions covering the crane operation, maintenance and lubrication shall be mounted in the cabin in permanent frame for convenient reference.</p> <p>Non-slip type insulation mat should be provided on cabin's floor.</p> <p>One no. of 2.5 kg CO₂ gas type fire extinguisher shall be provided inside the cabin.</p> <p>Other mountings shall include a hand operated metal gong, ventilation fan with guard and regulator and a tool box equipped with all necessary mechanical & electrical tools along-with the tools listed below:-</p> <ol style="list-style-type: none"> 1) Double end spanner – one set 2) Ring spanner – one set 3) Hammer 2lbs –one no 4) Hammer 5lbs – one no 5) Screw driver – one set 6) Cutter pliers – three nos. 7) 50 T Hydraulic Jack (Remote pump type) –one no. 8) Grease gun (5kg capacity) – two nos. 9) Socket wrench – one set 10) Torque wrench – 1 No 	
3.6.26.5	CAPACITY PLATE	A plate mentioning rated capacity of hoist, year of manufacture etc. shall be placed so as to be easily legible to read from the grounds.	
3.7	BOUGHT-OUT COMPONENTS	<p>a) All the items shall have rating / specifications to take care of full design factors as per tender technical specifications or relevant I.S. standard whichever is more stringent.</p> <p>b) The bidder will have to clearly mention the make/model being offered by them for the bought out items as per Annexure-A at bidding stage. The bidder may mention more than one make or their own make, if any. Bids not mentioning the make/makes or the bids with name of make/makes followed by the words like “or equivalent”, “similar” etc. will be rejected.</p>	

		<p>c) The Purchaser shall have right to inspect purchase orders, test certificates etc. of the bought items.</p> <p>d) Bought out items should not be modified by crane’s manufacturer and a certificate stating that no modification have been done by crane’s manufacturer for any bought out items, should be provided.</p> <p>e) Make/model of the bought out items will be subject to purchaser’s approval. Manufacturer’s catalogue with detailed specifications will have to be submitted to ensure the purchaser that the offered make/model meets all the technical requirements of this specifications.</p>	
3.8	APPLICABLE CODES & STANDARDS	<p>The crane shall comply with all currently applicable statues, regulation and safety codes relating to the design, construction and operation of cranes in the locality where the crane will be installed. No part of these specifications shall be construed to relieve the vendor of his responsibility to supply a functionally adequate crane. The crane supplied shall comply with the latest applicable Indian / International standards. Other national standards are acceptable if they are established to be equal or superior to the referred standards.</p>	
		<p>In the event of any conflict between codes, standards referred below and this specification, the requirements of this specification shall govern. Some of the applicable codes are listed below:</p>	
		<ul style="list-style-type: none"> • IS : 807 (2006) 	Code of Practice for Design, Manufacture, Erection & Testing (Structural portion) of Cranes and Hoists.
		<ul style="list-style-type: none"> • IS : 3177 (1999) 	Code of Practice for Design of E.O.T. and Gantry Cranes other than steel works Cranes.
		<ul style="list-style-type: none"> • IS: 4460 (1995) / • ISO 6336: 	Gears - Spur and Helical Gears - Calculation of Load Capacity
		<ul style="list-style-type: none"> • IS-15560 (Supersedes • IS-3815) 2005: 	Point hooks with shank up to 160 Ton.
		<ul style="list-style-type: none"> • IS : 2266 (2002): 	Steel Wires for Ropes for General Engineering Purposes. Hoisting rope.

		• IS : 3443	Crane Rail Sections	
		• IS 2062 (2011):	Specification for structural steel.	
		• IS : 325 & 12615	Three Phase Induction Motors	
		• IS : 4029	Guide for Testing Three Phase Induction Motors	
		• ASME Section V	For non-destructive testing	
		• ASME Section VIII Div-1	Code of construction in conjunction with section IX for fabrication.	
		• ASME Section IX	For welding procedure and performance qualification	
		• IS : 3757	High strength structural bolts	
		• IS : 814	Welding Consumables	
		• IS : 816	Code of Practice for use of Metal Arc Welding for General Construction in Mild steel.	
		• IS : 823	Code of Practice for use of Metal Arc Welding of Mild steel.	
		• IS : 875	Code of Practice for design loads (other than earthquake) for building and structure Part-3:- Wind load	
4.0	FABRICATION AND TESTING REQUIREMENTS			
4.1	FABRICATION	The materials may be cut and formed to the required shape by any process that will not unduly impair the physical properties of materials. The edges that will be exposed in the finished form shall be rounded off to a radius of at least 3 mm or chamfered at 45 degrees to at least 4 mm flat. All materials shall be grounded smooth and straightened and any slag of previous molten material shall be removed prior to further fabrication or use.		

4.1.1	MATERIAL	Material of construction for various components will be as mentioned in the technical specifications for components at 3.6 above.	
4.1.2	WELDING		
4.1.2.1		Welding shall conform to IS-814, IS-816, IS-823. The welding procedures and performance qualification of welders shall be in accordance with Section-IX of ASME Boiler and pressure vessel code. Electrodes for welding shall conform to IS-814.	
4.1.2.2		The welding procedures and welder's performance qualification report shall be submitted to purchaser for approval. The welding shall be carried out only by the qualified welder as approved by purchaser.	
4.1.2.3		All welds should be free from defects like blow holes, lack of penetration, slag inclusions, porosity etc. and the welding shall be uniform.	
4.1.2.4		Purchaser reserves the right to check any weld by suitable non-destructive test and if any weld is found defective, supplier shall repair the same free of cost after obtaining the approval from the purchaser.	
4.1.2.5		Weld procedures adopted shall involve least amount of warping and not detrimental to the integrity of the sections being welded.	
4.2	INSPECTION	Supplier will prepare detailed quality assurance plan (QAP) based on enclosed indicative QAP at annexure-A and technical specifications and submit to purchaser for approval prior to fabrication/procurement of bought out items. The inspection requirements for all components/equipment shall conform to design and fabrication requirements as defined in the relevant codes and standards as well as in this specification. Stage-wise inspection and testing will be carried out as per approved QAP. Enclosed QAP is indicative only. Supplier should prepare the QAP based on the all the technical requirements of this specifications.	
4.2.1		The supplier shall maintain proper inspection records and make it available to purchaser's representative whenever required. Supplier shall make necessary arrangements for the inspection by the purchaser or his authorized representative.	

4.2.2		Supplier shall provide to the purchaser or his representative all the necessary test certificates for the standard components and materials bought out from the market. The test certificates for mechanical properties and chemical composition of the materials to be used for fabrication /construction of the crane shall be provided. The supplier shall make arrangements to scrutinize and purchase only good and trouble free components and preferably with the approval of the purchaser. The steel castings and forging for load carrying parts shall be tested by appropriate Dye-penetrant and ultrasonic tests for getting the defect free units.	
4.2.3		The supplier shall offer the inspection of main girders in U shape i.e. prior to welding of bottom flange and painting.	
4.2.4		Welds for major load bearing components like bridge girders, A-frame, end carriages, trolley frames etc. shall be examined as follows: a) All butt welds shall be 100% radiographed. b) All butt, T-joints and fillet welds shall be checked by dye penetrant test for root and subsequent each pass of welding.	
4.2.5		Purchaser reserves the right to inspect any material or equipment furnished or used by supplier under the contract and to reject any, which is found defective in workmanship or design, or otherwise unsuitable for the use and purpose intended, or which is not in accordance with the intend of contract.	
4.2.6		Should purchaser waive the right to inspect any equipment, that waiver shall not relieve supplier in any way of his responsibility and obligations under the contract.	
4.2.7		Purchaser reserves the right to call for certificates for all material and equipment at any stage of manufacture.	

4.2.8		In the events of purchaser's inspection revealing poor quality of goods, purchaser shall be at liberty to specify additional procedures, if required to ascertain supplier's compliance with the equipment specifications.	
4.2.9		Even though purchaser or his representative carries out inspection, such inspection shall not however relieve supplier from his responsibilities for furnishing the equipment conforming to the requirements of the contract.	
4.3	TEST CERTIFICATES	Following test certificates shall be furnished by the supplier for review/verification by the purchaser.	
		<ul style="list-style-type: none"> a) Manufacturer's test certificates (MTC)/Test certificates from NABL accredited lab for mechanical properties and chemical compositions of structural steels, fasteners, sheaves, hooks, wire ropes, rope drums, wheels, gears and pinions, shafts and axles etc. b) Functional tests for all equipment. c) Radiography Test (RT) reports of butt welds. d) Test reports of Liquid Penetrant Test (LPT) of fillet, butt and T-joint welds. e) Test reports of Liquid Penetrant Test of hooks and sheaves and test report for Magnetic Particle Test of hooks f) Ultrasonic Test (UT) reports for hooks (shank portion), rope drums, shafts & axles, gears & pinions, wheels etc. g) Insulation test for all electrical equipment and continuity test for all cables. h) Type and Routine tests for motors. i) Test certificates for brakes and clutches. j) Routine test certificates for all VVFDs and DBRs. k) Detailed list of brought out items with make, model, sr. no., rating etc. l) Test certificate for bought out components including material test certificates for all load bearing parts of these bought out components. 	

		m) Test certificate for proof load of hook & breaking strength of wire rope.	
4.3.1		In lieu of test certificates from the manufacturer of the materials or non-correlation of the material with corresponding MTC, purchaser's representative will randomly select the sample/samples of the material which shall be tested at NABL approved lab as per the specifications at supplier's cost and the test certificate shall be verified by the purchaser prior to the starting of fabrication.	
4.3.2		For reviewing the test reports for LPT, UT and RT, purchaser's representative may re-conduct upto 3 % of the total quantity of each type of these tests at random in his presence at supplier's cost. If considerable discrepancy is observed in the test results found by purchaser's representative and the test reports submitted by the supplier then the supplier will have to repeat the test for full quantity in presence of purchaser's representative.	
4.4	TESTING OF CRANE		
4.4.1		Before shipment, the crane shall be carefully fitted and shop assembled, clearly match marked to facilitate assembly at the site. The shop operational and running tests for machinery assembled on the bridge structure shall be conducted for all mechanical and electrical parts and automatic devices to demonstrate that the crane is in satisfactory operating condition. Supporting arrangements shall be provided in a manner to allow free movement of hook for determining high hook elevation and hook lift.	
4.4.2	TESTING AT SUPPLIER'S WORKS	The following tests on complete crane in presence of purchaser's representatives shall be carried out at supplier's works:- a) Review of test certificates as listed at 4.3 b) Visual inspection and dimensional checks. c) No load test trials shall be conducted. Motor currents, functional checks of drives for each motion, functionality of all limit switches and interlocks shall be verified (functionality of LT limit switches shall be verified by manually actuating the LT limit switches).	

		<p>d) Rated load test: Checks for functioning of CT and hoists motions, travel limits, interlock operations, brake operations, functioning of drive mechanisms at rated load shall be conducted in addition to checks for specified speeds and bridge girder's deflection at rated load.</p> <p>e) Noise level shall be less than 80db at 1 m. distance from crab.</p> <p>f) Overload test at 125% of rated load for each hoist. No permanent deflection or flaw should be there in the load bearing components after overload test. Slippage of brake should not be there. Deflection should be within (1/900) of the span. No distortion, permanent strain, damages or deformation of any part of the equipment to be supplied under this specification shall occur as a result of the above testing. This shall be confirmed by LPT of hooks and weld joints on load bearing structural components and visual examination of other components after the load test.</p>	
<p>4.4.3</p>	<p>TESTING AT PURCHASER'S SITE (AFTER ERECTION)</p>	<p>Following tests on the crane shall be carried after erection at purchaser's site:-</p> <p>a) Checks for dimensions and alignments. After assembly of bridge, the water level test for wheel assemblies shall be conducted.</p> <p>b) Test for proper functioning of the crane at no load condition.</p> <p>c) Test for proper functioning of the crane at intermediate loads (i.e. at loads between no load and rated load)</p> <p>d) Rated load test: After erecting the crane at site, the crane shall be tested at the rated load. Checks for functioning of all motions, travel limits, interlock operations, positioning accuracy of drive mechanisms at rated load shall be conducted in addition to the checking of specified speeds at rated load. The maximum deflection with rated load shall not exceed 1/900 of the span. For both the hoists each type of braking mechanism will be tested independently by isolating other type of braking mechanism. Each braking mechanism should be able to hold the rated load without</p>	

		<p>slippage. Supplier will produce detailed procedure for purchaser's approval for testing individual brakes at rated load.</p> <p>e) Overload test of main and auxiliary hoists at loads 35 Tons and 6.25 Tons respectively. No slippage of brakes should be there.</p>	
4.4.4		All the tests shall be carried out as per latest IS-3177 unless otherwise specified.	
4.4.5		No distortion, permanent strain, damages or deformation of any part of the equipment to be supplied under this specification shall occur as a result of the above testing.	
4.4.6	ARRANGEMENT OF TEST LOADS	<p>The necessary loads and lifting tackles for conducting load testing at purchaser's site will be arranged by purchaser.</p> <p>Supplier will arrange tests loads for testing at supplier's works.</p>	
4.4.7	ARRANGEMENT OF TESTING INSTRUMENTS	The supplier shall arrange at his own cost the required testing and inspection instruments for use at ex-works and at site.	
5.0	DOCUMENTATION		
5.1	DESIGN DOCUMENTS	The supplier shall provide detailed design calculations for selection of mechanisms like motors, brake, wheel, rail, wire rope, rope drum, hook & its bearings, gear boxes, etc. and structural members like girders, end carriage, crab structure etc. The design calculation shall be approved by the purchaser before the fabrication of the crane.	
5.1.1		The design calculations of structural members for seismic and wind load should also be produced by the supplier for purchaser's approval prior to fabrication. The swing calculation, design calculations for anti-topple lugs, wheel stoppers, end buffers shall also be provided.	
5.1.2		Four copies of approved design calculations shall be provided to the purchaser.	
5.2	DRAWINGS		

5.2.1		The bids shall accompany general layout drawings of the crane based on purchaser's tender specifications.	
5.2.2		<p>The supplier shall furnish two sets of following drawings to get the approval of the purchaser prior to fabrication.</p> <ul style="list-style-type: none"> a) General Arrangement of crane. b) Main girders, L.T. bridge and end carriage: Assembly and structural details. c) Crab Assembly and structural details. d) Drive units for L.T., C.T. and main & auxiliary hoists: assembly and parts details. e) L.T. drive shaft and wheels: Assembly and details. f) Assembly and detail drawings for rope drum, hook and hook block. g) Rails details and their fixing arrangement C.T along with end stoppers. h) Limit switch arrangement and details. i) Arrangement for LT & CT cable takes up and fixing details. j) Electrical power and control circuit diagram along with Bill of material of electrical items. k) Schematic & wiring diagram of power and control system. l) GA of control panel, LT, CT and HT panels. m) Pendant and its control panel control wiring diagram along with BOM. n) Crane clearance diagram. o) Operator's cabin and crab cover p) Necessary installation, maintenance and operational drawing. 	
5.2.3		The drawings shall be made using AutoCAD.	
5.2.4		It is the responsibility of the supplier to incorporate correctly all the comments conveyed by the purchaser on supplier's drawings.	
5.2.5		Drawings prepared by supplier and approved by purchaser shall be considered as part of specification. However, examination and approval of drawings by purchaser shall not relieve the supplier of his	

		responsibility for proper engineering, design, workmanship and functioning of the cranes under the contract.	
5.2.6		If any time before the completion of work, changes are made necessitating revision of approved drawings, supplier shall make such revisions and obtain the approval of the purchaser.	
5.2.7		Supplier shall incorporate the as built changes in the drawing.	
5.2.8		All bought out components specifications (order specs) shall be specified in drawing.	
5.2.9		Supplier shall provide 3 sets of hard copies of all the drawings as well as soft copies in AutoCAD as well as in pdf format in CD media to purchaser for his records.	
5.3	OTHER DOCUMENTATION		
5.3.1		Supplier shall furnish Three sets of bound copies of following documents: a) Quality Surveillance Document. b) Design Documents. c) Operation & Maintenance manuals. d) Spare parts manual.	
5.3.1.1		Quality Surveillance document shall consist of Technical Specification of crane, Purchase Order copy, amendments if any, shipping release, packing list, approved quality assurance plan, test certificates for all raw materials, test certificates and performance test reports for bought out items, internal inspection report, assembly inspection report, joint inspection report, minutes of meeting, approved procedures for welding qualifications (WPS, PQR and WPQ) and NDT procedures (LPT, MPT, RT and UT) and finally load testing and functional test reports.	
5.3.1.2		Design documents shall consist of design calculations for mechanisms, structural members, swing calculation & verification for earthquake event and wind load and all as built drawings mentioned.	
5.3.1.3		Operation & Maintenance manual	

		Supplier shall provide operation and maintenance manuals for installation, operation and maintenance of all equipment. The instructions for use of spare parts recommended with special emphasis on trouble shooting. Maintenance schedule and its frequency shall also be included. Each manual shall consist of one set of above-mentioned approved as built drawings and catalogues / technical literatures for the bought out components.	
5.3.1.4		The manuals shall be specific to the equipment supplied and shall not be general in nature.	
5.3.1.5		The supplier shall submit one preliminary copy of operation and maintenance manuals to the purchaser before submission of final actual manuals. One approved copy will be provided to the supplier for preparing final operation and maintenance manuals.	
6.0	PACKING, SHIPMENT AND DELIVERY		
6.1	PACKING	After carrying out the tests at manufacturing works as specified in this document, the crane shall be carefully disassembled into major sub-assemblies and then properly packed, crated and protected from damage during transport, transit and storage at site. The packing shall include adequate cushioning, blocking, bracing, skidding, hoisting and tie down provisions. All machined parts shall be protected with anti-rust grease. All electrical devices shall be sealed against dust and moisture or water, wherever applicable.	
6.2	SHIPMENT AND UNLOADING	Supplier shall be responsible for any damage to the equipment during transport, transit and storage equipment at the site. Transit insurance and unloading of equipment and its components at site /store is in supplier's scope. The supplier without any extra cost shall replace the damaged item and supply any short supply inside the intact package.	
6.3	PLACE OF DELIVERY	The intact packages shall be safely transported to the following destination:-	

		ASSTT. STORES OFFICER, RWMF STORES, B.A.R.C., TARAPUR, PO - GHIVALI, Via.-BOISAR (W.RLY), TARAPUR, DISTRICT- PALGHAR, MAHARASHTRA - 401 502	
7.0	ERECTION AT SITE AND COMMISSIONING		
7.1		The supplier shall install the crane at SWMF, R&WM, INRP(O), NRB, BARC, TARAPUR as per specifications and drawings in consultation with purchaser's site representative. Supplier is advised to visit the site and get himself fully acquainted with all the conditions and procedures at site. Ignorance of site conditions shall, in no case whatsoever be the basis for claim for extra payment.	
7.2		Temporary electric power 415 V, 3 Phase, 50 Hz and 230 Volts 1 phase, 50 Hz will be supplied free of cost subject to the following conditions: a) Supplier shall make his own arrangement for supply, erection and dismantling on completion of the work, of his temporary distribution system required to take power from the purchaser's supply points. b) Purchaser will supply this power to the supplier at a point within 50 meters of the location of work place. c) Purchaser will not be held responsible for the consequences of any unintentional interruptions in power supply.	
7.3		Service water will be made available at one point at site free of cost.	
7.4		Contractor shall at his own cost, make arrangements for transport of his personnel to and from the site. Neither living accommodation for space for labor colony will be provided by purchaser. It shall be supplier's responsibility to make all accommodation arrangements.	
7.5		For arranging temporary entry passes to their workers for unloading/erection/testings etc. at site the supplier will have to submit applications in prescribed format well in advance to purchaser's security section along-with their latest photographs, valid photo-identity proof (e.g. voter ID, Aadhar, PAN, Passport, Driving License etc.) and Police verification certificate.	

<p>7.6</p>		<ul style="list-style-type: none"> a) All material handling equipment, scaffoldings, tools and tackles etc. required for the erection work shall be arranged by the supplier. b) Supplier will have to provide safety wears/gadgets to all his staff working at site as per instruction of purchaser's safety officer. Arrangement of all the safety wears/gadgets such as safety shoes, helmets, safety belt, hand gloves etc. is in scope of supplier. c) The supplier shall employ his rigging staff for shipment of material to desired area. Safety procedures prevalent at site shall be complied in total and instruction in this regard from time to time by purchaser's engineer shall be followed in all respects. d) Supplier shall cooperate with other contractors for the use of purchaser's facilities. Insurance of supplier's personnel working at site for installation purpose shall be taken care of as per stipulation of Government of India. e) Purchaser shall not be held liable for any damage to person or property resulting from the use of construction tools and equipment furnished, rented or loaned to the contractors by the purchaser. Supplier shall take suitable insurance policy for the work-force engaged by him to work at site. f) Contractor shall be solely responsible for all injury to persons and for any other damage due to any cause in any way connected with carrying out this contract. Contractor shall indemnify purchaser in respect of all claims brought against the purchaser by anybody in this regard. 	
<p>7.7</p>		<p>The supplier at all times shall work in coordination with purchaser's engineering staff and offer them all facilities to become familiar with the erection, operation and maintenance of the equipment. Contractor shall work in harmony with other contractors at site in such a manner to enable the other work to be performed without any hindrance.</p>	
<p>7.8</p>		<p>After installation the crane shall be commissioned by the supplier and handed to the purchaser in complete working condition. Before handing over the tests (full load test, overload test, travel limits, hook approaches</p>	

		<p>etc.) as desired at site shall be carried out and demonstrated in presence of the purchaser's representatives.</p> <p>Inspection of crane shall be carried out as per latest edition of IS:3177</p>	
7.9		<p>Installation and commissioning of the complete crane at site shall be done as per the agreed time schedule between the supplier and purchaser. The complete responsibility for the installation and commissioning of the crane shall rest with the supplier.</p>	
7.10		<p>The contractor shall at all times keep the site free from the accumulation of waste materials and debris and upon completion of the works shall clean away and dispose of all surplus materials, rubbish and temporary works of whatsoever nature and kind as directed by the purchaser and shall leave the works and site clean and tidy.</p> <p>The contractor shall be responsible for the taking of all safety precautions during the construction and on completion of the works and for leaving the site safe at all times and at the end of each working day and at all times when the work is temporarily suspended he shall protect all construction materials, equipment and facilities from causing damage to existing property or interfering with the operations of the facility when it goes into service.</p> <p>The contractor shall comply with all applicable provisions of the safety regulations, clean-up programme and other precautionary measures which the purchaser has in effect at site.</p> <p>During erection of the various units, safety precautions such as providing ladders for safe approach shall be provided by the contractor. A safety supervisor will be stationed on the works and the contractor shall comply with any instruction given by the safety supervisor regarding safety, precautions, protective measures, clean up and any practices with which in the opinion of the safety supervisor may present unavoidable hazard.</p>	
8.0	CLEANING, PROTECTION AND PAINTING	<p>All exposed surfaces other than machined surfaces, shall be sand blast cleaned to fine surface as per IS 1477. Casting shall be properly smoothed before painting. All oils and grease shall be removed by solvent cleaning. Sand blast cleaning of the surfaces shall remove completely all visible mill</p>	

		<p>scales, rust, old paint & foreign matter. All treated surfaces shall be cleaned before application of paints. After cleaning and drawing, all surfaces except finished and machined surface and inside the gear cases shall receive two coats of epoxy primer. Final two coats of 3 mill thk. Each of golden yellow epoxy finish paint shall be applied after erection at site by vendor. All exposed metal surfaces shall be protected from environmental effects.</p> <p>Interior of all gearbox housing shall be given one coat of rust inhibitor. Painting of all equipment and structures shall be done by Supplier. Internal painting of all panels shall be semi-gloss white with external painting semi-gloss light grey. Before the equipment is closed they shall be carefully checked to be sure that all extraneous matters such as rags, rubbish, foreign matter etc. have been removed. After the interior is cleaned and dried opening shall be closed with cap to prevent entry of water, dirt or any other foreign matter.</p>	
9.0	GUARANTEE	<p>Supplier shall guarantee that the goods furnished by him shall be in full accordance with the requirements of the specifications and are new and of high quality.</p> <p>Supplier shall also provide the guarantee that the goods are free from defects in design, materials or workmanship.</p> <p>The supplier shall indicate clearly the terms covered under guarantee / warranty and its period from the date of satisfactory commissioning and handing over of the crane.</p> <p>The guarantee /warranty shall cover for a period of 12 months from the date of satisfactory commissioning and handing over of the crane to the purchaser at site.</p>	
10.0	DELIVERY PERIOD	<p>The equipment should be manufactured, tested, supplied, erected and satisfactorily commissioned at site within 12 months from the date of issue of purchase order.</p> <p>Supplier should submit the detailed schedule along-with the bid as per the format at enclosed annexure-C</p>	
11.0	QUALIFICATION CRITERIA FOR THE BIDDER		

<p>11.1</p>		<p>The bidders should have experience in design, manufacturing supply and installation of following during last seven years:-</p> <ol style="list-style-type: none"> 1) At-least 3 nos. of gantry or EOT cranes (out of these at-least one no. of crane should be a gantry crane of capacity 30 Ton or above) and 2) At-least one no. of gantry/EOT crane to DAE/BARC/PSU/Central or State Govt. Sector. <p>Copies of purchase orders should be submitted along-with completion certificate/commissioning report (or similar document ensuring completion of the work) from the user for confirmation of this.</p>	
<p>11.2</p>		<p>The bidder shall have organizational structure with respect to design, drafting, engineering planning, procurement, and manufacturing/production and quality assurance. An organization chart and details of available facility shall be submitted. Minimum requirement is as follows:-</p> <p>Organization Structure:-</p> <ol style="list-style-type: none"> 1)Mechanical/Electrical Engineers with experience of, design (refer notes below), manufacturing, erection and testing of gantry/EOT crane 2)Quality Assurance Engg./Supervisor (Level-2 as per ASNT/ISNT for LPT, UT and RT.) (Refer notes below) 3)Skilled technicians (Fitter, Welder, Machinist ,Electrician) <p>Facility:-</p> <ol style="list-style-type: none"> 1) Work-shop equipped with welding machines, cutting equipment, lathe, shaper, milling machines, drilling machines etc. for fabrication of the gantry crane as per this tender. 2)Material handling equipment for handling the gantry crane during fabrication and assembling. 3)Testing facility including test loads for 30T capacity -20m span gantry crane. 4)Manufacturing and testing facilities for components where the bidder is offering its own make. 	

		<p>Notes:- Outsourcing of design and quality assurance is permitted. But in such case the bidder will have to provide details of the sub-vendors along-with their bids. Sub-vendors may also be evaluated in such cases. For Design: Sub-vendors should have past experience of design of gantry/EOT cranes and should have Mechanical /Electrical Engineers with experience of design of gantry/EOT cranes. For Quality Assurance: Sub-vendors should have Engg./Supervisor (Level-2 as per ASNT/ISNT for LPT, UT and RT)</p>	
11.3		<p>Annual Turn-over of the bidder in last three financial years (average) ending year 2019 shall not be less than Rs. 1,00,00,000/- and there should not be losses during any two consecutive years in last five financial years ending year 2019. CA audited certificate should be submitted for confirmation of this.</p>	
11.4		<p>The firm should not be under liquidation, court receivership, or similar proceedings. A self-certified statement by the firm should be furnished in this regard.</p>	
11.5		<p>BIDDER EVALUATION FORM:- A bidder evaluation form is enclosed as annexure- B. Bidder will have to submit filled form and supporting documents along-with their bids.</p>	
12.0	CONFIRMATION/DEVIATION STATEMENT	<p>Fourth column of this above technical specification sheet is to be filled by the bidder and is to be submitted along-with the bid. Confirmation to the specifications or deviations should be clearly mentioned. Technical data of the equipment being offered should be mentioned wherever applicable. Make of brought out items should also be mentioned at annexure-A. Separate annexures may be attached if required.</p>	

ANNEXURE-A

TECHNICAL DATA SHEET FOR BOUGHT-OUT ITEMS

(TO BE FILLED BY VENDOR AND SUBMITTED ALONG-WITH TECHNICAL BID)

Sr. No.	Item	MH	AH	LT	CT	Crane protective panel	Common/other component
A	Control and MCC panels	----	----	-----	----	----	----
1.	Incomer MCCB Make & Model No.						----
2.	Semiconductor fuse for VFD Make & Model No.					----	----
3.	Thermal Over load relay Make, & Model No.	----	----		----	----	----
B	Motor	-----	-----	-----	-----	-----	-----
1.	Make					----	----
2.	Type					----	----
3.	Class of Insulation (VPI)					----	----
C	Drive & Accessories	-----	-----	-----	-----	-----	-----
1.	VVFD Drive Make & Model No.					----	----
2.	Input choke Make & Model No.					----	----
3.	Encoder Make & Model No.					----	----
4.	DBR Make & Model No.					----	----
D	Contactors	----	----	----	----	----	----
1.	Power Contactor Make & Model No.						
2.	Control contactor Make & Model No.						

E	Brake	-----	-----	-----	-----	-----	-----
1.	Electro Hydraulic Thruster Make & Model No.					-----	-----
2.	DC EM Brake Make & Model No.			-----	-----	-----	-----
3.	Brake rectifier unit make						-----
F	Limit Switch	-----	-----	-----	-----	-----	-----
1.	Rotary Limit Switch Make & Model No.			-----	-----	-----	-----
2.	Gravity Limit Switch Make & Model No.			-----	-----	-----	-----
3.	Cross bar Limit Switch Make & Model No.	-----	-----				-----
G	Power Cable	-----	-----	-----	-----	-----	-----
1.	Make						
2.	Insulation Type						
H	Control Cable	-----	-----	-----	-----	-----	-----
1.	Make						
2.	Insulation Type						
I	Control Wire	-----	-----	-----	-----	-----	-----
1.	Make						
2.	Insulation Type						
J	Master Controller Make & Model No						-----
K	RRC Make & Model No					-----	-----
L	Transformer	-----	-----	-----	-----	-----	
M	Fuses	-----	-----	-----	-----	-----	
N	Fixed cabling system						
O	Flexible Cable wiring (HFFR / FRLS)						

P	LED indicating lamps	-----	-----	-----	-----	-----	
Q	Load cell			-----	-----	-----	-----
R	Plates and Structural Steel (Make)	-----	-----	-----	-----	-----	
S	Gear box (Make & Model)					-----	-----
T	Hoisting rope (Make)			-----	-----	-----	-----
U	Hook & Hook Block (Make)			-----	-----	-----	-----
V	Bearing (Make)	-----	-----	-----	-----	-----	
W	Geared Coupling (Make)					-----	-----
X	Fasteners (Make)	-----	-----	-----	-----	-----	

QUALITY ASSURANCE PLAN- QAP

[NOTE:-This QAP is indicative only. Vendor will have to prepare the QAP fulfilling all the technical requirements of the technical specifications, drawings and relevant codes/standards for approval of purchaser]

QAP – Part-1 – For Structural Components

Sr. No.	Item	Type of checks/inspection	Quantum of check	Reference standard/ acceptance criteria	Format of record	Agency			Remarks
						P	W	R	
1	Drawings	Review of drawing	100%	Technical specifications	Approved drawings	V		C	
2	Material Identification								
2.a	Plates & rolled structural steels	1. Visual Identification 2. Dimensional checks 3. Chemical composition analysis 4. Mechanical properties analysis	100%	IS 2062:2011 Grade E250 A/B	Correlated Mill Test Reports or Lab. Test Certificates*	V		C	*Test reports/certificates should be from NABL accredited lab.
2.b	Welding consumables	1. Visual inspection 2. Chemical composition analysis	100%	IS 814	Correlated Mill Test Reports	V		C	
2.c	Fasteners	1. Visual inspection 2. Chemical composition analysis 3. Mechanical properties	100%	IS 3757	Correlated Mill Test Reports or Lab. Test Certificates*	V		C	*Test reports/certificates should be from NABL accredited lab.
3	Welding Process	1. Welding Procedure Qualification 2. Welding Performance Qualification	100%	ASME B&PV Sec IX and technical specification	Approved WPS, PQR and WPQ	V	C	C	

4	NDT procedure	Review of NDT procedures to be carried at different stages (VT, LPT, RT etc.)	100%	Technical specification and ASME B&PV Sec V	Approved NDT procedures	V		C	
5	Marking, cutting and dimensional checks	Visual inspection and dimensional measurements	100%	Technical specification and approved drawings	Inspection reports	V		C	
6	Weld joints	1. Visual fit-up check 2. VT and LPT after root pass for all welds joints 3. VT and LPT after each pass for all weld joints 4. RT of butt welds after final pass	100%	Technical specifications and approved NDT procedures	WIR (Weld Inspection Report)	V		C*	*For reviewing the test reports for LPT and RT, purchaser's representative may re-conduct upto 3 % of the total quantity of each type of these tests at random in his presence at supplier's cost. If considerable discrepancy is observed in the test results found by purchaser's representative and the test reports submitted by the supplier then the supplier will have to repeat the test for full quantity in presence of purchaser's representative.
7	Stress Relieving	Review of HT charts	100%	IS-3177 and approved HT process	Reviewed HT charts	V		C	
8	Painting	1. Visual inspection 2. DFT checks for each coat	100%	Technical specifications	Inspection report	V		C	

LEGENDS:-

P:- Perform, **W:-** Witness, **R:-** Review; **V:-** Vendor (Supplier) , **C:-** Customer (Purchaser)

QAP – Part-2 – For Bought out items and other components

Sr. No.	Item	Type of checks/inspection	Quantum of check	Reference standard/ acceptance criteria	Format of record	Agency			Remarks
						P	W	R	
1.0	Bought out components	Review of list containing details of bought out items	100%	Technical specifications and approved design documents	Approved list of bought out items	V		C	
2.0	Wire ropes	1. Visual examination 2. Dimensional checks 3. Mechanical properties analysis	100%	IS 2266 and approved design documents	Correlated Mill Test Reports or Lab. Test Certificates*	V		C	*Test reports/certificates should be from NABL accredited lab.
3.0	Wire rope drum								
3.1	Raw material identification	1. Visual Identification 2. Dimensional checks 3. Chemical composition analysis 4. Mechanical properties analysis	100%	ASTM A106 Gr. B for pipe and IS 2062:2011 Grade E250 A/B for plate	Correlated Mill Test Reports or Lab. Test Certificates*				*Test reports/certificates should be from NABL accredited lab.
		UT of pipe/plate	100%	Technical specification and approved UT procedure	UT report	V		C	
3.2	Weld joint inspection (For welded rope drum)	1.VT and LPT after root pass 2.VT and LPT after each pass 3.RT after final pass	100%	Technical specifications and approved NDT procedures	WIR (Weld Inspection Report)	V		C	
3.3	Dimensional checks	Visual examination and dimensional checks	100%	Approved design and IS 3177	Dimensional check reports	V		C	

4.0	Sheave	1. Visual examination 2. Dimensional checks	100%	IS 3177	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	IS 2707	Mill Test Reports or Lab. Test Certificates	V		C	
5.0	Hook	1. Visual examination 2. Dimensional checks	100%	IS-15560 or IPSS	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	IS-1875 Class 3A (high tensile forged steel) or 20Mn2 for IPSS	Mill Test Reports or Lab. Test Certificates	V		C	
		1. MPT 2. UT	100%	Technical specification and approved NDT procedure	MPT and UT report	V		C	
6.0	Bearings	1. Visual examination 2. Dimensional checks 3. Review of TC	100%	Technical specification and manufacturer's catalogue	Manufacturer's TC	V		C	
7.0	Coupling	1. Visual examination 2. Dimensional checks	100%	Technical specification and manufacturer's catalogue	Manufacturer's TC	V		C	
8.0	Shafts & Axles	1. Visual examination 2. Dimensional checks	100%	Technical specifications, approved design,	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	BS 970 (EN8 or EN9) or better material as per approved design	Mill Test Reports or Lab. Test Certificates	V		C	
		1. UT	100%	Approved UT procedure	UT report	V		C	

		Heat treatment	100%	Technical specification and Approved HT procedure	Reviewed HT charts	V		C	
9.0	Gear Boxes								
9.1	Gears & pinions	1. Visual examination 2. Dimensional checks	100%	Technical specifications and manufacturer's catalogue	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	BS 970 (EN19 for gear EN24 for pinion) or better material as per approved design	Mill Test Reports or Lab. Test Certificates	V		C	
		1. UT	100%	Manufacturer's UT procedure	UT report	V		C	
		Heat treatment	100%	Manufacturer's HT procedure	Reviewed HT charts	V		C	
9.2	Gear box shafts	1. Visual examination 2. Dimensional checks	100%	Technical specifications and manufacturer's catalogue	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	BS 970 (EN8 or EN9) or better material as per approved design	Mill Test Reports or Lab. Test Certificates	V		C	
		1. UT	100%	Manufacturer's UT procedure	UT report	V		C	
		Heat treatment	100%	Manufacturer's HT procedure	Reviewed HT charts	V		C	
9.3	Gear housing	1. Visual examination 2. Chemical composition & Mechanical properties analysis	100%	Manufacturer's catalogue and technical specifications	Manufacturer's TC	V		C	

9.4	Gear Box assembly	1. Visual examination 2. Checks for speed reduction ratio, temperature, noise & vibration at no load	100%	Manufacturer's catalogue and technical specifications	Manufacturer's TC	V		C	
10.0	Wheels	1. Visual examination 2. Dimensional checks	100%	IS-3177	Dimensional check reports	V		C	
		1. Chemical composition analysis 2. Mechanical properties analysis	100%	BS-970 (EN9) or equivalent IS code	Mill Test Reports or Lab. Test Certificates	V		C	
		UT	100%	Technical specification and approved NDT procedure	UT report	V		C	
11.0	Electric Items								
11.1	Main Hoist Motor	1. Visual examination 2. Routine test 3. Type test	100%	Technical specifications and manufacturer's catalogue	Routine test and type test reports	V	C	C	
11.2	Other Motors	1. Visual examination 2. Routine test 3. Type test	100%	Technical specifications and manufacturer's catalogue	Routine test and type test reports	V		C	
11.3	VFDs	Routine test	100%	Technical specifications and manufacturer's catalogue	Routine test reports	V		C	
11.4	Radio remote and its' panel	Test Certificate	100%	Technical specifications and manufacturer's catalogue	TC	V		C	

11.5	All Panels	Routine Tests like Insulation resistance and High Voltage test	100%	---	Routine Test Certificate	V	C	C	
12.0	Brakes	1. Visual examination 2. Review of manufacturer's TC	100%	Manufacture's catalogue	Reviewed TC	V		C	
13.0	Rotary Components (Wheels, sheaves, shafts and brake drums)	Balancing	100%	Balancing grade 2.5 as per ISO 1940	Balancing certificate	V		C	

LEGENDS:-

P:- Perform, **W:-** Witness, **R:-** Review; **V:-** Vendor (Supplier) , **C:-** Customer (Purchaser)

QAP – Part-3 – For Fully assembled crane

Sr. No.	Item	Type of checks/inspection	Quantum of check	Reference standard/ acceptance criteria	Format of record	Agency			Remarks
						P	W	R	
1	Verification of completeness of earlier stages of inspection	Review of QA documents	100%	Technical specifications, QAP Part-1 &2	Verified history docket			C	
2	Main girder, end carriages, trolley, MH, AH, LT & CT drive assemblies, MH, AH, LT & CT gear boxes,	Visual inspection and Dimensional checks	100%	Technical specifications & approved drawing	Dimensional check reports				
		Speed checks-LT & CT wheels (forward/reverse)	100%	Technical specifications, manufacturer’s catalogue and name plate details	Inspection report	V	C		
		Speed checks-MH & AH (upward/downward)							
		MH, AH, LT & CT drive assemblies							
		MH, AH, LT & CT Brakes operation							
		No load currents for MH, AH, LT & CT in clock-wise & anti clock-wise motions							
3	Fully assembled	Load test & deflection tests with no load, intermediate loads and SWL	100%	Technical specifications	Test reports	V	C		
		Overload test		Technical specifications and motor’s name plate details					
		Load currents for all motors							
		LT, CT, MH, AH operations including speed measurements with SWL							
4	As built drawings	Review of all the as built drawings	100%	Technical specifications	Approved as built drawings	V		C	

LEGENDS:-

P:- Perform, **W:-** Witness, **R:-** Review; **V:-** Vendor (Supplier) , **C:-** Customer (Purchaser)

ANNEXURE B				
BIDDER EVALUATION FORM				
Notes :				
<ul style="list-style-type: none"> • The form shall be completed in all respects by the bidder. Comments/remarks like “already given with the tender” or “details shall be on receipt of order” etc. are not acceptable. • Bidder shall obtain solvency certificate from his banker and attach with this form. If the bidder has more than one banker, a separate solvency certificate from each banker shall be submitted. • If space is not sufficient, bidder may give additional information on separate sheets. 				
1.	Vendor’s Name			
2.	Quotation No. & Date			
3.	Equipment Offered		Tendered item	
4.1	Product(s) Manufactured by the Bidder			
4.2	Product(s) Marketed by the Bidder			
5.	Registration Details (With Registration Number)			
6.	Works Premises Owned By or Rented in Name Of :			
7.	Nature of Organisation (Proprietary/Partnership/Pvt.Ltd./Public Ltd./others)			
8.	Date of incorporation (include all details in case of sister organization, if any)			
9.	Top Management (Names, Qualification, Position and Experience)			
	Name(s)	Qualification	Position	Experience

10.	Performance of Preceeding three years with profit and loss. (also indicate anticipated performance for current year)			
	Year	Capital (Authorised / Working)	Turnover	Net Profit/Loss
	Yr-1			
	Yr-2			
	Yr-3			
	Yr-4			
	Yr-5			
	Note : Copies of Annual Reports/Profit & Loss Accounts for periods mentioned above must be enclosed for reference.			
11.	Name of Banker(s) with full Address, Fax. No. & Tel. No.			
12.	Value of Solvency Certificate(s) issued by Banker(s). The certificate(s) shall be latest ones			
	The Bidder shall obtain Solvency Certificate from each of firm's banker and submit the same to the Purchaser.			
13.	Year of Starting the Factory			
14.	Year of Starting Manufacture of Equipment indicated in the Tender			

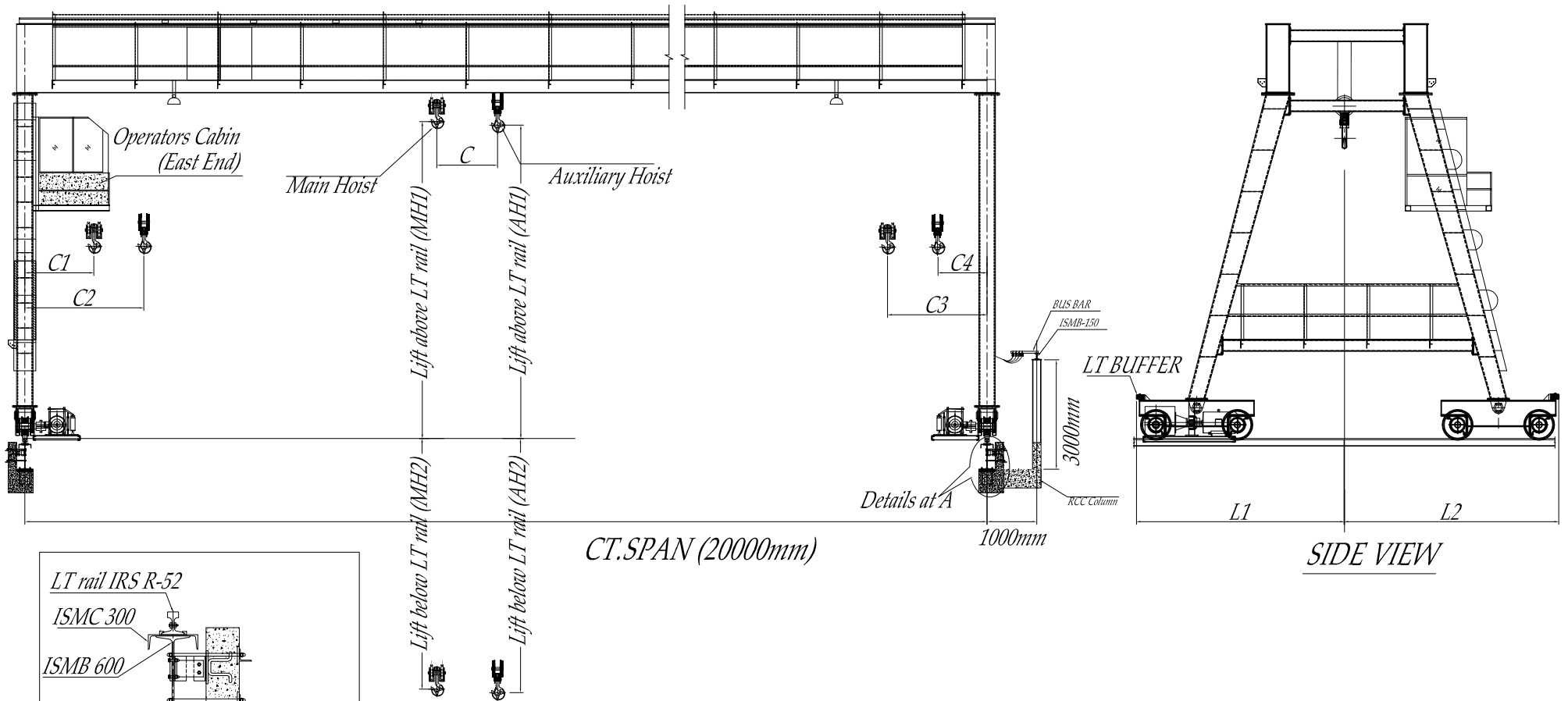
15.	License/Contract Details					
16.	Sub contract details for any of the parts of crane					
17.	List of Key Department (Enclose organisation chart for reference)					
18.	Staff Details					
	Graduate Engineers	Diploma Holders	Supervisors Trained/Skilled Operators	Unskilled Operators	Others (Specify)	
Design & Drawing						
Production Planning & Control						
Fabrication & Metal Finish						
Quality Control & Testing						
Sales						
Others (Specify)						
TOTAL						
Note : In case of common staff for various departments, indicate the same as common staff						
19.	Details of Facilities Available					

19.1	Office Area :			
19.2	Works Area (s) : If manufacturing facilities are at more than one place, details of each works shall be separately given			
	Addresses of Works	Covered Area	Uncovered Area	Total Plot Area
19.3	Design & Drawing Office Facilities Available : (Give details)			
20.	Details of Fabrication facilities: It shall include list of machines, equipment etc. available, No. and details of welding sets, No. and details of qualified welders:			
20.1	Quality Control and Testing Facilities Available : (Specifications & other details of the Equipments, machines & Facilities, available at Works and Quality Assurance Plan shall be given separately)			
20.2	Quality Assurance Plan followed : Note : Enclose QAP followed in respect of the equipment specified in the tender. (Ignore if already furnished.)			

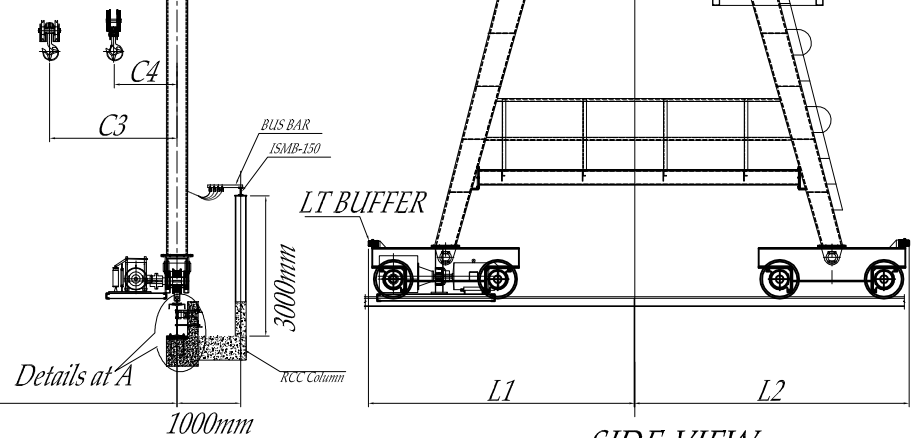
20.3	Tie Up with Testing Agencies/Laboratories and details of tests carried out:	
	Type of Tests/ Qualifications	Address of Testing Agencies/Laboratories with FAX & Tel Nos.
	Physical	
	Chemical	
	Radiography	
	Ultrasonic	
	Welder Qualification	
20.4	Facilities available for Load Testing of Crane	
21.	Documentation: (yes/no)	
	<p>(a) Reference standards specific to tender enquiry</p> <p>(b) Plant standards availability with each departments duly updated</p> <p>(c) Drawing availability for purchaser's retention</p> <p>(d) Procurement of materials with emphasis on test certificates for purchaser's verification</p> <p>(e) Availability of inward inspection</p> <p>(f) Availability of process inspection</p> <p>(g) Availability of final inspection</p>	

22.	Work Experience:					
22.1	The BIDDER shall furnish here a list (as per format given hereunder) of similar jobs executed by him during past seven years.					
	Sr. No	Name of the Client	Details of Gantry/E.O.T. Cranes supplied (especially gantry crane of capacity 30T and above)	Value of Order	Year & Period of Job execution	Name, address, Tel. & FAX No. of the officer of the client to whom reference may be made by the Purchaser.
22.2	Give a list of similar jobs executed during past seven years for the DAE/BARC/PSU/Central or State Govt. organization as per format given hereunder					
	Sr. No	Name of the Client	Details of Gantry/E.O.T. Cranes supplied	Value of Order	Year & Period of Job execution	Name, address, Tel. & FAX No. of the officer of the client to whom reference may be made by the Purchaser.
23.	List of Gantry Cranes/E.O.T. Cranes under manufacture at vendor's works at present					
Sl. No.	Details of Cranes under manufacture		Client's address, Fax.No., Telex No., Phone No.		Remarks	
<p>Signature :</p> <p>Name of the Officer :</p>						
<u>Company Seal</u>						

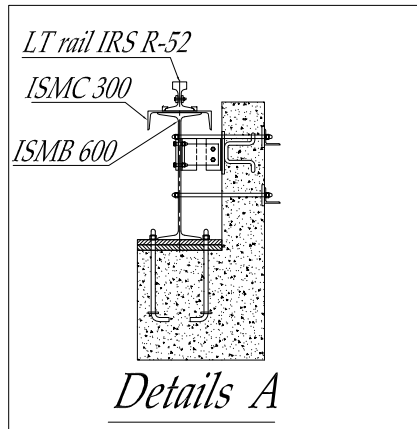
ANNEXURE C:		
BIDDER'S TIME SCHEDULE FOR MANUFACTURE, SHIPMENT TO SITE, ERECTION AND COMMISSIONING OF CRANE		
The BIDDER shall indicate the time schedule for the following key events from the date of issue of Letter of Intent/Purchase Order.		
	Particulars of Activities	TIME REQUIRED
1.1	Design of crane, preparation & submission of design drawings, design calculations and data.	
1.2	Preparation of additional shop drawings if any, submission of the same to the purchaser for information and comments if any. (It shall be the responsibility of the supplier to satisfy himself that any such additional drawings prepared by him satisfy all the design requirements as indicated in the purchaser's drawings and tender specification.)	
1.3	Time required for manufacture of the crane, including procurement of major items for the crane after clearance/approval of the drawings/items by the Purchaser and making the entire equipment available for testing at the manufacturer's workshop	
1.4	Testing of the crane & major items at the manufacturer's works.	
1.5	Start delivery to Site of Structures/Equipment	
1.6	Completion of delivery of Structures/Equipment	
1.7	Start of erection	
1.8	Mechanical erection of crane	
1.9	Completion of Electrification of crane.	
2.0	Performance tests in the Purchaser's premises.	
2.1	Time required for submission of all as built drawings and manuals.	
We, the undersigned hereby undertake to meet the above time schedule from the date of issue of Letter of Intent/Purchaser Order.		
SIGNATURE :		
DESIGNATION :		
COMPANY :		
SEAL OF COMPANY	DATE	:



CT.SPAN (20000mm)



SIDE VIEW



Sketch No. TWMP/2018/GC/01
 Hooks approach and LT girder arrangement