Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

An ISO 9001 Company

ENQUIRY NOTICE INVITING TENDER	Phone: +91 431 257 7653 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	Enquiry Number: 2621600003	Enquiry Date: 30.04.2016	Due date for submission of quotation: 25.05.2016

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Quantity
10	30 Ton EOT Crane, Span 22.70 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1.00 No.**
20	20 Ton EOT Crane, Span 22.70 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**4.00 Nos**
30	10 Ton EOT Crane, Span 22.70 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**2.00 Nos.**
40	5 Ton EOT Crane, Span 7.75 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1.00 No.**
50	5 Ton EOT Crane, Span 10.75 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1.00 No.**
60	5 Ton EOT Crane, Span 12.50 Mtr as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1.00 No.**

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Important points to be taken care during submission of offer

a) Delivery required
30 Ton EOT Crane} Supply: 6 Months from the date of PO, E&C: 2.5 Months from the date of
20 Ton EOT Crane} intimation by BHEL to vendor for deputation of their Engineers for E&C.
10 Ton EOT Crane}

5 Ton EOT Crane – Supply: 5 Months from the date of PO, E&C: 2.5 Months from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.

b) EMD for this Tender will be (INR) : 2,00,000.00

c) PRICE BIDS ARE TO BE SUBMITTED FOR EACH LINE ITEM IN SEPARATE SEALED COVERS INDICATING ENQUIRY NO. ITEM DESCRIPTION WITH ITEM SL.NO

d) Compliance Form No.TRY/IND/06 to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.

e) All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

PATTERN OF DISTRIBUTION OF CRANES WHEN THE SAME VENDOR BECOMES L1 FOR ALL ITEMS OR EXCEEDING 7 CRANES

Condition after Reverse Auction / PBO---------->				If Vendor B accepts L1 rate	If Vendor B not accepting and Vendor C accepts L1 rate
Type of Crane	Qty. in Nos.	L1 bidder	Qty. that shall be ordered on Vendor - A	Qty. that shall be ordered on Vendor -B	Qty. that shall I be ordered on Vendor-C
30 T – Span 22.7M	**1**	A	1 No.	----	----
20 T – Span 22.7M	**4**	A	2 Nos.	** 2 Nos.	
10 T – Span 22.7M	**2**	A	1 No.	** 1 No.	
5T – Span 7.75M	**1**	A	1 No.	----	----
5T – Span 10.75M	**1**	A	1 No.	----	----
5T – Span 12.50M	**1**	A	1 No.	----	----
Total	10		**7 Nos.**	**3 Nos.**	

** Note: Except the Qty. of cranes mentioned for vendor - A as above, for the remaining qty./cranes (ie.20 Ton Crane – 2 Nos. and 10 Ton Crane – 1 No), counter offer (L1 rate) will be extended to all other vendors B, C, D, E....etc up to n – 1 vendors (n-1= ie.H1 Bidder in case of sealed bid auction of Reverse Auction and also H1 Bidder in PBO) and the order will be given to the vendor who accepts first in the order of counter offering by BHEL.

In Reverse Auction, during English Reverse, if more than one vendor is not offering, counter offer possibility is not there and hence order will be released for that item on the L1 vendor who offered it. For any case, if the counter offer is not acceptable to any other vendor, bidder A (L1) will be awarded the order.

In any case, one single vendor will not be awarded with more than 7 cranes, except when no other bidder accepts the L1 rate in the counter offer process, in the above case of single / same vendor becoming L1 for all the items.

Above distribution pattern will be applicable, only when a single / same vendor exceeds 7 cranes as L1 bidder

If vendor other than "A", becomes L1 for 10 Ton crane, counter offering will be done only for 20Ton crane, if bidder A is L1 in addition to 30Ton – 1No. and 5Ton – all 3 types.

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BHEL's General guidelines / instructions (refer MM / CE / GENL / 001 - EMD) including bank guarantee formats and list of consortium banks, commercial terms - Compliance Form can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2621600003".	
Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For **BHARAT HEAVY ELECTRICALS LIMITED** DGM / Capital Equipment / MM

S. KARUNANIDHY
Dy. General Manager
Capital Equipment / MM
BHEL, Tiruchirappalli - 620 014.

PART 1

The tender contains two parts- PART 1, Technical and Commercial bid and PART 2, price bid. PART 1 of the tender is again divided into sub clauses, SECTION I, SECTION II and SECTION III.

NOTE: PART –I has three sections which are to be filled and submitted as Technical and Commercial Offer

SECTION –I - One page (1 of 3)
SECTION –II - Two pages (2 & 3 of 3)
SECTION –III - Twenty nine pages (1 to 29)

SECTION – I: CHECK LIST FOR VENDORS

Vendor to note the following

S.No.	INSTRUCTIONS TO VENDOR	VENDOR'S RESPONSE
1.0	The VENDOR shall submit the offer in TWO PARTS - Technical and commercial bid, PART 1 and Price Bid, PART 2.	
2.0	The Offer shall be submitted in the same format as given in section-III. The vendor's offer shall have detailed response against each clause and a mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words may lead to disqualification of the Technical Offer.	
3.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets and complete technical details of 'Bought-Out-Items' with a copy of Product Catalogue and Selection Criteria against each item.	
4.0	The Technical and Commercial Offer shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
5.0	VENDOR has to indicate the Country of Origin for the supply of equipment.	

SECTION-II: -QUALIFYING CRITERIA

The VENDOR has to compulsorily meet the following requirements to get qualified for consideration of the technical offer for the SUPPLY OF
30T 22.7m span EOT CRANE : Quantity - 1 No.

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	The vendor should have minimum 5 years' experience in design, fabrication, supply and commissioning of EOT cranes.	
2.0	Only those vendor (OEM), who have supplied and commissioned at least ONE crane of 30Ton or higher capacity double girder EOT type class-3 with minimum span of 22.7 Mtr or higher, fitted with Variable voltage variable frequency converter drive, in the last five years and such crane is working satisfactorily for more than one year after commissioning (on the original date of opening of Tender), shall quote.	
3.0	Vendor to submit ONE Performance certificate along with their offer from any of their customer for satisfactory performance of the crane referred in above clause , supplied to them and is working satisfactorily for more than one year after commissioning (as on original date of opening of Tender). Copy of Purchase Order with all Annexures, corresponding Commissioning certificate/test certificate and performance certificate shall be submitted along with the offer for the above reference. Suggestive performance certificate format is given in the annexure	
4.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
5.0	The vendor should have 'in-house' or 'self-owned' facility for FABRICATION and TESTING in fully assembled condition at 125 % of the rated capacity of the crane.	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the Equipment :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5.
   a) Crane Type: Double Girder EOT crane- Yes / NO

   b) Crane Capacity (Metric Tonnes):

   c) Crane span :

   d) Mechanism class: Type 3 –Yes / No

   e) Drive: VVVF type- Yes/ No

6. Performance of the Equipment : Satisfactory /
   (Strike off whichever is not applicable)
   Not Satisfactory

7. Any other remarks:

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

SECTION-III

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
1.0.0	**APPLICATION**	a) The subject crane is meant for the purpose of handling small to large (within the lifting capacity of the crane) components, in a heavy and large steel fabrication shop floor. b) The crane will be put to use for continuous duty with CT, LT and Hoist movements, which may occur simultaneously (within the operating parameters specified under Clause Nos. – 3.1.0, 3.4.0, 3.6.0 and 3.7.0). c) The shop floor environment will be dust prone, humid, welding fume filled and ambient temperature going up to 45 °C.	
2.0.0	**SCOPE OF SUPPLY**	30T capacity EOT crane of Long Travel (LT) span - 22,700mm. : Quantity - 1 No. a) Design as per Tender Specifications b) Detailed Design and Manufacture as per BHEL Specifications c) Complete Assembly and Testing before Dispatch at Supplier Works d) Supply in Modules / Sub-Assemblies e) Complete Erection and wiring/cabling of the EOT Crane f) Commissioning and Performance Prove-Out of the EOT crane at BHEL, Trichy. g) Performance Guarantee for 12 months, from the date of commissioning.	
3.0.0	**TECHNICAL SPECIFICATIONS**		

SECTION-III

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.1.0	**CAPACITY**	Lifting Capacity	
3.1.1	Main Hoist	30 Metric Ton	
3.1.2	Auxiliary Hoist	10 Metric Ton	
3.2.0	**SPAN**	Wheel Centre to Wheel Centre Dimensions (Rail Centre to Rail Centre)	
3.2.1	Long Travel (LT)	22,700 mm	
3.2.2	Cross Travel (CT) Wheel gauge	3,200 mm	
3.3.0	Height of Lift	13,500 mm [Effective Height of Lift for both the HOISTS]	
3.4.0	Duty Class	Class – 3 [Indoor Service]	
3.4.1	Mechanism Group Classification	M 6	
3.5.0	LT wheel base	6,000 mm Minimum	
3.5.1	CT wheel base	3,200 mm Minimum	
3.6.0	**DUTY CYCLE**	Related to Drive Motor & Mechanisms	
3.6.1	Hoists	40 % CDF	
3.6.2	Long Travel	40 % CDF	
3.6.1	Cross Travel	40 % CDF	
3.7.0	**SPEED**	Operating / Working Speed [Maximum]	
3.7.1	Main Hoist	7.5 mtrs. / minute.	
3.7.2	Auxiliary Hoist	15.0 mtrs. / minute.	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.7.3	Cross Travel (CT)	30.0 mtrs. / minute.	
3.7.4	Long Travel (LT)	60.0 mtrs. / minute.	
3.8.0	**HOOK APPROACH**	Main Hoist shall be positioned closer to the Operator cabin	
3.8.1	**Main Hoist approach (On cabin side)**	2,000mm.	
3.8.2	**Main Hoist Hook approach (On opposite side)**	2,300mm.	
3.9.0	**MOTOR RATINGS**	Electric Motor Ratings & Frame Sizes	
3.9.1	Main Hoist	Min.53.5 kW ; Frame Size – 280S	
3.9.2	Auxiliary Hoist	Min.35 kW ; Frame Size – 250M	
3.9.3	Cross Travel (CT)	Min. 9.3 kW ; Frame Size – 160M	
3.9.4	Long Travel (LT)	Min. 2 x 22 kW ; Frame Size – 200L	
3.9.5	Motor type	Electric Motor Ratings & Frame Sizes shall be as per IS-325 and IS-1231. All motors shall be of 6 pole, sq. cage induction motors with 300 starts per hour rating and shall be of S4 duty cycle suitable for VVVF Drive starting, running, braking.	
3.10.0	**ACCELERATION**		
3.10.1	Cross Travel (CT)	300 mm / sec.sq.	
3.10.2	Long Travel (LT)	300 mm / sec. sq.	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS			VENDOR's TECHNICAL OFFER (With Complete Details)
3.11.0	**GEAR BOX**	**Type / Mounting**	**Centre distance between Input & output shafts Range (mm)**	**No. of stages of gear reduction**	
3.11.1	Main Hoist	HR*	750 to 800	2 or 3	
3.11.2	Auxiliary Hoist	HR	650 to 710	2 or 3	
3.11.3	Cross Travel (CT)	VR**	475 to 550	2 or 3	
3.11.4	Long Travel (LT)	HR	500 to 560	2 or 3	
**HR – Horizontal Reducer* ***VR – Vertical Reducer*					
3.12.0	**HOIST ROPE DETAILS**	Construction:6x37 or 6x36; Fiber core; Tensile strength 1770 kg/mm sq.			
3.12.1	Main Hoist	Dia. 22 mm ; Falls - 8			
3.12.2	Auxiliary Hoist	Dia. 18 mm ; Falls - 4			
3.13.0	**CONTROL**				
3.13.1	Control system	Frequency Converter type for all motions (with VVVF drive)			
3.13.2	Operational controls	Through Cabin Control and Radio Remote Control with option for control selection (using 3 way selector switch provided at end carriage)			
3.14.0	Control Voltage	110 V AC			
3.15.0	Input Power Supply	415 Volts with ± 10% fluctuation , 50 Hz with ± 3%			

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		fluctuation, 3 Phase- AC	
3.16.0	**STANDARDS**		
3.16.1	DESIGN STANDARD	IS – 807 & 3177 / 2006	
3.16.2		The specifications in these technical specifications are complementary to those set in the Indian Standard Specification IS 3177 and IS 807 mentioned above. If any one of the conditions mentioned in the specification is at variance with those of BIS, the technical specification herein shall prevail.	
3.16.3		1. All equipment and material shall comply with appropriate Indian Standards (Latest) or national Standards of the country of the origin provided latter or equivalent to or better than the former. 2. The equipment shall also comply with latest Indian Electricity Rules, as regards safety requirement and other essential provisions of the act applicable to the installation and operation of the EOT cranes. 3. Items for which Indian standards are not published, national standard of the country of origin shall be applicable. All latest standards indicated in schedule C3 of IS: 3177/1999 should be applicable in general. 4. The equipment shall be designed to facilitate inspection, cleaning, replacement, repair and for	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		use where continuity of operation and safety are important.	
3.17.0	**Runway Rail Size**		
3.17.1	Cross Travel (CT)	ISR 60 Lbs./Yard	
3.17.2	Long Travel (LT)	ISR 90 lbs./Yard	(For reference only - not supplier scope)
3.18.0	**Wheel Size**		
3.18.1	Cross Travel (CT)	Dia. 320 mm - 4 nos	
3.18.2	Long Travel (LT)	Dia. 630 mm – 4 nos	
3.19.0	**Brake Drum Size**		
3.19.1	Main Hoist*	Dia. 400 mm – 1 no	
3.19.2	Auxiliary Hoist*	Dia. 300 mm -1 no	
3.19.3	Cross Travel (CT)	Dia. 200 mm -1 No	
3.19.4	Long Travel (LT)	Dia. 250 mm – 2 Nos	
**Hoist brake drums shall be of BCH make only (refer S.No.8.4.0).*			
3.20.0	Long Travel Motion	Dual Drive Mechanism shall be provided for LT (Long Travel) Motion.	
4.0.0	End Clearance	End Clearances to be fixed to suit the workshop building clearances [Refer Drawing No. **3-M-02A06-15581** – Drawing enclosed with the tender as **ANNEXURE-1.**]	
5.0.0	**STRUCTURAL FABRICATION**	Crane Structure Constructional Details	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.1.0	Bridge / Girder & End carriages of LT and CT	Plate formed Box type Construction for Girders, End carriages of LT and CT	
5.1.1	Cross section of bridge girder	The minimum dimensions of the bridge girders shall be as given below. 1. Girder Height (Flange inner- inner) – 1500mm 2. Girder width (Web inner- inner) – 584mm 3. Top flange plate thickness – 16mm 4. Bottom flange plate thickness – 12mm 5. Web plate thickness – 8mm 6. Width of top and bottom flanges – 620mm 7. Vertical diaphragm plate thickness – 6mm • Maximum Distance between long diaphragms – 1200mm • Vertical Diaphragms shall be made of solid plates only • Horizontal Stiffener to be provided- An ISA 50x50x6 shall be provided throughout the length of the web (for both webs) at about 1/3rd of the bridge height from the top.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.1.2	Limiting Deflection	The maximum vertical deflection of the girder produced by the dead load, the weight of the trolley and the rated load shall not exceed 1/1000 of the span of the crane.	
5.1.2	Camber for bridge	The Crane Bridge shall be cambered at the top as well as the bottom. The camber after erection at site (during commissioning) shall not be less than 22mm. The manufacturer shall suitably calculate camber while plate cutting to compensate for welding distortion during fabrication, dead load deflection after erection and permanent set after load test at his works during PDI.	
5.2.0	Cross section of LT End carriage	The minimum dimensions of the End carriages shall be as given below. 1. Height (Flange inner- inner) – 650mm. 2. Width (Web inner- inner) – 320mm. 3. Top flange plate thickness – 12mm. 4. Bottom flange plate thickness – 12mm. 5. Web plate thickness – 8 mm. 6. Width of Top flange and Bottom flange – 380mm. 7. Vertical diaphragm plate thickness – 6 mm. • Vertical Diaphragms shall be made of solid plates only.	
5.3.0	Jacking pads	Jacking pad shall be provided between web plates of end carriage ends for removal of LT and CT Wheels.	
5.4.0	Wheel Clearance	Minimum clearance to be maintained between rail top	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		and bottom flange of end carriage shall be as follows 1. For Long travel – 100 mm. 2. For Cross travel – 50 mm.	
5.5.0	Sweeper Plates	The End carriages should be provided with sweeper plates at all four corners.	
5.6.0	Bridge-End Carriage connection.	1. The main girder shall extend over the whole width of the end carriage and the extension shall have sufficient section to take the maximum reaction and moment. 2. The girder shall be rigidly attached to the end carriages by suitable end plates, capable of resisting the torsional movement at the end of the girder. 3. The bridge girders should be connected to end carriages by large gusset plates and Turned fitted bolts in reamed holes should be used (Also refer to S.No.6.6.0.).	
5.7.0	Raw Material	Only steel plates tested and certified for quality by reputed inspection authorities, shall be used. Test Certificates to be produced for BHEL verification and form part of the documentation.	
5.8.0	Welded Joints	To be followed for Girder & End carriage Fabrication	
5.8.1	Number of butt welded joints allowed in web and flange plates of bridge girder.	Max Two joints only. (Joint at the center of the span shall be avoided.)	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.8.2	Welding between Web plate and Top flange	Full welding shall be done on the outside between web plates and top flange. On the inside equal stitch welding of 100mm to be done between web plate and top flange.	
5.8.3	Welding of Vertical diaphragms	The vertical diaphragms shall be equal stitch welded to the top flange and both the webs. The length of stitch welding shall be 100mm.	
5.8.4	Welding Electrodes	a. For all Horizontal Welding E 7018 /ER70S-6 (MIG) Electrode only should be used. b. For all Vertical Welding E 7048 /ER70S-6 (MIG) Electrode only should be used.	
5.8.5	Welded Joint Testing	All Butt Welded Joints (compression / tension and flanges / web joints) shall be subjected to 100% radiography Testing and the Films and its reports are to be produced to BHEL for verification and form part of the documentation.	
5.9.0	Splice Joints	NO bolted SPLICE JOINT IS ALLOWED IN GIRDER FABRICATION [Girder has to be of SINGLE PIECE only to the total length of the span 22,700 mm].	
5.10.0	Platform on Girders	The Platforms provided on both the Girders shall be for full length and fixed through BOLTED JOINTS only. 6mm thick Chequered plates shall be used for the platforms. The width of the platform shall be as follows 1. Drive Bridge – 1,200mm. 2. Non-drive bridge – 800mm.	
5.10.1	Platform rafters	The rafters shall not be more than 1,200mm apart. The rafters and handrails shall have bolted joints. The rafters	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		shall be in alignment with the internal stiffeners of the bridge girders.	
5.11.0	DSL Maintenance cage	A DSL repair cage shall be provided on the Non-Drive bridge for DSL maintenance purposes. The trap door and mounting points for the DSL repair cage shall be provided on both ends of the Auxiliary bridge so that the cage can be mounted as per requirement. Proper access ladder shall be provided for the cage. Note: Distance of DSL lines from LT rail – 230mm. (For reference)	
5.12.0	Operator Cabin	The Operator cabin shall be open type. The side walls of the cabin shall be of wire mesh to ensure maximum visibility. The cabin shall be mounted on one end of the main bridge – 800mm from the LT rail centre. A vertical access ladder shall be provided for the operator cabin. The opening in the platform for operator entry and exit shall be at least 700mmx700mm.	
5.13.0	Wheel Assembly	The Wheel Assembly for Cross Travel (CT) & Long Travel (LT) shall be LIVE AXLE SYSTEM with L-Type Bearings. They shall be as per BHEL Drawing No. **3-M-02R-0011993**. [Drawing is enclosed and given as **ANNEXURE -2**].	
5.14.0	Trolley weld NDT Examination	All welds of the CT trolley main frame shall be tested by LPI.	
5.15.0	Machining Operation	All mechanical mating surfaces and wheel seating areas are to be machined and protected as per relevant Indian	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Standards.	
5.16.0	Surface Cleaning	The Girders, End carriages and the Trolley are to be thoroughly cleaned after completion of all operations but prior to painting.	
5.17.0	**Painting**	**The crane parts are to be painted as follows**	
5.17.1	At supplier works	During Stage-I inspection, the interior surfaces of the girder & end carriage shall be painted with one coat of red oxide before closing. This shall be verified during inspection.	
5.17.2	At supplier works	During Stage-II inspection, the crane shall be painted with One coat of Primer with 25 microns of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. The crane shall be dispatched with one coat of Primer only.	
5.17.3	At Erection Site	After the crane erection is complete, the crane has to be painted as follows a. Touch-up painting of Primer wherever necessary b. Two coats of Enamel Paint (Color – Tractor Orange) each with a DFT of 25 microns and intermittent curing of minimum 16 hours.	
5.17.4	Paint & labor	All paints and labor etc. for painting at site also shall be the scope of the crane supplier.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.0.0	**MECHANICAL ELEMENTS**		
6.1.0	Gearboxes	1. Gearboxes shall be specially designed for crane duty. 2. Gearbox casing shall be of fabricated type, made from minimum 8mm thick plate and stress relieved prior to machining. 3. The radial clearance between the gearboxes inner surface and outside diameter of the gears, shall not be less than 20mm. 4. The facial clearance between the inner surface of the gearbox and the face of gear and pinion shall be at least 10mm. 5. Gearboxes shall be provided with lugs or other means of lifting. 6. The gearboxes shall be provided with breather vents, oil level indicator, dipstick and easily accessible drain plug. 7. All gear boxes shall be oil tight and sealed with the heat resistant and leak proof rubber gasket.	
6.2.0	Gears	1. The gears shall be of suitable wear resistant alloy steel and should confirm to relevant Indian standard. All gears shall be fully hardened and ground or lapped in sets. Surface hardening is not permitted. The hardness of the pinions and gears shall be in the range of 300-350 BHN and 250-300 BHN respectively. The difference in hardness of pinion and gears shall not be less	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		than 20 BHN. 2. Gears in all the Stages shall be helical in design. 3. Test certificates for material and heat treatment shall be produced for BHEL verification and shall form part of documentation.	
6.3.0	Rope Drum	Shall be of fabricated type and stress relieved. The circumferential weld joints shall be tested by 100 % Radiography for quality assurance.	
6.3.1	Main Hoist rope drum size	Min. 500 mm diameter (at the bottom of the grove)	
6.3.2	Aux. Hoist rope drum size	Min. 400 mm diameter (at the bottom of the grove)	
6.3.3	Main Hoist & Auxiliary Hoist rope drums Location.	Main Hoist & Auxiliary Hoist rope drums shall be at the middle of the CT span.	
6.3.4	Flange in rope drum	Main Hoist & Auxiliary Hoist rope drums shall be provided with minimum 100mm height flange at both ends to prevent rope slip.	
6.4.0	Type of Coupling	Between : a) Motor and Gear Box - Full gear coupling. b) Gear Box and Rope Drum - Geared rope drum coupling / spline shaft. c) Gear Box and Wheels (For LT and CT) - Half gear coupling with floating shaft (Minimum floating shaft length for Long Travel shall be 1500 mm).	
6.4.1	Placing of CT gear box	The CT gearbox shall be located at the center of the CT span.	
6.5.0	Wheels	The Wheels shall be of Forged and Wheel Tread	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		hardened to 300/350 BHN. Wheels shall be fitted with L-Type Bearings (Also refer to S.No.5.13.0.). Test certificates for material and tread hardness shall be produced for BHEL verification and shall form part of documentation.	
6.6.0	Mechanical Joints	Fit Bolts shall be as per IS 3640-1982 for all joints connecting the main members and platform supports.	
6.7.0	**Main Hoist & Aux. Hoist Hook block assemblies**	In both Main Hoist and Aux. Hoist Hook block assemblies the Hook housing shall be mounted on separate trunnion pin and not on the pulley centre pin.	
6.7.1	**Pulley size**	**Pulley sizes shall be as follows**	
6.7.2	Main Hoist & Aux. Hoist Pulley	Bottom block and top return pulleys - 500mm. (at the bottom of the grove)	
6.7.3	Main Hoist & Aux. Hoist eq. pulley	320mm with antifriction bearing. (at the bottom of the grove)	
6.8.0	Hook latch	Hook latch shall be provided for Main Hoist & Aux. Hoist hooks	
6.9.0	Gear & thruster oil	Appropriate grade oil should be supplied for all gearboxes and thruster brakes to the required quantity.	
6.10.0	Buffer	Spring loaded buffer shall be provided for LT and CT end carriages as per standard.	
6.11.0	Tools	The following tools of makes acceptable to BHEL shall be supplied along with each crane. Vendor to clearly specify the make of each item in the	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		offer.	
6.11.1	List of Tools	1. 3T chain pulley block Indef make - 1 no. 2. 20T Hydraulic Jack (Remote type) ENERPAC make - 1 set.	
7.0.0	**ELECTRICAL ELEMENTS**		
7.1.0	Type of Brakes	a. Main Hoist - DC Brake with panel. b. Auxiliary Hoist - DC Brake with panel. c. Cross Travel - Thruster brake. d. Long Travel - Thruster brake.	
7.2.0	Ingress Protection	All Panels, Limit-Switches and Motors shall have IP 54 protection.	
7.2.1	Control panels	Individual panels shall be provided for 1. Protective panel, 2. Main Hoist, 3. Aux. Hoist, 4. LT & CT combined.	
7.3.0	Electric Contactors	All Panels shall have only SIEMENS / L&T / INDO-ASIAN Contactors and shall be suitable for AC3 Duty Class. The coil voltage of all the contactors shall be 110 V. Suitable surge suppressors shall be provided for all contactors.	
7.4.0	Contactors Rating	The rating of all Contactors shall be at least 50% higher than the respective electric motor full load current at the specified duty cycle.	
7.5.0	VVVF drive	1. Rating of VVVF drive shall be at least 25% higher	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		than the respective electric motor rating at the specified duty cycle. *(Also refer to S.No.8.23.0, Note-1)* 2. Dynamic Braking Unit (DBU) with suitable DBR shall be supplied for Hoist, LT & CT motion. DBU & DBR selection shall be as per OEM recommendation with respect to the selected Drive Capacity. The duty cycle of all the DBRs shall be 40%.	
7.6.0	Illumination	a. Two numbers of LED flood lights shall be provided for shop floor illumination under the crane. b. All Electric Panels shall be provided with suitable illumination for visibility and trouble shooting.	
7.6.1	LED Bridge lights	LED Flood Lights: Nominal Voltage: 220-240W Mains Frequency: 50 Hz Nominal Wattage: Minimum 160W Body Material: Aluminum die-cast Product Color: Metallic grey Protection: IP65 Cover Material: Toughened or Tempered glass Color Rendering Index, Ra >70 Shall conform to LM80. Mounting: The fittings should be supported by shock proof rubber sheet. The lights shall be mounted rigidly	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		and safely on the End carriages between the bridges (1 No. on each side).	
7.7.0	Master Controller	A 4-Step Controller has to be provided for a. Main Hoist. b. Auxiliary Hoist. c. Long Travel. d. Cross Travel. Note: Cam discs should be made of metal / Bakelite only.	
7.8.0	Under Voltage Relay	An Under voltage relay shall be provided on the output of control transformer.	
7.9.0	Anti-Collision Device	An Anti-Collision Device of infra-red type shall be provided on both sides of the crane. The operating range shall be 3.0 meters to 10.0 meters.	
7.10.0	Load Cell	a. For main hoist, load Weighing System (with tolerance +/- 1% of SWL) with LOAD CELL (shear pin type) to be fixed / provided at the equalizer pulley. b. The remote display shall be of 100 mm size (JUMBO) Note: JUMBO display and controller shall be wired and mounted on the CT trolley.	
7.10.1	Overload Prevention System	The crane shall be supplied with an overload prevention system that senses the load through the load cell and if the load is above the Safe Working Load, the hoist motion shall be tripped.	
7.11.0	Limit Switches	The crane shall be provided with the following limit	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		switches. 1. Hoist Limit- Each hoist shall be provided with both rotary and counter weight limits. 2. CT Limit – Lever type limit switch 3. LT Limit – Lever type limit switch	
7.12.0	Moulded Case Circuit Breaker	MCCBs shall be provided for Protective panel, Hoist, Long Travel and Cross travel motions.	
7.13.0	Cabin	The following items shall be provided in the cabin. 1. Operator chair (fixed), 2. Light, 3. Fan, 4. Warning bell, 5. Remote Indication lamp and 6. Push button station – with the following buttons a. OFF Push Button - Mushroom Head [Plastic] Stay put- colour in RED. b. ON Push Button - Illuminated [GREEN colour 110Vac BA9 Filament Lamp] Flush type Push button[Plastic] c. BELL pushbutton – Projecting Head[Plastic] Push Button actuator [BLACK Colour] d. BRIDGE LIGHT ON/OFF switch - 2-Position Selector switch[Plastic] e. Each Push buttons and switch should have Legend Plate with Inscription of START, STOP, BELL & LIGHT ON/OFF	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		marked clearly. 7. A rubber mat shall be provided at the floor of the cabin. 8. Two nos. of switch-pin sockets shall be provided in the cabin.	
7.14.0	CT Cabling	Drag chain with cable system shall be used for CT motion. The cabling system shall be provided on the Non-drive / Idler bridge. For Drag chain the make and specification to be submitted with offer with specific details of prevention of wear of chain due to chain sliding.	
7.15.0	Electric Cables and recommended current rating	All the cables used in the crane shall be insulated flexible copper cables as per IS:1554 (Part-I)- 1964 and the current rating shall be as per IS: 3961 (Part-II)- 1967	
7.16.0	**CURRENT COLLECTORS (for DSL Shrouded conductor system)**		
7.16.1	Requirement	125A current collectors – 8 nos.	
7.16.2	Current Rating	125A	
7.16.3	Current collector type	Sliding contact with sufficient Contact pressure while on Movement (MACC 125A)	
7.16.4	Tolerance in Collector movement	Horizontal +/-200 mm & Vertical +/- 60 mm	
7.16.5	Mounting Bracket	Suitable mounting brackets – 2 Nos. Each mounting bracket shall support 4 Nos. current collectors.	
7.17.0	**Earthing**	A ring earthing system shall be provided on the crane.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Each and every electrical equipment shall be connected to this earthing at least at two points by means of suitable copper flat .The earthing shall be connected to the fourth line in DSL system through current collector.	
7.18.0	**Compulsory Spares**	The following spares shall be compulsorily supplied along with each crane. Vendor to clearly specify the makes of each item in the offer 1. Warning bell – 1 no. 2. Limit switches – 1 No. of each variety used in the crane. 3. Main Hoist & Aux. Hoist Brake drums – 1 no each. 4. Oil Seals - 1 No of each variety used in the crane. 5. Cable drag chain – one set of mounting end plates and links equivalent to one meter length. 6. The Input pinion shaft for Hoist, LT & CT Gearbox – 1 No. each. 7. Control card for Hoist VVVF Drive – 1 No.	
8.0.0	**SELECTION of BOI and COMPONENTS**	The makes of Components or Bought-Out-Items shall be strictly as per the list given below.	
8.1.0	Hoist Hooks	HERMAN MOHTTA / HERCULES / SILPA UDYOG / SMRITI FORGINGS / KARACHIWALA	
8.2.0	Wire Rope	USHA MARTIN / FORT WILLIAM / RA WIRE ROPE	
8.3.0	Electric Motors	GEC / BHARAT BIJLEE / SIEMENS / KEC/ ALSTHOM	
8.4.0	DC Brake Unit	BCH make Brake Drum, Brake unit and Brake Panel.	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.5.0	Thruster Brake Unit	ELECTROMAG / SPEED-O-CONTROL / OMEGA	
8.6.0	Radio Remote Control	Tele crane make(F24-10D) / Ittowa make (winner)	
8.7.0	Limit Switch (Gravity Type)	SIEMENS / INDUSTRIAL SYNDICATE / BCH / SKC / SOC	
8.8.0	Contactors	SIEMENS / L&T / INDO-ASIAN.	
8.9.0	Over-Load-Relay	SIEMENS /L&T (THERMAL TYPE)	
8.10.0	Under voltage relay	SIEMENS /L&T	
8.11.0	HRC Fuses	GE / L&T /SIEMENS	
8.12.0	Rotary limit switch	SIEMENS / OMEGA / SOC / INDUSTRIAL SYNDICATE	
8.13.0	Switch fuse unit	L&T / SIEMENS / GEC	
8.14.0	Moulded case C.B	SIEMENS / L&T	
8.15.0	Cable drag chain	IGUS / CABLE SCHLEPP/ TSUBAKIMOTO/ GORTRAC	
8.16.0	Push - Buttons	SIEMENS / L&T /AIRON	
8.17.0	Connectors	ELMAX make or reputed make with IS approved and acceptable BHEL.	
8.18.0	Couplings	KOP-FLEX / FENNER / LOVE-JOY / ESCO / ALLFLEX / SKF.	
8.19.0	Bearings	SKF / ZKL / TIMKEN / NBC / FAG.	
8.20.0	Cables	ELKAY / KUNDAN / GOVIND / GLOSTER / NICCO / L&T / RADIANT / HAVELLS / MARDIA / DELTON / RR / SIECHEM / FINOLEX.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.21.0	Bridge Light Fittings	PHILIPS / GE / CROMPTON GREAVES / HPL / OSRAM / BAJAJ / HAVELLS / SYSKA.	
8.22.0	Load Cell	IPA make only.	
8.23.0	VVVF Drives	FUJI / MITSUBISHI / YASKAWA / TOSHIBA. Note: Crane specific model from the above shall be selected. VVVF drive for Main Hoist, Auxiliary Hoist, LT & CT motions shall be of a single make.	
8.24.0	Gear boxes	ELECON / SHANTHI GEARS / RADICON / CROMTON GREAVES / NU-TECK / AGNEE TRANSMISSIONS.	
8.25.0	DSL Current collectors	SAFE-TRACK / SAFE-LINE / SILVER-LINE / SAFE-LINK / NBM INDUSTRIES.	
9.0.0	**DOCUMENTS/ DETAILS for APPROVAL**	The following documents and details are to be submitted for BHEL Approval, prior to taking up the manufacture of the crane.	
9.1.0	Drawings and Documents	Set-I: a. Calculations for Selection of Electric Motors, Gear Reducers, Brakes, Couplings, Spring Buffers, etc. b. Calculations for Bridge Girder, Crab, End - Carriage and their connections. c. GA Drawing of the Crane. d. GA Drawing of Trolley. e. GA Drawing of Individual Mechanisms. Set-II: a. Drawings of Bridge, End-Carriage and their	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		connection. b. Sub-Assembly Drawing for Wheels, Hook Blocks, Gear Boxes, Hoist rope drums and all brake Drums. c. Wiring Diagram with Logic Circuits with bill of materials. d. Cable Selection based on Current Rating and cable schedule. Initially Set-I drawings to be submitted in one lot and approval to be obtained from BHEL. Based on this, set II drawings to be submitted for approval. The vendor shall provide the Technical catalogues of the following bought-out items: 1. Steel Wire rope 2. Crane duty electric motors 3. Gearbox 4. DC Brake with panel 5. Thruster Brake 6. Radio Remote 7. Limit Switches 8. Load cell 9. VVVF Drive along with DBR selection chart. 10. Cable drag chain	
9.2.0	Technical Details	a. Total Weight of the Crane including all Electrical Equipment. b. Total Weight of Trolley including all Electrical Equipment c. Weight of each Bridge assembled and ready for	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		erection with and without Mechanical and Electrical Equipment. d. Weight of End-carriage assembled and ready for erection. e. Total Weight of Structural, Mechanical and electrical Equipment and indicated separately also. f. Weight of Operator's Cabin together with all Equipment mounted in it.	
10.0.0	INSPECTION	The following schedule of stage inspections is to be strictly adhered to, prior to dispatch from the suppliers works.	
10.1.0	STAGE – I	a. Verification of Test Certificate for Raw Materials used for Girders, End-Carriages, Trolley, Gear Box Casings, etc. b. Verification of X-Ray Report of Butt-Joints in the Girders and Random Testing on the Welds, by physical examination. c. Box Girder setting before closing of the Bottom Flanges – for inspecting the quality of welding and presence of waviness d. Trolley Frame Fabrication before setting the Mechanisms e. End–Carriage Fabrication before closing of the Bottom Flanges The following Test certificates to be produced during Stage-I Inspection a. TC for plates used for bridge fabrication	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		b. TC for plates used for End carriage fabrication c. TC for the steel rounds used for Gear fabrication. d. TC for plates used for Gearbox casing fabrication. e. X-Ray film and report for all the Butt-Joints in the girders.	
10.2.0	STAGE – II/ FINAL	a. Inspection of Bridges, End–Carriages and platform fabrication. b. Verification of Span & Diagonal Dimensions, Checking of Wheel Alignment, Mechanical Assemblies and Total Alignment. c. Free running of all the Mechanisms. d. Measurement of CAMBER in the Bridges. e. Complete assembly of the crane and free-running of all mechanisms f. Full / Rated Load Test for bridges and trolley and Deflection Test g. Deflection and Permanent Set Measurement. h. 25% OVER-LOAD Lifting Ability Check. The following Test Certificates to be produced during Stage-II Inspection. 1. TC for all Hoist Hooks 2. TC for Steel Wire ropes 3. TC for Heat treatment and final hardness for all gears. 4. TC for Wheel Hardness for LT and CT 5. TC for all thruster brakes 6. TC for all DCEM Brakes 7. TC for all motors	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		8. TC for all limit switches 9. TC for all VVVF Drives.	
11.0.0	**CRANE ERECTION & COMMISSIONING**		
11.1.0	Crane Erection & Cabling	Complete crane erection/installation, wiring/cabling of the various components at BHEL shall be the scope of the supplier.	
11.1.1	Supplier scope	Mobile crane, Welding & cutting equipment, All electrical & mechanical tools, labour and all consumables like electrodes, oxygen, acetylene, kerosene, oil, paint, etc., are in the scope of the supplier. All relevant PPE (Personal Protective Equipment) for the labourers is also under supplier scope.	
11.1.2	BHEL scope	BHEL shall provide Lifting tackles & Electricity at free of cost.	
11.2.0	Crane Commissioning	Commissioning of the Crane, Camber conformance (>22mm) and Performance Prove –Out for 125% of Crane's Capacity and Smooth Functioning of the Crane shall be the RESPONSIBILITY of the supplier.	
12.0.0	**O & M MANUALS**	The Crane shall be provided with the following: 1. VFD Programming & Maintenance manual and Technical Information catalogue of VFD 2. Data Sheet containing the Program data loaded in the VFD units. 3. Manual for the Load cell calibration and trouble	

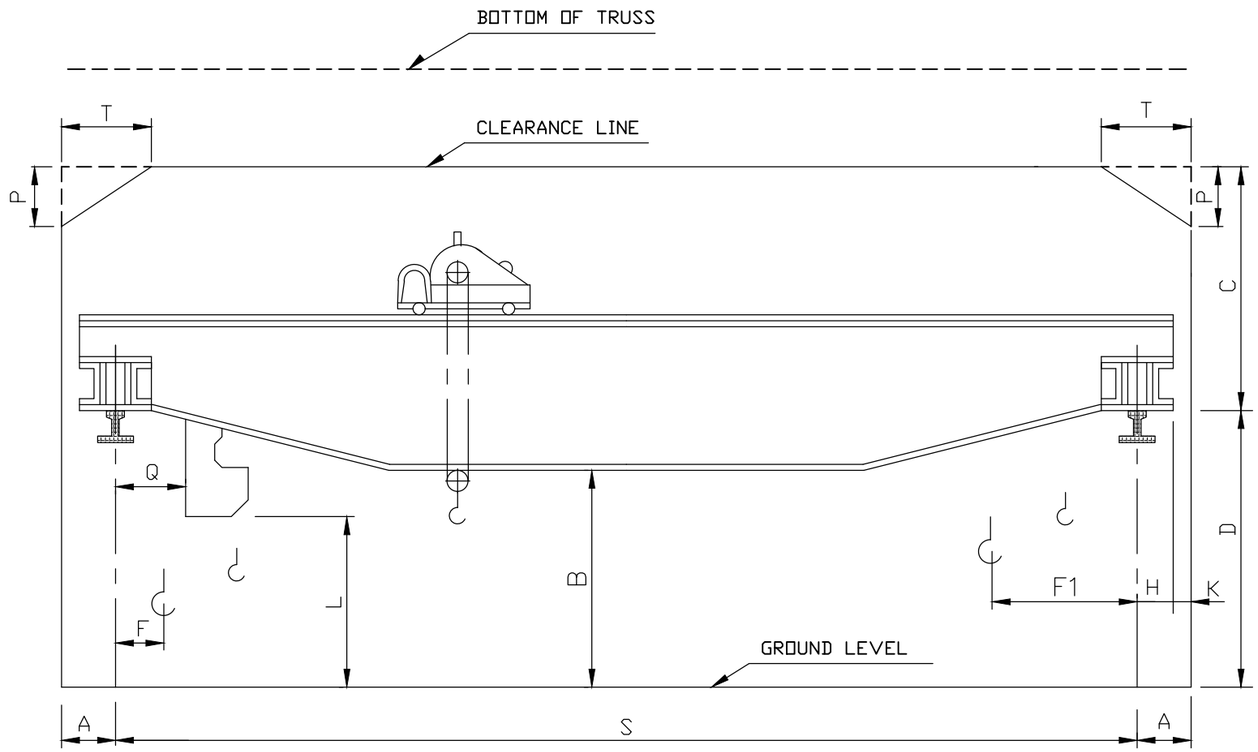
S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		shooting. 4. THREE hard Copies of Erection, Operation & Maintenance Manual for the crane and ONE soft copy in CD, containing the following technical details: a. Crane GA Drawing. b. Crab Assembly Drawing. c. Total Crane Wiring Schematics. d. Detailed Wiring Diagrams for Sub-Systems /Panels. e. VVVF Drive's Logic Circuits. f. Wheel Assembly Drawings. g. Bottom Block Assembly Drawing. h. Gear Box Assembly Drawings. i. Coupling Drawing and Details. j. Recommended list of spares. k. A complete list of All Bought-Out Items with Specifications & Ratings. l. Warranty/Guarantee Card for all Bought Out-items. m. Trouble Shooting Chart for all Systems. 5. Operation & Maintenance manual of Load Weighing System.	
13.0.0	**TRAINING**	The Supplier shall arrange 2 days training for BHEL persons at BHEL works free of cost on programming, operation, maintenance and trouble shooting of the offered drive.	

TECHNICAL SPECIFICATIONS FOR 30/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
14.0.0	**PERFORMANCE GUARANTEE**	The Performance of the Total Crane and/or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 12 months from the date of performance acceptance at BHEL Works or 18 months from the date of supply whichever is earlier.	

ALL DIMENSIONS ARE IN MILLIMETRES

DRAWING NO: 3-M-02A06-15581



	30T×22700/13.5H.T
S	22700
D	13500
C	2400
A	300
K	100
T	600
P	600
B	
L	
Q	800
F	2000
F1	2300
H	

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REV	DATE	ALTERED
		CHECKED
ZONE		APPROVED

ITEM NO	DESCRIPTION	DRAWING NO	MATL CODE	UNIT WT
			MATL SPEC	QTY

EQPT: E O T CRANE / 30Tx22.7M / 13.5 H.T

Bharat Heavy Electricals Ltd
HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

	NAME	SIGNATURE	DATE
DRN	G.Govindaraj	G.Govindaraj	30.03.16
CHD	G.Govindaraj	G.Govindaraj	30.03.16
APPD	G.Thiagarajan	G.Thiagarajan	30.03.16

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ASSY DWG NO	ITEM
M&S	¢/M/F IS: 2102	–	–		
CODE 2597				REF TO OLD DWG NO –	

TITLE
CLEARANCE DIAGRAM FOR E.O.T CRANE (30Tx22700 / 13.5H.T)

CARD CODE: U 01

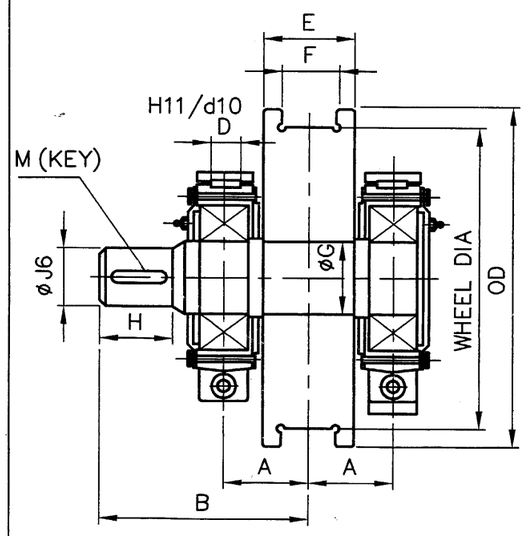
DRAWING NO : 3-M-02A06-15581

REV: 00

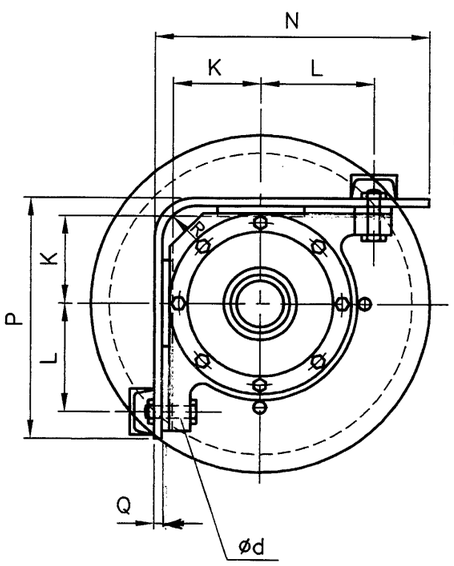
A3–SIZE

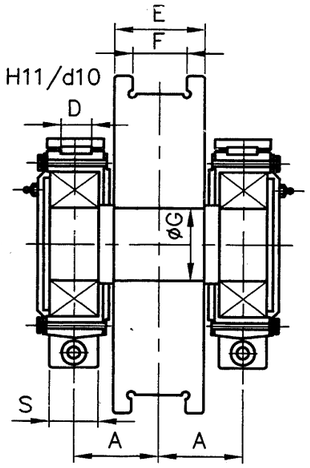
ALL DIMENSIONS ARE IN MM

SL. No.	O.D. (WHEEL DIA) IN MM	RAIL SIZE	A	B	D	E	F	øG	H	øJ	K	L	ød	M (KEY)	N	P	Q	S	R	COUPLING No.	SKF BRG No. & BRG. SIZE	TOTAL WEIGHT IN Kg. FOR DRIVE & IDLE
			DIMENSIONS																			
16	800/850	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	687	588	20	150	80	107	22330 150x320x108	870.00 845.00
15		CR-80	168	420	80	180	110	152	125	110	212	255	32	28x16x115	687	588	20	150	80	106	22330 150x320x108	796.00 775.00
14	710/750	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	642	588	20	150	80	107	22330 150x320x108	808.00 784.00
13		CR-100 CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	728.50 711.50
12		CR-80	180	400	71	180	110	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	653.00 636.00
11	630/680	CR-80/CR-100 & CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	567	517	20	130	80	106	22326 130x280x93	629.00 611.50
10		90-105 Lbs/Yd CR-80	150	365	60	180	105	111	110	90	160	190	26	25x14x100	547	462	20	120	60	105	22322 110x240x80	448.00 434.50
9	500/550	CR-80 CR-100	160	375	60	180	125	111	110	90	160	190	26	22x14x100	482	462	20	120	60	105	22322 110x240x80	253.00 245.50
8		CR-80	150	360	50	180	125	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	389.00 378.00
7		60/75/90 & 105 Lbs/Yd	150	360	50	180	105	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	301.00 294.00
6	400/450	CR-80 CR-100	150	360	50	180	125	91	105	80	125	160	26	22x14x90	395	395	20	100	50	104	22318 90x190x64	253.00 245.50
5		90 Lbs/Yd 105 Lbs/Yd	145	315	40	180	105	76	85	70	112	140	22	20x12x75	375	345	16	90	50	103	22315 75x160x55	197.00 192.00
4	320/370	75 / 90 & 105 Lbs/Yd CR-80	145	315	40	180	105	76	85	70	112	140	22	20x12x75	345	345	16	90	50	103	22315 75x160x55	162.00 157.00
3		50 SQ.BAR 60 Lbs/Yd 75 Lbs/Yd	112.5	260	40	125	85	61	65	55	85	112	17	16x10x55	312	287	16	80	50	102	22312 60x130x46	118.50 118.00
2	250/280	50 SQ.BAR 60 / 90 & 105 Lbs/Yd	105	250	32	125	85	61	65	55	76	100	17	16x10x55	254	249	12	60	40	102	22212 60x110x28	66.00 63.00
1	200/230	30 Lbs/Yd 50 SQ.BAR 60 Lbs/Yd	95	220	32	100	67	46	55	40	71	95	17	12x8x45	239	232	12	65	40	101	22309 45x100x36	51.00 50.00



DRIVING WHEEL ASSY





IDLE WHEEL ASSY

MATERIAL :- SHAFT - 45C8/IS:1570.
WHEEL - 55C8/IS:5517.
FORGED.
TREAD PORTION WHEEL HARDNESS 300 TO 350 (BHN)

No.of Pieces	DESCRIPTION	MATERIAL	STANDARD	NET.WT.IN KGS.	DRAWING No.	ITEM No.
REFERENCE:			COMPONENT CODE: 29		EQUIPMENT CODE: 00	
			ALTERATIONS:	DCN REF	DATE	SIGN.	INDEX
SCALE \	DRAWN						
	CHECKED	R.Ramamoorthy					
	APPROVED						
	DATE	20-10-2000					

MACHINE: CRANE WHEEL ASSY
TYPE: GENERAL
TITLE: STANDARD CRANE WHEEL ASSY
DRAWING No: 3-M-02R-11993 00
REV.
No.of Sheets: Sheet No:

PART 1

The tender contains two parts- PART 1, Technical and Commercial bid and PART 2, price bid. PART 1 of the tender is again divided into sub clauses, SECTION I, SECTION II and SECTION III.

NOTE: PART –I has three sections which are to be filled and submitted as Technical and Commercial Offer

SECTION –I - One page (1 of 3)
SECTION –II - Two pages (2 & 3 of 3)
SECTION –III - Twenty nine pages (1 to 29)

SECTION – I: CHECK LIST FOR VENDORS

Vendor to note the following

S.No.	INSTRUCTIONS TO VENDOR	VENDOR'S RESPONSE
1.0	The VENDOR shall submit the offer in TWO PARTS - Technical and commercial bid, PART 1 and Price Bid, PART 2.	
2.0	The Offer shall be submitted in the same format as given in section-III. The vendor's offer shall have detailed response against each clause and a mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words may lead to disqualification of the Technical Offer.	
3.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets and complete technical details of 'Bought-Out-Items' with a copy of Product Catalogue and Selection Criteria against each item.	
4.0	The Technical and Commercial Offer shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
5.0	VENDOR has to indicate the Country of Origin for the supply of equipment.	

SECTION-II: -QUALIFYING CRITERIA

The VENDOR has to compulsorily meet the following requirements to get qualified for consideration of the technical offer for the SUPPLY OF
20T 22.7m span EOT CRANE : Quantity - 4 Nos.

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	The vendor should have minimum 5 years' experience in design, fabrication, supply and commissioning of EOT cranes.	
2.0	Only those vendor (OEM), who have supplied and commissioned at least TWO cranes of 20 Ton or higher capacity double girder EOT type class-3 with minimum span of 22.7 Mtr or higher, fitted with Variable voltage variable frequency converter drive, in the last five years and such cranes are working satisfactorily for more than one year after commissioning (as on original date of opening of Tender), shall quote.	
3.0	Vendor to submit Performance certificates along with their offer from minimum TWO of their customers for satisfactory performance of the cranes referred in above clause , supplied to them and are working satisfactorily for more than one year after commissioning (as on original date of opening of Tender). Copy of Purchase Order with all Annexures, corresponding Commissioning certificate/test certificate and performance certificate shall be submitted along with the offer for the above reference. Suggestive performance certificate format is given in the annexure.	
4.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
5.0	The vendor should have 'in-house' or 'self-owned' facility for FABRICATION and TESTING in fully assembled condition at 125 % of the rated capacity of the cranes.	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the Equipment :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5.
   a) Crane Type: Double Girder EOT crane- Yes / NO

   b) Crane Capacity (Metric Tonnes):

   c) Crane span :

   d) Mechanism class: Type 3 –Yes / No

   e) Drive: VVVF type- Yes/ No

6. Performance of the Equipment : Satisfactory /
   (Strike off whichever is not applicable)
   Not Satisfactory

7. Any other remarks:

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

SECTION-III

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
1.0.0	**APPLICATION**	a) The subject crane is meant for the purpose of handling small to large (within the lifting capacity of the crane) components, in a heavy and large steel fabrication shop floor. b) The crane will be put to use for continuous duty with CT, LT and Hoist movements, which may occur simultaneously (within the operating parameters specified under Clause Nos. – 3.1.0, 3.4.0, 3.6.0 and 3.7.0). c) The shop floor environment will be dust prone, humid, welding fume filled and ambient temperature going up to 45 °C.	
2.0.0	**SCOPE OF SUPPLY**	20T capacity EOT crane of Long Travel (LT) span - 22,700mm. : Quantity - 4 Nos. a) Design as per Tender Specifications b) Detailed Design and Manufacture as per BHEL Specifications c) Complete Assembly and Testing before Dispatch at Supplier Works d) Supply in Modules / Sub-Assemblies e) Complete Erection and wiring/cabling of the EOT Crane f) Commissioning and Performance Prove-Out of the EOT crane at BHEL, Trichy. g) Performance Guarantee for 12 months, from the date of commissioning.	
3.0.0	**TECHNICAL SPECIFICATIONS**		

SECTION-III

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.1.0	**CAPACITY**	Lifting Capacity	
3.1.1	Main Hoist	20 Metric Ton	
3.1.2	Auxiliary Hoist	10 Metric Ton	
3.2.0	**SPAN**	Wheel Centre to Wheel Centre Dimensions (Rail Centre to Rail Centre)	
3.2.1	Long Travel (LT)	22,700 mm	
3.2.2	Cross Travel (CT) Wheel gauge	3,000 mm	
3.3.0	Height of Lift	9,000 mm [Effective Height of Lift for both the HOISTS]	
3.4.0	Duty Class	Class – 3 [Indoor Service]	
3.4.1	Mechanism Group Classification	M 6	
3.5.0	LT wheel base	5,200 mm Minimum	
3.5.1	CT wheel base	3,200 mm Minimum	
3.6.0	**DUTY CYCLE**	Related to Drive Motor & Mechanisms	
3.6.1	Hoists	40 % CDF	
3.6.2	Long Travel	40 % CDF	
3.6.1	Cross Travel	40 % CDF	
3.7.0	**SPEED**	Operating / Working Speed [Maximum]	
3.7.1	Main Hoist	7.5 mtrs. / minute.	
3.7.2	Auxiliary Hoist	15.0 mtrs. / minute.	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.7.3	Cross Travel (CT)	30.0 mtrs. / minute.	
3.7.4	Long Travel (LT)	60.0 mtrs. / minute.	
3.8.0	**HOOK APPROACH (CT)**	Main Hoist shall be positioned closer to the Operator cabin	
3.8.1	**Main Hoist approach (On cabin side)**	1950mm.	
3.8.2	**Main Hoist Hook approach (On opposite side)**	2200mm.	
3.9.0	**MOTOR RATINGS**	Electric Motor Ratings & Frame Sizes	
3.9.1	Main Hoist	Min.35 kW ; Frame Size – 250M	
3.9.2	Auxiliary Hoist	Min.35 kW ; Frame Size – 250M	
3.9.3	Cross Travel (CT)	Min. 7.5 kW ; Frame Size – 132M	
3.9.4	Long Travel (LT)	Min. 2 x 18 kW ; Frame Size – 200L	
3.9.5	Motor type	Electric Motor Ratings & Frame Sizes shall be as per IS-325 and IS-1231. All motors shall be of 6 pole, sq. cage induction motors with 300 starts per hour rating and shall be of S4 duty cycle suitable for VVVF Drive starting, running, braking.	
3.10.0	**ACCELERATION**		
3.10.1	Cross Travel (CT)	300 mm / sec.sq.	
3.10.2	Long Travel (LT)	300 mm / sec. sq.	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS			VENDOR's TECHNICAL OFFER (With Complete Details)
3.11.0	**GEAR BOX**	**Type / Mounting**	**Centre distance between Input & output shafts Range (mm)**	**No. of stages of gear reduction**	
3.11.1	Main Hoist	HR*	650 to 710	2 or 3	
3.11.2	Auxiliary Hoist	HR	650 to 710	2 or 3	
3.11.3	Cross Travel (CT)	VR**	400 to 475	2 or 3	
3.11.4	Long Travel (LT)	HR	400 to 450	2 or 3	
**HR – Horizontal Reducer* ***VR – Vertical Reducer*					
3.12.0	**HOIST ROPE DETAILS**	Construction:6x37 or 6x36; Fiber core; Tensile strength 1770 kg/mm sq.			
3.12.1	Main Hoist	Dia. 18 mm ; Falls - 8			
3.12.2	Auxiliary Hoist	Dia. 18 mm ; Falls - 4			
3.13.0	**CONTROL**				
3.13.1	Control system	Frequency Converter type for all motions (with VVVF drive)			
3.13.2	Operational controls	Through Cabin Control and Radio Remote Control with option for control selection (using 3 way selector switch provided at end carriage)			
3.14.0	Control Voltage	110 V AC			
3.15.0	Input Power Supply	415 Volts with ± 10% fluctuation , 50 Hz with ± 3%			

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		fluctuation, 3 Phase- AC	
3.16.0	**STANDARDS**		
3.16.1	DESIGN STANDARD	IS – 807 & 3177 / 2006	
3.16.2		The specifications in these technical specifications are complementary to those set in the Indian Standard Specification IS 3177 and IS 807 mentioned above. If any one of the conditions mentioned in the specification is at variance with those of BIS, the technical specification herein shall prevail.	
3.16.3		1. All equipment and material shall comply with appropriate Indian Standards (Latest) or national Standards of the country of the origin provided latter or equivalent to or better than the former. 2. The equipment shall also comply with latest Indian Electricity Rules, as regards safety requirement and other essential provisions of the act applicable to the installation and operation of the EOT cranes. 3. Items for which Indian standards are not published, national standard of the country of origin shall be applicable. All latest standards indicated in schedule C3 of IS: 3177/1999 should be applicable in general. 4. The equipment shall be designed to facilitate inspection, cleaning, replacement, repair and for	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		use where continuity of operation and safety are important.	
3.17.0	**Runway Rail Size**		
3.17.1	Cross Travel (CT)	ISR 60 Lbs./Yard	
3.17.2	Long Travel (LT)	ISR 90 lbs./Yard	(For reference only - not supplier scope)
3.18.0	**Wheel Size**		
3.18.1	Cross Travel (CT)	Dia. 320 mm - 4 nos	
3.18.2	Long Travel (LT)	Dia. 500 mm – 4 nos	
3.19.0	**Brake Drum Size**		
3.19.1	Main Hoist*	Dia. 300 mm – 1 no	
3.19.2	Auxiliary Hoist*	Dia. 300 mm -1 no	
3.19.3	Cross Travel (CT)	Dia. 160 mm -1 No	
3.19.4	Long Travel (LT)	Dia. 200 mm – 2 Nos	
**Hoist brake drums shall be of BCH make only (refer S.No.8.4.0).*			
3.20.0	Long Travel Motion	Dual Drive Mechanism shall be provided for LT (Long Travel) Motion.	
4.0.0	End Clearance	End Clearances to be fixed to suit the workshop building clearances [Refer Drawing No. **3-M-02A49-15582** – Drawing enclosed with the tender as **ANNEXURE-1.**]	
5.0.0	**STRUCTURAL FABRICATION**	Crane Structure Constructional Details	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.1.0	Bridge / Girder & End carriages of LT and CT	Plate formed Box type Construction for Girders, End carriages of LT and CT	
5.1.1	Cross section of bridge girder	The minimum dimensions of the bridge girders shall be as given below. 1. Girder Height (Flange inner- inner) – 1270mm 2. Girder width (Web inner- inner) – 464mm 3. Top flange plate thickness – 16mm 4. Bottom flange plate thickness – 12mm 5. Web plate thickness – 8mm 6. Width of top and bottom flanges – 500mm 7. Vertical diaphragm plate thickness – 6mm • Maximum Distance between long diaphragms – 1200mm • Vertical Diaphragms shall be made of solid plates only • Horizontal Stiffener to be provided- An ISA 50x50x6 shall be provided throughout the length of the web (for both webs) at about 1/3rd of the bridge height from the top.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.1.2	Limiting Deflection	The maximum vertical deflection of the girder produced by the dead load, the weight of the trolley and the rated load shall not exceed 1/1000 of the span of the crane.	
5.1.2	Camber for bridge	The Crane Bridge shall be cambered at the top as well as the bottom. The camber after erection at site (during commissioning) shall not be less than 22mm. The manufacturer shall suitably calculate camber while plate cutting to compensate for welding distortion during fabrication, dead load deflection after erection and permanent set after load test at his works during PDI.	
5.2.0	Cross section of LT End carriage	The minimum dimensions of the End carriages shall be as given below. 1. Height (Flange inner- inner) – 550mm. 2. Width (Web inner- inner) – 292mm. 3. Top flange plate thickness – 12mm. 4. Bottom flange plate thickness – 12mm. 5. Web plate thickness – 8 mm. 6. Width of Top flange and Bottom flange – 350mm. 7. Vertical diaphragm plate thickness – 6 mm. • Vertical Diaphragms shall be made of solid plates only.	
5.3.0	Jacking pads	Jacking pad shall be provided between web plates of end carriage ends for removal of LT and CT Wheels.	
5.4.0	Wheel Clearance	Minimum clearance to be maintained between rail top	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		and bottom flange of end carriage shall be as follows 1. For Long travel – 100 mm. 2. For Cross travel – 50 mm.	
5.5.0	Sweeper Plates	The End carriages should be provided with sweeper plates at all four corners.	
5.6.0	Bridge-End Carriage connection.	1. The main girder shall extend over the whole width of the end carriage and the extension shall have sufficient section to take the maximum reaction and moment. 2. The girder shall be rigidly attached to the end carriages by suitable end plates, capable of resisting the torsional movement at the end of the girder. 3. The bridge girders should be connected to end carriages by large gusset plates and Turned fitted bolts in reamed holes should be used (Also refer to S.No.6.6.0.).	
5.7.0	Raw Material	Only steel plates tested and certified for quality by reputed inspection authorities, shall be used. Test Certificates to be produced for BHEL verification and form part of the documentation.	
5.8.0	Welded Joints	To be followed for Girder & End carriage Fabrication	
5.8.1	Number of butt welded joints allowed in web and flange plates of bridge girder.	Max Two joints only. (Joint at the center of the span shall be avoided.)	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.8.2	Welding between Web plate and Top flange	Full welding shall be done on the outside between web plates and top flange. On the inside equal stitch welding of 100mm to be done between web plate and top flange.	
5.8.3	Welding of Vertical diaphragms	The vertical diaphragms shall be equal stitch welded to the top flange and both the webs. The length of stitch welding shall be 100mm.	
5.8.4	Welding Electrodes	a. For all Horizontal Welding E 7018 /ER70S-6 (MIG) Electrode only should be used. b. For all Vertical Welding E 7048 /ER70S-6 (MIG) Electrode only should be used.	
5.8.5	Welded Joint Testing	All Butt Welded Joints (compression / tension and flanges / web joints) shall be subjected to 100% radiography Testing and the Films and its reports are to be produced to BHEL for verification and form part of the documentation.	
5.9.0	Splice Joints	NO bolted SPLICE JOINT IS ALLOWED IN GIRDER FABRICATION [Girder has to be of SINGLE PIECE only to the total length of the span 22,700 mm].	
5.10.0	Platform on Girders	The Platforms provided on both the Girders shall be for full length and fixed through BOLTED JOINTS only. 6mm thick Chequered plates shall be used for the platforms. The width of the platform shall be as follows 1. Drive Bridge – 1,200mm. 2. Non-drive bridge – 800mm.	
5.10.1	Platform rafters	The rafters shall not be more than 1,200mm apart. The rafters and handrails shall have bolted joints. The rafters	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		shall be in alignment with the internal stiffeners of the bridge girders.	
5.11.0	DSL Maintenance cage	A DSL repair cage shall be provided on the Non-Drive bridge for DSL maintenance purposes. The trap door and mounting points for the DSL repair cage shall be provided on both ends of the Auxiliary bridge so that the cage can be mounted as per requirement. Proper access ladder shall be provided for the cage. Note: Distance of DSL lines from LT rail – 230mm. (For reference)	
5.12.0	Operator Cabin	The Operator cabin shall be open type. The side walls of the cabin shall be of wire mesh to ensure maximum visibility. The cabin shall be mounted on one end of the main bridge – 800mm from the LT rail centre. A vertical access ladder shall be provided for the operator cabin. The opening in the platform for operator entry and exit shall be at least 700mmx700mm.	
5.13.0	Wheel Assembly	The Wheel Assembly for Cross Travel (CT) & Long Travel (LT) shall be LIVE AXLE SYSTEM with L-Type Bearings. They shall be as per BHEL Drawing No. **3-M-02R-0011993**. [Drawing is enclosed and given as **ANNEXURE -2**].	
5.14.0	Trolley weld NDT Examination	All welds of the CT trolley main frame shall be tested by LPI.	
5.15.0	Machining Operation	All mechanical mating surfaces and wheel seating areas are to be machined and protected as per relevant Indian	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Standards.	
5.16.0	Surface Cleaning	The Girders, End carriages and the Trolley are to be thoroughly cleaned after completion of all operations but prior to painting.	
5.17.0	**Painting**	**The crane parts are to be painted as follows**	
5.17.1	At supplier works	During Stage-I inspection, the interior surfaces of the girder & end carriage shall be painted with one coat of red oxide before closing. This shall be verified during inspection.	
5.17.2	At supplier works	During Stage-II inspection, the crane shall be painted with One coat of Primer with 25 microns of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. The crane shall be dispatched with one coat of Primer only.	
5.17.3	At Erection Site	After the crane erection is complete, the crane has to be painted as follows a. Touch-up painting of Primer wherever necessary b. Two coats of Enamel Paint (Color – Tractor Orange) each with a DFT of 25 microns and intermittent curing of minimum 16 hours.	
5.17.4	Paint & labor	All paints and labor etc. for painting at site also shall be the scope of the crane supplier.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.0.0	**MECHANICAL ELEMENTS**		
6.1.0	Gearboxes	1. Gearboxes shall be specially designed for crane duty. 2. Gearbox casing shall be of fabricated type, made from minimum 8mm thick plate and stress relieved prior to machining. 3. The radial clearance between the gearboxes inner surface and outside diameter of the gears, shall not be less than 20mm. 4. The facial clearance between the inner surface of the gearbox and the face of gear and pinion shall be at least 10mm. 5. Gearboxes shall be provided with lugs or other means of lifting. 6. The gearboxes shall be provided with breather vents, oil level indicator, dipstick and easily accessible drain plug. 7. All gear boxes shall be oil tight and sealed with the heat resistant and leak proof rubber gasket.	
6.2.0	Gears	1. The gears shall be of suitable wear resistant alloy steel and should confirm to relevant Indian standard. All gears shall be fully hardened and ground or lapped in sets. Surface hardening is not permitted. The hardness of the pinions and gears shall be in the range of 300-350 BHN and 250-300 BHN respectively. The difference in hardness of pinion and gears shall not be less	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		than 20 BHN. 2. Gears in all the Stages shall be helical in design. 3. Test certificates for material and heat treatment shall be produced for BHEL verification and shall form part of documentation.	
6.3.0	Rope Drum	Shall be of fabricated type and stress relieved. The circumferential weld joints shall be tested by 100 % Radiography for quality assurance.	
6.3.1	Main Hoist rope drum size	Min. 400 mm diameter (at the bottom of the grove)	
6.3.2	Auxiliary Hoist rope drum size	Min. 400 mm diameter (at the bottom of the grove)	
6.3.3	Main Hoist & Auxiliary Hoist rope drums Location.	Main Hoist & Auxiliary Hoist rope drums shall be at the middle of the CT span.	
6.3.4	Flange in rope drum	Main Hoist & Auxiliary Hoist rope drums shall be provided with minimum 100mm height flange at both ends to prevent rope slip.	
6.4.0	Type of Coupling	Between : a) Motor and Gear Box - Full gear coupling. b) Gear Box and Rope Drum - Geared rope drum coupling / spline shaft. c) Gear Box and Wheels (For LT and CT) - Half gear coupling with floating shaft (Minimum floating shaft length for Long Travel shall be 1500 mm).	
6.4.1	Placing of CT gear box	The CT gearbox shall be located at the center of the CT span.	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.5.0	Wheels	The Wheels shall be of Forged and Wheel Tread hardened to 300/350 BHN. Wheels shall be fitted with L-Type Bearings (Also refer to S.No.5.13.0.). Test certificates for material and tread hardness shall be produced for BHEL verification and shall form part of documentation.	
6.6.0	Mechanical Joints	Fit Bolts shall be as per IS 3640-1982 for all joints connecting the main members and platform supports.	
6.7.0	**Main Hoist & Aux. Hoist Hook block assemblies**	In both Main Hoist and Aux. Hoist Hook block assemblies the Hook housing shall be mounted on separate trunnion pin and not on the pulley centre pin.	
6.7.1	**Pulley size**	**Pulley sizes shall be as follows**	
6.7.2	Main Hoist & Aux. Hoist Pulley	Bottom block and top return pulleys - 400 mm. (at the bottom of the grove)	
6.7.3	Main Hoist & Aux. Hoist eq. pulley	250 mm with antifriction bearing. (at the bottom of the grove)	
6.8.0	Hook latch	Hook latch shall be provided for Main Hoist & Aux. Hoist hooks	
6.9.0	Gear & thruster oil	Appropriate grade oil should be supplied for all gearboxes and thruster brakes to the required quantity.	
6.10.0	Buffer	Spring loaded buffer shall be provided for LT and CT end carriages as per standard.	
6.11.0	Tools	The following tools of makes acceptable to BHEL shall be supplied along with each crane.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Vendor to clearly specify the make of each item in the offer.	
6.11.1	List of Tools	1. 3T chain pulley block Indef make - 1 no. 2. 20T Hydraulic Jack (Remote type) ENERPAC make - 1 set.	
7.0.0	**ELECTRICAL ELEMENTS**		
7.1.0	Type of Brakes	a. Main Hoist - DC Brake with panel. b. Auxiliary Hoist - DC Brake with panel. c. Cross Travel - Thruster brake. d. Long Travel - Thruster brake.	
7.2.0	Ingress Protection	All Panels, Limit-Switches and Motors shall have IP 54 protection.	
7.2.1	Control panels	Individual panels shall be provided for 1. Protective panel, 2. Main Hoist, 3. Aux. Hoist, 4. LT & CT combined.	
7.3.0	Electric Contactors	All Panels shall have only SIEMENS / L&T / INDO-ASIAN Contactors and shall be suitable for AC3 Duty Class. The coil voltage of all the contactors shall be 110 V. Suitable surge suppressors shall be provided for all contactors.	
7.4.0	Contactors Rating	The rating of all Contactors shall be at least 50% higher than the respective electric motor full load current at the specified duty cycle.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
7.5.0	VVVF drive	1. Rating of VVVF drive shall be at least 25% higher than the respective electric motor rating at the specified duty cycle. *(Also refer to S.No.8.23.0, Note-1)* 2. Power Regenerative Unit / Power Regnerative Converter along with Current Suppression reactor and Power Coordinating reactor shall be supplied for Hoist VVVF Drive. The Unit and reactors shall be selected as per the OEM recommendation with respect to the selected Drive Capacity. 3. Dynamic Braking Unit (DBU) with suitable DBR shall be supplied for Hoist, LT & CT motion. DBU & DBR selection shall be as per OEM recommendation with respect to the selected Drive Capacity. The duty cycle of all the DBRs shall be 40%. 4. Note: In case of failure of Power Regenerative Unit / Power Regenerative Converter, DBU & DBR will be connected to the VVVF Drive.	
7.6.0	Illumination	a. Two numbers of LED flood lights shall be provided for shop floor illumination under the crane. b. All Electric Panels shall be provided with suitable illumination for visibility and trouble shooting.	
7.6.1	LED Bridge lights	LED Flood Lights:	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Nominal Voltage: 220-240W Mains Frequency: 50 Hz Nominal Wattage: Minimum 160W Body Material: Aluminum die-cast Product Color: Metallic grey Protection: IP65 Cover Material: Toughened or Tempered glass Color Rendering Index, Ra >70 Shall conform to LM80. Mounting: The fittings should be supported by shock proof rubber sheet. The lights shall be mounted rigidly and safely on the End carriages between the bridges (1 No. on each side).	
7.7.0	Master Controller	A 4-Step Controller has to be provided for a. Main Hoist. b. Auxiliary Hoist. c. Long Travel. d. Cross Travel. Note: Cam discs should be made of metal / Bakelite only.	
7.8.0	Under Voltage Relay	An Under voltage relay shall be provided on the output of control transformer.	
7.9.0	Anti-Collision Device	An Anti-Collision Device of infra-red type shall be provided on both sides of the crane. The operating range shall be 3.0 meters to 10.0 meters.	
7.10.0	Load Cell	a. For main hoist, load Weighing System (with tolerance +/- 1% of SWL) with LOAD CELL (shear	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		pin type) to be fixed / provided at the equalizer pulley. b. The remote display shall be of 100 mm size (JUMBO) Note: JUMBO display and controller shall be wired and mounted on the CT trolley.	
7.10.1	Overload Prevention System	The crane shall be supplied with an overload prevention system that senses the load through the load cell and if the load is above the Safe Working Load, the hoist motion shall be tripped.	
7.11.0	Limit Switches	The crane shall be provided with the following limit switches. 1. Hoist Limit- Each hoist shall be provided with both rotary and counter weight limits. 2. CT Limit – Lever type limit switch 3. LT Limit – Lever type limit switch	
7.12.0	Moulded Case Circuit Breaker	MCCBs shall be provided for Protective panel, Hoist, Long Travel and Cross travel motions.	
7.13.0	Cabin	The following items shall be provided in the cabin. 1. Operator chair (fixed), 2. Light, 3. Fan, 4. Warning bell, 5. Remote Indication lamp and 6. Push button station – with the following buttons a. OFF Push Button - Mushroom Head	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		[Plastic] Stay put- colour in RED. b. ON Push Button - Illuminated [GREEN colour 110Vac BA9 Filament Lamp] Flush type Push button[Plastic] c. BELL pushbutton – Projecting Head[Plastic] Push Button actuator [BLACK Colour] d. BRIDGE LIGHT ON/OFF switch - 2-Position Selector switch[Plastic] e. Each Push buttons and switch should have Legend Plate with Inscription of START, STOP, BELL & LIGHT ON/OFF marked clearly. 7. A rubber mat shall be provided at the floor of the cabin. 8. Two nos. of switch-pin sockets shall be provided in the cabin.	
7.14.0	CT Cabling	Drag chain with cable system shall be used for CT motion. The cabling system shall be provided on the Non-drive / Idler bridge. For Drag chain the make and specification to be submitted with offer with specific details of prevention of wear of chain due to chain sliding.	
7.15.0	Electric Cables and recommended current rating	All the cables used in the crane shall be insulated flexible copper cables as per IS:1554 (Part-I)- 1964 and the current rating shall be as per IS: 3961 (Part-II)- 1967	
7.16.0	**CURRENT COLLECTORS (for DSL Shrouded conductor system)**		

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
7.16.1	Requirement	125A current collectors – 8 nos.	
7.16.2	Current Rating	125A	
7.16.3	Current collector type	Sliding contact with sufficient Contact pressure while on Movement (MACC 125A)	
7.16.4	Tolerance in Collector movement	Horizontal +/-200 mm & Vertical +/- 60 mm	
7.16.5	Mounting Bracket	Suitable mounting brackets – 2 Nos. Each mounting bracket shall support 4 Nos. current collectors.	
7.17.0	**Earthing**	A ring earthing system shall be provided on the crane. Each and every electrical equipment shall be connected to this earthing at least at two points by means of suitable copper flat .The earthing shall be connected to the fourth line in DSL system through current collector.	
7.18.0	**Compulsory Spares**	The following spares shall be compulsorily supplied along with each crane. Vendor to clearly specify the makes of each item in the offer 1. Warning bell – 1 no. 2. Limit switches – 1 No. of each variety used in the crane. 3. Hoist Brake drum – 1 no. 4. Oil Seals - 1 No of each variety used in the crane. 5. Cable drag chain – one set of mounting end plates and links equivalent to one meter length. 6. The Input pinion shaft for Hoist, LT & CT Gearbox – 1 No. each. 7. Control card for Hoist VVVF Drive – 1 No.	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.0.0	**SELECTION of BOI and COMPONENTS**	The makes of Components or Bought-Out-Items shall be strictly as per the list given below.	
8.1.0	Hoist Hooks	HERMAN MOHTTA / HERCULES / SILPA UDYOG / SMRITI FORGINGS / KARACHIWALA	
8.2.0	Wire Rope	USHA MARTIN / FORT WILLIAM / RA WIRE ROPE	
8.3.0	Electric Motors	GEC / BHARAT BIJLEE / SIEMENS / KEC/ ALSTHOM	
8.4.0	DC Brake Unit	BCH make Brake Drum, Brake unit and Brake Panel.	
8.5.0	Thruster Brake Unit	ELECTROMAG / SPEED-O-CONTROL / OMEGA	
8.6.0	Radio Remote Control	Tele crane make(F24-10D) / Ittowa make (winner)	
8.7.0	Limit Switch (Gravity Type)	SIEMENS / INDUSTRIAL SYNDICATE / BCH / SKC / SOC	
8.8.0	Contactors	SIEMENS / L&T / INDO-ASIAN.	
8.9.0	Over-Load-Relay	SIEMENS /L&T (THERMAL TYPE)	
8.10.0	Under voltage relay	SIEMENS /L&T	
8.11.0	HRC Fuses	GE / L&T /SIEMENS	
8.12.0	Rotary limit switch	SIEMENS / OMEGA / SOC / INDUSTRIAL SYNDICATE	
8.13.0	Switch fuse unit	L&T / SIEMENS / GEC	
8.14.0	Moulded case C.B	SIEMENS / L&T	
8.15.0	Cable drag chain	IGUS / CABLE SCHLEPP/ TSUBAKIMOTO/ GORTRAC	
8.16.0	Push - Buttons	SIEMENS / L&T /AIRON	

TECHNICAL SPECIFICATIONS FOR 20/10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.17.0	Connectors	ELMAX make or reputed make with IS approved and acceptable BHEL.	
8.18.0	Couplings	KOP-FLEX / FENNER / LOVE-JOY / ESCO / ALLFLEX / SKF.	
8.19.0	Bearings	SKF / ZKL / TIMKEN / NBC / FAG.	
8.20.0	Cables	ELKAY / KUNDAN / GOVIND / GLOSTER / NICCO / L&T / RADIANT / HAVELLS / MARDIA / DELTON / RR / SIECHEM / FINOLEX.	
8.21.0	Bridge Light Fittings	PHILIPS / GE / CROMPTON GREAVES / HPL / OSRAM / BAJAJ / HAVELLS / SYSKA.	
8.22.0	Load Cell	IPA make only.	
8.23.0	VVVF Drives	FUJI / MITSUBISHI / YASKAWA / TOSHIBA. Note: 1. Crane specific model from the above shall be selected. 2. VVVF drive for Main Hoist, Auxiliary Hoist, LT & CT motions including Power Regenerative Unit / Power Regenerative Converter for Hoist Motion & Dynamic Braking Unit for Hoist, LT and CT Motion shall be of a single make.	
8.24.0	Gear boxes	ELECON / SHANTHI GEARS / RADICON / CROMTON GREAVES / NU-TECK / AGNEE TRANSMISSIONS.	
8.26.0	DSL Current collectors	SAFE-TRACK / SAFE-LINE / SILVER-LINE / SAFE-LINK / NBM INDUSTRIES.	
9.0.0	**DOCUMENTS/ DETAILS**	The following documents and details are to be submitted	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
	for APPROVAL	for BHEL Approval, prior to taking up the manufacture of the crane.	
9.1.0	Drawings and Documents	Set-I: a. Calculations for Selection of Electric Motors, Gear Reducers, Brakes, Couplings, Spring Buffers, etc. b. Calculations for Bridge Girder, Crab, End - Carriage and their connections. c. GA Drawing of the Crane. d. GA Drawing of Trolley. e. GA Drawing of Individual Mechanisms. Set-II: a. Drawings of Bridge, End-Carriage and their connection. b. Sub-Assembly Drawing for Wheels, Hook Blocks, Gear Boxes, Hoist rope drums and all brake Drums. c. Wiring Diagram with Logic Circuits with bill of materials. d. Cable Selection based on Current Rating and cable schedule. Initially Set-I drawings to be submitted in one lot and approval to be obtained from BHEL. Based on this, set II drawings to be submitted for approval. The vendor shall provide the Technical catalogues of the following bought-out items: 1. Steel Wire rope 2. Crane duty electric motors	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		3. Gearbox 4. DC Brake with panel 5. Thruster Brake 6. Radio Remote 7. Limit Switches 8. Load cell 9. VVVF Drive along with Regenerative Braking Unit / Power Regenerative Unit selection chart for hoist motion. 10. VVVF Drive along with DBR selection chart for Hoist, CT & LT motions. 11. Cable drag chain	
9.2.0	Technical Details	a. Total Weight of the Crane including all Electrical Equipment. b. Total Weight of Trolley including all Electrical Equipment c. Weight of each Bridge assembled and ready for erection with and without Mechanical and Electrical Equipment. d. Weight of End-carriage assembled and ready for erection. e. Total Weight of Structural, Mechanical and electrical Equipment and indicated separately also. f. Weight of Operator's Cabin together with all Equipment mounted in it.	
10.0.0	INSPECTION	The following schedule of stage inspections is to be strictly adhered to, prior to dispatch from the suppliers	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		works.	
10.1.0	STAGE – I	a. Verification of Test Certificate for Raw Materials used for Girders, End-Carriages, Trolley, Gear Box Casings, etc. b. Verification of X-Ray Report of Butt-Joints in the Girders and Random Testing on the Welds, by physical examination. c. Box Girder setting before closing of the Bottom Flanges – for inspecting the quality of welding and presence of waviness d. Trolley Frame Fabrication before setting the Mechanisms e. End–Carriage Fabrication before closing of the Bottom Flanges The following Test certificates to be produced during Stage-I Inspection a. TC for plates used for bridge fabrication b. TC for plates used for End carriage fabrication c. TC for the steel rounds used for Gear fabrication. d. TC for plates used for Gearbox casing fabrication. e. X-Ray film and report for all the Butt-Joints in the girders.	
10.2.0	STAGE – II/ FINAL	a. Inspection of Bridges, End–Carriages and platform fabrication. b. Verification of Span & Diagonal Dimensions, Checking of Wheel Alignment, Mechanical Assemblies and Total Alignment.	

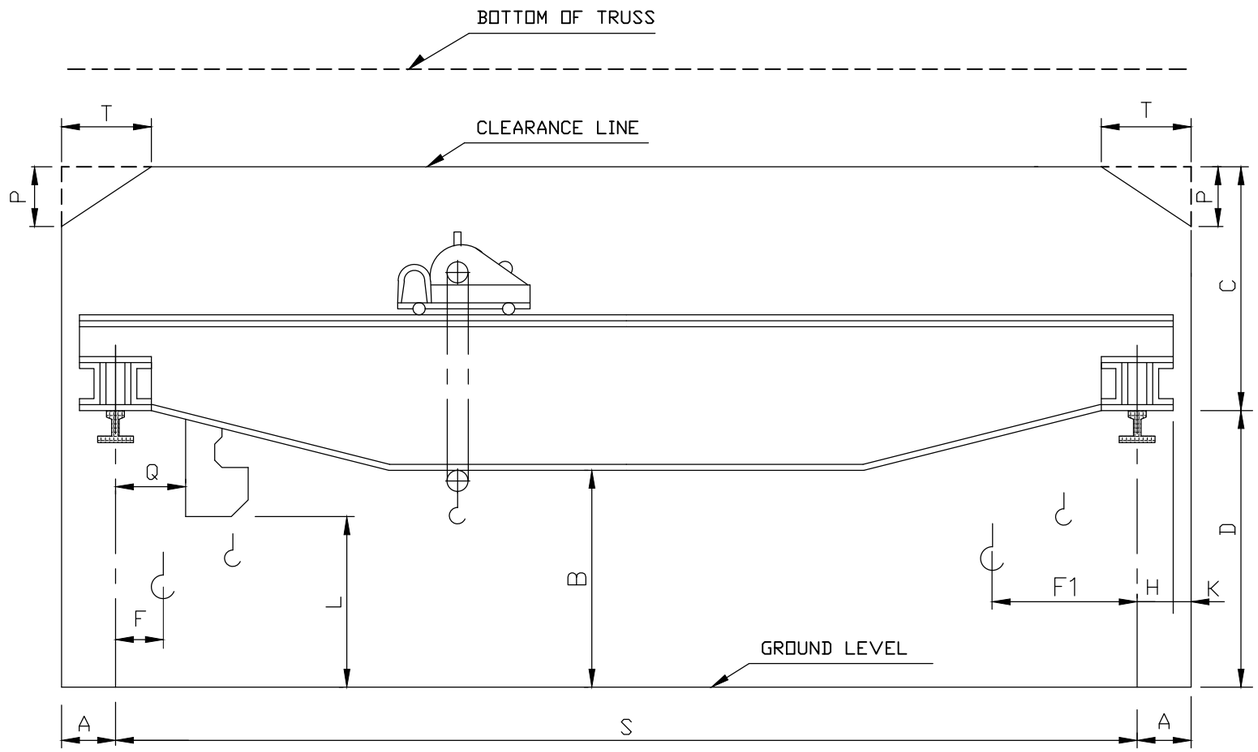
S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		c. Free running of all the Mechanisms. d. Measurement of CAMBER in the Bridges. e. Complete assembly of the crane and free-running of all mechanisms f. Full / Rated Load Test for bridges and trolley and Deflection Test g. Deflection and Permanent Set Measurement. h. 25% OVER-LOAD Lifting Ability Check. The following Test Certificates to be produced during Stage-II Inspection. 1. TC for all Hoist Hooks 2. TC for Steel Wire ropes 3. TC for Heat treatment and final hardness for all gears. 4. TC for Wheel Hardness for LT and CT 5. TC for all thruster brakes 6. TC for all DCEM Brakes 7. TC for all motors 8. TC for all limit switches 9. TC for all VVVF Drives.	
11.0.0	**CRANE ERECTION & COMMISSIONING**		
11.1.0	Crane Erection & Cabling	Complete crane erection/installation, wiring/cabling of the various components at BHEL shall be the scope of the supplier.	
11.1.1	Supplier scope	Mobile crane, Welding & cutting equipment, All electrical & mechanical tools, labour and all consumables like electrodes, oxygen, acetylene, kerosene, oil, paint, etc.,	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		are in the scope of the supplier. All relevant PPE (Personal Protective Equipment) for the labourers is also under supplier scope.	
11.1.2	BHEL scope	BHEL shall provide Lifting tackles & Electricity at free of cost.	
11.2.0	Crane Commissioning	Commissioning of the Crane, Camber conformance (>22mm) and Performance Prove –Out for 125% of Crane's Capacity and Smooth Functioning of the Crane shall be the RESPONSIBILITY of the supplier.	
12.0.0	**O & M MANUALS**	Each Crane shall be provided with the following: 1. VFD Programming & Maintenance manual and Technical Information catalogue of VFD 2. Data Sheet containing the Program data loaded in the VFD units. 3. Manual for the Load cell calibration and trouble shooting. 4. THREE hard Copies of Erection, Operation & Maintenance Manual for the crane and ONE soft copy in CD, containing the following technical details: a. Crane GA Drawing. b. Crab Assembly Drawing. c. Total Crane Wiring Schematics. d. Detailed Wiring Diagrams for Sub-Systems /Panels. e. VVVF Drive's Logic Circuits. f. Wheel Assembly Drawings.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		g. Bottom Block Assembly Drawing. h. Gear Box Assembly Drawings. i. Coupling Drawing and Details. j. Recommended list of spares. k. A complete list of All Bought-Out Items with Specifications & Ratings. l. Warranty/Guarantee Card for all Bought Out-items. m. Trouble Shooting Chart for all Systems. 5. Operation & Maintenance manual of Load Weighing System.	
13.0.0	**TRAINING**	The Supplier shall arrange 2 days training for BHEL persons at BHEL works free of cost on programming, operation, maintenance and trouble shooting of the offered drive.	
14.0.0	**PERFORMANCE GUARANTEE**	The Performance of the Total Crane and/or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 12 months from the date of performance acceptance at BHEL Works or 18 months from the date of supply whichever is earlier.	

ALL DIMENSIONS ARE IN MILLIMETRES

DRAWING NO: 3-M-02A49-15582



	20T×22700/9H.T
S	22700
D	9000
C	2400
A	300
K	100
T	600
P	600
B	
L	
Q	800
F	1950
F1	2200
H	

REV	DATE	ALTERED
		CHECKED
		APPROVED
ZONE		

ITEM NO	DESCRIPTION	DRAWING NO	MATL CODE	UNIT WT
			MATL SPEC	QTY

EQPT: E O T CRANE / 20Tx22.7M / 9 H.T

Bharat Heavy Electricals Ltd
HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

	NAME	SIGNATURE	DATE
DRN	G.Govindaraj	G.Govindaraj	30.03.16
CHD	G.Govindaraj	G.Govindaraj	30.03.16
APPD	G.Thiagarajan	G.Thiagarajan	30.03.16

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ASSY DWG NO	ITEM
M&S	¢/M/F IS: 2102	–	–		
CODE 2597				REF TO OLD DWG NO –	

TITLE
CLEARANCE DIAGRAM FOR E.O.T CRANE (20Tx22700 / 9H.T)

CARD CODE: U 01

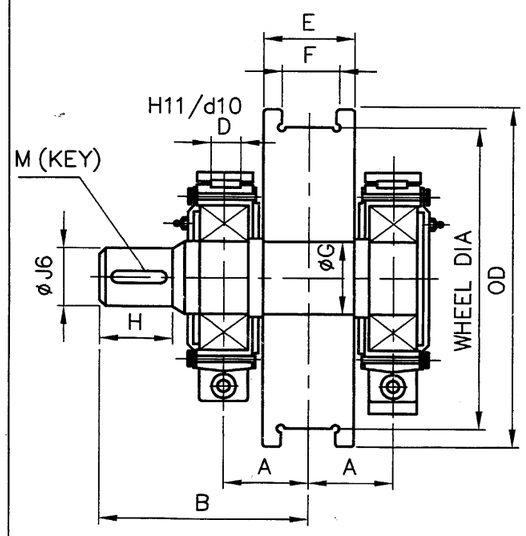
DRAWING NO : 3-M-02A49-15582

REV: 00

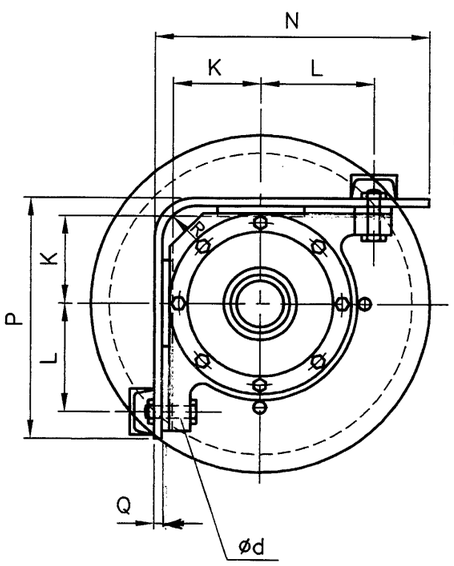
A3–SIZE

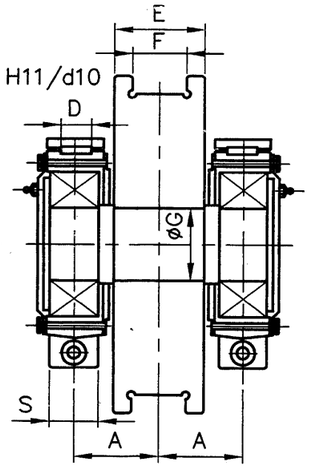
ALL DIMENSIONS ARE IN MM

SL. No.	O.D. (WHEEL DIA) IN MM	RAIL SIZE	A	B	D	E	F	øG	H	øJ	K	L	ød	M (KEY)	N	P	Q	S	R	COUPLING No.	SKF BRG No. & BRG. SIZE	TOTAL WEIGHT IN Kg. FOR DRIVE & IDLE
			DIMENSIONS																			
16	800/850	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	687	588	20	150	80	107	22330 150x320x108	870.00 845.00
15		CR-80	168	420	80	180	110	152	125	110	212	255	32	28x16x115	687	588	20	150	80	106	22330 150x320x108	796.00 775.00
14	710/750	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	642	588	20	150	80	107	22330 150x320x108	808.00 784.00
13		CR-100 CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	728.50 711.50
12		CR-80	180	400	71	180	110	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	653.00 636.00
11	630/680	CR-80/CR-100 & CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	567	517	20	130	80	106	22326 130x280x93	629.00 611.50
10		90-105 Lbs/Yd CR-80	150	365	60	180	105	111	110	90	160	190	26	25x14x100	547	462	20	120	60	105	22322 110x240x80	448.00 434.50
9	500/550	CR-80 CR-100	160	375	60	180	125	111	110	90	160	190	26	22x14x100	482	462	20	120	60	105	22322 110x240x80	253.00 245.50
8		CR-80	150	360	50	180	125	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	389.00 378.00
7		60/75/90 & 105 Lbs/Yd	150	360	50	180	105	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	301.00 294.00
6	400/450	CR-80 CR-100	150	360	50	180	125	91	105	80	125	160	26	22x14x90	395	395	20	100	50	104	22318 90x190x64	253.00 245.50
5		90 Lbs/Yd 105 Lbs/Yd	145	315	40	180	105	76	85	70	112	140	22	20x12x75	375	345	16	90	50	103	22315 75x160x55	197.00 192.00
4	320/370	75 / 90 & 105 Lbs/Yd CR-80	145	315	40	180	105	76	85	70	112	140	22	20x12x75	345	345	16	90	50	103	22315 75x160x55	162.00 157.00
3		50 SQ.BAR 60 Lbs/Yd 75 Lbs/Yd	112.5	260	40	125	85	61	65	55	85	112	17	16x10x55	312	287	16	80	50	102	22312 60x130x46	118.50 118.00
2	250/280	50 SQ.BAR 60 / 90 & 105 Lbs/Yd	105	250	32	125	85	61	65	55	76	100	17	16x10x55	254	249	12	60	40	102	22212 60x110x28	66.00 63.00
1	200/230	30 Lbs/Yd 50 SQ.BAR 60 Lbs/Yd	95	220	32	100	67	46	55	40	71	95	17	12x8x45	239	232	12	65	40	101	22309 45x100x36	51.00 50.00



DRIVING WHEEL ASSY





IDLE WHEEL ASSY

MATERIAL :- SHAFT - 45C8/IS:1570.
WHEEL - 55C8/IS:5517.
FORGED.
TREAD PORTION WHEEL HARDNESS 300 TO 350 (BHN)

No.of Pieces	DESCRIPTION	MATERIAL	STANDARD	NET.WT.IN KGS.	DRAWING No.	ITEM No.
REFERENCE:			COMPONENT CODE: 29		EQUIPMENT CODE: 00	
			ALTERATIONS:	DCN REF	DATE	SIGN.	INDEX
SCALE \	DRAWN						
	CHECKED	R.Ramamoorthy					
	APPROVED						
	DATE	20-10-2000					

MACHINE: CRANE WHEEL ASSY
TYPE: GENERAL
TITLE: STANDARD CRANE WHEEL ASSY
DRAWING No: 3-M-02R-11993 00
REV.
No.of Sheets: Sheet No:

PART 1

The tender contains two parts- PART 1, Technical and Commercial bid and PART 2, price bid. PART 1 of the tender is again divided into sub clauses, SECTION I, SECTION II and SECTION III.

NOTE: PART –I has three sections which are to be filled and submitted as Technical and Commercial Offer

SECTION –I - One page (1 of 3)
SECTION –II - Two pages (2 & 3 of 3)
SECTION –III - Twenty eight pages (1 to 28)

SECTION – I: CHECK LIST FOR VENDORS

Vendor to note the following

S.No.	INSTRUCTIONS TO VENDOR	VENDOR'S RESPONSE
1.0	The VENDOR shall submit the offer in TWO PARTS - Technical and commercial bid, PART 1 and Price Bid, PART 2.	
2.0	The Offer shall be submitted in the same format as given in section-III. The vendor's offer shall have detailed response against each clause and a mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words may lead to disqualification of the Technical Offer.	
3.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets and complete technical details of 'Bought-Out-Items' with a copy of Product Catalogue and Selection Criteria against each item.	
4.0	The Technical and Commercial Offer shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
5.0	VENDOR has to indicate the Country of Origin for the supply of equipment.	

SECTION-II: -QUALIFYING CRITERIA

The VENDOR has to compulsorily meet the following requirements to get qualified for consideration of the technical offer for the SUPPLY OF
10T 22.7m span EOT CRANE : Quantity - 2 Nos.

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	The vendor should have minimum 5 years' experience in design, fabrication, supply and commissioning of EOT cranes.	
2.0	Only those vendor (OEM), who have supplied and commissioned at least ONE crane of 10Ton or higher capacity double girder EOT type class-3 with minimum span of 22.7 Mtr or higher, fitted with Variable voltage variable frequency converter drive, in the last five years and such crane is working satisfactorily for more than one year after commissioning (on the original date of opening of Tender), shall quote.	
3.0	Vendor to submit ONE Performance certificate along with their offer from any of their customer for satisfactory performance of the crane referred in above clause , supplied to them and is working satisfactorily for more than one year after commissioning (as on original date of opening of Tender). Copy of Purchase Order with all Annexures, corresponding Commissioning certificate/test certificate and performance certificate shall be submitted along with the offer for the above reference. Suggestive performance certificate format is given in the annexure	
4.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
5.0	The vendor should have 'in-house' or 'self-owned' facility for FABRICATION and TESTING in fully assembled condition at 125 % of the rated capacity of the cranes.	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the Equipment :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5.
   a) Crane Type: Double Girder EOT crane- Yes / NO

   b) Crane Capacity (Metric Tonnes):

   c) Crane span :

   d) Mechanism class: Type 3 –Yes / No

   e) Drive: VVVF type- Yes/ No

6. Performance of the Equipment : Satisfactory /
   (Strike off whichever is not applicable)
   Not Satisfactory

7. Any other remarks:

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

SECTION-III

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
1.0.0	**APPLICATION**	a) The subject crane is meant for the purpose of handling small to large (within the lifting capacity of the crane) components, in a heavy and large steel fabrication shop floor. b) The crane will be put to use for continuous duty with CT, LT and Hoist movements, which may occur simultaneously (within the operating parameters specified under Clause Nos. – 3.1.0, 3.4.0, 3.6.0 and 3.7.0). c) The shop floor environment will be dust prone, humid, welding fume filled and ambient temperature going up to 45 °C.	
2.0.0	**SCOPE OF SUPPLY**	10T capacity EOT crane of Long Travel (LT) span - 22,700mm. : Quantity - 2 Nos. a) Design as per Tender Specifications b) Detailed Design and Manufacture as per BHEL Specifications c) Complete Assembly and Testing before Dispatch at Supplier Works d) Supply in Modules / Sub-Assemblies e) Complete Erection and wiring/cabling of the EOT Crane f) Commissioning and Performance Prove-Out of the EOT crane at BHEL, Trichy. g) Performance Guarantee for 12 months, from the date of commissioning.	
3.0.0	**TECHNICAL SPECIFICATIONS**		

SECTION-III

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.1.0	**CAPACITY**	Lifting Capacity	
3.1.1	Hoist	10 Metric Ton	
3.2.0	**SPAN**	Wheel Centre to Wheel Centre Dimensions (Rail Centre to Rail Centre)	
3.2.1	Long Travel (LT)	22,700 mm	
3.2.2	Cross Travel (CT) Wheel gauge	2,500 mm	
3.3.0	Height of Lift	9,000 mm [Effective Height of Lift for both the HOISTS]	
3.4.0	Duty Class	Class – 3 [Indoor Service]	
3.4.1	Mechanism Group Classification	M 6	
3.5.0	LT wheel base	5,000 mm Minimum	
3.5.1	CT wheel base	1,500 mm Minimum	
3.6.0	**DUTY CYCLE**	Related to Drive Motor & Mechanisms	
3.6.1	Hoist	40 % CDF	
3.6.2	Long Travel	40 % CDF	
3.6.3	Cross Travel	40 % CDF	
3.7.0	**SPEED**	Operating / Working Speed [Maximum]	
3.7.1	Hoist	7.5 mtrs. / minute.	
3.7.2	Cross Travel (CT)	30.0 mtrs. / minute.	
3.7.3	Long Travel (LT)	60.0 mtrs. / minute.	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS			VENDOR's TECHNICAL OFFER (With Complete Details)
3.8.0	**HOOK APPROACH**				
3.8.1	**Hoist Hook approach (On both sides)**	1,100mm. (pl. refer Dwg 3-M-02A28-15586)			
3.9.0	**MOTOR RATINGS**	Electric Motor Ratings & Frame Sizes			
3.9.1	Hoist	Min.30 kW ; Frame Size – 225M			
3.9.2	Cross Travel (CT)	Min. 4.9 kW ; Frame Size – 132M			
3.9.3	Long Travel (LT)	Min. 2 x 9.8 kW ; Frame Size – 200L			
3.9.4	Motor type	Electric Motor Ratings & Frame Sizes shall be as per IS-325 and IS-1231. All motors shall be of 6 pole, sq. cage induction motors with 300 starts per hour rating and shall be of S4 duty cycle suitable for VVVF Drive starting, running, braking.			
3.10.0	**ACCELERATION**				
3.10.1	Cross Travel (CT)	300 mm / sec.sq.			
3.10.2	Long Travel (LT)	300 mm / sec. sq.			
3.11.0	**GEAR BOX**	**Type / Mounting**	**Centre distance between Input & output shafts Range (mm)**	**No. of stages of gear reduction**	
3.11.1	Hoist	HR*	650 to 710	2 or 3	
3.11.2	Cross Travel (CT)	VR**	320 to 350	2 or 3	
3.11.3	Long Travel (LT)	HR	350 to 400	2 or 3	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
**HR – Horizontal Reducer* ***VR – Vertical Reducer*			
3.12.0	**HOIST ROPE DETAILS**	Construction:6x37 or 6x36; Fiber core; Tensile strength 1770 kg/mm sq.	
3.12.1	Hoist	Dia. 18 mm ; Falls - 4	
3.13.0	**CONTROL**		
3.13.1	Control system	Frequency Converter type for all motions (with VVVF drive)	
3.13.2	Operational controls	Through Cabin Control and Radio Remote Control with option for control selection (using 3 way selector switch provided at end carriage)	
3.14.0	Control Voltage	110 V AC	
3.15.0	Input Power Supply	415 Volts with ± 10% fluctuation , 50 Hz with ± 3% fluctuation, 3 Phase- AC	
3.16.0	**STANDARDS**		
3.16.1	DESIGN STANDARD	IS – 807 & 3177 / 2006	
3.16.2		The specifications in these technical specifications are complementary to those set in the Indian Standard Specification IS 3177 and IS 807 mentioned above. If any one of the conditions mentioned in the specification is at variance with those of BIS, the technical specification herein shall prevail.	
3.16.3		1. All equipment and material shall comply with	

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		appropriate Indian Standards (Latest) or national Standards of the country of the origin provided latter or equivalent to or better than the former. 2. The equipment shall also comply with latest Indian Electricity Rules, as regards safety requirement and other essential provisions of the act applicable to the installation and operation of the EOT cranes. 3. Items for which Indian standards are not published, national standard of the country of origin shall be applicable. All latest standards indicated in schedule C3 of IS: 3177/1999 should be applicable in general. 4. The equipment shall be designed to facilitate inspection, cleaning, replacement, repair and for use where continuity of operation and safety are important.	
3.17.0	**Runway Rail Size**		
3.17.1	Cross Travel (CT)	ISR 60 Lbs./Yard	
3.17.2	Long Travel (LT)	ISR 90 lbs./Yard	(For reference only - not supplier scope)
3.18.0	**Wheel Size**		
3.18.1	Cross Travel (CT)	Dia. 320 mm - 4 nos	
3.18.2	Long Travel (LT)	Dia. 500 mm – 4 nos	
3.19.0	**Brake Drum Size**		

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.19.1	Hoist*	Dia. 300 mm -1 no	
3.19.2	Cross Travel (CT)	Dia. 160 mm -1 No	
3.19.3	Long Travel (LT)	Dia. 200 mm – 2 Nos	
**Hoist brake drum shall be of BCH make only (refer S.No.8.4.0).*			
3.20.0	Long Travel Motion	Dual Drive Mechanism shall be provided for LT (Long Travel) Motion.	
4.0.0	End Clearance	End Clearances to be fixed to suit the workshop building clearances [Refer Drawing No. **3-M-02A28-15586** – Drawing enclosed with the tender as **ANNEXURE-1.**]	
5.0.0	**STRUCTURAL FABRICATION**	Crane Structure Constructional Details	
5.1.0	Bridge / Girder & End carriages of LT and CT	Plate formed Box type Construction for Girders, End carriages of LT and CT	
5.1.1	Cross section of bridge girder	The minimum dimensions of the bridge girders shall be as given below. 1. Girder Height (Flange inner- inner) – 1220mm 2. Girder width (Web inner- inner) – 464mm 3. Top flange plate thickness – 12mm 4. Bottom flange plate thickness – 8mm 5. Web plate	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		thickness – 6mm 6. Width of top and bottom flanges – 500mm 7. Vertical diaphragm plate thickness – 6mm • Maximum Distance between long diaphragms – 1100mm • Vertical Diaphragms shall be made of solid plates only • Horizontal Stiffener to be provided- An ISA 50x50x6 shall be provided throughout the length of the web (for both webs) at about 1/3rd of the bridge height from the top.	
5.1.2	Limiting Deflection	The maximum vertical deflection of the girder produced by the dead load, the weight of the trolley and the rated load shall not exceed 1/1000 of the span of the crane.	
5.1.2	Camber for bridge	The Crane Bridge shall be cambered at the top as well as the bottom. The camber after erection at site (during commissioning) shall not be less than 22mm. The manufacturer shall suitably calculate camber while plate cutting to compensate for welding distortion during fabrication, dead load deflection after erection and permanent set after load test at his works during PDI.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.2.0	Cross section of LT End carriage	The minimum dimensions of the End carriages shall be as given below. 1. Height (Flange inner- inner) – 500mm. 2. Width (Web inner- inner) – 294mm. 3. Top flange plate thickness – 10mm. 4. Bottom flange plate thickness – 10mm. 5. Web plate thickness – 8mm. 6. Width of Top flange and Bottom flange – 330mm. 7. Vertical diaphragm plate thickness – 6mm. • Vertical Diaphragms shall be made of solid plates only.	
5.3.0	Jacking pads	Jacking pad shall be provided between web plates of end carriage ends for removal of LT and CT Wheels.	
5.4.0	Wheel Clearance	Minimum clearance to be maintained between rail top and bottom flange of end carriage shall be as follows 1. For Long travel – 100 mm. 2. For Cross travel – 50 mm.	
5.5.0	Sweeper Plates	The End carriages should be provided with sweeper plates at all four corners.	
5.6.0	Bridge-End Carriage connection.	1. The main girder shall extend over the whole width of the end carriage and the extension shall have sufficient section to take the maximum reaction and moment. 2. The girder shall be rigidly attached to the end	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		carriages by suitable end plates, capable of resisting the torsional movement at the end of the girder. 3. The bridge girders should be connected to end carriages by large gusset plates and Turned fitted bolts in reamed holes should be used (Also refer to S.No.6.6.0.).	
5.7.0	Raw Material	Only steel plates tested and certified for quality by reputed inspection authorities, shall be used. Test Certificates to be produced for BHEL verification and form part of the documentation.	
5.8.0	Welded Joints	To be followed for Girder & End carriage Fabrication	
5.8.1	Number of butt welded joints allowed in web and flange plates of bridge girder.	Max Two joints only. (Joint at the center of the span shall be avoided.)	
5.8.2	Welding between Web plate and Top flange	Full welding shall be done on the outside between web plates and top flange. On the inside equal stitch welding of 100mm to be done between web plate and top flange.	
5.8.3	Welding of Vertical diaphragms	The vertical diaphragms shall be equal stitch welded to the top flange and both the webs. The length of stitch welding shall be 100mm.	
5.8.4	Welding Electrodes	a. For all Horizontal Welding E 7018 /ER70S-6 (MIG) Electrode only should be used. b. For all Vertical Welding E 7048 /ER70S-6 (MIG) Electrode only should be used.	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.8.5	Welded Joint Testing	All Butt Welded Joints (compression / tension and flanges / web joints) shall be subjected to 100% radiography Testing and the Films and its reports are to be produced to BHEL for verification and form part of the documentation.	
5.9.0	Splice Joints	NO bolted SPLICE JOINT IS ALLOWED IN GIRDER FABRICATION [Girder has to be of SINGLE PIECE only to the total length of the span 22,700 mm].	
5.10.0	Platform on Girders	The Platforms provided on both the Girders shall be for full length and fixed through BOLTED JOINTS only. 6mm thick Chequered plates shall be used for the platforms. The width of the platform shall be as follows 1. Drive Bridge – 1,200mm. 2. Non-drive bridge – 800mm.	
5.10.1	Platform rafters	The rafters shall not be more than 1,100mm apart. The rafters and handrails shall have bolted joints. The rafters shall be in alignment with the internal stiffeners of the bridge girders.	
5.11.0	DSL Maintenance cage	A DSL repair cage shall be provided on the Non-Drive bridge for DSL maintenance purposes. The trap door and mounting points for the DSL repair cage shall be provided on both ends of the Auxiliary bridge so that the cage can be mounted as per requirement. Proper access ladder shall be provided for the cage. Note: Distance of DSL lines from LT rail – 230mm. (For reference)	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.12.0	Operator Cabin	The Operator cabin shall be open type. The side walls of the cabin shall be of wire mesh to ensure maximum visibility. The cabin shall be mounted on one end of the main bridge – 800mm from the LT rail centre. A vertical access ladder shall be provided for the operator cabin. The opening in the platform for operator entry and exit shall be at least 700mmx700mm.	
5.13.0	Wheel Assembly	The Wheel Assembly for Cross Travel (CT) & Long Travel (LT) shall be LIVE AXLE SYSTEM with L-Type Bearings. They shall be as per BHEL Drawing No. **3-M-02R-0011993**. [Drawing is enclosed and given as **ANNEXURE -2**].	
5.14.0	Trolley weld NDT Examination	All welds of the CT trolley main frame shall be tested by LPI.	
5.15.0	Machining Operation	All mechanical mating surfaces and wheel seating areas are to be machined and protected as per relevant Indian Standards.	
5.16.0	Surface Cleaning	The Girders, End carriages and the Trolley are to be thoroughly cleaned after completion of all operations but prior to painting.	
5.17.0	**Painting**	**The crane parts are to be painted as follows**	
5.17.1	At supplier works	During Stage-I inspection, the interior surfaces of the girder & end carriage shall be painted with one coat of red oxide before closing. This shall be verified during	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		inspection.	
5.17.2	At supplier works	During Stage-II inspection, the crane shall be painted with One coat of Primer with 25 microns of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. The crane shall be dispatched with one coat of Primer only.	
5.17.3	At Erection Site	After the crane erection is complete, the crane has to be painted as follows a. Touch-up painting of Primer wherever necessary b. Two coats of Enamel Paint (Color – Tractor Orange) each with a DFT of 25 microns and intermittent curing of minimum 16 hours.	
5.17.4	Paint & labor	All paints and labor etc. for painting at site also shall be the scope of the crane supplier.	
6.0.0	**MECHANICAL ELEMENTS**		
6.1.0	Gearboxes	1. Gearboxes shall be specially designed for crane duty. 2. Gearbox casing shall be of fabricated type, made from minimum 8mm thick plate and stress relieved prior to machining. 3. The radial clearance between the gearboxes inner surface and outside diameter of the gears, shall not be less than 20mm. 4. The facial clearance between the inner surface of the gearbox and the face of gear and pinion shall	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		be at least 10mm. 5. Gearboxes shall be provided with lugs or other means of lifting. 6. The gearboxes shall be provided with breather vents, oil level indicator, dipstick and easily accessible drain plug. 7. All gear boxes shall be oil tight and sealed with the heat resistant and leak proof rubber gasket.	
6.2.0	Gears	1. The gears shall be of suitable wear resistant alloy steel and should confirm to relevant Indian standard. All gears shall be fully hardened and ground or lapped in sets. Surface hardening is not permitted. The hardness of the pinions and gears shall be in the range of 300-350 BHN and 250-300 BHN respectively. The difference in hardness of pinion and gears shall not be less than 20 BHN. 2. Gears in all the Stages shall be helical in design. 3. Test certificates for material and heat treatment shall be produced for BHEL verification and shall form part of documentation.	
6.3.0	Rope Drum	Shall be of fabricated type and stress relieved. The circumferential weld joints shall be tested by 100 % Radiography for quality assurance.	
6.3.2	Hoist rope drum size	Min. 400 mm diameter (at the bottom of the grove)	
6.3.3	Hoist rope drum Location.	Hoist rope drum shall be at the middle of the CT span.	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.3.4	Flange in rope drum	Hoist Rope drum shall be provided with minimum 100mm height flange at both ends to prevent rope slip.	
6.4.0	Type of Coupling	Between : a) Motor and Gear Box - Full gear coupling. b) Gear Box and Rope Drum - Geared rope drum coupling / spline shaft. c) Gear Box and Wheels (For LT and CT) - Half gear coupling with floating shaft (Minimum floating shaft length for Long Travel shall be 1500 mm).	
6.4.1	Placing of CT gear box	The CT gearbox shall be located at the center of the CT span.	
6.5.0	Wheels	The Wheels shall be of Forged and Wheel Tread hardened to 300/350 BHN. Wheels shall be fitted with L-Type Bearings (Also refer to S.No.5.13.0.). Test certificates for material and tread hardness shall be produced for BHEL verification and shall form part of documentation.	
6.6.0	Mechanical Joints	Fit Bolts shall be as per IS 3640-1982 for all joints connecting the main members and platform supports.	
6.7.0	**Hoist Hook block assembly**	In Hoist Hook block assembly the Hook housing shall be mounted on separate trunnion pin and not on the pulley centre pin.	
6.7.1	**Pulley size**	**Pulley sizes shall be as follows**	
6.7.2	Hoist Pulleys	Bottom block and top return pulleys - 400mm. (at the bottom of the grove)	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.7.3	Hoist equalizer pulley	250mm with antifriction bearing. (at the bottom of the grove)	
6.8.0	Hook latch	Hook latch shall be provided for Hoist hook.	
6.9.0	Gear & thruster oil	Appropriate grade oil should be supplied for all gearboxes and thruster brakes to the required quantity.	
6.10.0	Buffer	Spring loaded buffer shall be provided for LT and CT end carriages as per standard.	
6.11.0	Tools	The following tools of makes acceptable to BHEL shall be supplied along with each crane. Vendor to clearly specify the make of each item in the offer.	
6.11.1	List of Tools	1. 3T chain pulley block Indef make - 1 no. 2. 20T Hydraulic Jack (Remote type) ENERPAC make - 1 set.	
7.0.0	**ELECTRICAL ELEMENTS**		
7.1.0	Type of Brakes	a. Hoist - DC Brake with panel. b. Cross Travel - Thruster brake. c. Long Travel - Thruster brake.	
7.2.0	Ingress Protection	All Panels, Limit-Switches and Motors shall have IP 54 protection.	
7.2.1	Control panels	Individual panels shall be provided for 1. Protective panel, 2. Hoist,	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		3. LT & CT combined.	
7.3.0	Electric Contactors	All Panels shall have only SIEMENS / L&T / INDO-ASIAN Contactors and shall be suitable for AC3 Duty Class. The coil voltage of all the contactors shall be 110 V. Suitable surge suppressors shall be provided for all contactors.	
7.4.0	Contactors Rating	The rating of all Contactors shall be at least 50% higher than the respective electric motor full load current at the specified duty cycle.	
7.5.0	VVVF drive	1. Rating of VVVF drive shall be at least 25% higher than the respective electric motor rating at the specified duty cycle. *(Also refer to S.No.8.23.0, Note-1)* 2. Dynamic Braking Unit (DBU) with suitable DBR shall be supplied for Hoist, LT & CT motion. DBU & DBR selection shall be as per OEM recommendation with respect to the selected Drive Capacity. The duty cycle of all the DBRs shall be 40%.	
7.6.0	Illumination	a. Two numbers of LED flood lights shall be provided for shop floor illumination under the crane. b. All Electric Panels shall be provided with suitable illumination for visibility and trouble shooting.	
7.6.1	LED Bridge lights	LED Flood Lights: Nominal Voltage: 220-240W	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Mains Frequency: 50 Hz Nominal Wattage: Minimum 160W Body Material: Aluminum die-cast Product Color: Metallic grey Protection: IP65 Cover Material: Toughened or Tempered glass Color Rendering Index, Ra >70 Shall conform to LM80. Mounting: The fittings should be supported by shock proof rubber sheet. The lights shall be mounted rigidly and safely on the End carriages between the bridges (1 No. on each side).	
7.7.0	Master Controller	A 4-Step Controller has to be provided for a. Hoist. b. Long Travel. c. Cross Travel. Note: Cam discs should be made of metal / Bakelite only.	
7.8.0	Under Voltage Relay	An Under voltage relay shall be provided on the output of control transformer.	
7.9.0	Anti-Collision Device	An Anti-Collision Device of infra-red type shall be provided on both sides of the crane. The operating range shall be 3.0 meters to 10.0 meters.	
7.10.0	Load Cell	a. Load Weighing System (with tolerance +/- 1% of SWL) with LOAD CELL (shear pin type) to be fixed / provided at the equalizer pulley. b. The remote display shall be of 100 mm size	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		(JUMBO) Note: JUMBO display and controller shall be wired and mounted on the CT trolley.	
7.10.1	Overload Prevention System	The crane shall be supplied with an overload prevention system that senses the load through the load cell and if the load is above the Safe Working Load, the hoist motion shall be tripped.	
7.11.0	Limit Switches	The crane shall be provided with the following limit switches. 1. Hoist Limit- Each hoist shall be provided with both rotary and counter weight limits. 2. CT Limit – Lever type limit switch 3. LT Limit – Lever type limit switch	
7.12.0	Moulded Case Circuit Breaker	MCCBs shall be provided for Protective panel, Hoist, Long Travel and Cross travel motions.	
7.13.0	Cabin	The following items shall be provided in the cabin. 1. Operator chair (fixed), 2. Light, 3. Fan, 4. Warning bell, 5. Remote Indication lamp and 6. Push button station – with the following buttons a. OFF Push Button - Mushroom Head [Plastic] Stay put- colour in RED. b. ON Push Button - Illuminated [GREEN colour 110Vac BA9 Filament Lamp] Flush	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		type Push button[Plastic] c. BELL pushbutton – Projecting Head[Plastic] Push Button actuator [BLACK Colour] d. BRIDGE LIGHT ON/OFF switch - 2-Position Selector switch[Plastic] e. Each Push buttons and switch should have Legend Plate with Inscription of START, STOP, BELL & LIGHT ON/OFF marked clearly. 7. A rubber mat shall be provided at the floor of the cabin. 8. Two nos. of switch-pin sockets shall be provided in the cabin.	
7.14.0	CT Cabling	Drag chain with cable system shall be used for CT motion. The cabling system shall be provided on the Non-drive / Idler bridge. For Drag chain the make and specification to be submitted with offer with specific details of prevention of wear of chain due to chain sliding.	
7.15.0	Electric Cables and recommended current rating	All the cables used in the crane shall be insulated flexible copper cables as per IS:1554 (Part-I)- 1964 and the current rating shall be as per IS: 3961 (Part-II)- 1967	
7.16.0	**CURRENT COLLECTORS (for DSL Shrouded conductor system)**		
7.16.1	Requirement	125A current collectors – 8 nos.	
7.16.2	Current Rating	125A	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
7.16.3	Current collector type	Sliding contact with sufficient Contact pressure while on Movement (MACC 125A)	
7.16.4	Tolerance in Collector movement	Horizontal +/-200 mm & Vertical +/- 60 mm	
7.16.5	Mounting Bracket	Suitable mounting brackets – 2 Nos. Each mounting bracket shall support 4 Nos. current collectors.	
7.17.0	**Earthing**	A ring earthing system shall be provided on the crane. Each and every electrical equipment shall be connected to this earthing at least at two points by means of suitable copper flat .The earthing shall be connected to the fourth line in DSL system through current collector.	
7.18.0	**Compulsory Spares**	The following spares shall be compulsorily supplied along with each crane. Vendor to clearly specify the makes of each item in the offer 1. Warning bell – 1 no. 2. Limit switches – 1 No. of each variety used in the crane. 3. Hoist Brake drum – 1 no. 4. Oil Seals - 1 No of each variety used in the crane. 5. Cable drag chain – one set of mounting end plates and links equivalent to one meter length. 6. The Input pinion shaft for Hoist, LT & CT Gearbox – 1 No. each. 7. Control card for Hoist VVVF Drive – 1 No.	
8.0.0	**SELECTION of BOI and COMPONENTS**	The makes of Components or Bought-Out-Items shall be strictly as per the list given below.	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.1.0	Hoist Hook	HERMAN MOHTTA / HERCULES / SILPA UDYOG / SMRITI FORGINGS / KARACHIWALA	
8.2.0	Wire Rope	USHA MARTIN / FORT WILLIAM / RA WIRE ROPE	
8.3.0	Electric Motors	GEC / BHARAT BIJLEE / SIEMENS / KEC/ ALSTHOM	
8.4.0	DC Brake Unit	BCH make Brake Drum, Brake unit and Brake Panel.	
8.5.0	Thruster Brake Unit	ELECTROMAG / SPEED-O-CONTROL / OMEGA	
8.6.0	Radio Remote Control	Tele crane make(F24-10D) / Ittowa make (winner)	
8.7.0	Limit Switch (Gravity Type)	SIEMENS / INDUSTRIAL SYNDICATE / BCH / SKC / SOC	
8.8.0	Contactors	SIEMENS / L&T / INDO-ASIAN.	
8.9.0	Over-Load-Relay	SIEMENS /L&T (THERMAL TYPE)	
8.10.0	Under voltage relay	SIEMENS /L&T	
8.11.0	HRC Fuses	GE / L&T /SIEMENS	
8.12.0	Rotary limit switch	SIEMENS / OMEGA / SOC / INDUSTRIAL SYNDICATE	
8.13.0	Switch fuse unit	L&T / SIEMENS / GEC	
8.14.0	Moulded case C.B	SIEMENS / L&T	
8.15.0	Cable drag chain	IGUS / CABLE SCHLEPP/ TSUBAKIMOTO/ GORTRAC	
8.16.0	Push - Buttons	SIEMENS / L&T /AIRON	
8.17.0	Connectors	ELMAX make or reputed make with IS approved and acceptable BHEL.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.18.0	Couplings	KOP-FLEX / FENNER / LOVE-JOY / ESCO / ALLFLEX / SKF.	
8.19.0	Bearings	SKF / ZKL / TIMKEN / NBC / FAG.	
8.20.0	Cables	ELKAY / KUNDAN / GOVIND / GLOSTER / NICCO / L&T / RADIANT / HAVELLS / MARDIA / DELTON / RR / SIECHEM / FINOLEX.	
8.21.0	Bridge Light Fittings	PHILIPS / GE / CROMPTON GREAVES / HPL / OSRAM / BAJAJ / HAVELLS / SYSKA.	
8.22.0	Load Cell	IPA make only.	
8.23.0	VVVF Drives	FUJI / MITSUBISHI / YASKAWA / TOSHIBA. Note: Crane specific model from the above shall be selected. VVVF drive for Main Hoist, Auxiliary Hoist, LT & CT motions shall be of a single make.	
8.24.0	Gear boxes	ELECON / SHANTHI GEARS / RADICON / CROMTON GREAVES / NU-TECK / AGNEE TRANSMISSIONS.	
8.25.0	DSL Current collectors	SAFE-TRACK / SAFE-LINE / SILVER-LINE / SAFE-LINK / NBM INDUSTRIES.	
9.0.0	**DOCUMENTS/ DETAILS for APPROVAL**	The following documents and details are to be submitted for BHEL Approval, prior to taking up the manufacture of the crane.	
9.1.0	Drawings and Documents	Set-I: a. Calculations for Selection of Electric Motors, Gear Reducers, Brakes, Couplings, Spring Buffers, etc. b. Calculations for Bridge Girder, Crab, End - Carriage	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		and their connections. c. GA Drawing of the Crane. d. GA Drawing of Trolley. e. GA Drawing of Individual Mechanisms. Set-II: a. Drawings of Bridge, End-Carriage and their connection. b. Sub-Assembly Drawing for Wheels, Hook Block, Gear Boxes, Hoist rope drum and all brake Drums. c. Wiring Diagram with Logic Circuits with bill of materials. d. Cable Selection based on Current Rating and cable schedule. Initially Set-I drawings to be submitted in one lot and approval to be obtained from BHEL. Based on this, set II drawings to be submitted for approval. The vendor shall provide the Technical catalogues of the following bought-out items: 1. Steel Wire rope 2. Crane duty electric motors 3. Gearbox 4. DC Brake with panel 5. Thruster Brake 6. Radio Remote 7. Limit Switches 8. Load cell	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		9. VVVF Drive along with DBR selection chart. 10. Cable drag chain	
9.2.0	Technical Details	a. Total Weight of the Crane including all Electrical Equipment. b. Total Weight of Trolley including all Electrical Equipment c. Weight of each Bridge assembled and ready for erection with and without Mechanical and Electrical Equipment. d. Weight of End-carriage assembled and ready for erection. e. Total Weight of Structural, Mechanical and electrical Equipment and indicated separately also. f. Weight of Operator's Cabin together with all Equipment mounted in it.	
10.0.0	INSPECTION	The following schedule of stage inspections is to be strictly adhered to, prior to dispatch from the suppliers works.	
10.1.0	STAGE – I	a. Verification of Test Certificate for Raw Materials used for Girders, End-Carriages, Trolley, Gear Box Casings, etc. b. Verification of X-Ray Report of Butt-Joints in the Girders and Random Testing on the Welds, by physical examination. c. Box Girder setting before closing of the Bottom Flanges – for inspecting the quality of welding and presence of waviness	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		d. Trolley Frame Fabrication before setting the Mechanisms e. End–Carriage Fabrication before closing of the Bottom Flanges The following Test certificates to be produced during Stage-I Inspection a. TC for plates used for bridge fabrication b. TC for plates used for End carriage fabrication c. TC for the steel rounds used for Gear fabrication. d. TC for plates used for Gearbox casing fabrication. e. X-Ray film and report for all the Butt-Joints in the girders.	
10.2.0	STAGE – II/ FINAL	a. Inspection of Bridges, End–Carriages and platform fabrication. b. Verification of Span & Diagonal Dimensions, Checking of Wheel Alignment, Mechanical Assemblies and Total Alignment. c. Free running of all the Mechanisms. d. Measurement of CAMBER in the Bridges. e. Complete assembly of the crane and free-running of all mechanisms f. Full / Rated Load Test for bridges and trolley and Deflection Test g. Deflection and Permanent Set Measurement. h. 25% OVER-LOAD Lifting Ability Check. The following Test Certificates to be produced during Stage-II Inspection. 1. TC for all Hoist Hooks	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		2. TC for Steel Wire ropes 3. TC for Heat treatment and final hardness for all gears. 4. TC for Wheel Hardness for LT and CT 5. TC for all thruster brakes 6. TC for all DCEM Brakes 7. TC for all motors 8. TC for all limit switches 9. TC for all VVVF Drives.	
11.0.0	**CRANE ERECTION & COMMISSIONING**		
11.1.0	Crane Erection & Cabling	Complete crane erection/installation, wiring/cabling of the various components at BHEL shall be the scope of the supplier.	
11.1.1	Supplier scope	Mobile crane, Welding & cutting equipment, All electrical & mechanical tools, labour and all consumables like electrodes, oxygen, acetylene, kerosene, oil, paint, etc., are in the scope of the supplier. All relevant PPE (Personal Protective Equipment) for the labourers is also under supplier scope.	
11.1.2	BHEL scope	BHEL shall provide Lifting tackles & Electricity at free of cost.	
11.2.0	Crane Commissioning	Commissioning of the Crane, Camber conformance (>22mm) and Performance Prove –Out for 125% of Crane's Capacity and Smooth Functioning of the Crane shall be the RESPONSIBILITY of the supplier.	
12.0.0	**O & M MANUALS**	Each Crane shall be provided with the following:	

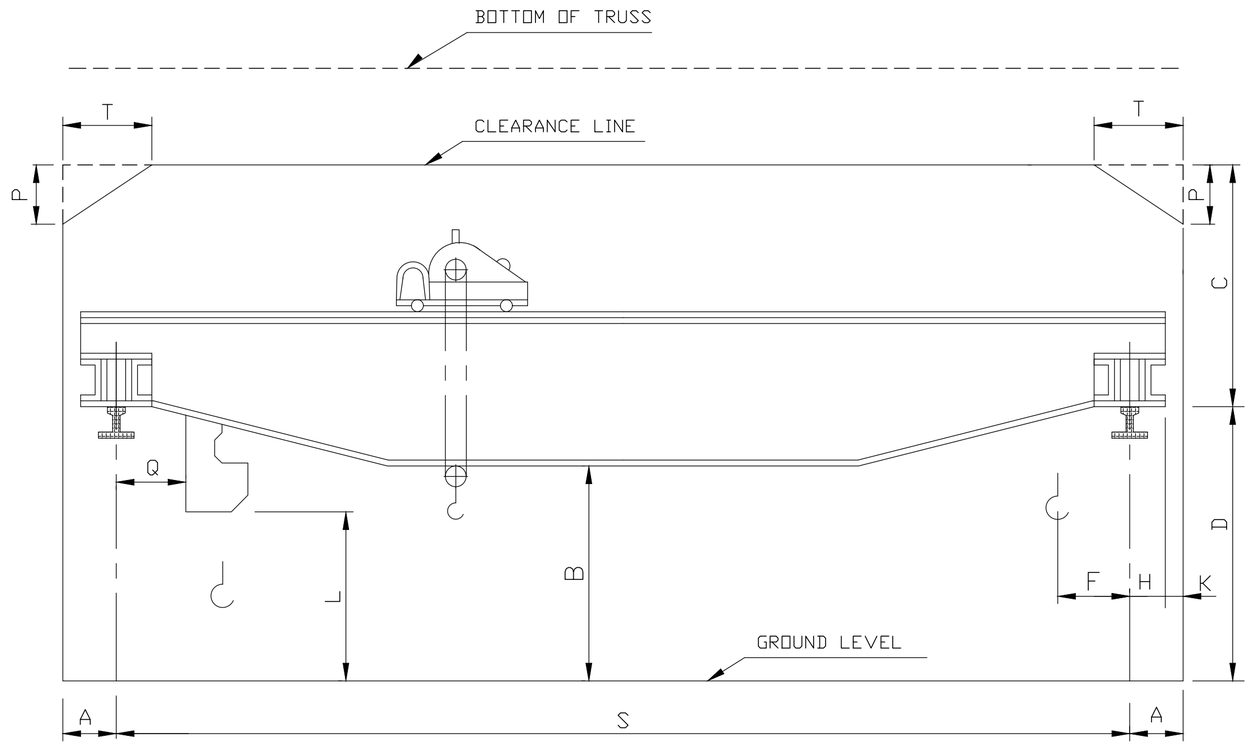
S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		1. VFD Programming & Maintenance manual and Technical Information catalogue of VFD 2. Data Sheet containing the Program data loaded in the VFD units. 3. Manual for the Load cell calibration and trouble shooting. 4. THREE hard Copies of Erection, Operation & Maintenance Manual for the crane and ONE soft copy in CD, containing the following technical details: a. Crane GA Drawing. b. Crab Assembly Drawing. c. Total Crane Wiring Schematics. d. Detailed Wiring Diagrams for Sub-Systems /Panels. e. VVVF Drive's Logic Circuits. f. Wheel Assembly Drawings. g. Bottom Block Assembly Drawing. h. Gear Box Assembly Drawings. i. Coupling Drawing and Details. j. Recommended list of spares. k. A complete list of All Bought-Out Items with Specifications & Ratings. l. Warranty/Guarantee Card for all Bought Out-items. m. Trouble Shooting Chart for all Systems. 5. Operation & Maintenance manual of Load Weighing System.	

TECHNICAL SPECIFICATIONS FOR 10T 22.7m SPAN ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
13.0.0	**TRAINING**	The Supplier shall arrange 2 days training for BHEL persons at BHEL works free of cost on programming, operation, maintenance and trouble shooting of the offered drive.	
14.0.0	**PERFORMANCE GUARANTEE**	The Performance of the Total Crane and/or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 12 months from the date of performance acceptance at BHEL Works or 18 months from the date of supply whichever is earlier.	

ALL DIMENSIONS ARE IN MILLIMETRES

DRAWING NO: 3-M-02A28-15586



	10T×22700/9H.T
S	22700
D	9000
C	2400
A	300
K	100
T	600
P	600
B	
L	
Q	800
F	1100
F1	
H	

REV	DATE	ALTERED
		CHECKED
		APPROVED
ZONE		

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

ITEM NO	DESCRIPTION	DRAWING NO	MATL CODE	UNIT WT
			MATL SPEC	QTY

EQPT: E O T CRANE / 10Tx22.7M / 9 H.T

Bharat Heavy Electricals Ltd
HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

	NAME	SIGNATURE	DATE
DRN	G.Govindaraj	G.Govindaraj	30.03.16
CHD	G.Govindaraj	G.Govindaraj	30.03.16
APPD	G.Thiagarajan	G.Thiagarajan	30.03.16

DEPT	GRADE OF UNTOL. DIM		SCALE	WEIGHT (Kg)	REF TO ASSY DWG NO	ITEM
M&S	¢/M/f		–	–		
CODE 2597	IS: 2102				REF TO OLD DWG NO M&S–PD–08–018	

TITLE
CLEARANCE DIAGRAM FOR E.O.T CRANE (10Tx22700 / 9H.T)

CARD CODE U 01

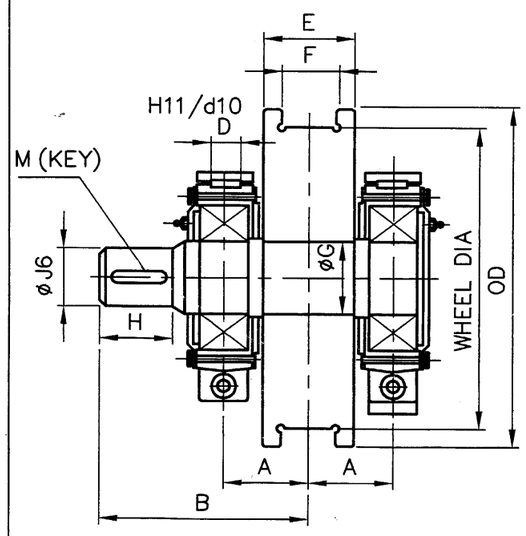
DRAWING NO : 3-M-02A28-15586

REV 00

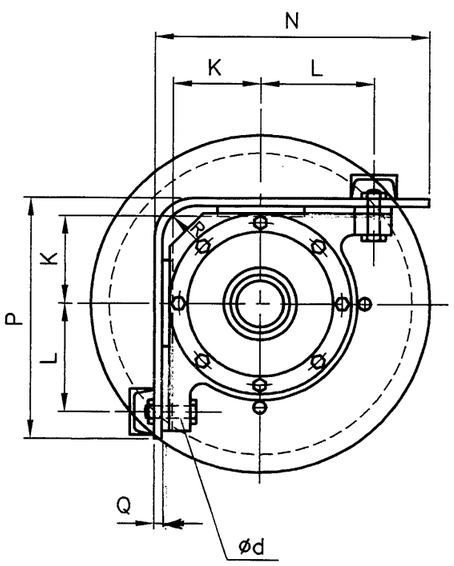
A3–SIZE

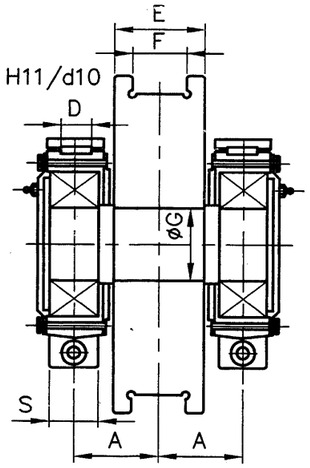
ALL DIMENSIONS ARE IN MM

SL. No.	O.D. (WHEEL DIA) IN MM	RAIL SIZE	A	B	D	E	F	øG	H	øJ	K	L	ød	M (KEY)	N	P	Q	S	R	COUPLING No.	SKF BRG No. & BRG. SIZE	TOTAL WEIGHT IN Kg. FOR DRIVE & IDLE
			DIMENSIONS																			
16	800/850	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	687	588	20	150	80	107	22330 150x320x108	870.00 845.00
15		CR-80	168	420	80	180	110	152	125	110	212	255	32	28x16x115	687	588	20	150	80	106	22330 150x320x108	796.00 775.00
14	710/750	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	642	588	20	150	80	107	22330 150x320x108	808.00 784.00
13		CR-100 CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	728.50 711.50
12		CR-80	180	400	71	180	110	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	653.00 636.00
11	630/680	CR-80/CR-100 & CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	567	517	20	130	80	106	22326 130x280x93	629.00 611.50
10		90-105 Lbs/Yd CR-80	150	365	60	180	105	111	110	90	160	190	26	25x14x100	547	462	20	120	60	105	22322 110x240x80	448.00 434.50
9	500/550	CR-80 CR-100	160	375	60	180	125	111	110	90	160	190	26	22x14x100	482	462	20	120	60	105	22322 110x240x80	253.00 245.50
8		CR-80	150	360	50	180	125	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	389.00 378.00
7		60/75/90 & 105 Lbs/Yd	150	360	50	180	105	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	301.00 294.00
6	400/450	CR-80 CR-100	150	360	50	180	125	91	105	80	125	160	26	22x14x90	395	395	20	100	50	104	22318 90x190x64	253.00 245.50
5		90 Lbs/Yd 105 Lbs/Yd	145	315	40	180	105	76	85	70	112	140	22	20x12x75	375	345	16	90	50	103	22315 75x160x55	197.00 192.00
4	320/370	75 / 90 & 105 Lbs/Yd CR-80	145	315	40	180	105	76	85	70	112	140	22	20x12x75	345	345	16	90	50	103	22315 75x160x55	162.00 157.00
3		50 SQ.BAR 60 Lbs/Yd 75 Lbs/Yd	112.5	260	40	125	85	61	65	55	85	112	17	16x10x55	312	287	16	80	50	102	22312 60x130x46	118.50 118.00
2	250/280	50 SQ.BAR 60 / 90 & 105 Lbs/Yd	105	250	32	125	85	61	65	55	76	100	17	16x10x55	254	249	12	60	40	102	22212 60x110x28	66.00 63.00
1	200/230	30 Lbs/Yd 50 SQ.BAR 60 Lbs/Yd	95	220	32	100	67	46	55	40	71	95	17	12x8x45	239	232	12	65	40	101	22309 45x100x36	51.00 50.00



DRIVING WHEEL ASSY





IDLE WHEEL ASSY

MATERIAL :- SHAFT - 45C8/IS:1570.
WHEEL - 55C8/IS:5517.
FORGED.
TREAD PORTION WHEEL HARDNESS 300 TO 350 (BHN)

No.of Pieces	DESCRIPTION	MATERIAL	STANDARD	NET.WT.IN KGS.	DRAWING No.	ITEM No.
REFERENCE:			COMPONENT CODE: 29		EQUIPMENT CODE: 00	
			ALTERATIONS:	DCN REF	DATE	SIGN.	INDEX
SCALE \	DRAWN						
	CHECKED	R.Ramamoorthy					
	APPROVED						
	DATE	20-10-2000					

MACHINE: CRANE WHEEL ASSY
TYPE: GENERAL
TITLE: STANDARD CRANE WHEEL ASSY
DRAWING No: 3-M-02R-11993 00
REV.
No.of Sheets: Sheet No:

PART 1

The tender contains two parts- PART 1, Technical and Commercial bid and PART 2, price bid. PART 1 of the tender is again divided into sub clauses, SECTION I, SECTION II and SECTION III.

NOTE: PART –I has three sections which are to be filled and submitted as Technical and Commercial Offer

SECTION –I - One page (1 of 3)
SECTION –II - Two pages (2 & 3 of 3)
SECTION –III - Twenty six pages (1 to 26)

SECTION – I: CHECK LIST FOR VENDORS

Vendor to note the following

S.No.	INSTRUCTIONS TO VENDOR	VENDOR'S RESPONSE
1.0	The VENDOR shall submit the offer in TWO PARTS - Technical and commercial bid, PART 1 and Price Bid, PART 2.	
2.0	The Offer shall be submitted in the same format as given in section-III. The vendor's offer shall have detailed response against each clause and a mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words may lead to disqualification of the Technical Offer.	
3.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets and complete technical details of 'Bought-Out-Items' with a copy of Product Catalogue and Selection Criteria against each item.	
4.0	The Technical and Commercial Offer shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
5.0	VENDOR has to indicate the Country of Origin for the supply of equipment.	

SECTION-II: -QUALIFYING CRITERIA

The VENDOR has to compulsorily meet the following requirements to get qualified for consideration of the technical offer for the SUPPLY OF

1. 5T x 7.75m span EOT CRANE : Quantity - 1 No.
2. 5T x 10.75m span EOT CRANE : Quantity - 1 No.
3. 5T x 12.5m span EOT CRANE : Quantity - 1 No.

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	The vendor should have minimum 5 years' experience in design, fabrication, supply and commissioning of EOT cranes.	
2.0	Only those vendor (OEM), who have supplied and commissioned at least TWO cranes of 5 Ton or higher capacity double girder EOT type class-3 with minimum span of 12.5 Mtr or higher, fitted with Variable voltage variable frequency converter drive, in the last five years and such cranes are working satisfactorily for more than one year after commissioning (as on original date of opening of Tender), shall quote.	
3.0	Vendor to submit Performance certificates along with their offer from minimum TWO of their customers for satisfactory performance of the cranes referred in above clause , supplied to them and are working satisfactorily for more than one year after commissioning (as on original date of opening of Tender). Copy of Purchase Order with all Annexures, corresponding Commissioning certificate/test certificate and performance certificate shall be submitted along with the offer for the above reference. Suggestive performance certificate format is given in the annexure.	
4.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
5.0	The vendor should have 'in-house' or 'self-owned' facility for FABRICATION and TESTING in fully assembled condition at 125 % of the rated capacity of the cranes.	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the Equipment :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5.
   a) Crane Type: Double Girder EOT crane- Yes / NO

   b) Crane Capacity (Metric Tonnes):

   c) Crane span :

   d) Mechanism class: Type 3 –Yes / No

   e) Drive: VVVF type- Yes/ No

6. Performance of the Equipment : Satisfactory /
   (Strike off whichever is not applicable)
   Not Satisfactory

7. Any other remarks:

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

SECTION-III

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
1.0.0	**APPLICATION**	a) The subject crane is meant for the purpose of handling small to large (within the lifting capacity of the crane) components, in a heavy and large steel fabrication shop floor. b) The crane will be put to use for continuous duty with CT, LT and Hoist movements, which may occur simultaneously (within the operating parameters specified under Clause Nos. – 3.1.0, 3.4.0, 3.6.0 and 3.7.0). c) The shop floor environment will be dust prone, humid, welding fume filled and ambient temperature going up to 45 °C.	
2.0.0	**SCOPE OF SUPPLY**	1) 5 Ton capacity EOT Crane of *Long Travel (LT) span - 7,750mm*: Qty - 1 No. 2) 5 Ton capacity EOT Crane of *Long Travel (LT) span - 10,750mm*: Qty - 1 No. 3) 5 Ton capacity EOT Crane of *Long Travel (LT) span - 12,500mm*: Qty - 1 No. a) Design as per Tender Specifications b) Detailed Design and Manufacture as per BHEL Specifications c) Complete Assembly and Testing before Dispatch at Supplier Works d) Supply in Modules / Sub-Assemblies e) Complete Erection and wiring/cabling of the EOT	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Crane f) Commissioning and Performance Prove-Out of the EOT crane at BHEL, Trichy. g) Performance Guarantee for 12 months, from the date of commissioning.	
3.0.0	**TECHNICAL SPECIFICATIONS**		
3.1.0	**CAPACITY**	Lifting Capacity	
3.1.1	Hoist	5 Metric Ton	
3.2.0	Cross Travel (CT) Wheel gauge	1,500 mm	
3.3.0	Height of Lift	6,500 mm [Effective Height of Lift for both the HOISTS]	
3.4.0	Duty Class	Class – 3 [Indoor Service]	
3.4.1	Mechanism Group Classification	M 6	
3.5.0	LT wheel base	3,000 mm Minimum	
3.5.1	CT wheel base	1,500 mm Minimum	
3.6.0	**DUTY CYCLE**	Related to Drive Motor & Mechanisms	
3.6.1	Hoist	40 % CDF	
3.6.2	Long Travel	40 % CDF	
3.6.1	Cross Travel	40 % CDF	
3.7.0	**SPEED**	Operating / Working Speed [Maximum]	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS			VENDOR's TECHNICAL OFFER (With Complete Details)
3.7.1	Hoist	8 mtrs. / minute.			
3.7.2	Cross Travel (CT)	15.0 mtrs. / minute.			
3.7.3	Long Travel (LT)	30.0 mtrs. / minute.			
3.8.0	**HOOK APPROACH**				
3.8.1	**Hoist Hook approach (On both sides)**	1,000mm. (pl. refer Dwg 3-M-02A64-15585)			
3.9.0	**MOTOR RATINGS**	Electric Motor Ratings & Frame Sizes			
3.9.1	Hoist	Min.6.7 kW ; Frame Size – 160M			
3.9.2	Cross Travel (CT)	Min. 2.6 kW ; Frame Size – 132M			
3.9.3	Long Travel (LT)	Min. 2 x 2.6 kW ; Frame Size – 132M			
3.9.4	Motor type	Electric Motor Ratings & Frame Sizes shall be as per IS-325 and IS-1231. All motors shall be of 6 pole, sq. cage induction motors with 300 starts per hour rating and shall be of S4 duty cycle suitable for VVVF Drive starting, running, braking.			
3.10.0	**ACCELERATION**				
3.10.1	Cross Travel (CT)	300 mm / sec.sq.			
3.10.2	Long Travel (LT)	300 mm / sec. sq.			
3.11.0	**GEAR BOX**	**Type / Mounting**	**Centre distance between Input & output shafts Range (mm)**	**No. of stages of gear reduction**	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS			VENDOR's TECHNICAL OFFER (With Complete Details)
3.11.1	Hoist	HR*	500 to 560	2 or 3	
3.11.2	Cross Travel (CT)	VR**	320 to 350	2 or 3	
3.11.3	Long Travel (LT)	HR	300 to 350	2 or 3	
**HR – Horizontal Reducer* ***VR – Vertical Reducer*					
3.12.0	**HOIST ROPE DETAILS**	Construction:6x37 or 6x36; Fiber core; Tensile strength 1770 kg/mm sq.			
3.12.1	Hoist	Dia. 12 mm ; Falls - 4			
3.13.0	**CONTROL**				
3.13.1	Control system	Frequency Converter type for all motions (with VVVF drive)			
3.13.2	Operational controls	The Crane shall be provided with the following controls : Radio Remote Control [Microprocessor based Two Step Push Button Type] for all motions.			
3.14.0	Control Voltage	110 V AC			
3.15.0	Input Power Supply	415 Volts with ± 10% fluctuation , 50 Hz with ± 3% fluctuation, 3 Phase- AC			
3.16.0	**STANDARDS**				
3.16.1	DESIGN STANDARD	IS – 807 & 3177 / 2006			
3.16.2		The specifications in these technical specifications are complementary to those set in the Indian Standard Specification IS 3177 and IS 807 mentioned above. If any			

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		one of the conditions mentioned in the specification is at variance with those of BIS, the technical specification herein shall prevail.	
3.16.3		1. All equipment and material shall comply with appropriate Indian Standards (Latest) or national Standards of the country of the origin provided latter or equivalent to or better than the former. 2. The equipment shall also comply with latest Indian Electricity Rules, as regards safety requirement and other essential provisions of the act applicable to the installation and operation of the EOT cranes. 3. Items for which Indian standards are not published, national standard of the country of origin shall be applicable. All latest standards indicated in schedule C3 of IS: 3177/1999 should be applicable in general. 4. The equipment shall be designed to facilitate inspection, cleaning, replacement, repair and for use where continuity of operation and safety are important.	
3.17.0	**Runway Rail Size**		
3.17.1	Cross Travel (CT)	ISR 60 Lbs./Yard	
3.17.2	Long Travel (LT)	ISR 60 lbs./Yard	(For reference only - not supplier scope)
3.18.0	**Wheel Size**		

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
3.18.1	Cross Travel (CT)	Dia. 250 mm - 4 nos.	
3.18.2	Long Travel (LT)	Dia. 320 mm – 4 nos.	
3.19.0	**Brake Drum Size**		
3.19.1	Hoist*	Dia. 200 mm - 1 no.	
3.19.2	Cross Travel (CT)	Dia. 160 mm - 1 No.	
3.19.3	Long Travel (LT)	Dia. 160 mm – 2 Nos.	
**Hoist brake drum shall be of BCH make only (refer S.No.8.4.0).*			
3.20.0	Long Travel Motion	Dual Drive Mechanism shall be provided for LT (Long Travel) Motion.	
4.0.0	End Clearance	End Clearances to be fixed to suit the workshop building clearances [Refer Drawing No. **3-M-02A64-15585** – Drawing enclosed with the tender as **ANNEXURE-1.**]	
5.0.0	**STRUCTURAL FABRICATION**	Crane Structure Constructional Details	
5.1.0	Bridge / Girder & End carriages of LT and CT	Plate formed Box type Construction for Girders, End carriages of LT and CT	
5.1.1	Cross section of bridge girder	The minimum dimensions of the bridge girders shall be as given below. 1. Girder Height (Flange inner- inner) – 750mm 2. Girder width (Web inner- inner) – 300mm 3. Top flange	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		plate thickness – 10mm 4. Bottom flange plate thickness – 8mm 5. Web plate thickness – 8mm 6. Width of top and bottom flanges – 330mm 7. Vertical diaphragm plate thickness – 6mm • Vertical Diaphragms shall be made of solid plates only • Horizontal Stiffener to be provided- An ISA 50x50x6 shall be provided throughout the length of the web (for both webs) at about 1/3rd of the bridge height from the top.	
5.1.2	Limiting Deflection	The maximum vertical deflection of the girder produced by the dead load, the weight of the trolley and the rated load shall not exceed 1/1000 of the span of the crane.	
5.1.2	Camber for bridge	The Crane Bridge shall be cambered at the top as well as the bottom. The camber after erection at site (during commissioning) shall not be less than 12mm. The manufacturer shall suitably calculate camber while plate cutting to compensate for welding distortion during fabrication, dead load deflection after erection and permanent set after load test at his works during PDI.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.2.0	Cross section of LT End carriage	The minimum dimensions of the End carriages shall be as given below. 1. Height (Flange inner- inner) – 350mm. 2. Width (Web inner- inner) – 294mm. 3. Top flange plate thickness – 10mm. 4. Bottom flange plate thickness – 10mm. 5. Web plate thickness – 8mm. 6. Width of Top flange and Bottom flange – 330mm. 7. Vertical diaphragm plate thickness – 6 mm. • Vertical Diaphragms shall be made of solid plates only.	
5.3.0	Jacking pads	Jacking pad shall be provided between web plates of end carriage ends for removal of LT and CT Wheels.	
5.4.0	Wheel Clearance	Minimum clearance to be maintained between rail top and bottom flange of end carriage shall be as follows 1. For Long travel – 50 mm. 2. For Cross travel – 50 mm.	
5.5.0	Sweeper Plates	The End carriages should be provided with sweeper plates at all four corners.	
5.6.0	Bridge-End Carriage connection.	1. The main girder shall extend over the whole width of the end carriage and the extension shall have sufficient section to take the maximum reaction and moment. 2. The girder shall be rigidly attached to the end	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		carriages by suitable end plates, capable of resisting the torsional movement at the end of the girder. 3. The bridge girders should be connected to end carriages by large gusset plates and Turned fitted bolts in reamed holes should be used (Also refer to S.No.6.6.0.).	
5.7.0	Raw Material	Only steel plates tested and certified for quality by reputed inspection authorities, shall be used. Test Certificates to be produced for BHEL verification and form part of the documentation.	
5.8.0	Welded Joints	To be followed for Girder & End carriage Fabrication	
5.8.1	Number of butt welded joints allowed in web and flange plates of bridge girder.	Max ONE joint only. (Joint at the center of the span shall be avoided.)	
5.8.2	Welding between Web plate and Top flange	Full welding shall be done on the outside between web plates and top flange. On the inside equal stitch welding of 100mm to be done between web plate and top flange.	
5.8.3	Welding of Vertical diaphragms	The vertical diaphragms shall be equal stitch welded to the top flange and both the webs. The length of stitch welding shall be 100mm.	
5.8.4	Welding Electrodes	a. For all Horizontal Welding E 7018 /ER70S-6 (MIG) Electrode only should be used. b. For all Vertical Welding E 7048 /ER70S-6 (MIG) Electrode only should be used.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
5.8.5	Welded Joint Testing	All Butt Welded Joints (compression / tension and flanges / web joints) shall be subjected to 100% radiography Testing and the Films and its reports are to be produced to BHEL for verification and form part of the documentation.	
5.9.0	Splice Joints	NO bolted SPLICE JOINT IS ALLOWED IN GIRDER FABRICATION [Girder has to be of SINGLE PIECE only to the total length of the span 22,700 mm].	
5.10.0	Platform on Girders	The Platforms provided on both the Girders shall be for full length and fixed through BOLTED JOINTS only. 6mm thick Chequered plates shall be used for the platforms. The width of the platform shall be as follows 1. Drive Bridge – 800mm. 2. Non-drive bridge – 500mm.	
5.10.1	Platform rafters	The rafters and handrails shall have bolted joints. The rafters shall be in alignment with the internal stiffeners of the bridge girders.	
5.11.0	DSL Maintenance cage	A DSL repair cage shall be provided on the Non-Drive bridge for DSL maintenance purposes. The trap door and mounting points for the DSL repair cage shall be provided on both ends of the Auxiliary bridge so that the cage can be mounted as per requirement. Proper access ladder shall be provided for the cage. Note: Distance of DSL lines from LT rail – 230mm. (For reference)	
5.12.0	Wheel Assembly	The Wheel Assembly for Cross Travel (CT) & Long Travel	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		(LT) shall be LIVE AXLE SYSTEM with L-Type Bearings. They shall be as per BHEL Drawing No. **3-M-02R-00-11993**. [Drawing is enclosed and given as **ANNEXURE - 2**].	
5.13.0	Trolley weld NDT Examination	All welds of the CT trolley main frame shall be tested by LPI.	
5.14.0	Machining Operation	All mechanical mating surfaces and wheel seating areas are to be machined and protected as per relevant Indian Standards.	
5.16.0	Surface Cleaning	The Girders, End carriages and the Trolley are to be thoroughly cleaned after completion of all operations but prior to painting.	
5.17.0	**Painting**	**The crane parts are to be painted as follows**	
5.17.1	At supplier works	During Stage-I inspection, the interior surfaces of the girder & end carriage shall be painted with one coat of red oxide before closing. This shall be verified during inspection.	
5.17.2	At supplier works	During Stage-II inspection, the crane shall be painted with One coat of Primer with 25 microns of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. The crane shall be dispatched with one coat of Primer only.	
5.17.3	At Erection Site	After the crane erection is complete, the crane has to be	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		painted as follows a. Touch-up painting of Primer wherever necessary b. Two coats of Enamel Paint (Color – Tractor Orange) each with a DFT of 25 microns and intermittent curing of minimum 16 hours.	
5.17.4	Paint & labor	All paints and labor etc. for painting at site also shall be the scope of the crane supplier.	
6.0.0	**MECHANICAL ELEMENTS**		
6.1.0	Gearboxes	1. Gearboxes shall be specially designed for crane duty. 2. Gearbox casing shall be of fabricated type, made from minimum 8mm thick plate and stress relieved prior to machining. 3. The radial clearance between the gearboxes inner surface and outside diameter of the gears, shall not be less than 20mm. 4. The facial clearance between the inner surface of the gearbox and the face of gear and pinion shall be at least 10mm. 5. Gearboxes shall be provided with lugs or other means of lifting. 6. The gearboxes shall be provided with breather vents, oil level indicator, dipstick and easily accessible drain plug. 7. All gear boxes shall be oil tight and sealed with the heat resistant and leak proof rubber gasket.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.2.0	Gears	1. The gears shall be of suitable wear resistant alloy steel and should confirm to relevant Indian standard. All gears shall be fully hardened and ground or lapped in sets. Surface hardening is not permitted. The hardness of the pinions and gears shall be in the range of 300-350 BHN and 250-300 BHN respectively. The difference in hardness of pinion and gears shall not be less than 20 BHN. 2. Gears in all the Stages shall be helical in design. 3. Test certificates for material and heat treatment shall be produced for BHEL verification and shall form part of documentation.	
6.3.0	Rope Drum	Shall be of fabricated type and stress relieved. The circumferential weld joints shall be tested by 100 % Radiography for quality assurance.	
6.3.2	Hoist rope drum size	Min. 300 mm diameter (at the bottom of the grove)	
6.3.3	Hoist rope drum Location.	Hoist rope drum shall be at the middle of the CT span.	
6.3.4	Flange in rope drum	Hoist Rope drum shall be provided with minimum 100mm height flange at both ends to prevent rope slip.	
6.4.0	Type of Coupling	Between : a) Motor and Gear Box - Full gear coupling. b) Gear Box and Rope Drum - Geared rope drum coupling / spline shaft. c) Gear Box and Wheels (For LT and CT) - Half gear coupling with floating shaft.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
6.4.1	Placing of CT gear box	The CT gearbox shall be located at the center of the CT span.	
6.5.0	Wheels	The Wheels shall be of Forged and Wheel Tread hardened to 300/350 BHN. Wheels shall be fitted with L-Type Bearings (Also refer to S.No.5.12.0.). Test certificates for material and tread hardness shall be produced for BHEL verification and shall form part of documentation.	
6.6.0	Mechanical Joints	Fit Bolts shall be as per IS 3640-1982 for all joints connecting the main members and platform supports.	
6.7.0	**Hoist Hook block assembly**	In Hoist Hook block assembly the Hook housing shall be mounted on separate trunnion pin and not on the pulley centre pin.	
6.7.1	**Pulley size**	**Pulley sizes shall be as follows**	
6.7.2	Hoist Pulleys	Bottom block pulleys - 300mm. (at the bottom of the grove)	
6.7.3	Hoist equalizer pulley	250mm with antifriction bearing. (at the bottom of the grove)	
6.8.0	Hook latch	Hook latch shall be provided for Hoist hook.	
6.9.0	Gear & thruster oil	Appropriate grade oil should be supplied for all gearboxes and thruster brakes to the required quantity.	
6.10.0	Buffer	Spring loaded buffer shall be provided for LT and CT end carriages as per standard.	
6.11.0	Tools	The following tools of makes acceptable to BHEL shall be	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		supplied along with each crane. Vendor to clearly specify the make of each item in the offer.	
6.11.1	List of Tools	1. 3T chain pulley block Indef make - 1 no. 2. 20T Hydraulic Jack (Remote type) ENERPAC make - 1 set.	
7.0.0	**ELECTRICAL ELEMENTS**		
7.1.0	Type of Brakes	a. Hoist - DC Brake with panel. b. Cross Travel - Thruster brake. c. Long Travel - Thruster brake.	
7.2.0	Ingress Protection	All Panels, Limit-Switches and Motors shall have IP 54 protection.	
7.2.1	Control panels	Individual panels shall be provided for 1. Protective panel, 2. Hoist, 3. LT & CT combined.	
7.3.0	Electric Contactors	All Panels shall have only SIEMENS / L&T / INDO-ASIAN Contactors and shall be suitable for AC3 Duty Class. The coil voltage of all the contactors shall be 110 V. Suitable surge suppressors shall be provided for all contactors.	
7.4.0	Contactors Rating	The rating of all Contactors shall be at least 50% higher than the respective electric motor full load current at the specified duty cycle.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
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S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
7.5.0	VVVF drive	1. Rating of VVVF drive shall be at least 25% higher than the respective electric motor rating at the specified duty cycle. *(Also refer to S.No.8.22.0, Note-1)* 2. Dynamic Braking Unit (DBU) with suitable DBR shall be supplied for Hoist, LT & CT motion. DBU & DBR selection shall be as per OEM recommendation with respect to the selected Drive Capacity. The duty cycle of all the DBRs shall be 40%.	
7.6.0	Illumination	a. Two numbers of LED flood lights shall be provided for shop floor illumination under the crane. b. All Electric Panels shall be provided with suitable illumination for visibility and trouble shooting.	
7.6.1	LED Bridge lights	LED Flood Lights: Nominal Voltage: 220-240W Mains Frequency: 50 Hz Nominal Wattage: Minimum 160W Body Material: Aluminum die-cast Product Color: Metallic grey Protection: IP65 Cover Material: Toughened or Tempered glass Color Rendering Index, Ra >70 Shall conform to LM80. Mounting: The fittings should be supported by shock	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		proof rubber sheet. The lights shall be mounted rigidly and safely on the End carriages between the bridges (1 No. on each side).	
7.7.0	Master Controller	A 4-Step Controller has to be provided for a. Hoist. b. Long Travel. c. Cross Travel. Note: Cam discs should be made of metal / Bakelite only.	
7.8.0	Under Voltage Relay	An Under voltage relay shall be provided on the output of control transformer.	
7.9.0	Limit Switches	The crane shall be provided with the following limit switches. 1. Hoist Limit- Each hoist shall be provided with both rotary and counter weight limits. 2. CT Limit – Lever type limit switch 3. LT Limit – Lever type limit switch	
7.10.0	Moulded Case Circuit Breaker	MCCBs shall be provided for Protective panel, Hoist, Long Travel and Cross travel motions.	
7.11.0	CT Cabling	Drag chain with cable system shall be used for CT motion. The cabling system shall be provided on the Non-drive / Idler bridge. For Drag chain the make and specification to be submitted with offer with specific details of prevention of wear of chain due to chain sliding.	
7.12.0	Electric Cables and recommended current	All the cables used in the crane shall be insulated flexible copper cables as per IS:1554 (Part-I)- 1964 and the	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
	rating	current rating shall be as per IS: 3961 (Part-II)- 1967	
7.13.0	**CURRENT COLLECTORS (for DSL Shrouded conductor system)**		
7.13.1	Requirement	125A current collectors – 8 nos.	
7.13.2	Current Rating	125A	
7.13.3	Current collector type	Sliding contact with sufficient Contact pressure while on Movement (MACC 125A)	
7.13.4	Tolerance in Collector movement	Horizontal +/-200 mm & Vertical +/- 60 mm	
7.13.5	Mounting Bracket	Suitable mounting brackets – 2 Nos. Each mounting bracket shall support 4 Nos. current collectors.	
7.14.0	**Earthing**	A ring earthing system shall be provided on the crane. Each and every electrical equipment shall be connected to this earthing at least at two points by means of suitable copper flat .The earthing shall be connected to the fourth line in DSL system through current collector.	
7.15.0	**Compulsory Spares**	The following spares shall be compulsorily supplied along with each crane. Vendor to clearly specify the makes of each item in the offer 1. Warning bell – 1 no. 2. Limit switches – 1 No. of each variety used in the crane. 3. Hoist Brake drum – 1 no. 4. Oil Seals - 1 No of each variety used in the crane. 5. Cable drag chain – one set of mounting end plates and links equivalent to one meter length.	

TECHNICAL SPECIFICATIONS FOR 5T ELECTRICALLY OPERATED
OVER-HEAD TRAVELLING [E O T] CRANE WITH DOUBLE GIRDER

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		6. The Input pinion shaft for Hoist, LT & CT Gearbox – 1 No. each. 7. Control card for Hoist VVVF Drive – 1 No.	
8.0.0	**SELECTION of BOI and COMPONENTS**	The makes of Components or Bought-Out-Items shall be strictly as per the list given below.	
8.1.0	Hoist Hook	HERMAN MOHTTA / HERCULES / SILPA UDYOG / SMRITI FORGINGS / KARACHIWALA	
8.2.0	Wire Rope	USHA MARTIN / FORT WILLIAM / RA WIRE ROPE	
8.3.0	Electric Motors	GEC / BHARAT BIJLEE / SIEMENS / KEC/ ALSTHOM	
8.4.0	DC Brake Unit	BCH make Brake Drum, Brake unit and Brake Panel.	
8.5.0	Thruster Brake Unit	ELECTROMAG / SPEED-O-CONTROL / OMEGA	
8.6.0	Radio Remote Control	Tele crane make(F24-10D) / Ittowa make (winner)	
8.7.0	Limit Switch (Gravity Type)	SIEMENS / INDUSTRIAL SYNDICATE / BCH / SKC / SOC	
8.8.0	Contactors	SIEMENS / L&T / INDO-ASIAN.	
8.9.0	Over-Load-Relay	SIEMENS /L&T (THERMAL TYPE)	
8.10.0	Under voltage relay	SIEMENS /L&T	
8.11.0	HRC Fuses	GE / L&T /SIEMENS	
8.12.0	Rotary limit switch	SIEMENS / OMEGA / SOC / INDUSTRIAL SYNDICATE	
8.13.0	Switch fuse unit	L&T / SIEMENS / GEC	
8.14.0	Moulded case C.B	SIEMENS / L&T	

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S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
8.15.0	Cable drag chain	IGUS / CABLE SCHLEPP/ TSUBAKIMOTO/ GORTRAC	
8.16.0	Push - Buttons	SIEMENS / L&T /AIRON	
8.17.0	Connectors	ELMAX make or reputed make with IS approved and acceptable BHEL.	
8.18.0	Couplings	KOP-FLEX / FENNER / LOVE-JOY / ESCO / ALLFLEX / SKF.	
8.19.0	Bearings	SKF / ZKL / TIMKEN / NBC / FAG.	
8.20.0	Cables	ELKAY / KUNDAN / GOVIND / GLOSTER / NICCO / L&T / RADIANT / HAVELLS / MARDIA / DELTON / RR / SIECHEM / FINOLEX.	
8.21.0	Bridge Light Fittings	PHILIPS / GE / CROMPTON GREAVES / HPL / OSRAM / BAJAJ / HAVELLS / SYSKA.	
8.22.0	VVVF Drives	FUJI / MITSUBISHI / YASKAWA / TOSHIBA. Note: Crane specific model from the above shall be selected. VVVF drive for Main Hoist, Auxiliary Hoist, LT & CT motions shall be of a single make.	
8.23.0	Gear boxes	ELECON / SHANTHI GEARS / RADICON / CROMTON GREAVES / NU-TECK / AGNEE TRANSMISSIONS.	
8.24.0	DSL Current collectors	SAFE-TRACK / SAFE-LINE / SILVER-LINE / SAFE-LINK / NBM INDUSTRIES.	
9.0.0	**DOCUMENTS/ DETAILS for APPROVAL**	The following documents and details are to be submitted for BHEL Approval, prior to taking up the manufacture of the crane.	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		Note: *A separate set of all drawings and documents listed in S.No.9.1.0 & 9.2.0 shall be submitted for each crane, since each crane has different Long Travel (LT) span.*	
9.1.0	Drawings and Documents	Set-I: a. Calculations for Selection of Electric Motors, Gear Reducers, Brakes, Couplings, Spring Buffers etc. b. Calculations for Bridge Girder, Crab, End - Carriage and their connections. c. GA Drawing of the Crane. d. GA Drawing of Trolley. e. GA Drawing of Individual Mechanisms. Set-II: a. Drawings of Bridge, End-Carriage and their connection. b. Sub-Assembly Drawing for Wheels, Hook Block, Gear Boxes, Hoist rope drum and all brake Drums. c. Wiring Diagram with Logic Circuits with bill of materials. d. Cable Selection based on Current Rating and cable schedule. Initially Set-I drawings to be submitted in one lot and approval to be obtained from BHEL. Based on this, set II drawings to be submitted for approval. The vendor shall provide the Technical catalogues of the following bought-out items: 1. Steel Wire rope	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		2. Crane duty electric motors 3. Gearbox 4. DC Brake with panel 5. Thruster Brake 6. Radio Remote 7. Limit Switches 8. VVVF Drive along with DBR selection chart. 9. Cable drag chain	
9.2.0	Technical Details	a. Total Weight of the Crane including all Electrical Equipment. b. Total Weight of Trolley including all Electrical Equipment c. Weight of each Bridge assembled and ready for erection with and without Mechanical and Electrical Equipment. d. Weight of End-carriage assembled and ready for erection. e. Total Weight of Structural, Mechanical and electrical Equipment and indicated separately also.	
10.0.0	INSPECTION	The following schedule of stage inspections is to be strictly adhered to, prior to dispatch from the suppliers works.	
10.1.0	STAGE – I	a. Verification of Test Certificate for Raw Materials used for Girders, End-Carriages, Trolley, Gear Box Casings, etc. b. Verification of X-Ray Report of Butt-Joints in the Girders and Random Testing on the Welds, by	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		physical examination. c. Box Girder setting before closing of the Bottom Flanges – for inspecting the quality of welding and presence of waviness d. Trolley Frame Fabrication before setting the Mechanisms e. End–Carriage Fabrication before closing of the Bottom Flanges The following Test certificates to be produced during Stage-I Inspection a. TC for plates used for bridge fabrication b. TC for plates used for End carriage fabrication c. TC for the steel rounds used for Gear fabrication. d. TC for plates used for Gearbox casing fabrication. e. X-Ray film and report for all the Butt-Joints in the girders.	
10.2.0	STAGE – II/ FINAL	a. Inspection of Bridges, End–Carriages and platform fabrication. b. Verification of Span & Diagonal Dimensions, Checking of Wheel Alignment, Mechanical Assemblies and Total Alignment. c. Free running of all the Mechanisms. d. Measurement of CAMBER in the Bridges. e. Complete assembly of the crane and free-running of all mechanisms f. Full / Rated Load Test for bridges and trolley and Deflection Test g. Deflection and Permanent Set Measurement.	

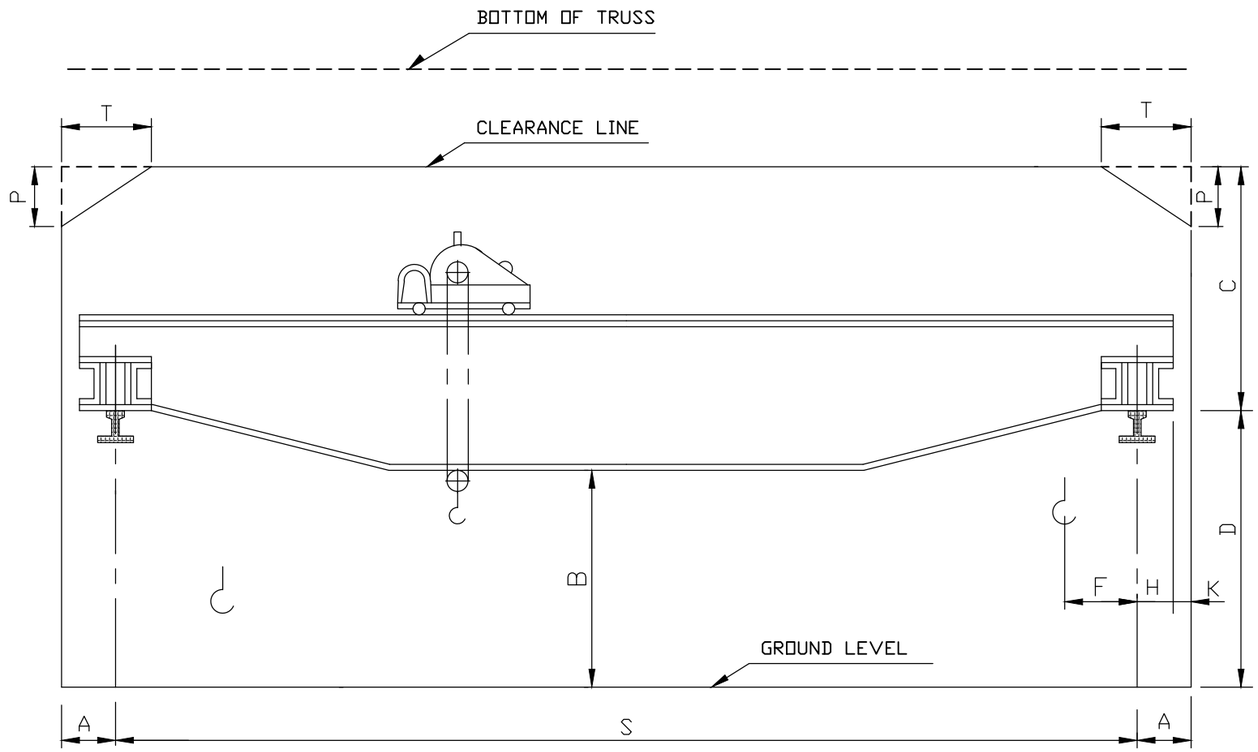
S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		h. 25% OVER-LOAD Lifting Ability Check. The following Test Certificates to be produced during Stage-II Inspection. 1. TC for all Hoist Hooks 2. TC for Steel Wire ropes 3. TC for Heat treatment and final hardness for all gears. 4. TC for Wheel Hardness for LT and CT 5. TC for all thruster brakes 6. TC for all DCEM Brakes 7. TC for all motors 8. TC for all limit switches 9. TC for all VVVF Drives.	
11.0.0	**CRANE ERECTION & COMMISSIONING**		
11.1.0	Crane Erection & Cabling	Complete crane erection/installation, wiring/cabling of the various components at BHEL shall be the scope of the supplier.	
11.1.1	Supplier scope	Mobile crane, Welding & cutting equipment, All electrical & mechanical tools, labour and all consumables like electrodes, oxygen, acetylene, kerosene, oil, paint, etc., are in the scope of the supplier. All relevant PPE (Personal Protective Equipment) for the labourers is also under supplier scope.	
11.1.2	BHEL scope	BHEL shall provide Lifting tackles & Electricity at free of cost.	
11.2.0	Crane Commissioning	Commissioning of the Crane, Camber conformance	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		(>12mm) and Performance Prove –Out for 125% of Crane's Capacity and Smooth Functioning of the Crane shall be the RESPONSIBILITY of the supplier.	
12.0.0	**O & M MANUALS**	Each Crane shall be provided with the following: 1. VFD Programming & Maintenance manual and Technical Information catalogue of VFD 2. Data Sheet containing the Program data loaded in the VFD units. 3. Manual for the Load cell calibration and trouble shooting. 4. THREE hard Copies of Erection, Operation & Maintenance Manual for the crane and ONE soft copy in CD, containing the following technical details: a. Crane GA Drawing. b. Crab Assembly Drawing. c. Total Crane Wiring Schematics. d. Detailed Wiring Diagrams for Sub-Systems /Panels. e. VVVF Drive's Logic Circuits. f. Wheel Assembly Drawings. g. Bottom Block Assembly Drawing. h. Gear Box Assembly Drawings. i. Coupling Drawing and Details. j. Recommended list of spares. k. A complete list of All Bought-Out Items with Specifications & Ratings. l. Warranty/Guarantee Card for all Bought Out-	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's TECHNICAL OFFER (With Complete Details)
		items. m. Trouble Shooting Chart for all Systems.	
13.0.0	**TRAINING**	The Supplier shall arrange 2 days training for BHEL persons at BHEL works free of cost on programming, operation, maintenance and trouble shooting of the offered drive.	
14.0.0	**PERFORMANCE GUARANTEE**	The Performance of the Total Crane and/or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 12 months from the date of performance acceptance at BHEL Works or 18 months from the date of supply whichever is earlier.	

ALL DIMENSIONS ARE IN MILLIMETRES

DRAWING NO: 3-M-02A64-15585



	5T/6.5H.T
S	LT SPAN
D	6500
C	1500
A	270
K	70
T	300
P	300
B	
F	1000
H	

REV	DATE	ALTERED
		CHECKED
		APPROVED
ZONE		

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

ITEM NO	DESCRIPTION	DRAWING NO	MATL CODE	UNIT WT
			MATL SPEC	QTY

EQPT: E O T CRANE / 5T / 6.5 H.T

Bharat Heavy Electricals Ltd
HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

	NAME	SIGNATURE	DATE
DRN	G.Govindaraj	G.Govindaraj	30.03.16
CHD	G.Govindaraj	G.Govindaraj	30.03.16
APPD	G.Thiagarajan	G.Thiagarajan	30.03.16

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ASSY DWG NO	ITEM
M&S	¢/M/F IS: 2102	–	–		
CODE 2597				REF TO OLD DWG NO –	

TITLE: CLEARANCE DIAGRAM FOR E.O.T CRANE (5T / 6.5 H.T)

CARD CODE: U 01

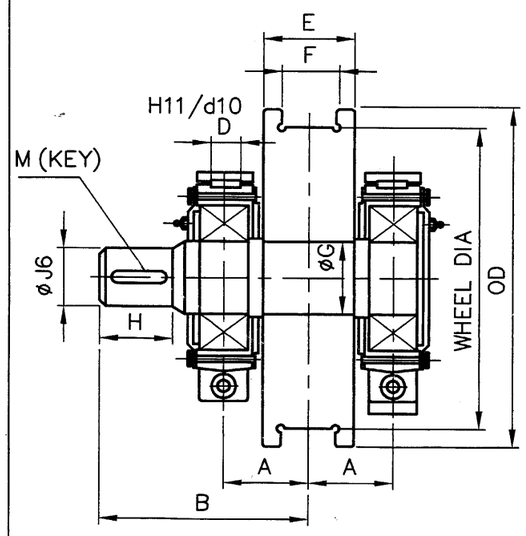
DRAWING NO : 3-M-02A64-15585

REV: 00

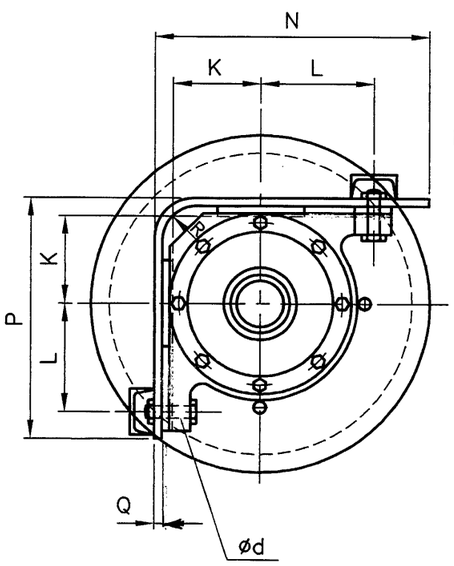
A3–SIZE

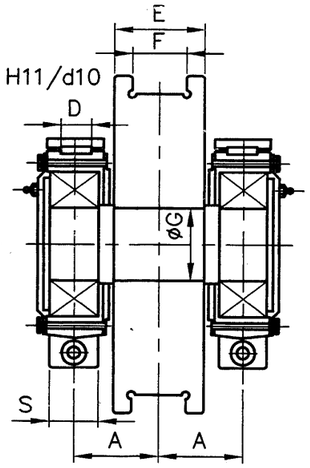
ALL DIMENSIONS ARE IN MM

SL. No.	O.D. (WHEEL DIA) IN MM	RAIL SIZE	A	B	D	E	F	øG	H	øJ	K	L	ød	M (KEY)	N	P	Q	S	R	COUPLING No.	SKF BRG No. & BRG. SIZE	TOTAL WEIGHT IN Kg. FOR DRIVE & IDLE
			DIMENSIONS																			
16	800/850	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	687	588	20	150	80	107	22330 150x320x108	870.00 845.00
15		CR-80	168	420	80	180	110	152	125	110	212	255	32	28x16x115	687	588	20	150	80	106	22330 150x320x108	796.00 775.00
14	710/750	CR-100 CR-120	190	450	80	210	150	152	140	130	212	255	32	32x18x130	642	588	20	150	80	107	22330 150x320x108	808.00 784.00
13		CR-100 CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	728.50 711.50
12		CR-80	180	400	71	180	110	132	125	110	180	224	32	28x16x115	607	517	20	130	80	106	22326 130x280x93	653.00 636.00
11	630/680	CR-80/CR-100 & CR-120	180	420	71	210	150	132	125	110	180	224	32	28x16x115	567	517	20	130	80	106	22326 130x280x93	629.00 611.50
10		90-105 Lbs/Yd CR-80	150	365	60	180	105	111	110	90	160	190	26	25x14x100	547	462	20	120	60	105	22322 110x240x80	448.00 434.50
9	500/550	CR-80 CR-100	160	375	60	180	125	111	110	90	160	190	26	22x14x100	482	462	20	120	60	105	22322 110x240x80	253.00 245.50
8		CR-80	150	360	50	180	125	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	389.00 378.00
7		60/75/90 & 105 Lbs/Yd	150	360	50	180	105	91	105	80	125	160	26	22x14x90	445	395	20	100	50	104	22318 90x190x64	301.00 294.00
6	400/450	CR-80 CR-100	150	360	50	180	125	91	105	80	125	160	26	22x14x90	395	395	20	100	50	104	22318 90x190x64	253.00 245.50
5		90 Lbs/Yd 105 Lbs/Yd	145	315	40	180	105	76	85	70	112	140	22	20x12x75	375	345	16	90	50	103	22315 75x160x55	197.00 192.00
4	320/370	75 / 90 & 105 Lbs/Yd CR-80	145	315	40	180	105	76	85	70	112	140	22	20x12x75	345	345	16	90	50	103	22315 75x160x55	162.00 157.00
3		50 SQ.BAR 60 Lbs/Yd 75 Lbs/Yd	112.5	260	40	125	85	61	65	55	85	112	17	16x10x55	312	287	16	80	50	102	22312 60x130x46	118.50 118.00
2	250/280	50 SQ.BAR 60 / 90 & 105 Lbs/Yd	105	250	32	125	85	61	65	55	76	100	17	16x10x55	254	249	12	60	40	102	22212 60x110x28	66.00 63.00
1	200/230	30 Lbs/Yd 50 SQ.BAR 60 Lbs/Yd	95	220	32	100	67	46	55	40	71	95	17	12x8x45	239	232	12	65	40	101	22309 45x100x36	51.00 50.00



DRIVING WHEEL ASSY





IDLE WHEEL ASSY

MATERIAL :- SHAFT - 45C8/IS:1570.
WHEEL - 55C8/IS:5517.
FORGED.
TREAD PORTION WHEEL HARDNESS 300 TO 350 (BHN)

No.of Pieces	DESCRIPTION	MATERIAL	STANDARD	NET.WT.IN KGS.	DRAWING No.	ITEM No.
REFERENCE:			COMPONENT CODE: 29		EQUIPMENT CODE: 00	
			ALTERATIONS:	DCN REF	DATE	SIGN.	INDEX
SCALE \	DRAWN						
	CHECKED	R.Ramamoorthy					
	APPROVED						
	DATE	20-10-2000					

MACHINE: CRANE WHEEL ASSY
TYPE: GENERAL
TITLE: STANDARD CRANE WHEEL ASSY
DRAWING No: 3-M-02R-11993 00
REV.
No.of Sheets: Sheet No: