2X800 MW LARA TPP STAGE II

TECHNICAL SPECIFICATION
FOR
DOUBLE GIRDER EOT CRANES FOR TG HALL 265/25T

SPECIFICATION No. **PE-TS-508-501-A501**

REV NO. 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA

INDEX

PROJECT INFORMATION

SL.NO	DESCRIPTION	DETAILS
1	**CUSTOMER**	**NTPC Ltd.**
2	**CUSTOMER CONSULTANT**	**N.A.**
3	**LOCATION**	The project is located in Raigarh district of Chhattisgarh State.
4	**DATA**	
4.1	THE BASIC WIND SPEED “Vb” AT TEN METERS ABOVE THE MEAN GROUND LEVEL.	44 METERS PER SECOND
4.2	THE RISK COEFFICIENT “K1”	1.07
4.3	CATEGORY OFTERRAIN	CATEGORY 2
4.4	OTHER FACTORS	IN LINE WITH IS 875
4.5	SEISMIC ZONE	ZONE-III AS PER IS:1893
4.6	DESIGN AMBIENT TEMPERATURE	50 DEG. CELCIUS
5	**ELECTRICAL DATA**	
5.1	RATED VOLTAGE	415 V
5.2	FREQUENCY	50 Hz
5.3	PERMISSIBLE VARIATIONS FOR	
a.	VOLTAGE	+/-10 %
b.	FREQUENCY	(-)5 to (+)3 %
c.	COMBINED VOLTAGE & FREQUENCY	10 %
5.4	SYSTEM FAULT LEVEL AT RATED VOLTAGE FOR 1 SEC	50 kA
5.5	SHORT TIME RATING FOR TERMINAL BOXES FOR 0.25 SEC	50 kA

SCOPE

SCOPE OF THIS PACKAGE COVERS THE FOLLOWING:

SL.NO	PARAMETERS	REQUIREMENT
1	Supply Including Design, Engineering, Manufacturing Of	
a)	Main Supply	YES
b)	Commissioning Spares	YES
2	Painting	YES
3	Inspection & Testing	YES
4	Packing	YES
5	Transportation & Delivery To Site	YES
6	Erection & Commissioning	NO
7	Supervision of Erection & Commissioning	YES
8	Performance Guarantee (PG) Test	YES
9	Mandatory Spares	YES
10	O & M Service	NO
11	O & M Spares	YES
12	Storage	NO

EXCLUSIONS

1	Supply feeder and cable from feeder / MCC to isolating switch.
2	Gantry girder
3	Dead load for load/ overload testing at site
4	Cradle for load/overload testing at site. Crane supplier shall provide drawing for fabrication of cradle at site (if required).
	Note
1	Load testing sling and any other item required by the vendor during the load testing shall be arranged by the vendor at no extra cost to the purchaser. Slings will be allowed to be taken back by the vendor, after completion of the test at site.

	GENERAL TECHNICAL REQUIREMENT
1.0	It is not the intent to specify herein all the details of design and manufacturing. Bidder shall ensure that the offered equipment confirms in all respects to high standards of design, engineering and workmanship.
2.0	The equipment shall comply with all applicable safety codes and statutory regulations of India as well as of the locality where the equipment is to be installed.
3.0	In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.
4.0	The equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.
5.0	Drawing/document submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and training for the same. Bidder to ensure proper internet connectivity at their end.
6.0	The first revision drawings/ documents submitted by vendor shall be complete in all respects.Any incomplete drawing submitted shall be treated as non- submission with delays attributable to vendor's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL / Customer's place as per the requirement for across the table discussions/ finalizations/ submissions of drawings.
7.0	In case of any change in codes, standards & regulations between the date of bid opening (03.03.2023) and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.
8.0	Bidder shall carry out the type tests as listed in the Quality Plan. OR Bidder shall furnish Type Test Certificate of specified Type Test as per quality plan for applicable equipment which has been carried out within last five years from 03.03.2023. These reports should be for the tests conducted on the equipment same (model / type / size / rating) to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. In absence of valid Type Test report vendor to conduct the same without any commercial & delivery implication to BHEL.
9.0	Bidder shall submit stamped QP on compliance route in the event of order. In case, the bidder is supplying the item from outside India, the third party inspection shall be arranged and considered by the bidder in their offer.

10.0	Sub vendor list is attached. Any additional sub - vendors proposed by biddder during contract stage shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
11	Document approval by BHEL / Customer shall not absolve the supplier of their contractual obligations of completing the work as per specification requirement without any commercial and delivery impact.
12	**Mandatory Spares**
12.1	One (1) Set is defined as 100% requirement for one crane for the entire cranes of similar size & capacity.
12.2	All essential spares shall be supplied as per the requirement of the specifications. In case any spare indicated in the specification is not applicable for particular equipment then equivalant applicable spare have been offered / shall be supplied without any financial implication.
12.3	In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder to offer equivalent spares applicable to offered design with quantities generally in line with the approach followed in the above list.
12.4	Any item which is quoted as "not applicable" in the above list and is found to be "applicable" at a later date shall be supplied by the Bidder without any commercial implications. The Bidder shall note that if there in any change/ variation in equipment/ system during detail engineering which causes any change/ variation in the essential spares quantity, the same shall be supplied without any commercial implications. The price indicated for the mandatory spares shall be considered for the purpose of evaluation.
12.5	Interchangeability and Packings: All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the original package. All electronic modules should be pre set and/or preprogrammed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre setting/pre programming before putting them in to service. The spare shall be treated and properly packed for long term storage.
12.6	Identification: Each spare shall be clearly marked and labeled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.
13.0	The type of bearings for various parts as per IS:3177 (latest). Bearing life not less than 10,000 working hours.
14.0	The crane shall be complete with trolley and truck, wheels and axles, Drive mechanisms, Hoisting Drums, Brakes, Creep Speed Arrangement, Lifting tackles, Buffers Electric Motors, Controls, Switch Board and cabling, horns, warning lights, Limit switches etc. Any item not mentioned herein but required to make the system complete for the satisfactory performance of the crane shall also be included.

15.0	Trolley stops of spring type to be mounted independently on bridge rails to prevent trolley from running off.
16.0	Buffers to be designed to bring the loaded crane to rest from a speed of 50% of the rated speed.
17.0	Suitable guard to push forward or off the rail track any object placed across to be provided. Suitable guards to live electrical wirings downshop lead.
18.0	Necessary access ladders shall be provided for access on to crane bridge platform form the gantry girder level, from crane bridge platform to trolley platform and from operating floor of pump to gantry girder level.
19.0	The lifting tackle shall consist of a safety type lower pulley block, hook, necessary sheave and flexible steel wire ropes. The lower block sheaves and ropes shall be of adequate design and size to handle the specified loads.
20.0	Each crane shall have a permanent inscription of English on each side, readily visible from the ground level, stating the safe working loads in tonnes for both the hooks, year of manufacture, crane serial number and manufacturer's name.
21	**SHOP TEST PROCEDURE FOR GEAR BOX**
21.1	Gear Box Running Test: The gear boxes shall be run under no-load condition at the rated speed for minimum four hours in each direction and the following are to be checked:
a	All bolts at the joints remain tight.
b	All gear mesh lines are getting enough lubrication.
c	All bearings are getting enough lubrication.
d	Bearing temperatures after running for four hours shall not exceed 50 deg. Centigrade or 15 deg. centigrade above ambient whichever is higher. Temperature shall be checked after every hour.
e	Vibration : Maximum limit 125 microns (peak to peak)
f	Sound: The gearbox shall not emit unusual sound as obtained under conditions of hard meshing, high spots etc. Maximum sound level shall be 85 dBA at a distance of 1000mm and 91 dBA at a distance of 300 mm.
g	There shall be no Oil leakage at parting lines, bearing housings or inspection covers.
21.2	**In addition to the above specific points, the following general points shall be ensured:**
a	Inspection pockets are provided as required.
b	Gear box casings are provided with at least two fit bolts/dowels at the parting line.
c	Dip sticks with minimum / maximum level markings are provided.
d	Drain plugs are provided at convenient locations preferably at vertical wall of the housing.
e	Breathers are provided.
f	Lifting lugs or eye bolts ar provided as required.
g	Wherever bearings have splash lubrication, oil retainers are provided.

h	Gear boxes are painted as per specification outside and inside. Inside surfaces shall be painted with Oil proof paint.
i	In case of vertical gear boxes having more than two stage reduction, forced lubrication is also provided.
j	Name plate should provide information eg. Ratio, KW rating, Bearing details and manufacturers name.
22	**STAGE INSPECTION OF EOT CRANES AT WORKS:** Stage inspection of various components of crane shall be guided by the MQP attached with this specification. However, following shall be ensured and read in conjunction with relevant clause of MQP w.r.t. stage inspection:
a	For tensile testing of hooks/ forgings, samples shall be drawn from the full cross section of the shank diameter of hooks/ forgings Samples forged to reduced cross section for testing purposes is not acceptable. Hooks shall be manufactured from Blooms, billets, rounds by forging with forging ratio of at least 3:1. Hooks manufactured from plates are not acceptable.
b	Radiographs shall be inspected to a sensitivity of 2%.
c	Gear boxes shall be checked at No load for backlash, tooth contact, noise, temperature rise and vibration.
d	Acceptance and routine tests (HV and insulation) for all electrical and electro-mechanical components and system as per governing specification.
23	**Testing at site under supervision of bidder**: Completely assembled crane at site shall be check for misalignment of gears, shafts and other items. The test shall be carried out with actual panel, RRC, Master Controller etc. Following minimum tests shall be conducted on the crane at the site
a	Deflection test of bridge girder at rated load. Crane shall rest on centerline of LT wheels.
b	Load test and Overload test (running of CT and Hoisting mechanism at 125% of the rated load). Capability of crane to lift the overload from mid-air shall be demonstrated. Electrical tests for brakes, panel, electrical equipment etc. as per IS - 3177
c	All Other tests as per IS-3177.
d	Speed test at rated load for hoisting, CT and LT mechanism.
e	Brake test.
24	**Services to be provided by the bidder**
a	Packing, forwarding and transportation to site

25	**GENERAL REQUIREMENT FOR SUPERVISION OF ERECTION & COMMISSIONING, SUPERVISION OF PERFORMANCE GUARANTEE TESTS AND VISITS DURING WARRANTY PERIOD FOR HEALTHINESS CHECK.**
a	Bidder shall be informed at least 10 days in advance for the requirement of visit at site.
b	Visiting team shall consist of one or two expert of bidder as deemed necessary by them.
c	Visit during material verification for MRC shall be free of cost by bidder at site.
d	Supervision of E&C and supervision of load testing scope shall include scope for supervision of operation in tandem(including PLC software installation and testing for smooth synchronized running of both EOT cranes).
e	During supervision of E&C or Load/ overload testing of crane or during warranty period, if any missing item is noticed which is not supplied (i.e. not part of packing list) and required for safe commissioning or operation of equipment, same shall be supplied by bidder on immediate basis without any cost implication to BHEL.
f	Replacement of all the parts found faulty or malfunctioning from start of erection to load testing activity and in Guarantee period (24 months from date of load testing of respective cranes at site) shall be in Crane supplier scope.

TECHNICAL DATA SHEET A

Sr. No.		DESCRIPTION	TECHNICAL PARTICULARS	
1.0.0		**General**		
1.1.0		**Basic Details**		
	a.	EOT Crane	265/25T Double Girder EOT crane	
	b.	Location	TG Hall Building (Indoor)	
1.2.0	a.	**Design, fabrication and testing of the crane confirm to standard / code number**	Mechanical and Electrical as per IS: 3177-2020 & Structure design in accordance to IS 807:2006 / IS 800:1984.	
	b.	**Minimum thickness of Structural members**	a) Load carrying members: 8 mm b) Tubes with both ends sealed: 4.9 mm (6 SWG) c) Tubes with unsealed ends: 8mm d) Chequered plates: 6 mm O/P e) web thickness - 10mm. f) diaphragm/stiffner thickness - 8mm	
	c.	**MAXIMUM SPAN/DEPTH RATIO FOR GIRDER:**	Plate girders : 18	
1.3.0		**Number of crane**	Two (2) nos.	
1.4.0		**Crane classification**	M5 (Mechanical, Structural and Electrical) as per IS: 3177-2020, IS: 807-2006 and 13834 (part-5)-1993	
1.5.0		**Suitable for outdoor or indoor duty**	Indoor	
1.6.0		**Capacity**		
1.6.1		**Main hoist**		
	a.	Rated SWL – tonnes	265T	
	b.	Test load SWL – tonnes	Rated SWL and over load test : 125% of SWL (Safe Working Load)	
	c.	Lift	30 m	
1.6.2		**Aux. hoists**		
	a.	Rated SWL – tonnes	25T	
	b.	Test load SWL – tonnes	Rated SWL and over load test : 125% of SWL	
	c.	Lift	36 m	
1.7.0		**Span**	29 m	
1.8.0		Operation from	Cabin + Pendent Push Button+ Radio remote control	
2.0		**CRANE PERFORMANCE**		
2.1.0		**Crane speed with full load**	Full speed m/min	Creep speed m/min
	a.	Main hoist	1.6	0.16 (10% of main speed thru' VVVF drives)
	b.	Aux. hoist	7.5	0.75 (10% of main speed thru' VVVF drives)
	c.	Trolley travel (CT)	15	1.5 (10% of main speed thru' VVVF drives)
	d.	Longitudinal bridge travel (LT)	30	3.0 (10% of main speed thru' VVVF drives)
2.2.0		**Acceleration values for LT motion (bridge travel) and CT motion (trolley travel)**	As per IS: 3177 (2020)	
2.3.0		**Hook Approaches from C.L. of rails**		
	a.	Main hook (non cabin side)	3250 mm	
	b.	Aux. Hook (non cabin side)	1850 mm	
	c.	Main hook (cabin side)	2450 mm	
	d.	Aux. Hook (cabin side)	3850 mm	
2.4.0		**Hand Rail Pipes**	32 mm NB Medium class of IS: 1161 having top and bottom rail at height of 1050 mm and 600 mm and vertical post spacing not exceeding 1500 mm with provision of kick plate (100 mm high and 6mm thick)	
3.0.0		**COMPONENT DETAILS**		
3.1.0		**Bridge girder**		

	a.	Type & Quantity	Box type – 2 nos. Material: Mild steel, grade ‘Br' of IS 2062 in 100% killed, normalised and ultrasonically tested quality or high strength steel of IS 8500 as appropriate.	
	b.	Stress consideration	Following to be consider as per IS 807: Static load (dead load), loads due to working load multiplied by dynamic coefficiendt, two most unfavourable horizontal effects excluding buffer forces.All these loads must then be multiplied by amplifying coefficient	
	c.	Maximum Limit for Vertical Deflection	Maximum vertical deflection of the girder producedb y the weight of the trolley and the rated load (excluding impact factor)shall not exceed 1/900 of the span of the crane.	
	d.	Type of connection to end carriage	By fitted bolts	
	e.	Nut & bolts	As per IS:1363, IS:1364 and IS:1367. High Tension Friction grip bolts as per IS: 3757. High Tension Friction grip nuts as per IS: 6623.	
3.2.0		**Type of platform required on the bridge**	Chequered plate platform 6mm thick over plain as per IS : 3502	
	a.	Length	Full span length	
	b.	Walkways	Access walkways of not less than 800 mm (clear) with hand railing of height of 1100 mm along the both side of bridge girder and cross over walkways.	
	c.	Type of access from gantry girder level to crane bridge	Rung ladder at ends from gantry girder level walkway to crane bridges walkway	
	d	Type of access to maintenance cage from crane bridges walkway	Rung ladder	
	e	Type of access to Cabin from crane bridges walkway	By Staircase	
	f	Provided at both ends	Yes	
3.3.0		**End carriage span (wheel base)**	As per IS 807 (latest edition)	
3.4.0		**Trolley**	The trolley frame shall be built up from heavy steel plates, angles and channels adequately braced to resist vertical, lateral and torsional strains, welded to form a rigid one piece frame. Alternatively, it may be of cast steel construction and should be covered by flooring as far as possible.	
			On bottom of trolley frame, on each side a double spring bumper shall be provided to engage stops at each end of the bridge.	
			800 mm (clear) with hand railing of height of 1100 mm along the cross over walkways on trolley.	
	a.	Type	Fabricated	
	b.	Method of fabrication	Fusion welded	
	c.	Material	Mild Steel (Fe410) Gr-Br IS: 2062, 100% killed, normalized & Ultrasonically tested.	
	d.	Other requirements	Upper pulley block shall be approachable for maintenance.	
	e.	Whether jacking pads for lifting trolley provided or not	Yes	
3.5.0		**Rope drums**	**Main hoist**	**Aux hoist**
	a.	Material (Indicate IS)	Seamless pipe ASTM A -106 Gr. B or fabricated rolled section to IS: 2062 Gr. Br & stress relieved	
	b.	Flange / flangeless	Flanged	
	c.	Numbers provided	One for each hoist	
	d.	Type of grooves	Identical Right hand and Left hand & other details shall be as per IS 3177:2020	
3.6.0		**Rope details**	**Main hoist**	**Aux hoist**
	a.	Construction	Extra flexible plough steel , 6 x 36 or 6x37 construction	
	b.	Standard conforming to	IS: 2266 (latest edition)	
	c.	Factor of safety	As per IS-3177 : 2020	
	d.	Type of core	Steel	Steel
3.7.0		**Sheaves details**	Main hoist	Aux hoist
	a.	Material	Fe 410 IS: 2062 Gr. Br / CS Gr. 280-520 IS: 1030 Design as per IS: 3177- 2020	

	b.	Type of guards provided	Fabricated from rolled steel plate	
3.8.0		**COUPLINGS & SHAFTING**		
3.8.1		**Coupling details (between motor and gear box)**	**(for Main hoist, Aux hoist, Cross Travel and long travel)**	
	a.	Type	Flexible shock absorbing coupling	
	b.	Guards and enclosures	Provided	
	c.	Coupling material and hardness	All couplings shall be of cast, wrought or from forged steel, tooth portion to be heat treated to hardness HB241-280	
3.8.2		**Coupling details (between gear box and wheels)**	**Cross Travel (CT)**	**Long Travel (LT)**
	a.	Type	Flexible geared type	
	b.	Guards and enclosures provided	Yes	
3.8.3		**Coupling details (between gear box and rope drum)**	**Main hoist**	**Aux hoist**
	a.	Type	One of the following arrangements will be adopted for connecting the rope drum with the gear- box. 1.Flexible joint, incorporating flexible geared coupling housed within the drum. 2.Fully flexible geared coupling between the drum & gearbox.	
	b.	Guards and enclosures provided	Yes	
3.8.4		**Shafting (Output)**	**Cross Travel**	**Long Travel**
	a.	Factor of Safety	As per IS: 3177-2020	
	b.	Arrangement of lubrication	Grease cups / Nipple	
	c.	Type of lubricant	Grease	
3.9.0		**Gear box details**		
3.9.1		**Hoist Motions**	**MH and MH Micro**	**AH and AH Micro**
	a.	Type of mounting of gear box	Horizontal / Vertical	
	b.	Classification	Suitable for M5 duty	
	c.	Type of gears	For MH and AH: Helical / Spur For MH Micro and AH Micro: Through VVVF drive	
	d.	Type of lubrication (grease / splash / pump lubrication)	Splash Lubrication	
	e.	Hardness (BHN) – gear	220 BHN (minimum)	
	f.	Hardness (BHN) – pinion	270 BHN (minimum)	
	g.	Difference in Gear and pinion hardness	Min 20 BHN	
	h.	Materials (gear/pinions)	Main Gears En 9/ 55C8/ IS2707 Gr. 1or 2. Pinions En 19/EN 24. Hardness conforming to IS: 3177-2020 Gears to be hardened, tempered & heat treated as per IS 4460	
	i.	Casings	Fabricated Fe 410w IS: 2062 Gr Br & stress relieved	
	j.	Noise level	85 db	
	k.	Standard conforming to	IS: 4460 / AGMA	
3.9.2		**Travel Motions**	**CT and CT Micro**	**LT and LT Micro**
	a.	Type of mounting gear box	Vertical/ Horizontal	
	b.	Classification	M5 duty	
	c.	Type of gears	For CT and LT: Helical / Spur For CT Micro and LT Micro: Through VVVF drive	
	d.	Type of lubrication (grease / splash / pump lubrication)	Splash Lubrication	
	e.	Hardness (BHN) – gear	220 BHN (minimum)	
	f.	Hardness (BHN) – pinion	270 BHN (minimum)	
	g.	Difference in Gear and pinion hardness	Min 20 BHN	
	h.	Materials (gear / pinions)	Main Gears En 9/ 55C8/ IS2707 Gr. 1or 2. Pinions En 19/EN 24. Hardness conforming to IS: 3177-2020 Gears to be hardened, tempered & heat treated as per IS 4460	
	i.	Casings	Fabricated Fe 410w IS: 2062 Gr Br & stress relieved	
	j.	Noise level	85 db	
	k.	Standard conforming to	IS: 4460 / AGMA	
3.10.0		**Wheels details**	**Cross Travel**	**Long Travel**

	a.	Material	Grade C55Mn75 of IS 1570 (Part 1 and Part 2/Sec 2) or 42CrMo4 or equivalent as per IS 3177-2020. UTS required for selection of PL value as indicated in Table 6 of IS 3177 shall be witnessed by BHEL.	
	b.	Hardness	300 – 350 BHN	
	c.	Depth of hardness	10 mm (min)	
	d.	Process of hardening	Volume hardening	
	e.	Type	Double flanged	
	f.	Min.Numbers provided	4 nos.	8 nos.
	g.	Specification conforming to	IS: 3177-2020	
	h.	Arrangement of lubrication	Grease	
3.11.0		**Lifting hooks**	**MH**	**AH**
	a.	Type	Ramshorn shank with safety latch swiveling type as per latest edition of DIN-15402	Plain with safety latch swiveling type as per latest edition of IS: 15560
	b.	Safe lifting capacity	SWL is 265 T , however 320T capacity hook model as per DIN-15402 is to be provided	25 T as per IS: 15560
	c.	Material	-As per DIN-15402	Class 3 for hook of grades L & M respectively as per IS 1875:1992 for hooks conforming to IS : 15560
	d.	Standard conforming to	DIN-15402	IS: 15560
	e.	Hook can rotate	Yes	
	f.	Safety latch on hook provided	Yes	
	g.	Locking device on swivelling hook required or not	Provided	
3.12.0		**Buffers**	**Cross travel**	**Long travel**
	a.	Type	Spring loaded type. To be designed to bring the loaded crane (In calculation crane is considered to be loaded with SWL) to rest from speed of 50% of the rated speed.	
	b.	Numbers provided	4	4
	c.	Details of end stop	Mild steel, grade 'B' of IS 2062 in 100% killed, normalised and ultrasonically tested quality or high strength steel of IS 8500 as appropriate.	
3.13.0		**Brakes**		
3.13.1		**Hoist Motions**	**MH**	**AH**
	a.	Type of brake	AC Electro-Hydraulic Thruster operated	
	b.	Number provided per motor	2	2
	c.	Braking capacity (% of torque transmitted to the brake drum with full load.)	150%	150%
	d.	Material		
		· Brake liners	Ferrodo liners	
		· Drum	CS IS : 1030 / CL 4 IS : 1875	
		· Springs	As per manufacturers standard	
3.13.2		**Travel Motions**	**CT**	**LT**
	a.	Type of brake (ac / dc / thrustor)	AC Electro-Hydraulic Thruster operated	
	b.	Number provided per motor	2	2
	c.	Braking capacity (% of motor rated torque before derating)	125%	125%
	d.	Material		
		· Brake liners	Ferrodo liners	
		· Drum	CS IS : 1030 / CL 4 IS : 1875	
		· Springs	As per manufacturers standard	
3.14.0		**Motors**		

	a.	Type	Three phase Squirrel Cage Induction motors to be operated from VFD system shall be suitable for speed range and torque without exceeding temperature rise limits as specified elsewhere in this specification. These motors shall be provided with insulated bearing on at least one side for motor frame size above 250 frame. However, contractor's proven practice with respect to use of insulated bearing in VFD driven motor may be accepted subject to Employer's approval.
	b.	Enclosure	TEFC
	c.	Numbers furnished	For Main hoist: one no.
			For aux hoist: one no.
			For Cross travel: one no.
			For long travel: 2 nos.
	d.	Voltage, phase and frequency	415V ± 10%, 3 Ph., 4 wire, 50 Hz, +3/-5 % Combined voltage & frequency variation = 10% absolute
	e.	Class of protection for motor including terminal box	IP – 55
	f.	Rated capacity (KW)	The motor shall be suitable for 40% CDF. Motor nameplate rating at 50 C shall have Motor rating will be calculated keeping margin of at least 10% over the maximum power requirement in the duty condition specified.
	g.	Duration factor/duty	40 % CDF / S-4
	h.	Class of insulation	Class 'F' for sq. cage motors with temp rise limited to 70 C
	i.	Number of starts/ hour	Starts / hr as per IS 3177-2020
	j	Overload protection for motors provided	Yes
	k	Space heater requirements	For motors of rating 30 KW and above. Separate terminal box for space heaters & RTDs shall be provided.
	l	Motor Duty and pull out torque	Duty S4 and pull out torque 275% of full load torque
	m	Terminal box of motor	-Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation.
			-Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated.
			- The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.
			- Rotation at 90 deg
	n	Cable glands and lugs	-Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used.
			-Gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable boxes.
	o	Earthing points suitable for conenction	Motor body shall be grounded at two earthing points on opposite sides with two separate and distinct grounding pads complete with tapped holes, GI bolts and washers. LT Motors above 125 KW --- 50 x 6mm GS flat 25 KW to 125 KW --- 25 x 6mm GS flat 1KW to 25 KW --- 25 x 3mm GS flat.
	p	Minimum spacing between gland plate & centre of bottom terminal stud	UP to 3 KW As per manufacturer's practice. Above 3 KW - upto 7 KW 85 mm Above 7 KW - upto 13 KW 115 mm Above 13 KW - upto 24 KW 167 mm Above 24 KW - upto 37 KW 196 mm Above 37 KW - upto 55 KW 249 mm Above 55 KW - upto 90 KW 277 mm Above 90 KW - upto 125 KW 331 mm Above 125 KW-upto 200 KW 385/203 (For Single core cables only) mm
	q	Minimum inter-phase and phase-earth air clearances with lugs installed	UP to 110 KW 10mm Above 110 KW and upto 150 KW 12.5mm Above 150 KW 19mm

	r	Other requirement		
	t.1	Squirrel cage Induction motor with VPI insulation shall be provided With VVVF system. Motor shall be energy efficient as per IS:12615, IEC 60034 and shall be Crane duty as per IS:3177. Winding & insulation shall be Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation. Vibration shall be limited within the limits IS:12075.		
	t.2	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time. permissible starting voltage for motor shall be as follows:Up to 85% of rated voltage for ratings below 110 KW.		
	t.3	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed 11 for motors above 50 KW upto 110 KW.		
3.15.3		**Storm brake**	2x50% storm brakes, one each at each end of the bridge, shall be provided for each crane. Storm brakes shall be designed for wind velocity and detail given in project data. Storm brakes shall be truck end mounted, hydraulic rail clamp type of adequate capacity (depending on wind pressure) to be provided. The setting shall include automatic engagement of clamps in case of crane is left idle for five minutes (adjustable).	
3.16.0		**Drive system for hoisting**		
	a.	Arrangement of drive from motor to rope drum (main)	Through geared coupling and gear box	
	b.	Arrangement of drive from pony motor to rope drum (creep speed)	Creep speed through VVVF drive.	
3.17.0		**Bearings (for crane hook, Trolley wheels, rope drum, gear box or any other assembly)**		
	a.	Type	Antifriction ball / roller bearings	
	b.	Number provided for each	As per assembly requirements	
	c.	Method of lubrication	Centralised grease lubrication with hand operated grease pump for all bearings as per bidder's standard proven practice.	
	d	Bearing life	not less than 10,000 working hours	
3.18.0		**Rails**		
	a.	Type / section	Rails sections as per IS: 3443. Joint to be butt-welded by thermit welding or fusion welding/ CR-100 with 45 degrees angle.	
	b.	Standard conforming to	IS: 3443	
3.19.0		**Power conductors (DSL) & Cables**		
	a.	Design Criteria	Cable from main isolating switch (1.5M above operating floor) to motor terminal shall be so sized that the voltage drop does not exceed 2% of rated voltage at motor terminals.	
	b.	Type	LT: PVC shrouded Cu/Al conductor bus bar. CT: EPR insulated, copper conductor trailing cables, as per IS: 9968, on the bridge/ energy chain trailing system	
	c.	LT POWER CABLES	All LT power cables of sizes more than 120 sq.mm. shall be XLPE insulated, and sizes shall be of 1Cx150, 1Cx300, 1Cx630, 3Cx150, 3Cx185, 3Cx240& 3Cx300 Sq.mm. However for cable sizes upto 120 sq.mm. both XLPE insulated & PVC insulated LT power cables are acceptable.	
	c.1	1.1 KV grade XLPE power cables	1.1 KV grade XLPE power cables shall have multi stranded compacted aluminum conductor (tensile strength of more than 100 N/ sq.mm), XLPE insulated, PVC inner-sheathed (black color as per IS:5831), Armoured (For single core Armoured cables, armoring shall be of aluminum wires H4 grade. For multicore Armoured cables armouring shall be of galvanized steel round wire/strip), PVC FRLS outer-sheathed (black colour) conforming to IS: 7098. (Part-I).	

	c.2	1.1KV grade PVC power cables	1.1KV grade PVC power cables shall have multi stranded aluminum conductor (compacted type for sizes above 10 sq.mm), PVC Insulated, PVC inner sheathed ((black color as per IS:5831)) Armoured (For single core Armoured cables, armoring shall be of aluminum wires H4 grade. For multicore Armoured cables armouring shall be of galvanized steel round wire/strip), PVC FRLS outer-sheathed (black colour) conforming to IS:1554 (Part-I).
	c.3	LT Control Cables	LT Control Cables are Cu conductor 1.5 sq mm, PVC insulated, PVC inner sheath, GS wire/strip armoured and FRLS PVC outer sheath confirming to IS 1554 Part-1. Standard control cable sizes shall preferably be 3CX1.5, 5CX1.5, 7CX1.5 & 10CX1.5mm2, 14CX1.5 mm2.
	c.4	1.1 kV grade trailing cables	1.1 kV grade trailing cables shall have tinned copper (class 5) conductor, insulated with heat resistant elastomeric compound based on Ethylene Propylene Rubber (EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250deg C during short circuit, inner sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968.
	d.	Size	a) Rated current of the equipment b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage. c) Short circuit withstand capability Derating factors for various conditions of installations (variation in ambient temperature, grouping of cables) shall be considered while cable sizing.
	e.	Length	Suitable for bay length
	f.	Guard provided for DSL	Yes
3.20.0		**Operators cabin**	
	a.	Type of construction	Open type with minimum 6mm toughened glass.
	b.	Area and minimum clear height	2500x1850 mm with a head room of 2000 mm
	c.	Operator’s seat	Revolving type
	d.	Warning gong	A foot operated electric warning horn of double bell type suitable for 240 V AC. of noise level 95 dB at 3.5 m. One brass gong suspended outside the Cabin and operated from inside.
	e.	Alarm	A distinct type alarm with conspicuous warning lights on either side of the crane bridge to indicate overloading of crane.
	f	Position of controllers	In front/ side of operator’s chair
	g	Ventilation	One no non oscillating ventilating electric fan in cabin
	h.	Additional features	-Emergency Push Button
			-Switches for lights and bells
			-Lamps for Power ‘ON’ indication and emergency corner switch operation
3.21.0		**Limit switches**	
	a.	Type	For MH: Rotary gear + Gravity
			For AH: Rotary gear + Gravity
			For CT: Lever type (one way/ two way)
			For LT: Lever type (one way/ two way)
	b.	Number provided	For MH: 1+1
			For AH: 1+1
			For CT: 2/1
			For LT: 2
	c.	Material of contacts	Double break Silver Cadmium
	d.	Control voltage / Enclosure	110 V/ IP 55
3.22.0		**Isolating switch**	

	a.	Main isolating cum changeover switch (01 no.), mushroom type emergency STOP push buttons : At center of bay length(to be decided during detail engineering). Additionally Two nos. isolating switch shall be provided at extreme ends of the bay length, at a distance of approximately 20 mtrs. From the centre line of first & last column for maintenance of the cranes	
	b.	BHEL will provide two number 415 V AC (3 PHASE 4 WIRE) supply feeder only up to isolating cum changeover switch. Any other voltage level (AC/DC) required will be derived by the vendor.	
	c.	Motor starter shall be part of crane control panel.	
3.23.0		**Protective Panel**	Shall be Provided with isolating switch, power contactor control and indication to switch ON/OFF power to starter panels, control and lighting transformer.
	a.	Material	Cold Rolled Sheet steel 2 mm size,3mm for Gland Plates (CRCA/HR),1.6mm: Doors, covers etc
	b.	Numbers and location	One number located in cabin
	c.	DOP	IP 54
3.24.0		**Control panel**	
	a.	Material	Cold Rolled 2 mm size,3mm for Gland Plates (CRCA/HR),1.6mm: Doors, covers etc: sheet steel 2mm size
	b.	Numbers and location	One each for MH, AH, CT and LT located on bridge platform with space heaters.
	c.	Degree of protection	IP 54
3.25.0		**Master Controllers (Desk Type)**	
	a.	Number of steps	For MH: 5
	b.	Voltage & current rating	415 V/10 A
	c.	Type	Heavy duty type having DOP IP54. Release of operators' hand from the controls shall stop motion and set brakes automatically.
	d.	Location	In cabin
3.26.0		**Control for Hoists /CT/LT operations**	Through Variable Voltage Variable frequency drive
	a.	Speed control	Thru' VVVF with minimum 6 pulse design
	b.	Starting torque of VVVF	Up to 400 % typical with/ without encoder
	c.	Starting current	Less than 150 % of rated torque.
	d.	Temperature	VVVF system shall be capable of withstanding up to 50 o C without derating.
	e	Other requirements for VFD	Necessary input & output devices to be provided to reduce harmonics, as per IEEE519, at supply side of the drive at the switchgear.
	f	Other requirements for VFD	The Variable frequency drive (VFD) system shall be of a modern proven design for similar applications in power plants/industry. The system shall be either Current Source Inverter (CSI) or Voltage Source Inverter (VSI) type with minimum Twelve (12) pulse design / 6 pulse with active frontend harmonic filter. For drives less than 100 KW Six (6) pulse can be offered meeting all other requirements.
	g	Other requirements for VFD	All necessary protections e.g., Input Phase Loss, Earth Fault, Over Voltage, Output Short Circuit, Load Loss, Input Transient Protection, overload etc to be provided.
3.27.0	**a.**	**Contactors**	AC 4 duty for reversing application. AC 3 duty for non-reversing application
	b.	**Switches**	AC 23 for motor application, AC 22 for other application.
	c.	**Fuses**	HRC
	d.	**Overload relay**	Temperature compensated bimetallic with single phasing preventor.
3.28.0		**Power supply**	Owner shall provide Two (2) nos. 415 V, 3 phase, 4 wire supply at operating floor near A row column at centre of bay length shall be provided. Bidder shall provide change over switch in enclosure to receive above power supply.
3.29.0		**Cable glands**	Cable glands shall conform to BS:6121. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and Hardware shall also be made of brass with nickel chrome plating. Rubber components shall be of neoprene or better synthetic material and of tested quality.

3.30.0		**Lugs**	Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections
3.31.0		**Transformer**	(Dry type, With Insulation Class B or Better)
	a.	Quantity	2 X 100 % for control, 1 no for lighting & 1 no for hand lamp.
	b.	Voltage Rating	Control 415/110V, Lighting 415/240V and hand lamp 415/24V.
	c.	KVA rating	20% over loading to be considered while sizing the rating
3.32.0		**Illumination**	
	a.	In cabin	40W florescent tube + Bulk head fitting with 60W incandescent lamp – 1 each 2 nos. 24V- 5A-3 pin industrial socket.
	b.	Over Bridge	4 no. 60W Bulk head fittings with Florescent lamp lamps and 4 nos.24V 20A -3 pin Industrial socket
	c.	Under bridge	4 nos. 250 W HPSV lamps
	d.	For inspection of crane components	One (1) portable 40W hand lamp with min. half span length flexible cable for inspection of crane compon-ents.
3.33.0		**Fire Extinguisher**	
	a.	Type and size	4.5 kg CO2 type
	b.	Location	One in cabin and Three on bridge
3.34.0		**Maintenance cage**	Suitable inspection cages to accommodate two persons to facilitate inspection
3.35.0		**Mechanical overload protection (Load Cell)**	To be provided for hoist mode
3.36.0		**RRC details**	
	a.	RRC should be supplied with transmitter unit, receiver unit, encoder unit, decoder unit, interface panel, coupling system, battery unit and any other control gear if required.	
	b.	The equipment should be based upon the microprocessor based digital technology with almost nil hard wiring.	
	c.	The remote unit should communicate up to the distance of approximately 100 meters.	
	d.	The system has to integrate with the control system of crane, which operates at 110 V AC, Single phase.	
	e.	The remote unit should have transmitter which can be mounted on shoulder by suitable belt. Main controls can be of single joystick movement or double joystick movement type stepped control with spring return. The Micro control should be toggle switch type or push control type.	
	f.	Frequency allotment for radio remote unit from Govt. of India, Dept. of Telecommunication or any other agency shall be the responsibility of supplier.	
	g.	The transmitter and receiver unit should have its own frequency and address code with each system having its own security code so that one particular set becomes unique and there is no interference from any other remote unit device. A microprocessor should check all security codes. The processor should have its own watchdog circuit. The receiver FM band should be sufficiently narrow to allow only passing of desired frequency and valid command. Any error should shut down the system immediately.	
	h.	The remote unit should have safety key to prevent any unauthorized operation. All the crane operations should stop at once the communication breakdown occurs.	
	i.	On local unit (receiver side), the system should be provided with one selector switch so that EOT crane can be operated either from Operator cabin or radio remote unit.	
	j.	In case tandem operation is envisaged, a suitable selector switch shall be provided in the cabin for selection of Tandem/normal operation.	
	k.	The receiver unit along with I/O interface unit should be able to bear the vibrations and shocks encountered in normal usage of EOT crane.	
	l.	The system should have very fast response time.	
3.37.0		**Sweep**	Sweep shall be attached to the end carriages and to the trolley to remove foreign materials from the rails.
3.38.0		**Whether tandem operation envisaged**	Yes

3.39.0		**Lifting Beam & its capacity**	SWL= 450T, Design Capacity= 472.5T, Overload test (Manufacturer works) at 1.25XSWL A suitable indicating device to indicate the difference in the lifts of the two cranes, which shall be limited to 200 mm shall be provided on the lifting beam. The level difference indication shall be visible from ground level. A limit switch shall be provided to give alarm at both the cabins to enable the crane operators to control the level difference within 200mm.
3.40.0		**Anti Collision device**	Suitable anti-collision device of two cranes, alongwith stoppers at both the gable ends.
3.41.0		**Lubrication**	
	a.	Provisions shall be made for proper lubrication of all parts.	
	b.	Bearings shall be provided with means of pressure lubrication.	
	c	The crane shall be provided with all necessary lubrication fittings.	
	d	Lubricating points shall be located for easy and safe access without the necessity of removing guards or other parts. Lubrication lines shall be securely fastened to the cranes structure and shall be located to provide the maximum protection and so that ordinary repairs can be made without removing the lines.	
	e	The crane shall be provided with a centralized lubrication system of reputed make. This system shall be manually operated, complete with a manual pump, reservoir, supply lines, connectors, valves, and discharge lines to all bearings. System shall be centralized lubrication type with at least, one pump mounted on the trolley and one on each of the crane bridge with supply line for connection to all lubrication points. .	
	f	Metering valves with indicators shall be provided for all points of grease application and shall be mounted at readily visible and accessible locations.	
	g	All piping shall be made of suitable metal tubing with flexible hoses where required.	
3.42.0		**DSL phase indicating lamps**	to be provided on both side of bay length.
3.43.0		**Consumables**	The Bidder’s scope includes requirements of consumables such as oils, lubricants including grease, servo fluids, cadmium compounds, gases and essential chemicals etc. First fill of all these consumables shall also be included in the scope of the Bidder.
3.44.0		**E-Learning Package**	
	a.	The courses shall be web based and mobile based Application type. It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/ Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.	
	b.	The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/ Mobile, Tablet and any other display devices.	
	c	Course content text shall be in English language and be associated with a voiceover in English language with Indian accent.	
	d	Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.	
	e	Each course shall have every physical and functional detail of the equipment / system supplied.	
	f	Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.	
	g	There shall be option for self-assessment test after every course. In case the user doesn’t opt for self-assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/ quiz.	
	h.	If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.	
	i.	Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.	
	j.	The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course.	
	k.	The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.	
	l.	The system shall provide the user with the ability to select the information with a Cursor.	

	m	The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop-up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function.	
	n	Every course shall contain the 3D design/drawing/exploded view/3600 turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio.	
	o	The users shall be able to control audio sound level associated with the courses.	
	p	Drawings / text in the courses shall be scalable (Zoom In/ Out).	
	q	The user shall have the capability to record a bookmark to mark displayed information for later recall, whenever he accesses the same course next time.	
	r	e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system.	
	s	e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system.	
	t	The vendor shall get the approval of one sample course from EIC before proceeding for further courses.	
3.45.00		**Nuts & Bolts**	As per IS:1363, IS:1364 and IS:1367.
3.46.00		**Electrodes**	Radiography quality, covered electrodes with heavy covering as per IS : 814 and relevant requirements of ASME Sec. IX and IIC. Bare Electrodes as per IS:7280 and flux wire combination as per IS : 3613.

	TECHNICAL SPECIFICATION 2X800 MW LARA TPP STAGE II DOUBLE GIRDER EOT CRANES FOR TG HALL 265/25T		**PE-TS-508-501-A501**	
			Rev. No. 00	
			Date : AUG 2024	
TECHNICAL DATA SHEET B				
(SUCCESSFUL BIDDER TO FILL AFTER PLACEMENT OF ORDER)				
Sr. No.		**DESCRIPTION**	**TECHNICAL PARTICULARS**	
1.0.0		**COMPONENT DETAILS**		
		Bridge girder		
	a.	Size		
	b.	Width		
	c.	Length		
2.0.0		**Trolley**		
	a.	Centre to centre distance of wheels (on the same rails)		
3.0.0		**Rope drums**	**Main hoist**	**Aux hoist**
	a.	Dimensions in mm length and diameter (PCD)		
	b.	Number of grooves		
	c.	Diameter on bottom of grooves		
4.0.0		**Rope details**	**Main hoist**	**Aux hoist**
	a.	Grade		
	b.	Diameter in mm		
	c.	Breaking strength		
	d.	Tensile designation		
	e.	Number of falls		
	f	Length of rope		
3.4.0		**Sheaves details**	**Main hoist**	**Aux hoist**
	a.	Diameter of main sheaves in mm on Root		
	b.	Diameter of Equalizing sheaves (in mm) on Root		
3.5.0		**COUPLINGS & SHAFTING**		
3.5.1		**Coupling details (between motor and gear box)**	**(for Main hoist, Aux hoist, Cross Travel and long travel)**	
	a.	Size & Torque rating		
3.5.2		**Coupling details (between gear box and wheels)**	**Cross Travel (CT)**	**Long Travel (LT)**
	a.	Size & Torque rating		
3.5.3		**Coupling details (between gear box and rope drum)**	**Main hoist**	**Aux hoist**
	a.	Size		
3.5.4		**Shafting (Output)**	**Cross Travel**	**Long Travel**
	a.	Diameter in mm		
	b.	Number of support bearings		
	c.	Type of support bearing		
	d.	Max unsupported length of shaft in mm		
3.6.0		**Gear box details**		
3.6.1		**Hoist Motions**	**MH and MH Micro**	**AH and AH Micro**
	a.	Total number of reductions		
	b.	Type of gears for MH and AH		
	c.	Reduction ratio		
	d.	Hardness (BHN) – gear		
	e.	Hardness (BHN) – pinion		
	f.	Difference in Gear and pinion hardness		
	g.	Materials (gear/pinions)		
3.6.2		**Travel Motions**	**CT and CT Micro**	**LT and LT Micro**
	a.	Total number of reduction		

	b.	Type of gears		
	c.	Reduction ratio		
	d.	Hardness (BHN) – gear		
	e.	Hardness (BHN) – pinion		
	f.	Difference in Gear and pinion hardness		
	g.	Materials (gear / pinions)		
3.7.0		**Wheels details**	**Cross Travel**	**Long Travel**
	a.	Material		
	b.	Hardness		
	c.	Depth of hardness		
	d.	Tread diameter in mm		
	e.	Tread width in mm		
	f.	Numbers provided		
3.8.0		**Lifting hooks**	**MH**	**AH**
	a.	Material		
3.9.0		**Brakes**		
3.9.1		**Hoist Motions**	**MH**	**AH**
	a.	Diameter of brake in mm		
	b.	Torque rating Kg. M		
	c.	Braking torque actually required		
	d.	Braking distance in mm		
	e.	Thruster material		
3.9.2		**Travel Motions**	**CT**	**LT**
	a	Dia of brake in mm		
	b.	Torque rating KgM		
	c.	Braking torque actually required		
	d.	Thruster material		
	e.	Braking distance in mm		
3.10.0		**Rails**	**CT**	**LT**
	a.	Weight per metre		
	b.	Top width in mm		
	c.	Height in mm		
3.11.0		**Motors**		
	a.	rating	For Main hoist: For aux hoist: For Cross travel: For long travel:	
	b.	Speed (rpm)		
	c.	Contactors for motor		
	d.	Spacing between gland plate & centre of bottom terminal stud		
	e.	Minimum inter-phase and phase-earth air clearances with lugs installed		
	f.	Space heater requirements details		
	g.	Overload protection details		
3.12.0		**Limit switches**		
	a.	Rating of contacts		
3.13.0		**Protective Panel**		
	a.	Dimension		
3.14.0		**Control panel for MH, AH, CT and LT**		
	a.	Dimension		
3.15.0		**Slings, suitable for load & overload test of EOT Crane (to be supplied alongwith load test certificate for joint at 2 X rated capacity)**		
	a	Length		
	b.	Size		

COMPLIANCE DRAWINGS

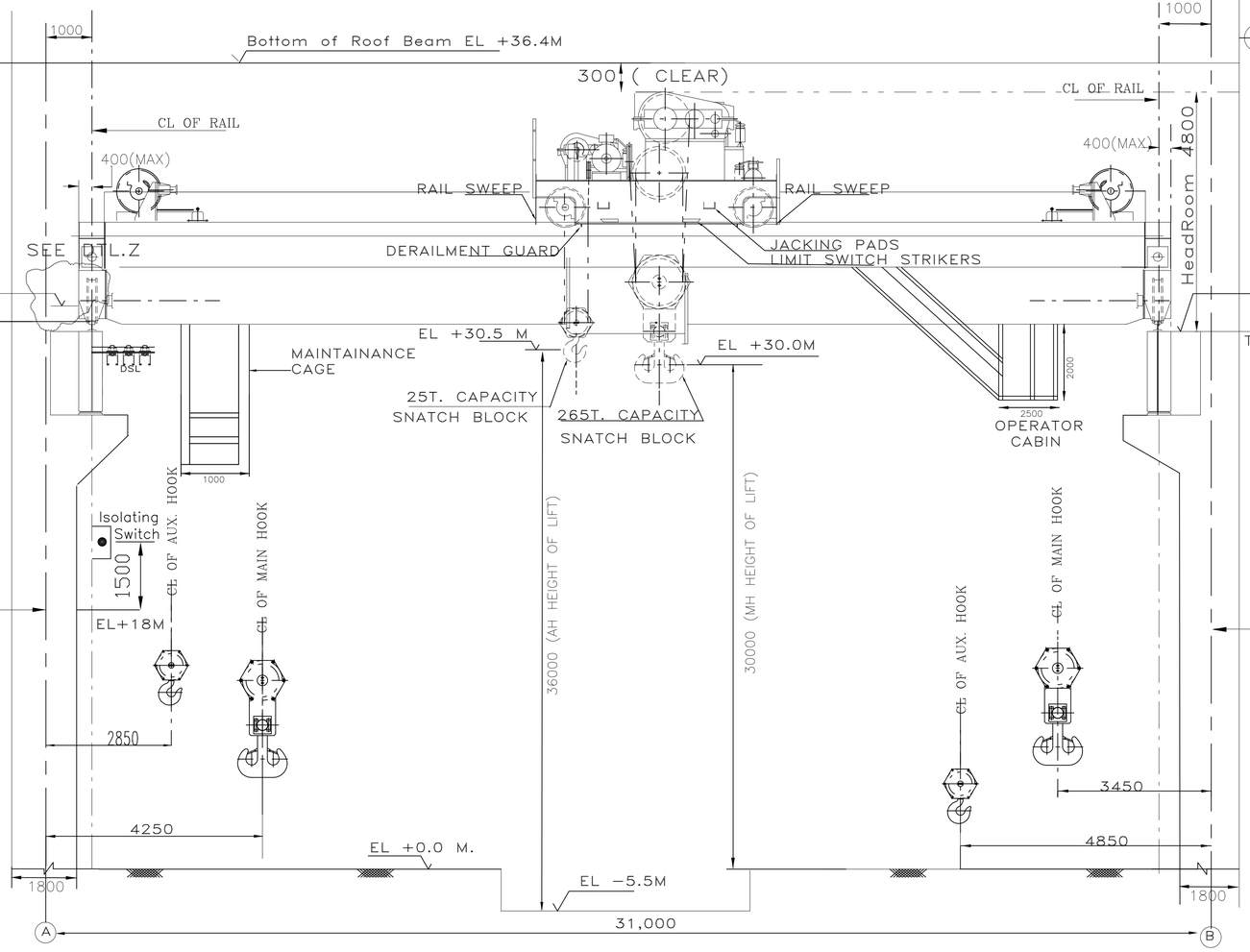
Fold-2 | ALL DIMENSIONS ARE IN MM | FIRST ANGLE PROJECTION | Fold-1

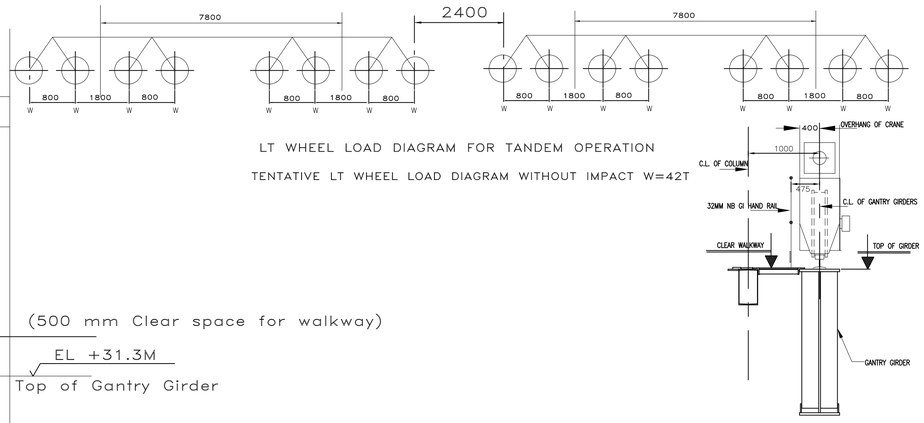
3 4 5 6

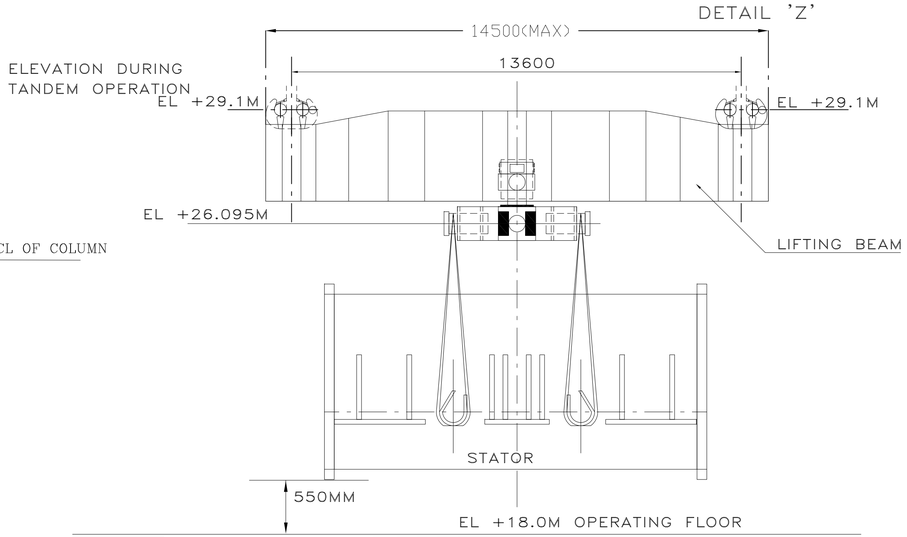
DRAWING NO.

CUSTOMER'S DRAWING NO.

COMPUTER FILE NAME : TAL5







DESIGN CRITERIA (CRANE)

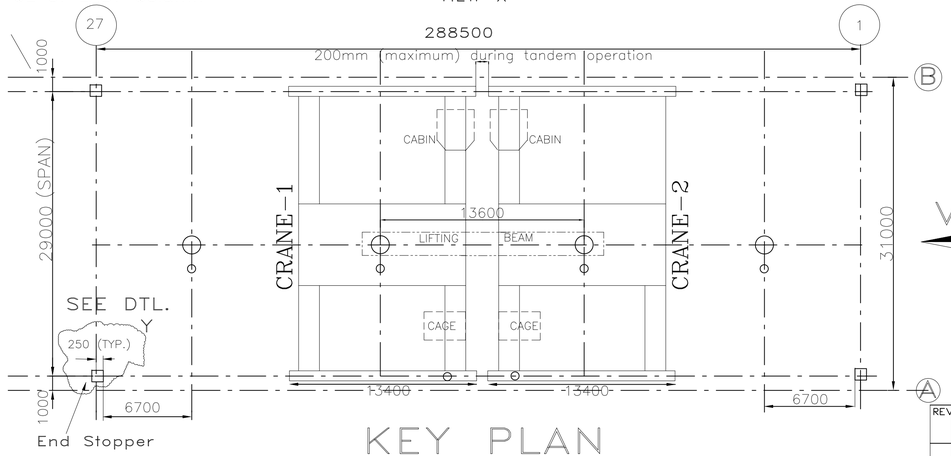
HEAVIEST WEIGHT (GEN STATOR) TO BE LIFTED (IN TANDEM) = 445 T
WEIGHT OF LIFTING BEAM, SLINGS ETC. = MAXIMUM 50 T
CONSIDERING 5 % MARGIN = 24.75 T
TOTAL DESIGN LOAD FOR TANDEM = 519.75 T
REQUIRED CAPACITY FOR EACH CRANE = 259.75 T

2ND HEAVIEST WEIGHT (HP TURBINE WITH TRANSPORT SKID) TO BE LIFTED
CONSIDERING 5 % MARGIN = 128T X 1.05= 134.4T
(2ND HEAVIEST WT. SHALL BE LIFTED BY SINGLE EOT CRANE)
CRANE CAPACITY SELECTED = 265 T

DESIGN CRITERIA (LIFTING BEAM)

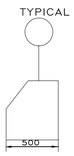
SWL OF LIFTING BEAM (CONSIDERING WEIGHT OF STATOR & SLINGS) = 450 T
DESIGN CAPACITY OF LIFTING BEAM (CONSIDERING 5% MARGIN ON SWL) = 472.5 T
DESIGN CAPACITY OF LIFTING BEAM SHALL BE USED FOR STRUCTURAL SIZING
OVERLOAD TESTING OF LIFTING BEAM – 1.25 X SWL AT MANUFACTURER'S WORKS

CL of LAST Column — VIEW−X — CL of FIRST Column



VIEW X

TYPICAL



DETAIL 'Y'

KEY PLAN

NOTE
1. THE DESIGN CODE FOR EOT CRANE SHALL BE IS:3177 (latest edition).
2. DRAWING IS NOT TO SCALE.

Ref. Drg.
1. TG Cross Section Drawing (Drg. No. 9587−001−110−PVM−F−053)
2. TG equipment plan at 18.0m drawing (9587−001−110−PVM−F−051)

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

NTPC DRG NO	9587−001−110−PVM−B−395
OWNER	NTPC LTD
CONTRACT	LARA STPS EXPANSION PHASE−II (2 X 800MW)
PRINT SCALE	0 2 4 6 8 10 20 30 40 50

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN			
	DESN			
	CHD			
	APPD			

SUB−CONTRACTOR

TITLE
CRANE CLEARANCE DIAGRAM OF TG HALL
265/25T (DOUBLE GIRDER) E.O.T. CRANES IN TANDEM OPERATION

DEPT.	SCALE
SIGN	
DATE	

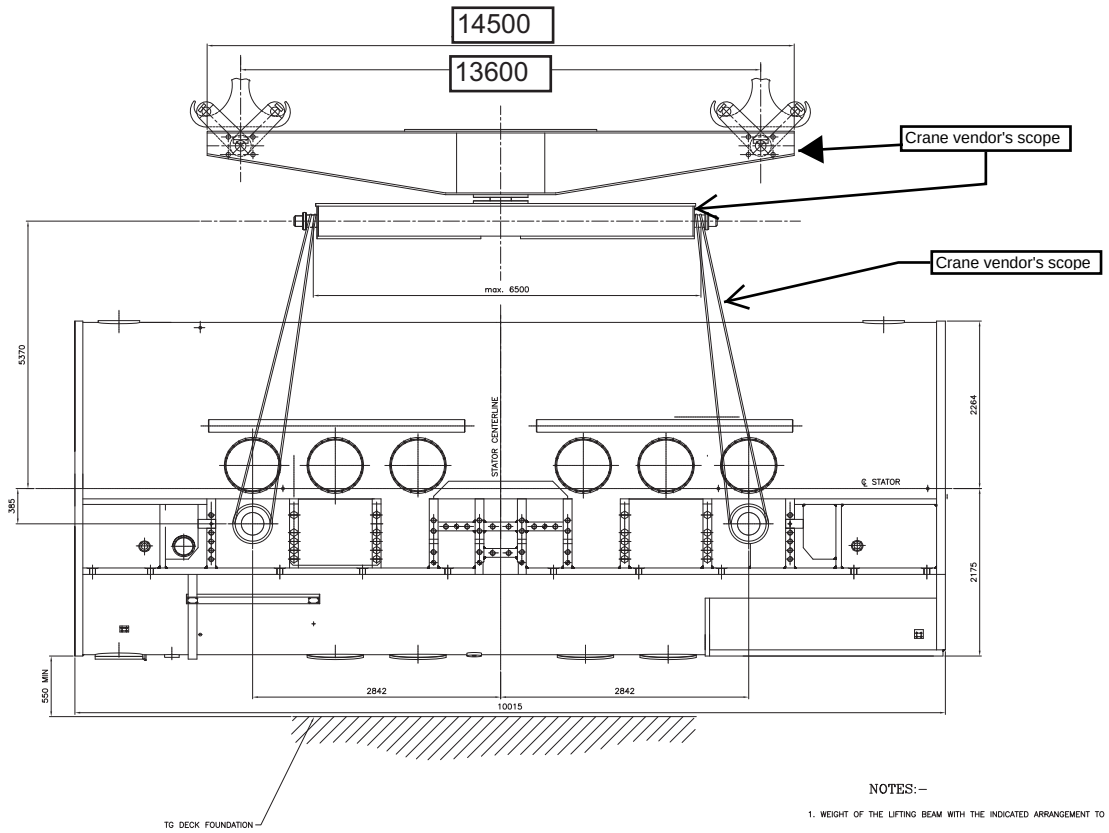
BHEL DRG NO : PE−DG−434−501−A001

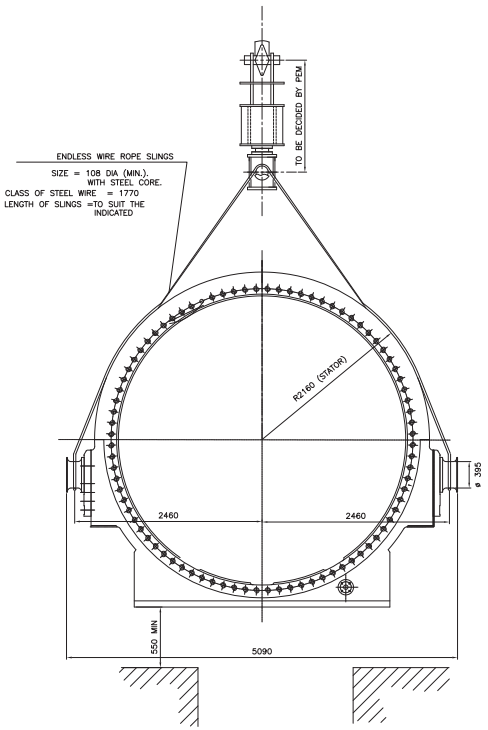
SHEET 1 OF 1 | REV 0

SIZE−A2

THIS IS PART OF TECHNICAL SPECIFICATION No. PE-TS-508-501-A501 REV 0

Fold-2





TECHNICAL REQUIREMENTS

1. THE DETAIL OF LIFTING BEAM WITH SWIVELLING ARRANGEMENT INCLUDING MATERIAL IS TO BE DONE BY THE FEM, FOR A MAXIMUM LIFTING CAPACITY OF 450 TONNES,

NOTES:–

1. WEIGHT OF THE LIFTING BEAM WITH THE INDICATED ARRANGEMENT TO BE USED FOR DECIDNG EOT CRANE CAPACITY.
2. WEIGHT OF THE PACKED STATOR WITH TERMINAL BUSHING BOX IS 450 TONNES.
3. DIFFERENCE IN THE LIFTS OF TWO CRANE AT ANY TIME SHOULD NOT EXCEED 200MM.
4. THE ARRANGEMENT SHOWN IN THIS SHEET IS FOR STATOR ALONE BROUGHT TO TG DECK TO BE PLACED ON PEDESTALS.

CBOM NO. | STAGE OF DRG.

	ASSIGNED DEPT	NAME	SIGN	DATE
DRN				
CHD				
APD				

GRADE OF UNTOL. DIM.:–
M/CG– V/C/W/F AA 0230208
WELDING–A/B/C/D–AA621104
GAS CUTTING–T3/AA0621101

REV.	DATE	ALTERED / CHECKED

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT: 800MW GENERATOR

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

DEPT. | SCALE | WEIGHT(Kg.) | REF. TO ASSY. DRG.

CODE

TITLE: LIFTING ARRANGEMENT FOR STATOR

DRAWING NO. TGE–2842

SHEET NO. 1 | NO. OF SHEETS 1 | SIZE A0

REF. DRG NO. | SIGN & DATE | INVENTORY NO.

PERFORMANCE GUARANTEES TO BE DEMOSTRATED AT SITE

PERFORMANCE GUARANTEES TO BE DEMOSTRATED AT SITE AS PER IS-3177.	
S.N.	**DESCRIPTION OF TESTS TO BE PERFORMED**
1	Speed test at rated load for hoisting, CT and LT mechanism.
2	Brakes test
3	Deflection test of bridge girder at rated load. Crane shall rest on centerline of LT wheels.
4	Overload test (running of CT and Hoisting mechanism at 125% of the rated load). Capability of crane to lift the overload from mid-air shall be demonstrated.

STANDARD MANUFACTURING QUALITY PLAN FOR DOUBLE GIRDER EOT CRANE

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project :
	Item: Double Girder EOT Crane QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6	2	7	8	9	D*	** 10			11
A	RAW MATERIAL													
a.	Steels Plates (Box Girder , End Carriage , Trolley , Gear Box Casing & Fab.Rope Drum)	1. Chemical & Physical	Major	Chemical & Physical	1 / Heat	1/Heat	NTPC APPD GA DRG. / CRANE DS / TECH SPEC / IS:2062 - 2011 , GR-BR (E-250/350)	NTPC APPD GA DRG. / CRANE DS / TECH SPEC / IS:2062 - 2011 , GR-BR (E-250/350)	TC	√	P	#V / W	V	# In absence of Co-related TC, check testing shall be witnessed on sample selected by Main Contractor.
		2. NDT	Major	UT (25 mm & above thickness)	100%	100%	ASTM A 435/ A 578 Level B	ASTM A 435/ A 578 Level B	IR	√	P	#V / W	V	# Co-related Mill TC inclusive of UT will be reviewed by BHEL/NTPC , in absence of UT conformance in Mill TC , Then UT will be witness by BHEL.
b.	Round Bars (For Pinion , Gears , Axels & Shafts)	1. Chemical & Physical	Major	Chemical & Physical	100%	100%	NTPC appd GA DRG./ CRANE DS / EN-8 (080M40), EN-9 (070M55) , EN-19 (709M40), EN-24, BS-970		TC	√	P	#V / W	V	# In absence of Co-related TC, check testing shall be witnessed on sample selected by Main Contractor.
		2. NDT	Major	UT	100%	100%	ASTM A 388 - 2007	Note A	IR	√	P	V	V	For Dia / thk more than or equal to 40 (mm)
		3. Hardness	Major	Measurement	100%	100%	Mfg. Drg / Crane data sheet / IS: 3177	Mfg. Drg / Crane data sheet / IS: 3177	IR	√	P	V	V	
c.	Forgings (For Gears, Wheels)	1. Chemical & Physical	Major	Chemical & Physical	100%	100%	NTPC APPD GA DRG./ CRANE DS / EN-9/19 (070M55) - BS - 970 / C55Mn75, IS: 1570 - 1979		TC	√	P	#V / W	V	# In absence of Co related TC, check testing shall be witnessed on sample selected by Main Contractor.
		2. NDT	Major	Ultrasonic	100%	10%	ASTM A388 - 2007	Note A	IR	√	P	W	W	
		3. Hardness	Major	Measurement	100%	100%	Mfg. Drg / Crane data sheet / IS: 3177	Mfg. Drg / Crane data sheet / IS: 3177	IR	√	P	V	V	
d.	Casting for gears (To be used , if allowed as per approved drg./ DS)	1. Chemical & Physical	Major	Chemical & Physcal	100%	100%	NTPC Apprd Drg. / DS / Cast steel as per IS:2707 GR A/B	NTPC Apprd Drg. / DS / Cast steel as per IS:2707 GR A/B	TC	√	P	V	V	
		2. NDT	Major	UT	100%	100%	ASME Sec. V, article-23, SA-609	SA-609, Level - II	IR	√	P	W	W	

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P: Perform , W : Witness , V : Verification as Appropriate,
CHP : NTPC Shall identified in colume "N" AS "W"
Note A : When back wall echo (BWE) set to 100% full screen heigth (FSH) in sound area of the material , a defect echo > 20% FSH is not acceptable.Also loss of BWE >20% is not acceptable.

FOR CUSTOMER USE	DOC NO:	REV:	CAT:
	REVIEVED BY	APPROVED BY	APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project :
	Item: Double Girder EOT Crane QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
e.	Pulley & Brake Drums	1. Chemical & Physical	Major	Chemical & Physical	100%	100%	IS 1030-1982/IS-2707-1989/NTPC Apprd Drg./DS	IS 1030-1982/IS-2707-1989/NTPC Apprd Drg./DS	TC	√	P	V	V	
		2. NDT	Major	UT (Only on Boss area)	100%	100%	ASME Sec. V, article-23, SA-609	SA-609, Level - II	IR	√	P	V	V	
f.	Seamless Pipe for Rope Drum	1. Chemical & Physical	Major	Chemical & Physical	100%	100%	NTPC appd Drg./ DS/ASTM-A106 GR-B	NTPC appd Drg./ DS/ASTM-A106 GR-B	TC	√	P	V	V	
		2. NDT	Major	UT	100%	100%	ASTM A 435 / A 578 Level B	ASTM A 435 / A 578 Level B	IR	√	P	V	V	
			Major	Micro Etching / Flattening for seamless pipe	100%	100%	ASTM-A106 - 2007 GR-B	ASTM-A106-2007 GR-B	IR	√	P	V	V	
a.	Hook MOC as per approved DS	1. Forging raw material	Major	Visual check	100%	100%	Drg./ Tech Spec. / IS:1875 - 1992	No Visual defect	IR	√	P	W	V	Forging Supplier - M/s. Markell (Durgapur) OR Sunil forging (Raigad)
			Major	UT after Forging	100%	100%	ASTM A 388-2007	Note A	IR	√	P	#W	V	# For MH Hook , UT in Proof Machining / grinding condition and AH Hook in grinding condition.
		2. Heat Treatment	Major	Heat Treatment after forging	100%	100%	Mfg. Std. / Drg. / Tech. Spec. / IS: 1875	Mfg. Std. / Drg. / Tech. Spec. / IS: 1875	Heat Chart	√	P	#V/W	V	HT Chart review for Main Hook at Mfg. place
		3. Chemical test	Major	Chemical integral piece	Per Heat / Batch	Per Heat / Batch	Appd Drg. / IS:1875 - 1992, CLASS - II	Appd Drg. / IS:1875 - 1992, CLASS - II	TC	√	P	V	V	
		4. Physical test	Major	Tensile test on integral test piece after heat treatment	Per Heat / Batch	Per Heat / Batch	Appd Drg. / IS:1875 - 1992, CLASS - II	Appd Drg. / IS:1875 - 1992, CLASS - II	TC	√	P	W	W	Test piece will be drawn from top of shank portion to be identified by BHEL and NTPC
		5. Micro etching	Major	Grain size	100%	100%	ASTM E 112	Grain size 5 or final	Lab TC	√	P	V	V	

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FOR CUSTOMER USE	DOC NO:	REV: 00 CAT
	REVIEVED BY	APPROVED BY / APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS F C V C	MANUFACTURING QUALITY ASSURANCE Item: Double Girder EOT Crane	CAP No. Rev. : Date : Page :	Project : Package : DG EOT CRANE ABOVE 100T Contract No. : L Contractor : BHEL - NOIDA

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
		6. NDT before proof load test.	Major	UT	100%	100%	ASTM A 388-2007	Note A	IR	√	P	V	V	
			Major	DPT	100%	100%	ASME Sec. V	ASME Sec. VIII, Div.1 , Appendix - 8	IR	√	P	V	V	
		7. Proof Load Test	Major	Proof Load Test	100%	100%	Drawing / IS: 5749/ IS: 15560 / DS	Drawing / IS: 5749/ IS: 15560 /DS	IR	√	P	W	#V /W	#W - For Main Hook
		8. NDT After Proof Load (UT ONLY SHANK PORTION)	Major	UT & MPI after Proof Load Test	100%	100%	ASTM A 388-2007 / ASTM E 709- 2007	No relevant indication.	IR	√	P	W	#V / W	
		9. Identification punch	Major	Visual	100%	100%	—	—	—	—	P	H	H	H- Hold Point (identification by NTPC & BHEL)
b.	Wire Rope	Visual and Breaking strength	Major	Type , Grade, breaking strength & visual,Diameter	100%	100%	Approved GA Drawing / IS:2266 - 2006 / DS	Approved GA Drawing / IS:2266 - 2006 / DS	Mill TC	√	P	V	V	
c.	Rails	Chemical & Tensile, Cross Section , Hardness , Dimension	Major	Chemical & Tensile, Hardness , Dimension	100%	100%	GA Drawing / IS:3443 - 1980 / APPD DS	GA Drawing / IS:3443 - 1980 / APPD DS	TC/R	√	P	V	V	
C.	ELECTRICAL ITEMS													
a.	Transformer (like control, Light transformer)	Make, rating	Major	Visual	100%	100%	NTPC approved BOI List / SLD / DRG / BOM / ADS		IR		P	V	V	
		Routine test	Major	Doc. Review	100%	100%	Mfg. Catlog / DS	IS: 2026 & 12021 for control transformer	Mfg.TC		P	V	V	

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FOR CUSTOMER USE	DOC NO:	REV: 00	CAT:
	REVIEVED BY	APPROVED BY	APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project : 2
F C V C	Item: Double Girder EOT Crane M LI	QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
b.	SFU, MCCB, MCB, CONTACTORS, DSL, RELAYS, FUSES, RESISTANCE BOX, HOOTER, PUSH BUTTONS, Junction Box, Limit Switches.	Make/rating/type/size	Major	Visual	100%	100%	NTPC Approved BOI list / SLD / DRG / BOM / ADS		IR		P	V	V	
		Functional/Continuity check	Major	Document review	100%	10%	Drawing / Data Sheet /Relevant STD.	Drawing / Data Sheet /Relevant STD.	IR/COC		P	V	V	10% Verification by NTPC
c.	Motor	Type/Rating/Make/Size	Major	Visual	100%	100%	NTPC Approved BOI list & ADS/ Drawing.		Mfg. TC	√	P	V	V	Refer Note 3 for Motor Up to 50 KW/ IOF Motor above 50 KW separate QP Shall be applicable. MH Motor : 75 KW AH Motor : 41 KW CT Motor : 8.5 KW LT Motor : 7.5 KW For COC of motors. Note on page no. 8 of 8
		Routine test	Major	MSMT	100%	100%	IS : 325 / APP Data sheet / NTPC ADS	IS : 325 / APP Data sheet / NTPC ADS	COC / Mfg. TC (As per Note - 3)	√	P	V	V	
d.	Brakes	Make / Type / Rating	Major	Measurement	100%	100%	NTPC Approved BOI list / SLD / ADS / DRG / BOM.		Mfg. TC		P	V	V	
		IR , HV functional test	Major	Measurement	100%	100%	MFG STD.	MFG STD	Mfg. TC		P	V	V	
e.	VVVF Drive	Make / Type / Rating	Major	Visual	100%	100%	NTPC Approved BOI list / SLD / ADS / DRG / BOM.		Mfg. TC / COC		P	V	V	
		Routine test	Major	Measurement	100%	100%	NTPC APPD DA/ Approved GA DRG.	NTPC APPD DA/ Approved GA DRG.	Mfg. TC	√	P	V	V	
f.	Cables (power / control / trialing / flexible)	Make / Type / Size	Major	Visual	100%	100%	NTPC Approved BOI list / SLD / ADS / DRG / BOM.		Mfg.TC		P	V	V	Being small quantity of cables used for each size and type less than 500 mtr. Separate QAP for cable not required.
		Routine test	Major	Measurement	100%	100%	NTPC Spec / IS: 9963 / IS: 694 / IS: 1554 / IS: 7098	NTPC Spec / IS: 9963 / IS: 694 / IS: 1554 / IS: 7098	Mfg.TC	√	P	V	V	

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FOR CUSTOMER USE	DOC NO:	REV: 00	CAT
	REVIEVED BY	APPROVED BY	APPROVAL SEAL

	MANUFACTURERS NAME & ADDRESS		MANUFACTURING QUALITY ASSURANCE Item: Double Girder EOT Crane						Project :					
									Package : DG EOT CRANE ABOVE 100T Contract No. : L Contractor : BHEL - NOIDA					
Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
g.	Radio Remote, Master Controller, pendent Station, Switches	Make / Rating / Type / functional	Major	Visual	100%	100%	NTPC Approved BOI list / SLD / DRG / BOM / ADS.		Mfg.TC / IR / COC		P	V	V	
h.	Anti - collision Device, Cable gland & lugs, Rectifier, lamps, load cell.	Make / Type	Major	Visual	100%	100%	NTPC Approved BOI list / SLD / DRG / BOM / ADS.		Mfg.TC / IR / COC		P	V	V	
D.	IN PROCESS FABRICATED COMPONENTS: Girder , End Carriage , Trolley gear box casing , Fabricated rope drum.													
a.	Welding	WPS & PQR	Major	Review of Document	100%	100%	ASME SEC IX 2007	ASME SEC IX 2007	ASME PRO	√	P	V	V	WPS/PQR/WPQ approved / Reviewed by NTPC /NPCIL/ BVI / VOITH / TUV acceptable.
b.	Weld Fit up & Edge Preparation	Dimension	Major	Dimension	100%	100%	Mfg. Drg	Mfg. Drg	IR		P	V	V	
c.	Fillet weld	NDT	Major	DPT on Fillet weld	100%	100%	ASME-SEC V	ASME SEC VIII Div 1 appendix 8	IR	√	P	V	V	
d.	Butt weld (Girder , End Carriage , Trolley & Fab.Rope drum if applicable)	NDT	Major	Radiography test/Gamma Ray	$	$	ASME-SEC V	ASME SEC VIII Clause UW - 51 & 52	IR	√	P	V	V	$ 100% in Tension zone / 25% in Compression zone & 100% for Rope Drum Seam Weld . Film shall be Reviewed by NTPC/BHEL
				DPT on butt weld	100%	10%	ASME-Sec V	ASME SEC VIII Div 1 appendix 8	IR	√	P	W	V	10% Random Witness BY BHEL
e.	Heat Treatment (SR) of Rope Drum & Gear Box casing	—	Major	Review of SR chart / test report	100%	100%	Drawing / Relevant std. / NTPC Spec.	Drawing / Relevant std. / NTPC Spec.	SR Chart	√	P	V	V	
f.	Cabin , Platform , Hand railing	Dimension	Major	Dimension	100%	100%	Mfg. Drg	Mfg. Drg	—	—	P	V	V	
g.	Final Inspection of fabricated component(Girder, End Carriages & Trolley)	Visual & dimensional	Major	Visual & Dimensional Check	100%	100%	App GA Drg / Crab	App GA Drg / Crab	IR	√	P	W	W	At the Time of Final Inspection of Crane

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FOR CUSTOMER USE	DOC NO:	REV: 00	CAT
	REVIEWED BY	APPROVED BY	APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project :
	Item: Double Girder EOT Crane QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
E.	IN PROCESS INSPECTION OF MACHINED COMPONENTS													
a.	Pinions , Gears & Wheel	1. Dimension check	Major	Measurement	100%	100%	Mfg. Drg / Crane data sheet	Mfg. Drg / Crane data sheet	IR	√	P	V	V	Note : Hardness test report review after applicable Q & T condition
		2. Hardness	Major	Measurement	100%	10%	Mfg. Drg / Crane data sheet / IS: 3177	Mfg. Drg / Crane data sheet / IS: 3177	IR	√	P	#W	V	# 10% random Witness by EHEL
		3. NDT	Major	DPT on teeth	100%	100%	IS : 3658-1981 / ASME Sec V	NO CRACKS & LINEAR INDICATION	IR	√	P	V	V	
b.	Difference of Hardness of pinion & gear	—	Major	Documents Review	100%	100%	NTPC Apprd. Drg / DS / IS: 3177	NTPC Apprd. Drg / DS / IS: 3177	IR	√	P	V	V	
c.	Rope drum	1. NDT & Dimensional check	Major	DPT test on fillet weld & Dimension	100%	100%	ASME - Sec VIII Div. 1 / Mfg. Drg.	NO RELEVANT INDICATION	IR	√	P	V	V	
		2. NDT	Major	DP Test on Groove after machining	100%	100%	IS : 3658-1981 / ASME Sec V	NO RELEVANT INDICATION	IR	√	P	V	V	
d.	Pulley & Brake Drum	1. Visual & Dimension	Major	Verification	100%	100%	Mfg. Drawing	Mfg. Drawing	IR	√	P	V	V	
		2. NDT (Only Groove of Pulley & Radius of BDC)	Major	DPT after machining	100%	100%	IS : 3658-1981 / ASME Sec V	NO RELEVANT INDICATION	IR	√	P	V	V	
e.	Assembled gear box	1. Visual & Dimensional	Major	Visual & Dimensional	100%	100%	As per Mfg. Std / DS / TS	As per Mfg. Std / DS / TS	IR	√	P	V	V	
		2. NDT	Major	DPT on Fillet weld	100%	100%	IS : 3658-1981 / ASME Sec V	NO RELEVANT INDICATION	IR	√	P	V	V	
		3. Mechanical	Major	Backlash , contact pattern	100%	100%	App. Drawing / DS / Mfg.Std.	App. Drawing / DS / Mfg.Std.		√	P	V	V	
			Major	Reduction ratio , no load run test for check of oil leakage / temp.rise , vibration & noise.	100%	100%	App. Drawing / DS / Mfg.Std.(AIL / QM / P / GB / 00)	App. Drawing / DS / Mfg.Std.(AIL / QM / P / GB / 00)	IR	√	P	W	V	Noise max 85 db a 1 mtr & 30 deg. Temp rise at ambient.

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P: Perform , W : Witness , V : Verification as Appropriate,
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Note A : When back wall echo (BWE) set to 100% full screen heigth (FSH) in sound area of the material , a defect echo > 20% FSH is not acceptable.Also loss of BWE >20% is not acceptable.

FOR CUSTOMER USE	DOC NO:	REV: 00 CAT	
	RELIEVED BY	APPROVED BY	APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project :
	Item: Double Girder EOT Crane QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operation	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
f.	DSL Guard	Dimensional	Major	Dimension	100%		Mfg. Drawing	Mfg. Drawing	IR		P	V	V	
F.	FINAL INSPECTION													
a.	CONTROL PANEL WITH VVVF DRIVE	Identification of all elct. Components , cable laying / dressing / ferulling / terminations dimensional functional , HV , IR , Interlocks , protection DOP	Major	Visual dimensional , operational & functional check , HV , IR , Painting	100%	2 100%	IS: 3177 - 1999 / App. Drawing / Data sheet	IS: 3177 - 1999 / App. Drawing / Data sheet	TC	√	P	W	W	HV at 2.5 KV AC for Power CKT & at 2KV for control CKT , DOP by paper insertion(method) BOI as per NTPC approved makes. Will be checked at the time of final inspection. Corelated MTC of VFD shall be reviewed during final inspecton. 2
		Paint shade / thk / adhesion	Major	Visual / DFT	100%	100%	Painting procedure / Approved GA Drawing	Painting procedure / Approved GA Drawing	TC		P	V	V	7 Tank treatment before painting of panels
b.	EOT crane assembly with control panel, master controller / remote controller pendant station (At vendor's works)	Visual & dimensional	Major	Dimensional , Span Diagonal & Wheel Base Dimension , LT Stopper Dimension	100%	100%	App. GA Drawing Relevant IS: 3177 / DS	App. GA Drawing Relevant IS: 3177 / DS	IR	√	P	W	W	Crane should be operable by RRC meant for that crane only
		Operational	Major	1. Speed & current measurement at No load for Hoist & CT / LT motion 2. Speed & current measurement at SWL for Hoist & CT motion (Only for 500 mm) 3. Overload test (125%) of SWL for Hoist motion (Only winching motions) 4. Deflection Test at SWL. 5. Operation check of Brake at SWL. 6. Interlock & Functional test.	100%	100%	App. GA Drawing / Relevant IS: 3177 / Data sheet / Load test Procedures	App. GA Drawing / Relevant IS: 3177 / Data sheet / Load test Procedures	IR	√	P	W	W	Functional & interlock test as per approved Elecrical schematic Drawing 2
		Paint shade / DFT	Major	Visual / DFT check	100%	100%	Painting scheme/DS/TS/Approved paint schedule	Painting scheme/DS/TS/Approved paint schedule	IR	√	P	V	V	

LEGEND :
* Records Identified With " Tick" (√) Shall be Essential
* M : Manufacrer / Sub Supplier , C : Main Supplier (BHEL) , N : NTPC
P: Perform , W : Witness , V : Verification as Appropriate,
CHP : NTPC Shall Identified in columne "N" AS "W"
Note A : When back wall echo (BWE) set to 100% full screen heigth (FSH) in sound area of the material , a defect echo >=20% FSH is not acceptable.Also loss of BWE >20% is not acceptable.

FOR CUSTOMER USE	DOC NO:	REV:00	CAT:
	REVIEWED BY	APPROVED BY	APPROVAL SEAL

MANUFACTURERS NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE	Project :
	Item: Double Girder EOT Crane QAP No. : Rev. : Date : Page :	Package : DG EOT CRANE ABOVE 100T Contract No. : Contractor : BHEL - NOIDA

Sl.No.	Components & operation	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance NormS	Format of Record		Inspection Agency			Remark
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	** 10			11
G	PACKING & PRE DISPATCH INSPECTION													
a.	Predispatch inspection	As per pre packing note (PPN)	Major	Visual	100%		As per Pre Packing Note	As per Pre Packing Note	PPN		P	V	—	

Note :

1. BOUGHT OUT ITEMS SHALL BE OF NTPC AGREED MAKE. PROJECT SPECIFIC LIST OF BOI IS ATTACHED.
2. ALL MATERIAL SHALL BE AS PER APPROVED DRG./DATA SHEET OF EOT CRANE. IN CASE OF ANY COMPONENT IS NOT INDICATED IN APPROVED DRG /DATA SHEET THE SAME SHALL BE AS PER RELEVANT IS / MANUFACTURING DRG.
3. **FOR MOTORS FOLLOWING MODALITIES SHALL BE ADOPTED.**
   (A) Less than 30 KW. ACCEPTANCE OF MOTORS LESS THAN 30 KW IS BASED ON COC OF THE MANUFACTURER AND THE CONTRACTOR CONFIRMING AS FOLLOWS.
   * IT IS HEREBY CONFIRMED THAT THE ABOVE MENTIONED MOTOR / MOTORS WAS /WERE MANUFACTURED TAKING CARE OF NTPC SPECIFIC REQUIREMENTS REGARDING AMBIENT TEMPERATURE, VOLTAGE & FREQUENCY VARIATION, HOT STARTS /PULL OUT TORQUE, STARTING KVA/KW, TEMP, RISE, DISTANCE BETWEEN CENTRE OF STUD AND GLAND PLATE AND TESTED IN ACCORDANCE WITH APPROVED DRAWING /DATA SHEETS.
   (B) 30 KW TO BELOW 50 KW
   ACCEPTANCE OF MOTOR RATING BETWEEN 30 KW TO 50 KW IS BASED ON NTPC REVIEW OF ROUTING TEST INSPECTION REPORT AS PER IS 325 ALONG WITH COC OF THE MANUFACTURER & THE CONTRACTOR CONFIRMING AS FOLLOWS:
   * IT IS HEREBY CONFIRMED THAT THE ABOVE MENTIONED MOTOR / MOTORS WAS /WERE MANUFACTURED TAKING CARE OF NTPC SPECIFIC REQUIREMENTS REGARDING AMBIENT TEMPERATURE, VOLTAGE & FREQUENCY VARIATION, HOT STARTS /PULL OUT TORQUE, STARTING KVA/KW, TEMP, RISE, DISTANCE BETWEEN CENTRE OF STUD AND GLAND PLATE SPACE HEATER AND TESTED IN ACCORDANCE WITH APPROVED DRAWING /DATA SHEETS.
4. IN ADDITION TO ABOVE, IF ANY NEW REQUIREMENT APPERS DURING CONTRACT EXECUTION PHASE, THE SAME HAS TO BE COMPLIED BY VENDOR.
5. LOAD CELLS SHALL BE ARRANGE AT THE TIME OF TESTING OF CRANES / Lifting beam.

LEGEND :
* Records Identified With " Tick " (√) Shall be Essentially included by Supplier in QA Documentation.
* M : Manufacrer / Sub Supplier , C : Main Supplier (BHEL) , N : NTPC
P: Perform , W : Witness , V : Verification as Appropriate,
CHP : NTPC Shall identified in colume "N" AS "W"
Note A : When back wall echo (BWE) set to 100% full screen heigth (FSH) in sound area of the material , a defect echo > 20% FSH is not acceptable.Also loss of BWE >20% is not acceptable.

FOR CUSTOMER USE	DOC NO:	REV: 00	CAT:
	REVIEVED BY	APPROVED BY	APPROVAL SEAL

Note-6
Material of Structural steel plates/ rolled section: Mild steel, grade 'B' of IS 2062 in 100% killed, normalised and ultrasonically tested quality or high strength steel of IS 8500 as appropriate.
GIRDERS, END CARRIAGE,CRAB, GEAR BOX AND ROPE DRUM - THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.

Note 7: Bidder has to include scope of inspection of main hook by reputed third party inspector in case of inspection being done at foreign location.

QUALITY CHECKS FOR MOTORS

MOTOR

TESTS/CHECKS / TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-1/ IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y										
Shaft	Y	Y	Y	Y	Y	Y			Y										
Magnetic Material	Y	Y	Y	Y			Y			Y		Y							
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes, for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	Y	Y	Y	Y				Y		Y								
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y											
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y											
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y										
Wound stator	Y	Y					Y	Y											
Wound Exciter	Y	Y					Y	Y											
Rotor complete	Y	Y					Y						Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y												

Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																
Complete Motor	Y	Y	Y												Y	Y	Y	Y1	Y

Note:

1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization:

Note for LT Motor:

i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets."

ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP: Acceptance of Motor rating above 50 KW & less than 75 KW is based on NTPC rev
report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets."

iii) Motor rating 75 KW & above: Inspection CAT-I: As per NTPC approved MQP.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard
3. Makes of major bought out items for HT motors will be subject to NTPC approval.
4. Y1 = for HT Motor / Machines only.
5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE2/IE3 shall be checked/verified in addition to Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission, the motor shall be subjected to efficiency test.

STANDARD MANUFACTURING QUALITY PLAN FOR LIFTING BEAM

MANUFACTURER NAME & ADDRESS	MANUFACTURING QUALITY PLAN	TECHNICAL SPECIFICATION: PE-TS-508-501-A501
	ITEM: LIFTING BEAM ASSEMBLY FOR TG HALL DOUBLE GIRDER EOT CRANES **W.O.NO**:	BHEL DOC. NO. : REV : DATE :
		PROJECT : 2X800 MW LARA TPP

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	D	10			11
1)	**For Lifting beam (Lower & Upper Lifting Beam)**									**M**	**C**	**N**	
i)	Material	Chem. & Phy.	Major	Co-relation with T.C. Check test in absence of	1/heat/batch	Drg. / Tech. Spec. / IS:2062:2006 , GR-BR, (E250) , AMD.1 ,2009	Drg. / Tech. Spec. / IS:2062:2006 , GR-BR, (E250) , AMD.1 ,2009	MTC	✓	P	R	R	
		NDT	Major	U.T	100%	ASTM A 435	ASTM A 435	I.R	✓	P	R	R	UT on 25 mm & above thick plate
ii)	Weld set up	Dimensional conformity	Major	Measurement	100% for butt weld joint	Component drawing	Component drawing	I.R	-	P	-	-	
iii)	Pins for Slings & Hooks	Chem. & Phy.	Major	Co-relation with T.C. Check test in absence of	100%	Mfg.drg/EN-9(070M55) / BS - 970-1983	Mfg.drg/EN-9(070M55) / BS - 970-1983	I.R	✓	P	R	R	
		NDT	Major	U.T	100%	ASTM A 388	ASTM A 388	I.R	✓	P	R	R	IF DIA >= 50mm UT to be Applicable.
iv)	Wire rope	Make, construction , breaking strength	Major	Visul corelation with TC	100%	IS:2266 / As Per Drg.	IS:2266 / As Per Drg.	MTC	✓	P	R	R	
2)	**Welding**												
i)	WPS , WPQ & PQR	Welding parameters	Major	Review of earlier appd. WPS/WPQ/ PQR records	100%	ASME SEC IX	ASME SEC IX	WPS/WPQ/ PQR records as per ASME SEC -IX format	✓	P	R	R	WPS already approved by LIOYDS/NTPC/NPCIL shall be valid. In case NTPC/BARC/NPCIL/ IRS/TPL/LIOYDS qualified welders already available & doing the same job regularly, re-qualification is not required. Alternatively welder qualified by above agences will be utilised.
ii)	Back chipping	Surface defects	Major	DPT	100%	ASME Sec.V	ASME - Sec. VIII Div 1 Appen.-8	-		P	R	-	

MANUFACTURER	CONTRACTOR (BHEL)	SIGNATURE

LEGEND:
RECORDS IDENTIFIED WITH 'TICK (✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION
"M" MANUFACTURER/ SUBCONTRACTOR
"C" CONTRACTOR (BHEL)
"S" CUSTOMER
INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE.
" CHP" SHALL IDENTIFIED IN COLUMN " N "
NOTE: ITEMS NOT COVERED IN MQP, MAY BE CLEARED ON BASIS OF "CERTIFICATE OF CONFIRMANCE"

FOR CUSTOMER USE	REVIEWED BY	APPROVED BY	APPROVAL SEAL

	MANUFACTURER NAME & ADDRESS	MANUFACTURING QUALITY PLAN		TECHNICAL SPECIFICATION: PE-TS-508-501-A501
		ITEM: LIFTING BEAM ASSEMBLY FOR TG HALL DOUBLE GIRDER EOT CRANES W.O.NO:	BHEL DOC. NO. : REV : DATE :	PROJECT : 2X800 MW LARA TPP

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	D	10			11
										M	C	S	
a)	Butt-Weld	Weld Quality	Critical	RT	100% in tension & 10% in compression	ASME SEC VIII	ASME SEC VIII Clause UW -51	RT report & Film	✓	P	R	R	Review of radiography report
			Major	DPT	100%	ASME Sec.V	ASME SEC VIII Appnd. 8	I.R	✓	P	R	R	
b)	Fillet Weld	Surface defect & size	Major	Visual	100%	Component Drawing	Component Drawing	I.R	✓	P	R		
			Major	DPT	10% at random	ASME Sec.V	ASME Sec. VIII	I.R	✓	P	**W**	R	W - At the time of final Inspection of Lifting beam
iii)	Inspection of Fabricated Lifting Beam	Visual & dimensional	Major	Dimensional & measurement	100%	Individual component drawing	Individual component drawing	I.R	✓	P	R	R	
3)	Final assembly of Lifting beam	Visual & Dimensional	Major	Visual & Dimensional check	100%	GA Drawing of lifting beam / IS 3177 / Tech-Specification.	GA Drawing of lifting beam / IS 3177 / Tech-Specification.	I.R	✓	P	**W**	**W**	CHP (AT WORKS)
4)	Review of QA Documents	-	-	-	-	-	As per approved QAP	-	-	R	R	R	
5)	Load test at Mfg. Works	Visual	Major	Visual	100%	Appd drawing / Load test procedure	Appd drawing / Load test procedure	I.R	✓	P	**W**	**W**	Overload test to be performed at @ 1.25 X SWL. Refer Annexure-A for procedure
		Deflection test at SWL	Major	Measurement	100%			I.R	✓	P	**W**	**W**	
		Overload test at (1.25 x SWL)	Major	Visual	100%			I.R	✓	P	**W**	**W**	

		LEGEND:	FOR CUSTOMER USE			
		RECORDS IDENTIFIED WITH 'TICK (✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/ SUBCONTRACTOR "C" CONTRACTOR (BHEL) "N" CUSTOMER INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE. " CHP" SHALL IDENTIFIED IN COLUMN " N " NOTE: ITEMS NOT COVERED IN MQP, MAY BE CLEARED ON BASIS OF "CERTIFICATE OF CONFIRMANCE"				
MANUFACTURER	CONTRACTOR (BHEL)					
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

BHEL	**TECHNICAL SPECIFICATION 2X800 MW LARA TPP STAGE II DOUBLE GIRDER EOT CRANES FOR TG HALL 265/25T**	**PE-TS-508-501-A501** **Rev. No. 00** **Date : AUG 2024**

(ANNEXURE-A TO MQP OF LIFTING BEAM)

LOAD TESTING PROCEDURE OF LIFTING BEAM FOR DOUBLE GIRDER TG HALL EOT CRANES AT WORKS

1	**SCOPE**
	This covers the guidelines for load testing of lifting beams of EOT cranes.

2	**ACCESSORIES AND FACILITIES NEEDED.**
a	Slings of suitable size and length , proof load tested at 2 X Safe working load (SWL).
b	Jacking system.
c	Supporting structure
d	Test loads.
e	Cradle for accommodating test load (if required).

3	**PROCEDURE**
3.1	Support the lifting beam on fabricated structure and hydraulic jacks at both ends or as per facility available at works.
3.2	Place the load to be lifted under the lower lifting beam. Total test load shall be 1.25 times the SWL.
3.3	Drop the lifting slings from the lifting beam and safely tie it with the load.
3.4	The sling should be tied with the lifting beam such that the slings should not be slack. This should ensure that the slings are in full tension when the lifting beam is elevated by at least 100mm.
3.5	Fix the necessary measuring instrument in the lifting beam with wire and plumb to measure the initial reading for vertical deflection of both lower and upper lifting beam.
3.6	Now elevate the lifting beam by means of hydraulic jacks , such that the lifting beam is elevated by at least 100mm.
3.7	Ensure that the whole load is lifted clear from the floor.
3.8	Ensure that the elevation is equal at both ends.
3.9	Now the load is lifted by 100 mm and hence the sling is in full tension.
3.10	Keep the load in lifted condition for one minute.
3.11	Measure the deflection of the lifting beam structure.
3.12	Bring down the lifting beam to its original position with the help of jack.
3.13	Make the lifting beam free from testing position and put in safe place.
3.14	Visually check the weldments of lifting beam and carryout DP test in case of doubt.

SUB VENDOR LIST

SR. NO.	ITEM	SUPPLIERS	REMARKS
1.	STEEL	SAIL	
		TISCO	
		JINDAL	
		RINL	
		ESSAR	
2.	HOOKS	STEEL FORGING & ENGG. CO.,	
		SIMRITI FORGING	
		IRIZAR FORGE, SPAIN	
		KARACHIWALA	UP TO 25T CAPACITY
3.	GEAR COUPLINGS	ALLIANCE	
		FLEX-TRANS (formerly known as HICLIFF)	
		SAHARA	
		NUTECH	
		OEM	
4.	WIRE ROPE	USHA MARTIN	
		FORT WILLIAMS	
		B OMBAY WIRE ROPES	
		BHARAT WIRE ROPES	
5.	BEARINGS	SKF	
		FAG	
		TATA	
		NBC	
6.	MOTORS	SIEMENS	
		NGEF	(up to 15KW)
		CROMPTON	
		KIRLOSKAR	
		BHARAT BIJLI	
		MARATHON	
		ABB	
		HAVELLS	UPTO 90 KW
		LHP	
		BHARAT BIJLEE	
7.	BRAKES	ELECTROMAG	
		SPEED-O- CONTROL	
		BCH	FOR DCEM BRAKES ONLY
		KAKKU	

		PATHE	
8.	CONTACTOR	SIEMENS	
		L&T	
		SCHNEIDER (Earlier TELE MECHANIQUE)	
		ABB	
		GE-POWER	
		BCH	
9.	OVER LOAD RELAYS	SIEMENS	
		L&T	
		ABB	
		SCHNEIDER (Earlier TELE MACHANIQUE)	
10.	HRC FUSES	SIEMENS	
		L&T	
		ENGLISH ELECTRIC	
		GE POWER	
		EATON (BUSSMANN)	
		INDO ASIAN	
		C&S ELECTRIC LTD.	
		SPACEAGE SWITCHGEARS LTD.	
		ALSTOM LTD	
		ESSEN DEINKI	
		SCHNEIDER ELECTRIC INDIA PVT. LTD.	
		ABB	
11.	ISOLATING SWITCH	SIEMENS	
		L&T	
		CONTROL & SWITCH GEAR	
		ABB	
12.	SWITCH FUSE UNITS	SIEMENS	
		L&T	
		SCHNEIDER	
		CONTROL & SWITCH GEAR	
		ABB	
13.	TIME DELAY RELAYS	SIEMENS	
		L&T	
		ABB	
		BCH	
		SCHNEIDER (Earlier TELE MACHANIQUE)	
14.	TRANSFORMERS	INDCOIL	
		LOGICSTAT	
		KAPPA	
		AUTOMATIC ELECTRIC	
		PRECISE ELECTRICALS	
		SILKAAN ELECTRIC MFG. CO. LTD.	

		SOUTHERN ELECTRIC	
		UNILEC ENGINEERS PVT. LTD.	
		NEC	
15.	**BULB & FLOURESCENT TUBES/FITTINGS**	PHILIPS	
		PHILIPS	
		CROMPTON	
16.	**CABLE LUGS (HEAVY DUTY)**	DOWELLS	
		UML ENGINEERS	
		CHETNA	
		BILLET	
		BRACO	
		JAINSON	
17.	**HOOTERS**	BEACON	
		OSC	
		TARGET	
		KHERAJ	
18.	**LIGHTING SWITCHES**	ANCHOR	
		ELLORA	
		GE	
		CROPMTON	
		BAJAJ	
		PHILIPS	
19.	**PVC POWER CABLES**	APAR INDUSTRIES LTD.	
		CORDS CABLE INDUSTRIES LTD.	
		DIAMOND POWER INFRASTRUCTURE LTD	
		GOYOLENE FIBRES (INDIA) PVT.LTD	
		GOVIND CABLE INDUSTRIES	
		GUPTA POWER INFRASTRUCTURE LIMITED	
		HAVELLS INDIA LIMITED	
		KEI INDUSTRIES LTD.	
		KRISHNA ELECTRICAL INDUSTRIES LTD	
		KEC INTERNATIONAL LIMITED	
		MANSFIELD CABLES COMPANY LTD.	
		NICCO CORPORATION LTD.	
		PARAMOUNT COMMUNICATIONS LTD.	
		POLYCAB WIRES PVT. LTD.	
		RADIANT CORPORATION PRIVATE LIMITED	
		RAVIN CABLES LIMITED	
		SUYOG ELECTRICALS LTD.	
		SRIRAM CABLES PVT. LTD.	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD.	

		SAM CABLES & CONDUCTORS (P) LTD	
		THERMO CABLES LTD	
20.	PVC CONTROL CABLES	ADVANCE CABLE TECHNOLOGIES (P) LTD	
		APAR INDUSTRIES LTD., CMI LTD	
		CMI LIMITED	
		CORDS CABLE INDUSTRIES LTD	
		CRYSTAL CABLE INDUSTRIES LTD	
		DELTON CABLES LTD	
		DIAMOND POWER INFRASTRUCTURE LTD	
		ELKAY TELELINKS LTD	
		GEMSCAB INDUSTRIES LTD	
		GOVIND CABLE INDUSTRIES	
		GUPTA POWER INFRASTRUCTURE LIMITED	
		HAVELLS INDIA LIMITED	
		INCOM CABLES (P) LTD	
		KEI INDUSTRIES LTD	
		KRISHNA ELECTRICAL INDUSTRIES LTD	
		KEC INTERNATIONAL LIMITED	
		MANSFIELD CABLES COMPANY LTD	
		NICCO CORPORATION LTD	
		PARAMOUNT COMMUNICATIONS LTD	
		POLYCAB WIRES PVT. LTD	
		RAVIN CABLES LIMITED	
		SUYOG ELECTRICALS LTD	
		SPECIAL CABLES PVT. LTD	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD	
		SAM CABLES & CONDUCTORS (P) LTD	
		SPM POWER & TELECOM PVT. LTD	
		TORRENT CABLES LTD	
		THERMO CABLES LTD	
		TIRUPATI PLASTOMATICS PVT. LTD	
		UNIVERSAL CABLES LTD	
21.	TRAILING CABLES	NICCO	
		UNIVERSAL	
		INCAB	
		ICL	
		APAR INDUSTRIES LTD	
		CMI LTD	
		KEI INDUSTRIES LTD	
		SUYOG ELECTRICALS LTD	
		APAR INDUSTRIES LTD	
		CORDS CABLE INDUSTRIES LTD	

22.	XLPE POWER CABLES	CRYSTAL CABLE INDUSTRIES LTD	
		DIAMOND POWER INFRASTRUCTURE LTD	
		GEMSCAB INDUSTRIES LTD	
		GOVIND CABLE INDUSTRIES	
		GUPTA POWER INFRASTRUCTURE LIMITED	
		HAVELLS INDIA LIMITED	
		KEI INDUSTRIES LTD	
		KRISHNA ELECTRICAL INDUSTRIES LTD	
		KEC INTERNATIONAL LIMITED	
		MANSFIELD CABLES COMPANY LTD	
		PARAMOUNT COMMUNICATIONS LTD	
		POLYCAB WIRES PVT. LTD	
		RAVIN CABLES LIMITED	
		SUYOG ELECTRICALS LTD	
		SPECIAL CABLES PVT. LTD	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD	
		SRIRAM CABLES PVT. LTD	
		TORRENT CABLES LTD	
		THERMO CABLES LTD	
		TIRUPATI PLASTOMATICS PVT. LTD	
23.	XLPE CONTROL CABLES	APAR INDUSTRIES LTD	
		CABLE CORPORATION OF INDIA LTD	
		CRYSTAL CABLE INDUSTRIES LTD	
		DIAMOND POWER INFRASTRUCTURE LTD	
		GEMSCAB INDUSTRIES LTD	
		HAVELLS INDIA LIMITED	
		KEI INDUSTRIES LTD	
		KRISHNA ELECTRICAL INDUSTRIES LTD	
		KEC INTERNATIONAL LIMITED	
		PARAMOUNT COMMUNICATIONS LTD	
		POLYCAB WIRES PVT. LTD	
		RADIANT CORPORATION PRIVATE LIMITED	
		RAVIN CABLES LIMITED	
		SUYOG ELECTRICALS LTD	
		SRIRAM CABLES PVT. LTD	
		TORRENT CABLES LTD	
		UNIVERSAL CABLES LTD	
24.	CABLE GLAND	COMMET	
		SUNIL&CO	
		ARUP ENGINEERING	
		JAINSON	
		ELECTROMAC INDUSTRIES	

		INCAB	
		DOWELL	
25.	**PUSH BUTTONS**	SIEMENS	
		L&T	
		BCH	
		SCHNEIDER	
26.	**LIMIT SWITCHES**	SPEED-O-CONTROL	
		ELECTROMAG	
27.	**MASTER CONTROLLER**	SPEED-O-CONTROL	
		ELECTROMAG	
28.	**SAFETY SWITCHES**	ALSTOM	
		L&T	
		SCHNEIDER	
		ABB	
		SIEMENS	
29.	**PENDENT PUSH BUTTON STATION**	OEM	
30.	**INDICATING LAMPS**	TECKNIC	
		BCH	
		SIEMENS	
		STANDARD	
31.	**MCB**	MDS	
		INDO COPP	
		STANDARD	
		SIEMENS	
		L&T	
		ABB	
		SCHNEIDER	
32.	**PANELS**	OEM	
		RITTAL	
		BCH	
		PYROTECH	
33.	**RESISTANCE BOXES**	ENAPROS	
		SOC	
		EMM	
		OEM	
34.	**FIRE**	ASKA EQUIPMENTS LTD.	
		ASHOKA ENGINEERING COMPANY	
		KANADIA FYR FYTER PVT. LTD	
		NITIN FIRE PROTECTION INDUSTRIES LTD	

34.	FIRE EXTINGUISHERS	NEW ENGINEERING CORPORATION	
		SAFEX FIRE SERVICES LTD	
		UNITED FIRE EQUIPMENTS PVT. LTD	
		ZENITH FIRE SERVICES (INDIA) PVT LTD	
		BIS APPROVED SOURCE WITH VALID LICENSE	
35.	VVVF	L&T -YASKAWA	
		ABB	
		SIEMENS	
		SCHNIEDER	
		FUJI ELECTRIC	
		ROCKWELL	
		VACON	
		MITSUBISHI ELECTRIC	
36.	SHROUDED DSL	SUSHEEL	
		STROMAG	
37.	ANTI COLLISION DEVICE	SICK	
		IFM	
		ELECTRONIC SWITCHES INDIA	
38.	LOAD CELL	IPA	
		METTLER TOLEDO	
		SARTORIUS	
39.	RRC	ACROPOLIS ENGINEERING	
		HBC	
		SOC	
		SNT CONTROLS	
40.	GEAR BOX	OEM	* = Applicable for Geared Motors only
		ELECON ENGINEERS	
		SHANTI GEARS	
		PBL*	
		NAW*	
		NORD*	
		SEW*	
		BONGFILIOLI*	
41.	RAIL	JSPL	
		SAIL	
42	CENTRALIZED LUBRICATION / HYDRAULIC	LUBCON, PUNE	CRANE OEM MAKE POWERPACK IS NOT
		PRAKASH LUBRICANT, KOLKATA	
		AFMC, KOLKATA	
		SKF ENGG AND LUBRICATION (LINCOLN HELIOS)	
		VIJAY ENGINEERS	
		INDO HYDRAULIC BOMBAY PVT LTD	

	HYDRAULIC POWER PACK	MEHATA HYDRAULIC EQUIPMENT	ALLOWED.
		CLAYSYS	
		VEDNAT ENGINEERING SERVICES	
		ELECTROPNEUMATICS AND HYDRAULIC PVT LTD	
		SN HYDRAULIC	
43	**MCCB/MPCB**	L&T	
		ABB	
		SIEMENS	
		SCHNIEDER	
44	**SINGLE PHASE PREVENTOR**	MINILEC	
		L&T	
		SIEMENS	

Note:

1	THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND NTPC APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL
2	BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.
3	THE INSPECTION CATEGORY WILL BE INTIMATED AFTER AWARD OF CONTRACT BY BHEL/CUSTOMER. HOWEVER THE SAME WILL BE ADHERED BY THE BIDDER WITHOUT ANY COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/ NTPC.

PAINTING REQUIREMENT

Package	Condition	Surface Preparation	Primer Coat	No. of Coats	DFT (in Microns)	Intermediate Coat (in Microns)	No. of Coats	DFT (in Microns)	Final Coat	No. of Coats	DFT (in Microns)	Total DFT
DOUBLE GIRDER EOT CRANE	STEEL STRUCTURE	Surface preparation: Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns.	Inorganic Ethyl Zinc Silicate.	1	35 µm per coat.	Epoxy base Tio2 pigmented coat	1 coat	35 µm per coat	Epoxy base paint - 2 coats, DFT 25 µm per coat. Final coat of paint Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.)	1 coat	30 µm. per coat	150µ
DOUBLE GIRDER EOT CRANE	For Indoor components such as motors, electrical parts etc	Epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat.										

COLOR SHADE

SL. No	Item Description	Color Shade	Remarks
1	Crane Structure	Golden Yellow shade 356 as per IS-5	Colour band-Black
2	Trolley and hook	Golden Yellow shade 356 as per IS-5	
3	Motors	RAL 5012 (Blue)	
4	Control Panels	Light Gray (Powder coated) as per IS-5	

PACKING REQUIREMENT

	COMMON GUIDELINES FOR PACKING
1	**GENERAL:**
1.1	The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.
1.2	All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.
1.3	The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement.
1.4	Each package shall be accompanied by a packing note quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

2.	**TYPES OF PACKING:**
	The following 5 types of packing have been standardized for packing of General Components/ Assemblies.
a	**OP'** - Open Type.
b	**PP'** - Partially Packed.
c	**CP'** – Crate/Box Packing - Components/Equipment requiring physical protection.
d	'**CQ'** - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
e	**'CR'** - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

3.	**DESCRIPTION OF TYPES OF PACKING:**
	The various types of packing, as standardized above, are described below.

3.1	**'OP' - Open Type**					
	In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.					

3.2	**PP' - Partially Packed**
3.2.1	Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene
3.2.2	Film. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film.

3.3	**'CP' - Crate Packing**	
	Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.	

3.4	**'CQ' - Case Packing -** Machined Components/Assemblies/Equipment
3.4.1	Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.
3.4.2	For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.

3.5	**CR' - Case Packing** - Electrical & Electronic Components/Assemblies
	Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel.

4	**PREPARATION OF PACKING CASES**
4.1	**DIMENSIONS:**
a)	Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units/manufacturers.
b)	Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.
c)	Minimum number of planks shall be used for a shook.
d)	Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.
e)	Width of binding planks shall be minimum 100mm.
f)	Distance between any 2 binding planks shall be less than 750mm.
g)	diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
h)	Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
i)	Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

4.2	**HOOP IRON STRIPS**
	These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

4.3	**BRACKETS**
	These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of “L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

4.4	**MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM**
	100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

4.5	**RUBBERISED COIR:**
	The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

5	**MULTI LAYER CROSS LAMINATED POLY FILM WHILE PACKING OF CUBICLES/CASING**
5.1	The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 4.4) using blue nails wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.
5.2	The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film. This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.
5.3	The cubicles shall be covered with Multi-layer cross laminated poly film.

6	**PACKING OF LOOSE ITEMS/SPARES**
6.1	Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 5.4) using blue nails.
6.2	Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
6.3	Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
6.4	Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
6.5	Silica gel held in cotton bags shall be kept at proper places in the box.
6.6	Packing slip kept in polyethylene bag shall be placed in the box.
6.7	Two numbers of hoop iron strips shall be strapped tightly on the case using clips.
6.8	Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
6.9	Loose items to be kept inside the cubicle/casing
	- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

7	**TYPICAL PATTERN OF WOODEN BOX**

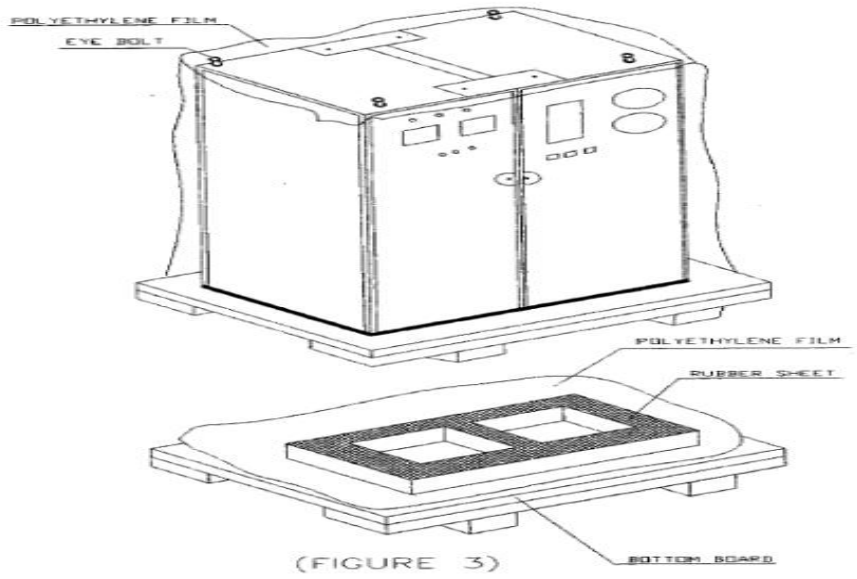

Figure 2

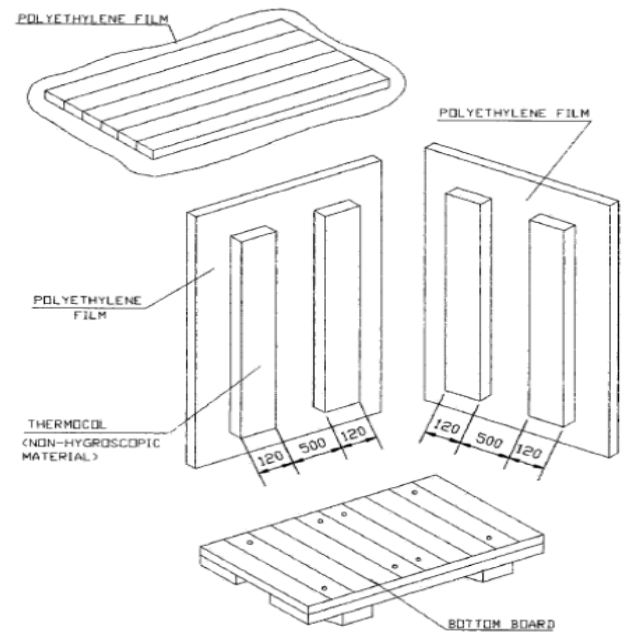

Figure 1

8	**SEALED PACKING:**
	Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and

9	**MARKINGS/STENCILINGS**
9.1	**"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".**
9.2	Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.
9.3	In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel.
9.4	Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.
9.5	Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.
9.6	In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

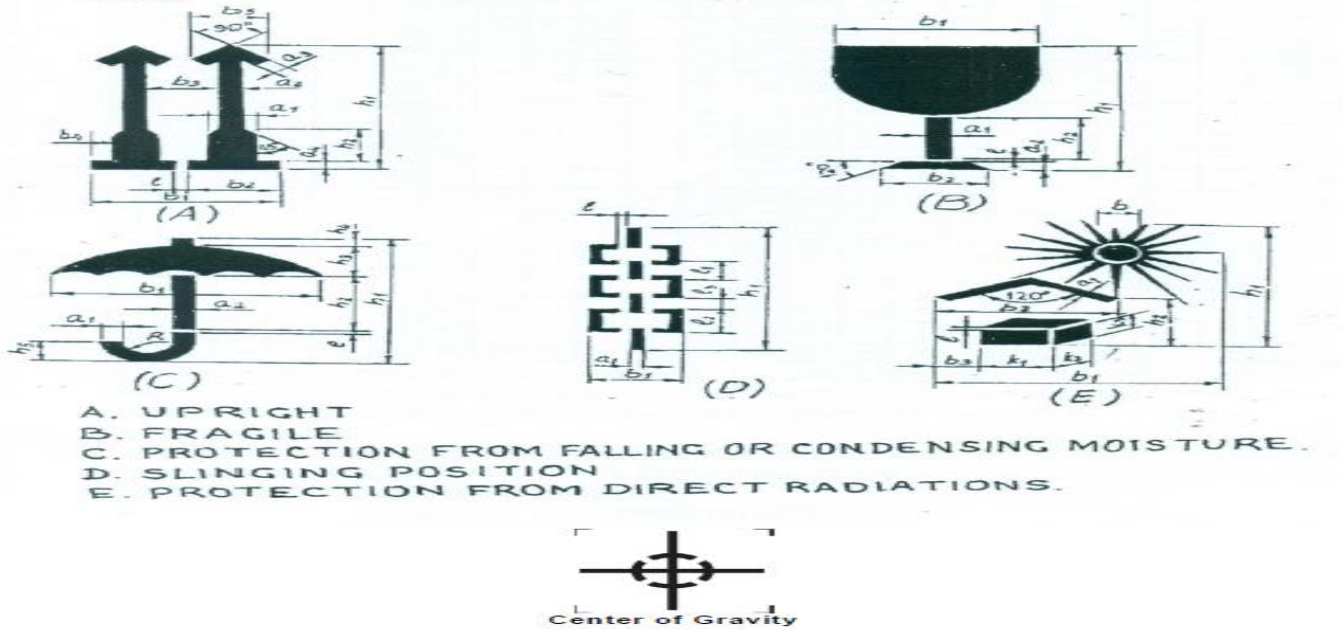

Figure 3

BHEL – <unit> - <location> - <pin>				
CONSIGNEE				
MATERIAL				
CUSTOMER REF.		MO. NO.		
DESPATCH ADVICE NOTE NO		CASE NO		
DIMENSIONS(MM) L x B x H			NET WT –KGS	GROSS WT –KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT			

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

10 STANDARD METHOD OF PACKING

Table 1 - Standard Method of Packing

S. No.	DESCRIPTION	CASE	CRATE	BUNDLE	BARE	DRUM
1	FAB STRUCTURALS, GIRDER				O	
2	FAB STRUCTURALS, GIRDER				O	
3	SUPPORTING STRUCTURALS				O	
4	STRUCTURE SUB ASSEMBLY, CRAB, END CARRIAGE, END STOPPERS, ROPE DRUM				O	
5	RAIL				O	
6	STAIR CASES				O	
7	HANDRAILS/ PLATFORMS/ LADDERS/ CAGE				O	
8	FASTENERS, RAIL CLAMPS AND FIXING ACCESSORIES	O				
9	BEARING BLOCKS	O				
10	FANS	O				
11	GASKETS	O	O			
12	FLANGES	O	O			
13	PAINT TINS		O			
14	PAINT DRUMS					O
15	MOTORS, TRANSMFORMERS, VVVFD, LIMIT SWITCHES, ELECTRIC HOIST ASSEMBLY, RELAYS, FUSES, LIGHTING FIXTURES, PENDANT, ISOLATING SWITCH, RRC, TRANSMITTERS AND OTHER ELECTRICAL ACCESORIES	O				
16	SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES, PANELS,		O			
17	INDICATORS, VIBRATOR SWITCHES	O				
18	CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL,		O			
19	OPERATIONAL SPARES , MAINTENANCE TOOLS AND TACKLES	O				
20	ALL OTHER LOOSE ITEMS	O				

Note

Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

BILL OF QUANTITY

A SUPPLY:

S. No.	Description	For 265/25T Double Girder Crane 1		For 265/25T Double Girder Crane 2		Common for both Double Girder cranes	
		Qty	UOM	Qty	UOM	Qty	UOM
1	Bridge girders along with walkway, platform, handrails, CT stoppers etc.	2	Nos.	2	Nos.	----	----
2	End carriages						
a	End carriages structure with walkway, platform, handrails, LT buffers etc.	1	set	1	set	----	----
b	Long Travel Mechanism (Motor, gear box, shaft couling, wheels, brakes, bearings etc.)	1	set	1	set	----	----
3	Crab (trolley)						
a.	Crab (trolley) structure with CT rails, platform, handrails, CT buffers etc.	1	set	1	set	----	----
b	Main Hoist Mechanism (Motor, Gear box, Rope drum, Rope Upper block, Lower block, hook, couplings, shaft, brakes, bearings etc.)	1	set	1	set	----	----
c.	Aux Hoist Mechanism (Motor, Gear box, Rope drum, Rope Upper block, Lower block, hook, couplings, shaft, bearings, brakes etc.)	1	set	1	set	----	----
d.	Cross Travel Mechanism (Motor, gear box, shaft couling, wheels, brakes, bearings etc.)	1	set	1	set	----	----
4	LT End stopper	4	Nos.	4	Nos.	----	----
5	Storm Brake	2	Nos.	2	Nos.	----	----
6	LT rail along with accessories	----	----	----	----	577	m
7	LT PVC insulated shrouded bus bar conductor type DSL with accessories and junction boxes as required	----	----	----	----	288.5	m
8	Operator's cabin along with operator's seat, gong, fan and other accesories	1	set	1	set	----	----
9	Main hoist limit switch (Rotory gar + Gravity)	1+1	Nos.	1+1	Nos.	----	----
10	Aux hoist limit switch (Rotory gar + Gravity)	1+1	Nos.	1+1	Nos.	----	----
11	CT lever type limit switch (one way/two way)	2/1	Nos./No.	2/1	Nos./No.	----	----
12	LT lever type limit switch (one way/two way)	2/1	Nos./No.	2/1	Nos./No.	----	----
13	Power cables, control cables etc. along with cable tray/conduits etc.	1	set	1	set	----	----
14	Temprory cable: 3.5 Core Power copper flexible cable of suitable size as per load calculation for commissioning, testing & operation of EOT Crane till such time the DSL is charged.	----	----	----	----	170	m
15	Main Isolating switch cum Changeover	----	----	----	----	1	No.
16	Protective Panel along with Control tansformers, lighting transformers, 415/24 V (DC) transformer, contactors, switches, fuses relays and other accessories	1	No.	1	No.	----	----
17	Main Hoist Panel along with VVVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	----	----
18	Aux Hoist Panel along with VVVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	----	----
19	Cross Travel Panel along with VVVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	----	----
20	Long Travel Panel along with VVVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	----	----
21	Master Controller	1	No.	1	No.	----	----
22	Lighting for cranes (including illumination in cabin, over bridge and under bridge) along with fittings, sockets etc.	1	set	1	set	----	----
23	Portable 40 W hand lamp with minimum 14.5 m length flexible cable for inspection	1	set	1	set	----	----
24	Fire extinguisher	4	Nos.	4	Nos.	----	----
25	Maintenance cage	1	No.	1	No.	----	----
26	Mechanical overload protection (Load cell) for hoist mode	1	No.	1	No.	----	----
27	Radio Remote control with transmitter unit, receiver unit, batterg etc.	1	set	1	set	----	----
28	Additional isolating switches for maintenance of cranes	1	No.	1	No.	----	----
29	Lifting beam & its slings	----	----	----	----	1	No.
30	Anti collission device	1	No.	1	No.	----	----

31	Centralized grease lubrication system to be provided with hand pumps located at crab and both end carriages for all grease lubricated bearings of crane.	1	set	1	set	----	----
32	DSL Phase indicating lamps (RYB)	----	----	----	----	4	Sets
33	Earthing strips	1	set	1	set	----	----
34	First fill of lubricants i.e. oils, grease, servo fluids, cadmium compounds etc.	1	set	1	set	----	----
35	E-Learning Package	----	----	----	----	1	no.
36	Slings for load & overload testing (on returnable basis)	----	----	----	----	1	set
37	**Maintenance tools & tackles**						
a.	Complete set of ring spanners	----	----	----	----	1	set
b.	Complete set of screwdrivers (Min. 6 Nos., Indicate the sizes)	----	----	----	----	1	set
c.	Adjustable Spanner	----	----	----	----	1	no.
d.	Insulated plier	----	----	----	----	1	no.
e.	Wrench spanner	----	----	----	----	1	no.
f.	Grease Gun	----	----	----	----	1	no.
g.	Oil Gun.	----	----	----	----	1	no.
h.	Hand Lamp.	----	----	----	----	1	no.
i.	Line tester	----	----	----	----	1	no.
j.	O&M Manual	----	----	----	----	1	no.
k.	Steel box to place above tools & manual	----	----	----	----	1	no.
41	**Erection & Commissioning Spares**	----	----	----	----		
a.	Oil seal for each gear box	2	nos.	2	nos.	----	----
b.	Indicating lamps of each color	2	nos.	2	nos.	----	----
c.	Push button of each type and rating	2	nos.	2	nos.	----	----
d.	Auxiliary Contactor of each rating	2	nos.	2	nos.	----	----
e.	Limit switches	2	nos.	2	nos.	----	----
f.	HRC Fuses of each size	1	no.	1	no.	----	----
g.	Touch up paints for structural component	10	Ltr.	10	Ltr.	----	----
42	**Operation and maintenance Spares**						
a.	Gear Oil (ISO VG 68)	20	litres	20	litres	----	----
b.	Grease (ISO VG 220)	20	kg	20	kg	----	----
c.	Brake shoes of each size and rating	2	nos.	2	nos.	----	----
d.	Brake liners of each size and rating	2	nos.	2	nos.	----	----
e.	Brake springs of each size and rating	1	no.	1	no.	----	----
f.	Oil seal of each size for each gear box	2	nos.	2	nos.	----	----
g.	Main contactors of each rating	1	no.	1	no.	----	----
h.	Overload relays of each rating	1	no.	1	no.	----	----
i.	Bearing for motors of each size and rating	1	no.	1	no.	----	----

B	**MANDATORY SPARES:**	**For 265/25T Double Girder Crane 1**		**For 265/25T Double Girder Crane 2**		**Common for both Double Girder cranes**	
S. NO.	**ITEM DESCRIPTION**	**Qty**	**UOM**	**Qty**	**UOM**	**Qty**	**UOM**
1.1	**Mechanical: Main TG Hall**						
(a)	Bearings for long travel wheels	----	----	----	----	1 Set (Requirement for one Crane)	
(b)	Bearings for cross travel wheels	----	----	----	----	1 Set (Requirement	
(c)	Bearings for Gear Boxes for each type of Hoist & travel (Main and aux hoist, LT and CT travel))	----	----	----	----	1 Set (Requirement for one Crane)	
(d)	Brake Liner for all the brakes (main and aux hoist, LT and CT travel))	----	----	----	----	2 Sets (Requirement for two Crane)	
(e)	Hydraulic thruster for all Brakes (Main and aux hoist, CT and LT travel)	----	----	----	----	1 Set (Requirement for one Crane)	
(f)	Oil Seals (both main and aux hoist, CT and LT)	----	----	----	----	2 Sets (Requirement for two Crane)	
(g)	Brake springs for all brakes (both main and aux hoist, LT and CT travel)	----	----	----	----	1 Set (Requirement for one Crane)	
(h)	Wire Rope for Aux. Hook	----	----	----	----	1	No.
(i)	Wire Rope for Main Hook	----	----	----	----	1	No.
1.2	**Electrical:**						
i)	Solenoid Coils for Brakes	----	----	----	----	2	sets
ii)	MCBs/MCCBS/Fuse links for the whole crane	----	----	----	----	1	set

iii)	Contactors and overload Relays of each type, size & rating for Motors of the EOT	----	----	----	----	1	set
iv)	Timers of each type, size & rating	----	----	----	----	1	set
v)	Limit Switches for	----	----	----	----		
a	Main Hoist	----	----	----	----	1	set
b	Aux. Hoist	----	----	----	----	1	set
c	Cross Travel	----	----	----	----	1	set
d	Long Travel	----	----	----	----	1	set
vi)	Master Controller for Aux. Hoist	----	----	----	----	1	set
vii)	Drive for MH, AH, CT & LT of each type and rating	----	----	----	----	1	No.

C	SUPERVISION OF E&C AND PERFORMANCE GUARANTEES	For 265/25T Double Girder Crane 1		For 265/25T Double Girder Crane 2		Common for both Double Girder	
S.N.	**Description**	**Qty**	**UOM**	**Qty**	**UOM**	**Qty**	**UOM**
1	**Visit during supervision of erection & Commisioning**						
a.	No .of visits for during erecton & commisioning for both cranes	2	visits	2	visits	1	visit
b.	No. of days of stay at site during Erection and Commissioning	60	days	60	days	4	days
2	**Visit during supervision of performance guarantee tests**						
a.	No .of visits for supervision of performance guarantee tests	1	visit	1	visit	----	----
b.	No. of days of stay at site during supervision of performance guarantee tests	4	days	4	days	----	----
3	**Visit during warranty period for healthiness checks**						
a.	No .of visits (tentatively in a span of 6 months for each crane)	----	----	----	----	4	visits
b.	No. of days of stay at site during supervision of performance guarantee tests	----	----	----	----	16	days

DOCUMENTATION REQUIREMENT

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY ALL THE BIDDERS ALONG WITH THE BID

Sl. No.	DOCUMENT TITLE
1	PQR CREDENTIALS
2	COMPLIANCE SHEET
3	"NO DEVIATION" CERTIFICATE DULY STAMPED AND SIGNED.

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

S.N.	BHEL drawing No.	Title	Approval category	Schedule date of submission (with in given weeks from date of LOI)
A	**BASIC ENGINEERING DRAWING / DOCUMENTS**			
A	**BASIC ENGINEERING DRAWING / DOCUMENTS**			
1	PE-V0-508-501-A501	Manufacturing Quality Plan with sub vendor list For TG Hall Crane	A	2
2	PE-V0-508-501-A504	Mechanism Sizing Calculation Including storm brake calculation for TG Hall Crane	A	2
3	PE-V0-508-501-A505	General arrangement for TG Hall Crane with CT DSL details	A	2
4	PE-V0-508-501-A512	Structural calculations For TG Hall Crane (including structual calculation for crab structure)	A	3
5	PE-V0-508-501-A517	"Schematic circuit diagram of a) Protective panel, Main and lighting circuit & BOM b) Main hoist panel & BOM c) Aux. hoist panel & BOM d) Cross Traverse & BOM e) Long Traverse & BOM Including earthing diagram For TG Hall Crane"	A	5
B	**BALANCE ENGINEERING DRAWING / DOCUMENTS**			
1	PE-V0-508-501-A503	Data sheet of motors for TG Hall Crane	I	5
2	PE-V0-508-501-A506	Crab sub assembly for TG Hall crane with CT wheel assembly	I	3
3	PE-V0-508-501-A508	General arrangement for PVC shrouded DSL for TG Hall crane	I	3
4	PE-V0-508-501-A509	Main and Auxiliary hook block assembly with details of hook, nut and check plate For TG Hall Crane	I	2
5	PE-V0-508-501-A510	Long travel Machinery Assembly with LT wheel assembly For TG Hall Crane	I	4
6	PE-V0-508-501-A511	Lifting beam assembly for TG Hall Crane	A	3
7	PE-V0-508-501-A516	Electrical equipment layout in cabin for TG Hall crane	I	5

8	PE-V0-508-501-A518	"General Arrangement of a) Protective panel b) Main hoist panel c) Aux. hoist panel d) Cross Travel panel e) Long Traverse travel panel. f) Pendent g) Remote Radio Control For TG Hall Crane"	I	5
9	PE-V0-508-501-A519	Cable Sizing and cable schedule For TG Hall Crane	A	6
10	PE-V0-508-501-A521	Type test certificate (for motors) For TG Hall Crane (Applicable for above 100 KW rating motors)	A	8
11	PE-V0-508-501-A526	Manufacturing Quality Plan For Lifting Beam	A	3
12	PE-V0-508-501-A527	Data sheet of TG Hall Crane with painting details	A	3
13	PE-V0-508-501-A532	Gantry Rail installation for TG Hall crane	I	3
14	PE-V0-508-501-A550	Crane lubrication drawing For TG Hall Crane	I	6
C	**Bidder to submit following additional document also.**			
1	PE-V0-508-501-A520	Crane Operational write up For TG Hall Crane	I	5
2	PE-V0-508-501-A523	Mandatory spare parts list For TG Hall Crane (if applicable)	A	8
3	PE-V0-508-501-A525	Erection procedure For TG Hall Crane	I	8
4	PE-V0-508-501-A514	O & M Manual For TG Hall Crane	I	9
5	PE-V0-508-501-A551	Cradle drawing For TG Hall Crane	I	8
6	PE-V0-508-501-AXXX	Any other documents if required during detail engineering	-	-
	LEGENDS			
	A= Approval category			
	I= Information category			

Notes:-

1	Bidder to follow the following the drawing submission schedule: i.1st submission of drawings from date of LOI as per the submission schedule. ii.Every revised submission incorporating comments – within 10 days.
2	Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

DRAWINGS & DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT			
Sl. No.	**DOCUMENT TITLE**	**No. of prints (Sets)**	**No. of portable hard**
1	APPROVED DOCUMENTS	3	2
2	AS BUILT DRAWINGS/ DOCUMENTS	3	2
3	ERECTION MANUAL	3	2
4	O&M MANUAL	3	2
5	PERFORMANCE AND FURNTIONAL GUARANTEE TEST REPORTS	3	0

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

1	The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under exclusion.
2	Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.
3	All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.
4	The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
5	All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
6	Guarantee for plant/ equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions.
7	In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account.
8	Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
9	As built drawings shall be submitted as and when required during the project execution.
10	The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

11	Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
12	In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

Signature of authorised Representative

Name and Designation :

Name & Address of the Bidder

Date

PRE QUALIFICATION REQUIREMENT (TECHNICAL)

Pre-Qualification Requirement:-Double girder EOT crane having capacity of 100T or more with span of 28M or more.

1	The Bidder should have designed, manufactured, erected and commissioned EOT cranes of capacity 100T or more with minimum crane span of 28 meters, which is in successful operation in at least one (1) station for a minimum period of one (1) year as on 03/03/2023. For this the supplier has to submit performance certificate in English from end user along with copy of Purchase Order, meeting above mentioned pre-qualifying requirement.
2	Bidder shall provide all necessary data such as type, design, make, capacity, duty conditions, date of commissioning/ operation etc.
3	Bidder shall submit design documents to substantiate technical parameters specified in PQR, if the same is not mentioned in performance certificate/purchase order.
4	Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
5	BHEL shall evaluate and qualify the bidders for this tender based on their performance in current projects under execution. Particulars for evaluation along with qualifying marks are mentioned in Annexure I.
6	Consideration of offer shall be subjected to customer's approval of bidders.
7	Notwithstanding anything stated above, BHEL/NTPC reserves the right to assess the capabilities and capacity of the Bidder/ its subcontractors to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL/NTPC.
8	After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

Annexure-I

Assessment of bidder wrt performance feedback from current projects under execution by PS- Region concerned

Name of Supplier:
Reference project & Enquiry details:
Packages quoted for:
Project Name for which assessment done

Sl. No.	Area of Assessment	Particulars for evaluation	Maximum marks	Qualifying marks	Marks awarded
1	**Material supply**		**40**	**20**	**0**
1a	Package Name	Whether agency has supplied the material within given contractual period. Supply 100% - 30 marks 75% - 20 marks 50% - 15 marks	30	15	
1b		Assement of Qualitative ability of agency to follow the approved documents/ BHEL procedures / guidelines for material inspections/ inspection call/ MDCC request / Dispatch documentation.	10	5	
2	**Execution Capabilities**		**60**	**40**	**0**
2a	Package Name	Whether agency has engaged competent graduate engineer as site incharge and other supervisiors/ manpowers to handle site execution.	10	10	
2b		Agency has made at least one no. office shed/container and one no. storage shed/ container.	10	5	
2c		Vendor involvement/ behaviour/ engagement during E&C at site and intiative to resolve of interface issues.	5	2	
2d		Quality of erection drawings and BOQ availability .	5	3	
2e		Agency efforts & inclination on implementation of HSE, Safety and quality during excution of system.	10	5	
2f		Whether agency has made the system ready before corresponding project milestone requirement.	20	15	
	Grand Total		**100**	**60**	

Note: 1. Performance feedback for each project under execution of respective PS-Region will be considered for evaluation.
2. The bidder will have to qualify in each project individually.

BHEL Region representative (Projects)

BHEL Region GM/Head (Projects)

PRE QUALIFICATION REQUIREMENT (FINANCIAL)