

**2X800MW DVC KODERMA TPS PHASE II**

FOR  
**DOUBLE GIRDER EOT CRANES  
FOR UPTO 100T CAPACITY**

SPECIFICATION No. **PE-TS-519-501-A001**

REV NO. 0



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



**TECHNICAL SPECIFICATION  
2X800MW DVC KODERMA TPS PHASE II  
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THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-519-501-A001 REV 0

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### PROJECT INFORMATION

SL.NO	DESCRIPTION	2X800MW DVC KODERMA TPS PHASE II
1	CUSTOMER	<b>Damodar Valley Corporation (DVC)</b>
2	CUSTOMER CONSULTANT	<b>Development Consultants Pvt. Ltd.</b>
3	LOCATION	The project is located near Benjhidih Village of Koderma District in Jharkhand.
<b>4</b>	<b>DATA</b>	
4.1	THE BASIC WIND SPEED "Vb" AT TEN METERS ABOVE THE MEAN GROUND LEVEL.	39 METERS PER SECOND
4.2	THE RISK COEFFICIENT "K1"	1.06
4.3	CATEGORY OF TERRAIN	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
<b>5</b>	<b>ELECTRICAL DATA</b>	
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

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### 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	YES
7	Supervision of Erection & Commissioning	NO
8	Performance Guarantee (PG) Test	YES
9	Mandatory Spares	YES
10	O & M Service	NO
11	O & M Spares	NO
12	Storage	YES

EXCLUSIONS	
1	Supply feeder and cable from feeder to isolating switch.
2	Steel Gantry girder
3	Dead load for load/ overload testing at site
	<b>Note</b>
1	Load testing sling, cradles 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 & cradles will be allowed to be taken back by the vendor, after completion of the test at site.

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<b>GENERAL TECHNICAL REQUIREMENT</b>		
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 (15.06.2024) 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	Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.	

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9.0	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.	
10.0	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 ten years from 15.06.2024. 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.	
11.0	Manufacturing Quality Plan is included for reference in this specification to enable the bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the quality plan's minimum requirement during manufacturing and testing. Further all checks and tests indicated in Quality Assurance Requirement as detailed in Customer's specification etc have to be followed.	
12.0	Sub vendor list is attached. Any additional sub - vendors proposed by bidder during contract stage shall be subject to BHEL/ Customer/Customer's Consultant	
13.0	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.	
14.0	<b>Mandatory Spares</b>	
14.1	One (1) Set is defined as 100% requirement for one crane for the entire cranes of similar size & capacity.	
14.2	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 suitable applicable alternate spare have been offered / shall be supplied without any financial implication.	
14.3	In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.	

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14.4	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.	
14.5	Interchangeability and Packings: All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.	
14.6	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.	
14.7	Bidder shall not indicate “Not Applicable” against any of the spare (except for those items for which “if applicable” is specified). In case of not applicability, functionally equivalent spare shall be offered.	
<b>15.0</b>	<b>SHOP TEST PROCEDURE FOR GEAR BOX</b>	
15.1	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.	
15.2	<b>In addition to the above specific points, the following general points shall be ensured:</b>	
a	Inspection pockets are provided as required.	
b	Gear box casings are provided with at least two fit bolts/dowels at the parting line.	

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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 are 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.	
16.0	<b>STAGE INSPECTION OF EOT CRANES AT WORKS:</b> 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 wrt 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.	
17.0	<b>Testing at site:</b> Completely assembled crane at site shall be checked 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	
c	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	
d	All Other tests as per IS-3177.	
e	Speed test at rated load for hoisting, CT and LT mechanism.	
f	Brake test.	
18	<b>Services to be provided by the bidder</b>	
a	Packing, forwarding and transportation to site.	

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b	Development of storage space including ward & watch of the equipment and handling	
c	<b>Unloading, storage and handling at site.</b> The Bidder shall provide means for all unloading and reloading for all consignments of plant; both during transport to Site and on the Site. Consignments shall be unloaded immediately on arrival at Site. The Bidder is required to take the necessary steps in order to provide the carriage, special supporting structures for heavy loads, etc. The following parts shall be stored inside enclosed warehouses:	
d	Bolts, pins, packing, tools, insulation materials, electrical parts with electrical devices attached, electric motors and excitation equipment, instruments, welding material and equipment, all small parts and all parts of the crane which already have been finally painted. If large parts are stored in the open air, they shall be provided with weather resistant and fire & resistant covers. Electrical parts, which are not packed in heavy duty polyethylene foil and those so packed, but whose packing has been damaged shall be kept in suitable places from the moment of storage to the moment of installation. All insulation materials which will be taken from the warehouse for installation and which are stored temporarily in the station shall be protected from weather or humidity. All the equipment shall be stored as per standard storage and preservation instructions etc. of the suppliers.	
e	<b>Arranging test load at site:</b> Collecting the test load at site within a radius of 1-2 KM from owner's storage to final testing bed of crane shall be under bidder's scope of work. Test load in the form of rolled steel, plates, girder, angle etc., as available at the site shall be made available by the purchaser. The test load shall be put back to the place from where it was lifted by the vendor, after the load testing. Load testing sling, cradles 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 & cradles will be allowed to be taken back by the vendor, after completion of the test at site.	
f	Erection and Commissioning	
g	Demonstration / Load test at bidder's Works and at site.	
h	Obtaining clearance and acceptance certificate from the concerned competent Authority after site test and as and when required as per Government Norms /Statutory body till the time of final handling over to Customer. Necessary fees/expenditure as required shall be borne by the supplier.	
i	Any service mentioned in GCC & SCC as relevant to the package.	

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<b>TECHNICAL DATA SHEET A</b>					
<b>Sr. No.</b>					
<b>DESCRIPTION</b>		<b>TECHNICAL PARTICULARS</b>			
1.0.0	<b>General</b>				
1.1.0	<b>Basic Details</b>				
	a.	Crane type	EOT	EOT	EOT
	b.	Location	BC Bay BFP Handling	CW Pump House	Heavy Material Store
	c.	Numbers of cranes	2 nos.	1 no.	1 no.
	d.	Outdoor or indoor duty	Indoor	Indoor	Indoor
	e.	Rated SWL – tonnes	75T	50T	30T
	f.	Monorail Electric Hoists (Attached under crane Girder (One per crane): SWL	NA	2T	NA
	g.	Test load SWL – tonnes	125% of SWL (Safe Working Load)		
	h.	Lift	13.3m	21.7 m	8.6 m
	i.	Span	10.1m	11.4m	13.6m
	j.	Mode of operation	Pendant Push Button + Radio Remote Control		
1.2.0	a.	<b>Design, fabrication and testing of the crane confirm to standard / code number</b>	Mechanical and Electrical as per IS: 3177-2020 & Structure design in accordance to IS 807:2006 or approved equivalent International Standard (latest edition).		
	b.	<b>Minimum thickness of Structural members</b>	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		
	c.	<b>MAXIMUM SPAN/DEPTH RATIO FOR GIRDER:</b>	Plate girders : 18		
1.3.0		<b>Crane classification</b>	M5 (Mechanical, Structural and Electrical) as per IS: 3177-2020, IS: 807-2006 and 13834 (part-5)-1993		
2.0	<b>CRANE PERFORMANCE</b>				
2.1.0	<b>Crane speed with full load</b>		<b>Full speed m/min</b>		<b>Creep speed m/min</b>
	a.	Main hoist	1.6		0.16 (10% of main speed thru'
	b.	Aux. hoist	Not applicable		Not applicable
	c.	Trolley travel (CT)	4		0.4 (10% of main speed thru' VVVF drives)
	d.	Longitudinal bridge travel (LT)	8		0.8 (10% of main speed thru' VVVF drives)
2.2.0	<b>Acceleration values for LT motion (bridge travel) and CT motion (trolley travel)</b>		As per IS: 3177 (2020)		
2.3.0	<b>Hook Approaches from centreline of rails</b>				
	a.	Main hook (non DSL side)	As per Crane clearance diagram (Refer Compliance Drawings)		
	b.	Aux. Hook (non DSL side)	Not applicable		
	c.	Main hook (DSL side)	As per Crane clearance diagram (Refer Compliance Drawings)		
	d.	Aux. Hook (DSL side)	As per Crane clearance diagram (Refer Compliance Drawings)		
2.4.0	<b>Hand Rail Pipes</b>				
			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	<b>COMPONENT DETAILS</b>				
3.1.0	<b>Bridge girder</b>				

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	a.	Type & Quantity	Box type – 2 nos. Material: Mild steel, grade 'B' 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 coefficient, two most unfavourable horizontal effects excluding buffer forces.All these loads must then be multiplied by amplifying coefficient.	
	c.	Maximum Limit for Vertical Deflection	The vertical deflection of crane girder shall not exceed 1/800 of the span. The girder shall be of box type and construction shall ensure non-accumulation of water/oil inside the box.	
	d.	Type of connection to end carriage	By fitted bolts.	
3.2.0		<b>Type of platform required on the bridge</b>	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	NOT APPLICABLE	
	f.	Provided at both ends	Yes	
3.3.0		<b>End carriage span (wheel base)</b>	As per IS 807 (latest edition)	
3.4.0		<b>Trolley</b>	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. 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, grade 'B' of IS 2062 in 100% killed, normalised and ultrasonically tested quality.	
	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		<b>Rope drums</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>
	a.	Material (Indicate IS)	Seamless pipe ASTM A -106 Gr. B or fabricated rolled section to IS: 2062 Gr. 'B' & stress relieved, 100% killed, normalised and ultrasonically tested quality.	
	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		<b>Rope details</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>
	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		<b>Sheaves details</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>
	a.	Material	The sheaves shall be of heavy duty with deep flanges made of cast steel and shall be properly grooved to fit the rope and adequately guarded.	
3.8.0		<b>COUPLINGS &amp; SHAFTING</b>		
3.8.1		<b>Coupling details (between motor and gear box)</b>	<b>for Main hoist, Aux hoist (if applicable), Cross Travel and Long Travel</b>	
	a.	Type	Flexible shock absorbing coupling	
	b.	Guards and enclosures	Provided	

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	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		<b>Coupling details (between gear box and wheels)</b>	<b>Cross Travel (CT)</b>	<b>Long Travel (LT)</b>	
	a.	Type	Flexible geared type		
	b.	Guards and enclosures provided	Yes		
3.8.3		<b>Coupling details (between gear box and rope drum)</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Type	One of the following arrangements will be adopted for connecting the rope drum with the gear- box. 1Flexible joint, incorporating flexible geared coupling housed within the drum. 2Fully flexible geared coupling between the drum & gearbox.		
	b.	Guards and enclosures provided	Yes		
3.8.4		<b>Shafting (Output)</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	a.	Factor of Safety	As per IS: 3177-2020		
	b.	Arrangement of lubrication	Grease cups / Nipple		
	c.	Type of lubricant	Grease		
3.9.0		<b>Gear box details</b>			
3.9.1		<b>Hoist Motions</b>	<b>Main hoist and Main hoist Micro</b>	<b>Aux hoist and Aux hoist</b>	
	a.	Type of mounting of gear box	Horizontal / Vertical		
	b.	Classification	Suitable for M5 duty		
	c.	Type of gears	For Main hoist and Aux hoist: Helical / Spur For Main hoist Micro and Aux hoist Micro: Through VVVF Drives		
	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. Pinions En 19/EN 24. Hardness conforming to IS: 3177-2020 Gears to be hardened, tempered & heat treated as per IS 4460		
	i.	Casings	Material of the gear box housing shall be cast or fabricated. The fabricated gear boxes shall be stress relieved before machining.		
	j.	Noise level	85 db		
	k.	Standard conforming to	IS: 4460 / AGMA		
3.9.2		<b>Travel Motions</b>	<b>Cross Travel and Cross Travel Micro</b>	<b>Long travel and Long travel Micro</b>	
	a.	Type of mounting gear box	Vertical/ Horizontal		
	b.	Classification	M5 duty		
	c.	Type of gears	For Cross Travel and Long Travel: Helical / Spur For Cross Travel Micro and Long Travel 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/ IS 2707 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	Material of the gear box housing shall be cast or fabricated. The fabricated gear boxes shall be stress relieved before machining.		
	j.	Noise level	85 db		
	k.	Standard conforming to	IS: 4460 / AGMA		
3.10.0		<b>Wheels details</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	a.	Material	Grade C55Mn75 of IS 1570 (Part 1 and Part 2/Sec 2) or 42CrMo4 or equivalent as per IS 3177-2020.		
	b.	Hardness	300 – 350 BHN		
	c.	Depth of hardness	10 mm (min)		

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	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	
<b>3.11.0</b>		<b>Lifting hooks</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>
	a.	Type	For 50T and above: Ramshorn type conforming to IS:5749 For less than 50T: shank type conforming to IS:15560	
	b.	Safe lifting capacity	As per SWL capacity of Crane	
	c.	Material	Class 2 as per IS 1875:1992 (re affirmed 2004) for hooks conforming to IS : 5749 Class 3 for hook of grades L & M respectively as per IS 1875:1992 for hooks conforming to IS : 15560	
	d.	Standard conforming to	IS-5749/ IS: 15560	
	e.	Hook can rotate	Yes	
	f.	Safety latch on hook provided	Yes	
	g.	Locking device on swivelling hook required or not	Provided	
<b>3.12.0</b>		<b>Buffers</b>	<b>Cross Travel</b>	<b>Long Travel</b>
	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 (E250) in 100% killed, normalised and ultrasonically tested quality.	
<b>3.13.0</b>		<b>Brakes</b>		
<b>3.13.1</b>		<b>Hoist Motions</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>
	a.	Type of brake	AC Electro-Hydraulic Thruster operated + DCEM	
	b.	Number provided per motor	1+1	1+1
	c.	Braking capacity of each (% 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	
<b>3.13.2</b>		<b>Travel Motions</b>	<b>Cross Travel</b>	<b>Long Travel</b>
	a.	Type of brake (ac / dc / thruster)	AC Electro-Hydraulic Thruster operated + DCEM	
	b.	Number provided per motor	1+1	1+1
	c.	Braking capacity of each (% 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	
<b>3.14.0</b>		<b>Motors</b>		
	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. VFD shall be used to drive three (3) phase squirrel cage inverter duty Induction motor with VPI insulation (Resin poor) suitable for VFD application. 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. Motors shall conform to latest revision IS 3177 and motor subsection of this specification.	

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	b.	Design Codes & Standards	1Three phase induction motors : IS15999, IEC:60034, IS: 12615, IS: 325 2Single phase AC motors : IS:996, IEC:60034 3Energy Efficient motors : IS 12615, IEC:60034-30 4Crane duty motors : IS:3177, IS/IEC:60034 5Designation of Methods of Cooling of Rotating Electrical Machines: IS 6362 6Designation for types of construction and mounting arrangement of rotating electrical machines: IS 2253
	c	Enclosure	TEFC
	d	Numbers furnished	For Main hoist: 1 no. For Aux hoist: Not applicable For Cross travel: As per bidder's design. For Long travel: 2 nos minimum.
	e.	Voltage, phase and frequency	415V $\pm$ 10%, 3 Ph., 4 wire, 50 Hz, +3/-5 % Combined voltage & frequency variation = 10% absolute
	f	Class of protection for motor including terminal box	IP – 55
	g	Rated capacity (KW)	Maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.
	h.	Duration factor/duty	40 % CDF / S-4
	i.	Bearings (Motors)	Grease lubricated ball or roller bearings for Horizontal motors Grease lubricated ball or roller bearings or combined trust and guide bearing for Vertical motors. These motors shall be provided with insulated bearing on at least one side for motor frame size above 250 frame. However, supplier's proven practice with respect to use of insulated bearing in VFD driven motor may be accepted subject to End customer's approval.
	j	Class of insulation	Temp rise 70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation
	k	Number of starts/ hour	300 Starts / hr
	l	Overload protection for motors provided	Yes
	m	Space heater requirements	For motors of rating 30 KW and above. Separate terminal box for space heaters & RTDs shall be provided.
	n	Motor pull out torque	275% of full load torque
	o	Terminal box of motor	-Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation. DOP of terminal box shall be same as motor. -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
	p	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.
	q	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.

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r	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		
s	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		
t	Inspection Testing ( for motor )			
t.1	List of Test for which reports have to be submitted. 1.Measurement of resistance of windings of stator and wound rotor. 2.No load test at rated voltage to determine input current power and speed 3.Open circuit voltage ratio of wound rotor motors ( in case of Slip ring motors). 4.Full load test to determine efficiency power factor and slip. 5.Temperature rise test. 6.Momentary excess torque test. 7.High voltage test. 8. Test for vibration severity of motor. 9.Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section). 10.Test for degree of protection and 11.Overspeed test.			
t.2	The type test listed above should have been conducted within 10 yrs prior to supply under this contract. In absence of type tests reports or in case reports are not found to be meeting the specification/standards requirements, vendor shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval.			
t.3	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of DVC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.			
t.4	All acceptance and routine tests as per the specification and relevant standards shall be carried out.Charges for these shall be deemed to be included in the equipment price.			
q	Other requirement			
q.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.			
q.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 & upto 80% of rated voltage for ratings from 110 kW to 200 kW. Starting Duty : Two hot starts, with motor initially at normal running temperature Maximum Locked Rotor Current : as per IS 12615			
q.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			
q.4	Starting Time: a) 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. b) For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time. c) For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time. d) Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.			

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	q.5	PAINT SHADE FOR MOTOR (CORROSION PROOF PAINTS OF COLOUR SHADE): - RAL 5012 (Blue). 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, minimum paint thickness of 50 microns shall be acceptable for finish coat. Epoxy based paint with suitable additives shall be used.		
<b>3.15.3</b>	<b>Storm brake</b>	Not applicable		
<b>3.16.0</b>	<b>Drive system for hoisting</b>			
	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.	
<b>3.17.0</b>		<b>Bearings (for crane hook, Trolley wheels, rope drum, gear box or any other assembly)</b>		
	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	
<b>3.18.0</b>		<b>Rails</b>		
	a.	Type / section	Rails Sections as per IS: 3443. LT Rail: CR 80. Joint to be butt-welded by the thermit welding or fusion welding.	
<b>3.19.0</b>		<b>Power conductors (DSL) &amp; Cables</b>		
	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 at extreme positions. DSL shall be sized with a margin of 10% overload requirement.	
	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 armoring 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 armoring 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 & 10CX1.5mm <sup>2</sup> , 14CX1.5 mm <sup>2</sup> .	
	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.	

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	d.	Size	Cables shall be sized based on the following considerations: a) Rated current of the equipment b) Short circuit withstand capability c) Derating factors for various conditions of installations (variation in ambient temperature, grouping of cables).	
	e.	Guard provided for DSL	Yes	
3.19.1		<b>CABLE TRAYS</b>	<p>Cable trays shall be ladder/perforated type complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power &amp; control cables and perforated for instrumentation cables.</p> <p>Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized.</p> <p>Cable trays shall have standard width of 150 mm, 300 mm &amp; 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.</p> <p>Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanized.</p> <p>Troughs shall be standard width of 50mm &amp; 75 mm with depth of 25 mm. The tolerance for cable tray and accessories shall be as per IS 2102 (Part-1). Tolerance Class: - Coarse</p>	
3.19.2		<b>SUPPORT SYSTEM FOR CABLE TRAYS</b>	<p>Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc. All steel components, accessories, fittings and hardware shall be hot dip galvanized.</p> <p>Cable tray support system shall be pre-fabricated out of single sheet. Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types : (i) C1:- having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides.</p> <p>The main support channel and cantilever arms shall be fabricated out of 2.5 thick rolled steel sheet conforming to IS 1079. Cantilever arms of 320 mm, 620mm and 750 mm in length are required.</p>	
3.20.0		<b>Operators cabin</b>	Not applicable.	
	a.	Type of construction		
	b.	Area and minimum clear height		
	c.	Operator's seat		
	d.	Warning gong		
	e.	Alarm		
	f.	Position of controllers		
	g.	Ventilation		
3.21.0		<b>Limit switches</b>		
	a.	Type	For Main hoist: Rotary gear + Gravity For Aux hoist: Not applicable For Cross Travel: Lever type (one way/ two way) For Long travel: Lever type (one way/ two way)	
	b.	Number provided	For Main hoist: 1+1 For Aux hoist: Not applicable For Cross Travel: 2/1 For Long travel: 2	
	c.	Material of contacts	Double break Silver Cadmium	
	d.	Control voltage / Enclosure	110 V/ IP 55	
3.22.0		<b>Isolating switch</b>		

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	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).		
	b.	BHEL will provide one number 415 V AC (3 PHASE 4 WIRE) supply feeder only up to isolating switch for each crane. 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		<b>Protective Panel</b>	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	
	c.	DOP	IP 54	
3.24.0		<b>Control panel</b>		
	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 Main hoist, Aux hoist (if applicable), Cross travel and Long travel located on bridge platform with space heaters.	
	c.	Degree of protection	IP 54	
3.25.0		<b>Master Controllers ( Desk Type)</b>		
	a.	Number of steps		
	b.	Voltage & current rating	Not applicable	
	c.	Type		
	d.	Location		
3.26.0		<b>Control for Hoists /Cross travel/Long travel operations / electric hoist hoisting &amp; Cross travel motion</b>	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 degree 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.	<b>Contactors</b>	AC 4 duty for reversing application. AC 3 duty for non-reversing application	
	b.	<b>Switches</b>	AC 23 for motor application, AC 22 for other application.	
	c.	<b>Fuses</b>	HRC	
	d.	<b>Overload relay</b>	Temperature compensated bimetallic with single phasing preventor.	
3.28.0		<b>Power supply</b>	Purchaser 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.	

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3.29.0	<b>Cable glands</b>	Cable shall be terminated using double compression type 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. Cable glands shall be suitable for the sizes of cable supplied/erected.	
3.30.0	<b>Lugs</b>	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	<b>Transformer</b>	(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	<b>Illumination</b>		
	a. In cabin	Not applicable.	
	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. 150 W LED 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	<b>Fire Extinguisher</b>		
	a. Type and size	4.5 kg CO2 type	
	b. Location	One no. on bridge per Crane	
3.34.0	<b>Maintenance cage</b>	Suitable inspection cages to accommodate two persons to facilitate inspection of down shop lead.	
3.35.0	<b>Mechanical overload protection (Load Cell with digital display)</b>	To be provided for hoist mode. Digital display of load should be clearly visible from operation floor.	
3.36.0	<b>RRC details</b>		
	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 pendent push button or radio remote unit.	
	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.	

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3.37.0	Pendent Push buttons station	Movable and retractable type. Emergency stop, start, lights, main and creep speed for up & down, forward & reverse for Cross travel and long travel, alarm, selector switch (for mode of operation), glow type push buttons to be provided. Indicative marking for easy operation shall be provided. 1.Suitable for IP 55 protection 2.Ambient temp (-25 to 60 deg C) 3.Pendant cable shall be multicore EPR flexible. 4.PVC coated steel wire rope for pendant shall be 2 mm.		
3.38.0	Sweep	Sweep shall be attached to the end carriages and to the trolley to remove foreign materials from the rails.		
3.39.0	Whether tandem operation envisaged	No		
3.40.0	Lifting Beam & its capacity	Not applicable		
3.41.0	Anti Collision device	Not applicable		
3.42.0	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.		
3.43.0	DSL phase indicating lamps	To be provided on both end of bay length.		
3.44.0	Consumables	Consumables such as oils, lubricants including grease, servo fluids, gases and essential chemicals etc. till one year after commissioning. Bidder shall also supply a quantity of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc. used which is expected to be utilized till one year after commissioning. This additional quantity shall be supplied in separate Containers.		
3.45.0	E-Learning Package	(Applicable for BC Bay BFP handling crane only)		
	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.		

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	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.		
3.46.00		<b>Nuts &amp; Bolts</b>	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.	
3.47.00		<b>Electrodes</b>	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.	
3.48.00		<b>Electric Hoist (to be erected on monorail beam welded underneath one bridge girder of CWPH crane)</b>		
	a.	Quantity	One number for CWPH crane	
	b.	Type, location	Electric wire rope hoist, indoor	
	c	Capacity	2T	
	d	Hook approach and lift	As per Crane clearance diagram (Refer Compliance Drawings)	
	e	Control	Pendant Push button of Electric hoist	
	f	Overload test	125% of SWL (Safe Working Load)	
	g	General Design & duty	As per IS: 3938 latest conforming to Class-II	
	h	Speed with full load (mtrs/min)		
	h.1	Creep speed M/Min	@ 10% of main speed for all the motions through VVVF drive	
	h.2	Hoisting speed	3 m/min	
	h.3	Trolley motion	10 m/min	
	i	Type of transmission	Through Electric motor and gearbox	
	j	Wire Rope		
	j.1	Construction / core	Extra flexible plough steel , 6 x 36 or 6x37 construction	
	j.2	Code	IS: 2266 (latest edition)	
	j.3	Number of falls	min 2	
	j.4	Factor of safety	As per IS-3938 latest edition	
	k	Load Hook and block	NORMALISED HOOK ONLY	
	k.1	Type of load hook	Shank type swiveling with safety latch	
	k.2	Load hook Code	IS: 15560	

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	k.3	Load hook Material	Class 3 for hook of grades L & M respectively as per IS 1875:1992 for hooks conforming to IS : 15560	
	k.4	Hook suspension	Thrust bearing	
	l	Gear & pinion		
	l.1	Type	Spur / Helical	
	l.2	Material	Gear: 16 Mn Cr 5 / 20 Mn Cr 5 / C40 / C50 / EN19 / EN24 / SAE 8620 / 16 Cr Ni 4 / 18 Ni Cr Mo5 / 39 Ni Cr. MO3 / 42 Cr	
	m.1	Trolley drive	Single flanged	
	m.2	Wheel conform to (Std. / code)	IS: 3938	
	m.3	Wheel material	Cast, forged or rolled steel	
	m.4	Hardness	200 BHN (max)	
	n	SHEAVE		
	n.1	material	Fabricated from steel plate. IS: 2062 Gr. B / carbon steel casting as per IS 1030 or as per IS: 3938.	
	n.2	Bearing type	Antifriction Ball / Roller	
	o	BRAKE (HOIST)		
	o.2	Type	DC EM (disc type- fail to safe)	
	o.3	Capacity	150 % of rated motor torque	
	o.4	Number	One number	
	p	BRAKE (TROLLEY)		
	p.1	Type	DC EM (disc type- fail to safe)	
	p.2	Capacity	150 % of rated motor torque	
	p.3	Number	One number for each motor	
	q	ROPE DRUM		
	q.1	Material	Seamless steel pipe. ASTM A106 Gr A /B /ASTM 53 grade B; Fabricated from MS as per IS 2062 Gr A/B.	
	q.2	Flange / Flangeless	Flanged	
	r	TYPE OF POWER SUPPLY TO HOIST		
	r.1	CT travel	Shrouded Bus Bar (Copper) Conductor Type DSL / EPR flexible trailing cable for hoist mounted panels.	
	s	MOTORS	as per details given above for double girder cranes	
	t	LIMIT SWITCHES	Hoisting / lowering Trolley	
	t.1	Type	Rotary geared + gravity type Two/ one-way lever	
	t.2	Material of contacts	Double break Silver Cadmium	
	t.3	Control voltage / Enclosure	110 V/ IP 55	
	u	CONTROL PANEL (Hoist mounted).	<ul style="list-style-type: none"> <li>* Fabricated from CRCA steel sheet min 2 mm thick.</li> <li>* Degree of protection shall be IP 55.</li> <li>* Power on indicating lamps shall be provided</li> <li>* Panel illumination lamps (LED type) operated by door switch.</li> <li>* 2 nos earthing bolts on panel.</li> <li>* 20 % spares terminals (clip on type) shall be provided.</li> <li>* Power and control terminals (clip on type) shall be on separate channels.</li> <li>* Gland plate thickness shall be minimum 3mm.</li> <li>* Gland plate shall be double brass compression type.</li> </ul>	

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	v	Pendent Push buttons station	Up /down / forward / Reverse push buttons (glow type). Indicative marking for easy operation shall be provided. 1.Suitable for IP 55 protection 2.Ambient temp (-25 to 60 deg C) 3.Suitable for upto: 1.5 X 14C cable entry. 4.Pendant cable shall be multicore EPR flexible. 5.PVC coated steel wire rope for pendant shall be 2 mm.	
	w	Control Transformer		
	w.1	Type	Dry type, with insulation class B or better.	
	w.2	Quantity & rating	2 x 100% with minimum 20% over loading to be considered while sizing the rating.	
<b>Note:-</b>				
	1	Material of all Structural steel plates and rolled section shall be Mild steel, grade 'B' of IS 2062 in 100% killed,normalised and ultrasonically tested quality or high strength steel of IS 8500 as appropriate.		
	2	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.		
	3	Trolley stops of spring type to be mounted independently on bridge rails to prevent trolley from running off.		
	4	Buffers to be designed to bring the loaded crane to rest from a speed of 50% of the rated speed.		
	5	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.		
	6	Necessary access ladders shall be provided for access on to crane bridge platform from the gantry girder level, from crane bridge platform to trolley platform and from operating floor of pump to gantry girder level.		
	7	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.		
	8	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.		

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<b>TECHNICAL DATA SHEET B</b> <b>(SUCCESSFUL BIDDER TO FILL AFTER PLACEMENT OF ORDER)</b>					
Sr. No.		DESCRIPTION	TECHNICAL PARTICULARS		
1.0.0		<b>COMPONENT DETAILS</b>			
		<b>Bridge girder</b>			
	a.	Size			
	b.	Width			
	c.	Length			
2.0.0		<b>Trolley</b>			
	a.	Centre to centre distance of wheels (on the same rails)			
3.0.0		<b>Rope drums</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Dimensions in mm length and diameter (PCD)			
	b.	Number of grooves			
	c.	Diameter on bottom of grooves			
4.0.0		<b>Rope details</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Grade			
	b.	Diameter in mm			
	c.	Breaking strength			
	d.	Tensile designation			
	e.	Number of falls			
	f.	Length of rope			
3.4.0		<b>Sheaves details</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Diameter of main sheaves in mm on Root			
	b.	Diameter of Equalizing sheaves (in mm) on Root			
3.5.0		<b>COUPLINGS &amp; SHAFTING</b>			
3.5.1		<b>Coupling details (between motor and gear box)</b>	<b>(for Main hoist, Aux hoist (if applicable), Cross Travel and long travel)</b>		
	a.	Size & Torque rating			
3.5.2		<b>Coupling details (between gear box and wheels)</b>	<b>Cross Travel (CT)</b>	<b>Long Travel (LT)</b>	
	a.	Size & Torque rating			
3.5.3		<b>Coupling details (between gear box and rope drum)</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Size			
3.5.4		<b>Shafting (Output)</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	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		<b>Gear box details</b>			
3.6.1		<b>Hoist Motions</b>	<b>MH and MH Micro</b>	<b>AH and AH Micro (if applicable)</b>	
	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		<b>Travel Motions</b>	<b>CT and CT Micro</b>	<b>LT and LT Micro</b>	
	a.	Total number of reduction			

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				Rev. No. 00	
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	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)			
<b>3.7.0</b>		<b>Wheels details</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	a.	Material			
	b.	Hardness			
	c.	Depth of hardness			
	d.	Tread diameter in mm			
	e.	Tread width in mm			
	f.	Numbers provided			
<b>3.8.0</b>		<b>Lifting hooks</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Material			
<b>3.9.0</b>		<b>Brakes</b>			
<b>3.9.1</b>		<b>Hoist Motions</b>	<b>Main hoist</b>	<b>Aux hoist (if applicable)</b>	
	a.	Diameter of brake in mm			
	b.	Torque rating Kg. M			
	c.	Braking torque actually required			
	d.	Braking distance in mm			
	e.	Thruster material			
<b>3.9.2</b>		<b>Travel Motions</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	a	Dia of brake in mm			
	b.	Torque rating KgM			
	c.	Braking torque actually required			
	d.	Thruster material			
	e.	Braking distance in mm			
<b>3.10.0</b>		<b>Rails</b>	<b>Cross Travel</b>	<b>Long Travel</b>	
	a.	Weight per metre			
	b.	Top width in mm			
	c.	Height in mm			
<b>3.11.0</b>		<b>Motors</b>			
	a.	rating	For Main hoist: For aux hoist (if applicable): 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			
<b>3.12.0</b>		<b>Limit switches</b>			
	a.	Rating of contacts			
<b>3.13.0</b>		<b>Protective Panel</b>			
	a.	Dimension			
<b>3.14.0</b>		<b>Control panel for MH, AH (if applicable), CT and LT</b>			
	a.	Dimension			
<b>3.15.0</b>		<b>Slings, suitable for load &amp; overload test of EOT Crane (to be supplied alongwith load test certificate for joint at 2 X rated capacity)</b>			

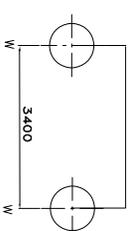
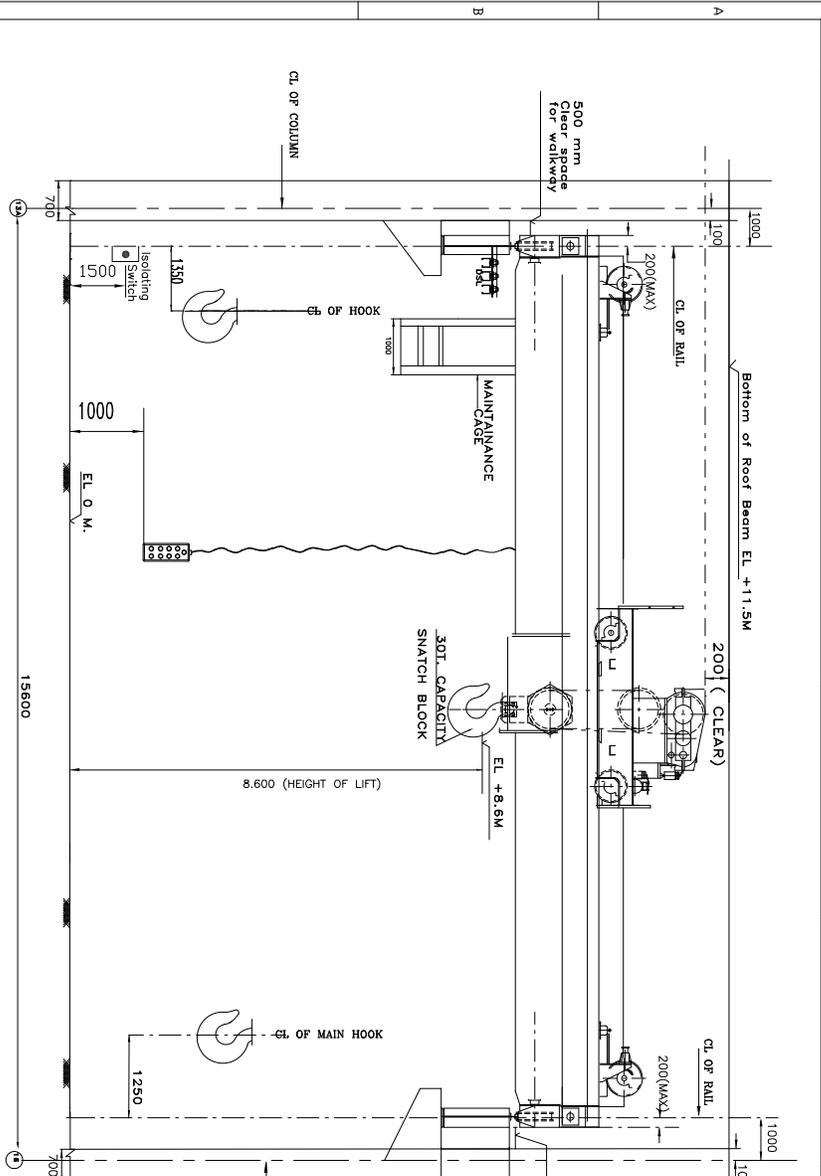
	<b>TECHNICAL SPECIFICATION</b> <b>2X800MW DVC KODERMA TPS PHASE II</b> <b>DOUBLE GIRDER EOT CRANES</b> <b>FOR UPTO 100T CAPACITY</b>		<b>PE-TS-519-501-A001</b>
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	a	Length	
	b.	Size	

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**COMPLIANCE DRAWINGS**

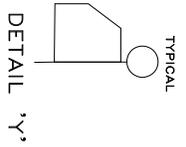




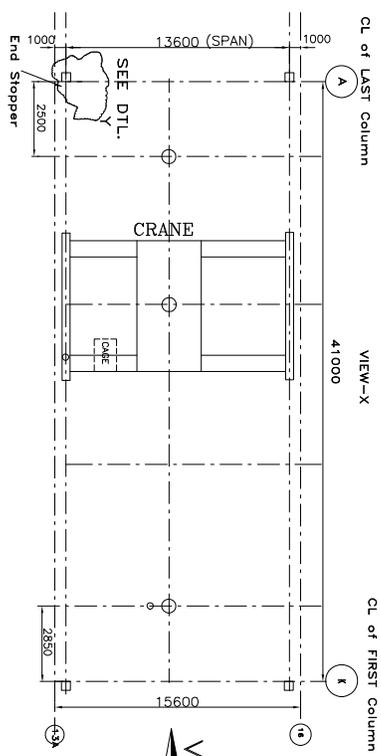


TENTATIVE LT WHEEL LOAD DIAGRAM WITHOUT IMPACT W=20T

- NOTE
1. THE DESIGN CODE FOR EOT CRANE SHALL BE IS:3177 (latest edition).
  2. DRAWING IS NOT TO SCALE.
  3. QTY OF CRANE: 1 NO.



KEY PLAN



VIEW X

Fold-2  
3  
4  
5  
6  
ALL DIMENSIONS ARE IN MM  
FIRST ANGLE PROJECTION

REV	DATE	ALT	CD	APPD	REV	DATE	ALT	CD	APPD
DVC DRG NO OWNER CONTRACT 519 DVC 2X800 MW KOBERMA TPS PHASE II BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI GILL SUB-CONTRACTOR									
PRINT SCALE 					DEPT NAME SIGN DATE BHARAT HEAVY ELECTRICALS LTD CODE DESN RS CHD VEH APPD L 15/09/23				
CRANE CLEARANCE DIAGRAM OF HEAVY MATERIAL STORE EOT CRANE BHHEL DRG NO : PB-DC-519-601-A003 SHEET 1 OF 1 SIZE-A4 REV. 0									

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**PERFORMANCE GUARANTEES TO BE DEMONSTRATED AT SITE**

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<b>PERFORMANCE GUARANTEES TO BE DEMONSTRATED AT SITE AS PER IS-3177.</b>	
<b>S.N.</b>	<b>DESCRIPTION OF TESTS TO BE PERFORMED</b>
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.

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**STANDARD MANUFACTURING QUALITY PLAN FOR DOUBLE GIRDER EOT CRANE**



MANUFACTURE/BIDDER/VENDOR NAME & ADDRESS		MANUFACTURING QUALITY PLAN										DATE: SEPT 2025	
		CUSTOMER: DYC		SPEC. NO.: PE-TS-519-501-A001		DATE:		Q.P. NO.: PE-V0-519-501-A001		DATE:		SHEET 2 OF 8	
		PROJECT: 2X800 MW KODERMA PHASE II		SYSTEM: EOT CRANES		SECTION:		FORMAT OF RECORD		AGENCY		REMARKS	
		ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T		REFERENCE DOCUMENT		ACCEPTANCE NORMS		9		**		10	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	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	M	C	N		
		Chemical test	Major	Chemical integral test piece.	1 Per Heat/Batch	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET	TC	P	V	V		
		Physical test	Major	Tensile test on integral test piece after heat treatment	1 Per Heat/Batch	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET	L.R	P	W	V	Refer Note 17	
		Macro etching	Major	Grain Size	100%	ASTM E 112	Grain size 6 or final	TC	P	V	V		
		NDT before Proof Load	Major	UT	100%	ASTM A 388-2007	UT PROCEDURE	NDT Report	P	V	V	For UT procedure refer Note 4	
			Major	DPT	100%	ASME Sec V	ASME SEC. VIII, Div-I, Append.- 8	NDT Report	P	V	V		
		Proof Load Test	Major	Proof Load Test	100%	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET	L.R	P	W	V	Refer Note 18	
		NDT after Proof Load (UT only shank portion)	Major	U.T & MPI after Proof Load Test	100%	ASTM A 388-2007 / ASTM E 709-2007	ASTM A 388-2007 / ASTM E 709-2007	NDT Report	P	W	V		
			Major	Visual	100%	—	—	L.R	P	H	V	Refer Note 20	
2.2	Wire Rope & slings	Visual & Breaking Strength	Major	Type, grade, breaking strength & visual, Diameter	100%	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	Mill T.C.	P	V	V		
2.3	Rails	Chemical & Tensile, Cross section, Hardness, Dimension	Major	Chemical & Tensile, Hardness, Dimension	100%	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	P	V	V		
<b>3.0 ELECTRICAL ITEMS</b>													
3.1	Transformer (Control transformer, Light transformer etc.)	Make, Rating	Major	Visual	100%	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	IR	P	V	V		
		Routine Test	Major	Doc. Review	100%	Mfg. Catalogue	Mfg. Standard	TC	P	V	V		

BHEL			
ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by:		Checked by:	
Reviewed by:		Reviewed by:	

BIDDER/ SUPPLIER			
Sign & Date		Sign & Date	
Seal		Name	Seal
Reviewed by:			
Approved by:			

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:		Sign & Date	Seal
Reviewed by:		Name	
Approved by:			

MANUFACTURING QUALITY PLAN				SPEC. NO: PE-TS-519-501-A001	DATE: SEPT 2025								
MANUFACTURE/BIDDER/VENDOR NAME & ADDRESS		CUSTOMER: DYC			DATE:								
PROJECT: 2X800 MW KODERMA PHASE II		PO NO.:			DATE:								
ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T		SYSTEM: EOT CRANES			SECTION:								
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									7	8	9	* D	
1	2	3	4	5	6	7	8	9	*	**			10
					M	C/N							

3.2	SFU, MCCB, MCB, CONTRACTORS, DSL, RELAYS, FUSES, RESISTENCE BANK, HOOTER, PUSH BUTTONS, indicating instruments, junction box, Limit Switches	Make / Rating / Type / Size	Major	Visual	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	IR	√	P	V	V	Refer Note 19
3.3	Motor	Functional / Continuity Check	Major	Operational	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	IR / COC	√	P	V	V	
3.4	Brakes	Type, Rating, Make, Size	Major	Visual	100%	-	CUSTOMER approved BOI list & ADS / DRG		Mfg. TC	√	P	V	V	
3.5	VVVF Drive	Routine Test / Clearance of OP for Motor above 50 KW	Major	Measurement	100%	-	IS: 325 / App. Data sheet/CUSTOMER ADS	IS: 325 / App. Data sheet/CUSTOMER ADS	COC / Mfg T.C. (As per Note-3)	√	P	V	V	
3.6	Cables ( Power / Control / Trialing / Flexible )	Make, Type, Rating	Major	Measurement	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	√	P	V	V	
3.7	Radio Remote, Master Controller, Pendant Station, Switches	IR, HV, Functional Test	Major	Measurement	100%	-	MFG. STD.	MFG. STD.	TC	√	P	V	V	
3.8	Anti - Collision Device, Cable Gland & lugs, Rectifier ,Lamps, Load cell, Illumination and Earthing material	Type, Rating, Make, Size	Major	Visual	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC / COC	√	P	V	V	
4.0	OTHER BOUGHT OUR ITEMS	Routine Test	Major	Measurement	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	√	P	V	V	
		Make, Type, Size	Major	Visual	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	√	P	V	V	
		Routine Test	Major	Measurement	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	√	P	V	V	
		Make / Rating / Type / Functional	Major	Visual	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC / COC	√	P	V	V	
		Make / Type	Major	Visual	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC / COC	√	P	V	V	

BHEL				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Doc No:			
Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Seal
Prepared by:		Checked by:		Reviewed by:		Approved by:	
Reviewed by:		Reviewed by:					

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS		MANUFACTURING QUALITY PLAN						SPEC. NO: PE-TS-519-501-A001	DATE: SEPT 2025								
		CUSTOMER: DYC		SYSTEM: EOT CRANES		FORMAT OF RECORD		AGENCY		REMARKS							
		PROJECT: 2X800 MW KODERMA PHASE II										9		**		10	
		ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T															
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	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	10	11	12						

4.1	Bearings	Type & Size	Major	Verification	100%	-	Appd.drg./ Mfr's catalogue	TC / IR / COC	✓	P	V	V	
4.2	Tools and tackles	Verification of type size / rating	Major	Verification	100%	-	As per PO / BBU SHEET	TC / COC	✓	P	V	V	
4.3	Spare (Mandatory / recommended spare / commissioning spares)	Verification of make, type, size, rating	Major	Review Of Internal Inspection Reports / Mfr's TC / COC	100%	-	Approved Spare List SHEET	IR / COC	✓	P	V/W	V/W	Refer Note 21
<b>IN PROCESS : FABRICATED COMPONENTS : GIRDER, END CARRIAGE, TROLLEY, GEAR BOX CASING , FABRICATED ROPE DRUM</b>													
5.1	Welding	WPS, PQR & WPG	Major	Review of Document	100%	-	ASME SEC IX	As ASME Format	✓	P	V	V	Refer Note 22
5.2	Heat Treatment (SR) of Rope drum and Gear Box Casing	Mechanical	Major	Review of SR chart/Test Report	100%	-	ASME SEC IX	I.R	✓	P	V	V	
5.3	Fillet Weld	NDT	Major	DPT on Fillet Weld	100%	-	ASME - Sec. V	NDT Report	✓	P	V	V	Refer Note 23
5.4	Butt Weld (Girder ,End-carriage, Trolley & Fabricated Rope drum, if applicable)	NDT	Major	Radiography Test / Gamma Ray DPT on Butt Weld	100%	10%	ASME - Sec. V	NDT Report	✓	P	V	V	
5.5	Heat Treatment (SR) of Rope drum and Gear Box Casing	Mechanical	Major	Review of SR chart/Test Report	100%	-	ASTM E165	I.R	✓	P	W	V	100% random witness by BHEL.
5.6	Cabin (as applicable), Platform, Hand railing	Dimension	Major	Dimension	100%	-	ASME SEC. VIII, Div-1, Append. - 8	SR Chart	✓	P	V	V	
5.7	Fabricated Components (Girders, End Carriages & Trolley, end stopper)	Visual & dimensional	Major	Dimensional & Visual Check	100%	-	ASME - Sec. V	I.R.	✓	P	V	V	At the Time of Final Insp. Of Crane
<b>IN PROCESS INSPECTION OF MACHINED COMPONENTS</b>													
6.1	Pinions, Gear & Wheel	1. Dimensional Check	Major	Measurement	100%	-	ASME - Sec. V	I.R	✓	P	V	V	
		2. Heat Treatment	Major	Heat Treatment chart	100%	-	ASME - Sec. V	HT Chart	✓	P	V	V	Refer Note 25
		3. Hardness	Major	Measurement	100%	100%	ASME - Sec. V	I.R	✓	P	W	V	
		4. NDT	Major	DPT on teeth	100%	-	ASME - Sec. V	NDT Report	✓	P	V	V	

ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by:		Checked by:	
Reviewed by:		Reviewed by:	

BHEL			
BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL	
Doc No:		Sign & Date	Name
Reviewed by:		Sign & Date	Name
Approved by:		Sign & Date	Name

MANUFACTURE/BIDDER/VENDOR NAME & ADDRESS		MANUFACTURING QUALITY PLAN										SPEC. NO: PE-TS-519-501-A001	DATE: SEPT 2025						
		CUSTOMER: DYC		SYSTEM: EOT CRANES		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY		REMARKS							
		PROJECT: 2X800 MW KODERMA PHASE II												SECTION: 9		**		10	
		ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T												7		*		D	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	DATE								
1	2	3	4	5	6	7	8	9	10	11	12								
6.2	Hardness Difference (Pinion & Gear)	Hardness	Major	Mechanical	100%	-	APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	✓	P	V	V						
6.3	Rope Drum	1. NDT & Dimensional Check 2. NDT	Major	DP test on fillet weld & Dimension after machining	100%	-	ASME SEC VIII Div -1 / Mfg. Drg. IS: 3658-1981 / ASME - Sec. V	NO RELEVANT INDICATION NO RELEVANT INDICATION	NDT Report NDT Report	✓	P	V	V						
6.4	Pulley & Brake Drums	1. Visual & dimension 2. NDT	Major	DPT after machining	100%	-	Mfg. Drg	Mfg. Drg	I.R.	✓	P	V	V						
6.5	Assembled Gear Box	1. Visual & Dimensional 2. NDT 3. Mechanical	Major	DPT on Fillet Weld	100%	-	Mfg. Standard ASME - Sec. V	Mfg. Standard NO RELEVANT INDICATION	I.R. NDT Report	✓	P	V	V						
6.6	DSL Guard	Dimensional	Major	Dimension	100%	-	Mfg. Drg.	Mfg. Drg.	I.R.	✓	P	V	V						
7.0	<b>FINAL INSPECTION</b>																		
7.1	CONTROL PANEL With VVVF Drive	Identification of all Elect. Components, Cable laying / Dressing/ Feruling /Terminations Dimensional, Functional , HV, IR, interlocks, Protection DOP	Major	Visual, dimensional, Operational & Functional Check , HV, IR, Painting	100%	100%	IS:3177 / APPD DRG / DATA SHEET	IS:3177 / APPD DRG / DATA SHEET	I.R.	✓	P	W	W	Refer Note 27					
		Paint Shade/ Thk/ Adhesion	Major	Visual / DFT Check	100%		APPD DRG / DATA SHEET	APPD DRG / DATA SHEET	TC	✓	P	V	V	Refer Note 28					

BHEL				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		BIDDER/ SUPPLIER		Doc No:	
Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Name
Prepared by:		Checked by:		Reviewed by:		Reviewed by:	
Reviewed by:		Reviewed by:		Approved by:		Approved by:	



MANUFACTURE/BIDDER/VENDOR NAME & ADDRESS		MANUFACTURING QUALITY PLAN						SPEC. NO.: PE-TS-519-501-A001	DATE: SEPT 2025				
		CUSTOMER: DVC		SYSTEM: EOT CRANES		ACCEPTANCE NORMS		AGENCY		REMARKS			
		PROJECT: 2X800 MW KODERMA PHASE II										FORMAT OF RECORD	
		ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T											
SL NO.	COMPONENT & OPERATIONS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	9	*	**	10				
1	2	4	5	6	7	8	D	M			C	N	

- 3) Performance of electrical & control devices along with the interlocks, protection & sequence to be checked after crane assembly at works.
- 4) Vendor's UT Procedure from NDT Level II to be submitted to BHEL for approval.
- 5) Following to be noted for packing:
  - a) Packing shall be suitable for storage at site in tropical climate conditions.
  - b) For export job, packing shall be as per BHEL seaworthy packing specification.
  - c) Photographs of items duly placed inside the box just before the final packing and photographs of the box just before dispatch to be sent to BHEL purchase group for review before issuing MDCC.
- 6) In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
- 7) The latest revisions/year of issue of all the standard indicated in the QP shall be referred.
- 8) Blank.
- 9) Blank.
- 10) The heat no. /plate identification no. shall be transferred on all major cut pieces of the MS plate for proper correlation, cutting plan of each plate shall be maintained for proper traceability.
- 11) Welder no. shall be punched near butt weld joints, the welding plan of each fabricated item shall be maintained.
- 12) In absence of co-related TC, check testing shall be witnessed on samples selected by Main contractor.
- 13) Co-related Mill TC inclusive of UT will be reviewed by BHEL/CUSTOMER. In absence of UT conformance in Mill TC, then UT will be witnessed by BHEL. For UT procedure refer Note 4.
- 14) Mech. Properties against H.T condition if applicable against respective Material standard/Grade. Hardness test report review after applicable Q & T condition.
- 15) For MH Hook, UT in proof machined condition and AH Hook in grinding condition. For UT procedure refer Note 4
- 16) HT chart review for Main Hook & AH Hook.
- 17) Test Piece will be drawn from top of shank portion to be identified by BHEL and CUSTOMER.
- 18) W - FOR MAIN HOOK, & AH Hook (Cap. >15T). For UT procedure refer Note 4.
- 18.1) In case of Indian Manufactured Hook : Proof Load test and NDT test (UT & MPI/PT) shall be witnessed by BHEL-CQS/Third Party/DVC.
- 18.2) In case of imported Hooks:
  - a) Proof load test & NDT of hooks before EOT crane load test may be jointly witnessed by a customer/ third party / IDLR approved Laboratory in India OR
  - b) IPIA viz. M/S Lloyds Inspection Agency, M/S Bureau Veritas, M/s DNV, M/s TPL etc. (duly approved by DVC) shall be appointed for proof load test & NDT at the country of origin. DVC shall witness proof load test and NDT remotely
- 18.3) Bidder has to include scope of inspection of main hook by reputed third party inspector in case of inspection being done at foreign location. Charges of Third party inspection at foreign location shall be borne by bidder.
- 19) For Motors of 50kW rating and above Routine Test will be witnessed by BHEL and Type test Certificate for identical frame size will be reviewed for validity and conformance. For below 50kW rating routine tests to be witnessed by supplier of crane and type test Certificate for identical frame size will be reviewed for validity and conformance. Photocopies of Type Test Certificates are acceptable but shall be authenticated by Manufacturer. SQP of Motor: PE-QP-999-Q-007, REV-04 Dated 17.04.2021 (MOTORS 55 KW & ABOVE) & PE-QP-999-Q-006, REV-02 Dated 17.04.2021 (MOTORS UPTO 55 KW)
- 20) Identification by BHEL/Customer
- 21) V/W for items as per the Quality Plan
- 22) Welder/procedure qualification will be witnessed by Customer/ BHEL as per appd. WPS. In case the BHEL/NTPC/Lloyds /any other renowned approving agency already available, and doing the job, requalification is not required.
- 23) DP test of fillet weld for rope drum to be conducted after final machining.

ENGINEERING		QUALITY		FOR CUSTOMER REVIEW & APPROVAL			
Sign & Date	Name	Sign & Date	Name	Doc No:	Sign & Date	Name	Seal
Prepared by:	Checked by:	Reviewed by:	Reviewed by:	Reviewed by:	Approved by:	Approved by:	Seal
Reviewed by:	Approved by:	Approved by:	Seal				

MANUFACTURING QUALITY PLAN		SPEC. NO: PE-TS-519-501-A001	DATE: SEPT 2025
CUSTOMER: DVC		DATE:	
PROJECT: 2X800 MW KODERMA PHASE II		DATE:	
ITEM: DOUBLE GIRDER EOT CRANES UPTO 100T		SHEET 8 OF 8	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	REMARKS
1	2	3	10
	4	5	
	6	7	
	8	9	*
	M	C/N	D
	M	C	N
	M	C	N

- 24) 100% in Tension Zone, 25% in Compression Zone & 100% for rope drum Seam weld. RT before Stress relieving. RT Film shall be reviewed by BHEL/Customer
- 25) Heat treatment Chart to be reviewed by BHEL/CUSTOMER.
- 26) Noise Max.85 db at 1 mtr. & 30° C temp. rise at ambient. Witness for Noise & vibration measurement during the final inspection
- 27) HV at 2.5 KV AC for power ckt at 2 KV for control ckt, DOP by paper insertion method. BOI as per CUSTOMER Approved Makes. Will be Checked at the time of Final Inspection.
- 28) 7 Tank Pretreatment before Painting.
- 29) Crane Should be Operable by RRC & PPB (Radio Remote Controller, Pendant) meant for that Crane only.
- 30) Functional & Interlock test to be checked as per approved Electrical Schematic drawing.
- 31) Note for L1 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 DVC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, 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 DVC approved MQP: acceptance of motor rating above 50 kw & less than 75 kw is based on DVC review of routine 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 DVC specific requirements regarding ambient temp., voltage frequency variation, hot starts, pull out torque, 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 DVC approved MQP.
- 32) Safe working load test & 125% over load test shall be conducted at shop with actual hooks, vvfid panels, shop wire ropes & temporary cables. Load test at site shall be offered with all actual components including radio remote control tests and covered in field quality assurance plan.
- 33) All raw material shall confirm to BHEL approved drg. / datasheet / specification. i.e 100 % killed, normalized and ultrasonically tested quality (UT of plate thickness \_ 25 mm).

**LEGENDS:**  
 \*RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,  
 \*\* M: SUPPLIER/MANUFACTURER/ SUB-SUPPLIER, C: BHEL/ THIRD PARTY INSPECTION AGENCY, N: DVC  
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE  
 MA: MAJOR, MI: MINOR, CR: CRITICAL, H - Hold point

BHEL		BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL	
ENGINEERING	Name	Name	Name	Name	Name
Sign & Date	Sign & Date	Sign & Date	Sign & Date	Sign & Date	Sign & Date
Prepared by:	Checked by:	Reviewed by:	Reviewed by:	Reviewed by:	Reviewed by:
Reviewed by:	Checked by:	Reviewed by:	Reviewed by:	Reviewed by:	Reviewed by:



**TECHNICAL SPECIFICATION  
2X800MW DVC KODERMA TPS PHASE II  
DOUBLE GIRDER EOT CRANES  
FOR UPTO 100T CAPACITY**

PE-TS-519-501-A001

Rev. No. 00

Date :Feb 2026

**SUB VENDOR LIST**

SR. NO.	ITEM	SUPPLIERS	REMARKS
1.	STEEL	SAIL	
		TISCO	
		JINDAL	
		RINL	
		ESSAR (AMNS)	
2.	HOOKS	STEEL FORGING & ENGG. CO.,	
		SIMRITI FORGING	
		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	
		ZKL	
		NORMA	
		NRB	
		NTN	
		KOYO	
		URB	
6.	MOTORS	JYOTI LTD.	
		NGEF	(up to 15KW)
		CROMPTON	
		KEC	(UPTO 90KW)
		BHARAT BIJLI	
		MARATHON	
		ABB	
		HAVELLS	UPTO 90 KW
		LHP	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-519-501-A001 REV 0



**TECHNICAL SPECIFICATION  
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		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 )	



**TECHNICAL SPECIFICATION  
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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	ANCHOR	
		PHILIPS	
		BAJAJ	
		Orient	
		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.	

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-519-501-A001 REV 0



**TECHNICAL SPECIFICATION  
2X800MW DVC KODERMA TPS PHASE II  
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Date : Feb 2026

		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	
		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	
		NICCO	
		UNIVERSAL	
		INCAB	
		ICL	
		APAR INDUSTRIES LTD	
		CMI LTD	
		KEI INDUSTRIES LTD	
		SUYOG ELECTRICALS LTD	
		APAR INDUSTRIES LTD	
20.	PVC CONTROL CABLES		
21.	TRAILING CABLES		



**TECHNICAL SPECIFICATION  
2X800MW DVC KODERMA TPS PHASE II  
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FOR UPTO 100T CAPACITY**

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22.	XLPE POWER CABLES	CORDS CABLE INDUSTRIES LTD		
		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		
				COMMET
SUNIL&CO				
ARUP ENGINEERING				



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24.	CABLE GLAND	JAINSON	
		ELECTROMAC INDUSTRIES	
		INCAB	
		BALIGA LIGHTING EQPT.PVT.LTD	
		DOWELL	
25.	PUSH BUTTONS	SIEMENS	
		L&T	
		BCH	
		SCHNEIDER	
26.	LIMIT SWITCHES	SPEED-O-CONTROL	
		OMEGA	
		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	
		S&S POWER SWITCHGEAR LTD,	
		SCHNEIDER	
32.	PANELS	OEM	
		RITTAL	
		BCH	
		PYROTECH	
33.	RESISTANCE	ENAPROS	
		SOC	



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	<b>BOXES</b>	EMM	
		OEM	
<b>34.</b>	<b>FIRE EXTINGUISHERS</b>	ASKA EQUIPMENTS LTD.	
		ASHOKA ENGINEERING COMPANY	
		KANADIA FYR FYTER PVT. LTD	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
		NEW ENGINEERING CORPORATION	
		SAFEX FIRE SERVICES LTD	
		UNITED FIRE EQUIPMENTS PVT. LTD	
		ZENITH FIRE SERVICES (INDIA) PVT LTD	
		BIS APPROVED SOURCE WITH VALID LICENSE	
<b>35.</b>	<b>VVVF</b>	L&T -YASKAWA	
		ABB	
		SIEMENS	
		SCHNIEDER	
		FUJI ELECTRIC	
		ROCKWELL	
		VACON	
		mitsubishi electric	
<b>36.</b>	<b>SHROUDED DSL</b>	SUSHEEL	
		STROMAG	
<b>37.</b>	<b>ANTI COLLISION DEVICE</b>	SICK	
		IFM	
		ELECTRONIC SWITCHES INDIA	
<b>38.</b>	<b>LOAD CELL</b>	IPA	
		METTLER TOLEDO	
		SARTORIUS	
<b>39.</b>	<b>RRC</b>	ACROPOLIS ENGINEERING	
		HBC	
		SOC	
		SNT CONTROLS	
<b>40.</b>	<b>GEAR BOX</b>	OEM	* = Applicable for Geared Motors only
		ELECON ENGINEERS	
		SHANTI GEARS	
		PBL*	
		NAW*	
		NORD*	
		SEW*	
BONGFILIOLI*			
<b>41.</b>	<b>RAIL</b>	JSPL	
		SAIL	



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42	CENTRALIZED LUBRICATION / HYDRAULIC POWER PACK	LUBCON, PUNE	CRANE OEM MAKE POWERPACK IS NOT ALLOWED.
		PRAKASH LUBRICANT, KOLKATA	
		AFMC, KOLKATA	
		SKF ENGG AND LUBRICATION (LINCOLN HELIOS	
		VIJAY ENGINEERS	
		INDO HYDRAULIC BOMBAY PVT LTD	
		MEHATA HYDRAULIC EQUIPMENT	
		CLAYSYS	
		VEDNAT ENGINEERING SERVICES	
		ELECTROPNEUMATICS AND HYDRAULIC PVT LT	
SN HYDRAULIC			
43	MCCB/MPCB	L&T	
		ABB	
		SIEMENS	
		SCHNIEDER	
44	SINGLE PHASE PREVENTOR	MINILEC	
		L&T	
		SIEMENS	
45	Drag Chain	IGUS/Reputed make	
46	CONTROL SWITCHES/ SELECTOR SWITCH	KAYCEE	
		GE-POWER	
		ALSTOM LTD	
		SCHNEIDER ELECTRICINDIA PVT. LTD.	
		M/s Shrenik & Co.	
		RECOM PVT. LTD.	
47	AUXILIARY RELAYS	ABB	
		ALSTOM LTD	
		JYOTI LTD.	
		OEN INDIA LTD	
		SIEMENS	
48	BIMETAL RELAYS	L&T	
		GE-POWER	
		SIEMENS	
		TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA	
49	CABLE CLAMPS & CABLE TIES	ELECTROMAC IND.CORPN.	
		INCAB	
		NOVOFLEX MARKETING PVT. LTD.	
50	GI CONDUITS	BIS APPROVED MAKE	

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51	<b>GI CONDUIT (EPOXY PAINTED)</b>	BIS APPROVED MAKE	
52	<b>FLEXIBLE CONDUITS ( LEAD COATED)</b>	PLICA INDIA PVT. LTD.	
53	<b>FLEXIBLE CONDUIT (PVC COATED)</b>	REPUTED MAKE	
54	<b>CONTROL SWITCHES/ SELECTOR SWITCH</b>	KAYCEE	
		GE-POWER	
		ALSTOM LTD	
		SCHNEIDER ELECTRIC INDIA PVT. LTD.	
		M/s Shrenik & Co. RECOM PVT. LTD.	
55	<b>FUSE BASE</b>	INDO ASIAN	
		GE-POWER	
		L&T	
		C&S ELECTRIC LTD.	
		SIEMENS	
		ABB	
		SPACEAGE SWITCHGEARS LTD.	
		SCHNEIDER ELECTRIC INDIA PVT. LTD.	
56	<b>MODULAR SWITCH BOARD</b>	ANCHOR	
		ELEXPRO ELECTRICALS PVT/ LTD.	
		HAVELLS INDIA LIMITED	
57	<b>SWITCH BOX</b>	ANCHOR	
		ELEXPRO ELECTRICALS PVT/ LTD.	
		BAJAJ ELECTRICALS	
		AJMERA INDUSTRIES & ENGG. WORKS S.B. ELECTRICAL ENGINEERING CORPORATION	
	<b>Note:</b>		
1	THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND DVC 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 / DVC.		

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**PAINTING REQUIREMENT**

Crane	Condition	Surface Preparation	Primer Coat	No. of Coats	DFT (in Microns)	Intermediate Coat (in Microns)	No. of Coats	No. of Coats	No. of Coats	No. of Coats	No. of Coats
BC BAY BFP HANDLING DOUBLE GIRDER EOT CRANE	STEEL STRUCTURE	Surface preparation: Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns.	Inorganic Zinc Phosphate. (epoxy based)	1	40 µm per coat.	Epoxy base TiO2 pigmented coat	1 coat	40 µm per coat	Epoxy based finish coat/Two pack polyurethane coat	2 coat	35 µm. per coat 150µ
CWPH DOUBLE GIRDER EOT CRANE AND HEAVY MATERIAL STORE CRANE	STEEL STRUCTURE	Surface preparation: Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns.	Inorganic Zinc Phosphate. (epoxy based)	1	75 µm per coat.	Epoxy base TiO2 pigmented coat	1 coat	75 µm per coat	Epoxy base paint - 2 coats, DFT 35 µm per coat. Final coat of paint : Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) : 1 coat.	2 +1 coat	2 x 35 + 1 x 30 µm = 100µm 250µ
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			Remarks
SL. No	Item Description	Color Shade	
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	RAL 9002 for front & rear and RAL 5012 for side	

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### PACKING REQUIREMENT

<b>COMMON GUIDELINES FOR PACKING</b>	
<b>1. GENERAL:</b>	
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.
<b>2. TYPES OF PACKING:</b>	
The following 5 types of packing have been standardized for packing of General Components/ Assemblies.	
a	<b>OP'</b> - Open Type.
b	<b>PP'</b> - Partially Packed.
c	<b>CP'</b> – Crate/Box Packing - Components/Equipment requiring physical protection.
d	<b>'CQ'</b> - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
e	<b>'CR'</b> - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc...
<b>3. DESCRIPTION OF TYPES OF PACKING:</b>	
The various types of packing, as standardized above, are described below.	
3.1	<b>'OP' - Open Type</b>
	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	<b>PP' - Partially Packed</b>
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	<b>'CP' - Crate Packing</b>
	Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.
3.4	<b>'CQ' - Case Packing - Machined Components/Assemblies/Equipment</b>
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 with 100GSM(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.

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3.5	<b>CR' - Case Packing - Electrical &amp; Electronic Components/Assemblies</b>
	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.

<b>4 PREPARATION OF PACKING CASES</b>	
<b>4.1 DIMENSIONS:</b>	
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 planing 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.

<b>4.2 HOOP IRON STRIPS</b>	
	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.

<b>4.3 BRACKETS</b>	
	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.

<b>4.4 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM</b>	
	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.

<b>4.5 RUBBERISED COIR:</b>	
	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.

<b>5 MULTI LAYER CROSS LAMINATED POLY FILM WHILE PACKING OF CUBICLES/CASING</b>	
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.

<b>6 PACKING OF LOOSE ITEMS/SPARES</b>	
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.

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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.	



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**7 TYPICAL PATTERN OF WOODEN BOX**

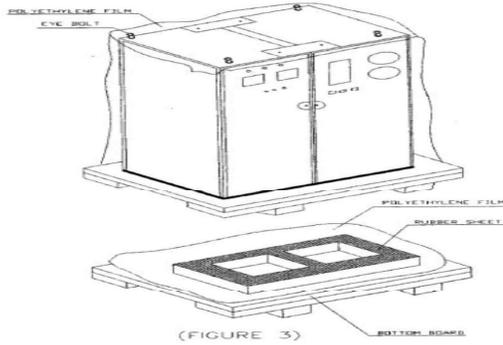


Figure 2

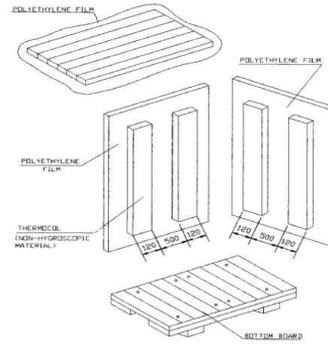


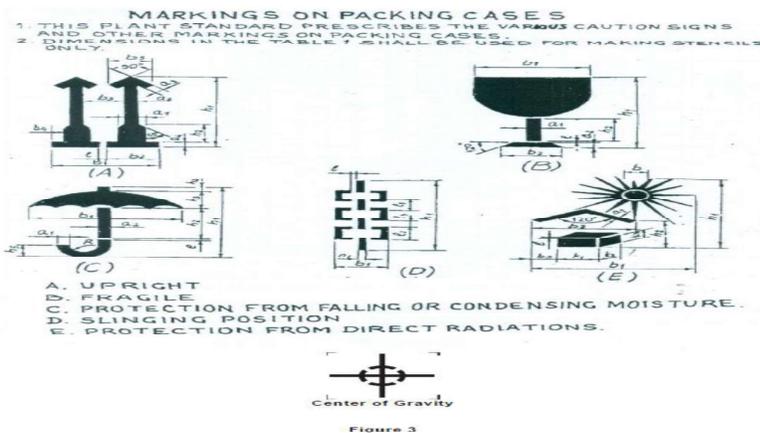
Figure 1

**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 edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

**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 shoosk & the side shoosk.
- 9.5 Caution sign (for slinging) shall be stencilled only on side shoosk 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.



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 <b>BHEL - &lt;unit&gt; - &lt;location&gt; - &lt;pin&gt;</b>			
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, TRANSFORMERS, VVFD, 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.

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**Site Storage and  
Preservation Guidelines**

## CONTENT

- 1 SCOPE OF THE DOCUMENT
- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
  - a) GENERAL STORAGE REQUIREMENTS
  - b) GENERAL PRESERVATION REQUIREMENTS
  - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
5. CONCLUSION
6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

## 1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

## 2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, lose some of their properties and become unusable due to atmospheric conditions and biological elements.

## 3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

### a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

**b) GENERAL PRESERVATION REQUIREMENTS**

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment
  - a. Rust preventive fluid (RPF)
  - b. Rust protective paints
  - c. Tarpaulin covers, in case of outdoor storage
  - d. De-oxy aluminate for weld-ments

**c) GENERAL INSPECTION REQUIREMENTS**

1. Period inspection of materials with specific reference to –
  - Ingress of moisture and corrosion damages.
  - Damage to protective coating.
  - Open ends in pipes, vessels and equipment -
    - In case any open ends are noticed, same shall be capped.
2. Any damages to equipment / materials.
  - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
  - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

#### 4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C )**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O )

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
<b>Raw material /mechanical items like pipes, plates, structure sections etc.)</b>				
1.	Steel pipes ( lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
<b>Fabricated mechanical items (pressure vessels, tanks etc.)</b>				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
<b>Mechanical components like valves, fittings, cables glands, spares etc.)</b>				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
<b>Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)</b>				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers( INTERNALS)	S	Damage , packing	
50.	Air conditioners ( split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators( CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
<b>Miscellaneous items like chain pulley blocks, hoists etc.</b>				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
<b>Chemicals and consumables ( acid, alkali, paints, oils, reagents and special chemicals)</b>				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> )	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals( powder)	C	Damage, Packing self- life	
77.	Laboratory chemicals( liquid)	C	Damage, Packing self- life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
<b>Electrical and C &amp; I items (motors, cables etc.)</b>				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments( gauges/analysers)	C	Damage	
<b>Special items</b>		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

## 5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

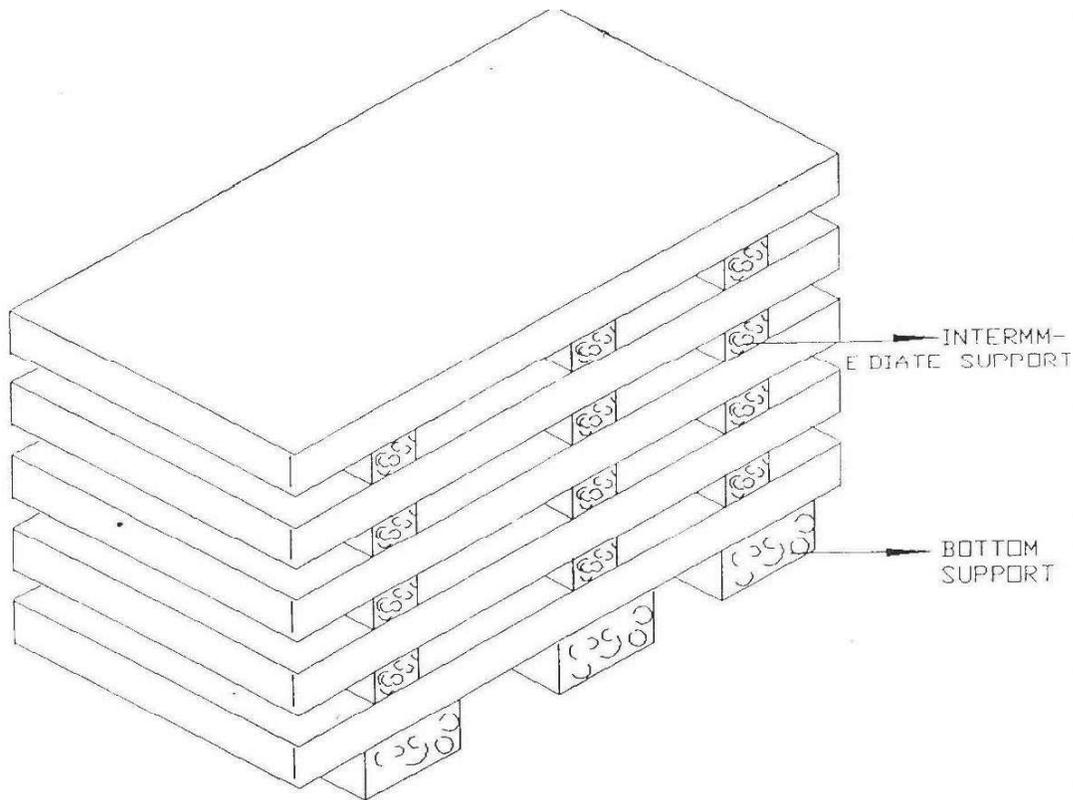


Figure - 1 - PLATE STACKING ARRANGEMENT

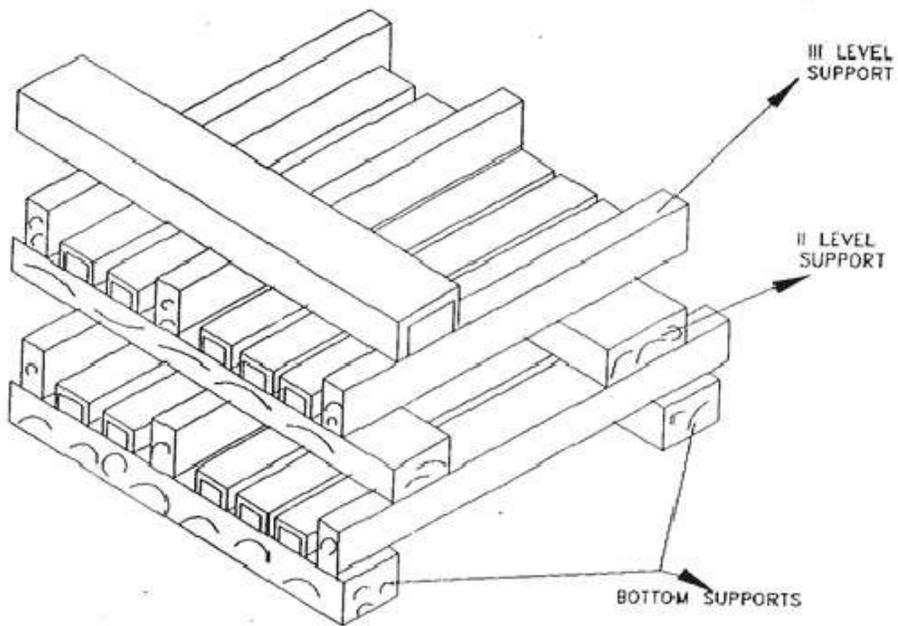


Figure - 2 - STRUCTURAL STEEL STACKING ARRANGEMENT

		TECHNICAL SPECIFICATION 2X800MW DVC KODERMA TPS PHASE II DOUBLE GIRDER EOT CRANES FOR UPTO 100T CAPACITY		PE-TS-519-501-A001		BILL OF QUANTITY											
						Rev. No. 00		Date : Feb 2026									
A		SUPPLY:															
S. No.	Description	75T BC Bay BFP handling Double Girder crane 1	Qty	UOM	75T BC Bay BFP handling Double Girder crane 2	Qty	UOM	50T CWPB Double Girder crane with 2T EH	Qty	UOM	30T Heavy Material store Double Girder crane	Qty	UOM	Common for all Double Girder cranes	Qty	UOM	
1	Bridge girders along with walkway, platform, handrails, CT stoppers etc.	2	Nos.		2	Nos.		2	Nos.		2	Nos.					
2	End carriages																
a	End carriages structure with walkway, platform, handrails, LT buffers etc.	1	set		1	set		1	set		1	set					
b	Long Travel Mechanism (Motor, gear box, shaft coupling, wheels, brakes, bearings etc.)	1	set		1	set		1	set		1	set					
3	Crab (trolley)																
a.	Crab (trolley) structure with CT rails, platform, handrails, CT buffers etc.	1	set		1	set		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		1	set		1	set					
c.	Aux Hoist Mechanism (Motor, Gear box, Rope drum, Rope Upper block, Lower block, hook, couplings, shaft, bearings, brakes etc.)	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	NA	
d.	Cross Travel Mechanism (Motor, gear box, shaft coupling, wheels, brakes, bearings etc.)	1	set		1	set		1	set		1	set					
4	LT End stopper	4	Nos.		4	Nos.		4	Nos.		4	Nos.					
5	Storm Brake	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	NA	
6	LT rail along with accessories	2x42.5	m		2x42.5	m		2x57	m		2x41	m					
7	LT PVC insulated shrouded bus bar conductor type DSL with accessories and junction boxes as required	42.5	m		42.5	m		57	m		41	m					
8	Operator's cabin along with operator's seat, gong, fan and other accessories	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	NA	
9	Main hoist limit switch (Rotary gar + Gravity)	1+1	Nos.		1+1	Nos.		1+1	Nos.		1+1	Nos.					
10	Aux hoist limit switch (Rotary gar + Gravity)	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	NA	
11	CT lever type limit switch (one way/two way)	2/1	Nos./No.		2/1	Nos./No.		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.		2/1	Nos./No.		2/1	Nos./No.					
13	Power cables, control cables etc. along with cable tray/conduits etc.	1	set		1	set		1	set		1	set					

		<b>TECHNICAL SPECIFICATION</b> <b>2X800MW DVC KODERMA TPS PHASE II</b> <b>DOUBLE GIRDER EOT CRANES</b> <b>FOR UPTO 100T CAPACITY</b>										<b>PE-TS-519-501-A001</b>					
												<b>Rev. No. 00</b>					
												<b>Date : Feb 2026</b>					
14	Temporory 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.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15	Main Isolating switch	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
16	Protective Panel along with Control transformers, lighting transformers, 415/24 V (DC) transformer, contactors, switches, fuses relays and other	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
17	Main Hoist Panel along with VVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
18	Aux Hoist Panel along with VVFD, contactors, switches, fuses relays and other accessories	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	Cross Travel Panel along with VVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
20	Long Travel Panel along with VVFD, contactors, switches, fuses relays and other accessories	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
21	Master Controller	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22	Lighting for cranes (including illumination in cabin (if applicable), over bridge and under bridge) along with	1	set	1	set	1	set	1	set	1	set	1	set	1	set	1	set
23	Portable 40 W hand lamp with minimum half of baylength length flexible cable for inspection	1	set	1	set	1	set	1	set	1	set	1	set	1	set	1	set
24	Fire extinguisher	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
25	Maintenance cage	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
26	Mechanical overload protection (Load cell) for hoist mode with digital display	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.	1	No.
27	Radio Remote control with transmitter unit, receiver unit, battery etc.	1	set	1	set	1	set	1	set	1	set	1	set	1	set	1	set
28	Additional isolating switches for maintenance of cranes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	Lifting beam & its slings	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	Anti collision device	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
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	1	set	1	set	1	set	1	set	1	set	1	set
32	DSL Phase indicating lamps (RYB)	2	Sets	2	Sets	2	Sets	2	Sets	2	Sets	2	Sets	2	Sets	2	Sets
33	Earthing strips	1	set	1	set	1	set	1	set	1	set	1	set	1	set	1	set
34	First fill of lubricants i.e. oils, grease, servo fluids, cadmium compounds etc. till one year after commissioning	1	set	1	set	1	set	1	set	1	set	1	set	1	set	1	set
35	E-Learning Package	1 set common for both BC Bay handling crane										-----	-----	-----	-----		

		TECHNICAL SPECIFICATION 2X800MW DVC KODERMA TPS PHASE II DOUBLE GIRDER EOT CRANES FOR UPTO 100T CAPACITY										PE-TS-519-501-A001	
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36	Load testing sling, cradles and any other item required by the vendor during the load testing at site on returnable basis	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	set	
38	Electric hoist including panel, trailing cable/DLSL, hoisting limit switch, brakes, wire rope, cross travel limit switch, VVVF drive etc.	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	set	
39	<b>Maintenance tools &amp; tackles</b>												
a.	Complete set of ring spanners	1	set	1	set	1	set	1	set	1	set	set	
b.	Complete set of screwdrivers (Min. 6 Nos., Indicate the sizes)	1	set	1	set	1	set	1	set	1	set	set	
c.	Adjustable Spanner	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
d.	Insulated plier	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
e.	Wrench spanner	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
f.	Grease Gun	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
g.	Oil Gun.	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
h.	Hand Lamp.	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
i.	Line tester	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
j.	O&M Manual	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
k.	Steel box to place above tools & manual	1	no.	1	no.	1	no.	1	no.	1	no.	no.	
40	<b>Erection &amp; Commissioning Spares (to be supplied as per requirement)</b>	1	set	1	set	1	set	1	set	1	set	set	
41	<b>Any other item/s for completion of scope of work</b>	1	set	1	set	1	set	1	set	1	set	set	

		TECHNICAL SPECIFICATION 2X800MW DVC KODERMA TPS PHASE II DOUBLE GIRDER EOT CRANES FOR UPTO 100T CAPACITY				PE-TS-519-501-A001 Rev. No. 00 Date : Feb 2026			
		MANDATORY SPARES:		Qty for both 75T BC Bay BFP handling Double Girder cranes		50T CWPB Double Girder crane		30T Heavy Material store Double Girder crane	
S. NO.	ITEM DESCRIPTION	Qty	UOM	Qty	UOM	Qty	UOM		
1.1	<b>Mechanical:</b>								
(a)	Bearings for long travel wheels			1 Set (Requirement for one Crane)					
(b)	Bearings for cross travel wheels			1 Set (Requirement for one Crane)					
(c)	Bearings for Gear Boxes for each type of Hoist & travel (Main and aux hoist(if applicable), LT and CT travel))			1 Set (Requirement for one Crane)					
(d)	Brake Liner for all the brakes (main and aux hoist(if applicable), LT and CT travel))			2 Sets (Requirement for two Crane)					
(e)	Hydraulic thruster for all Brakes (Main and aux hoist (if applicable), CT and LT travel)			1 Set (Requirement for one Crane)					
(f)	Oil Seals (both main and aux hoist (if applicable), CT and LT)			2 Sets (Requirement for two Crane)					
(g)	Brake springs for all brakes (both main and aux hoist (if applicable), LT and CT travel)			1 Set (Requirement for one Crane)					
(h)	Wire Rope for Main Hook	1	No.						
1.2	<b>Electrical:</b>								
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 each					
vii)	Drive for MH, AH, CT & LT of each tpe and rating	1	No.						



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		Date :Feb 2026

### 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 ( in weeks from date of LOA)
<b>BASIC ENGINEERING DRAWING / DOCUMENTS</b>				
1	PE-V0-519-501-A401	Manufacturing Quality Plan with sub vendor list For Double Girder EOT cranes upto 100T	A	3
2	PE-V0-519-501-A404	Mechanism Sizing Calculation Including storm brake calculation for Double Girder EOT cranes upto 100T	A	3
3	PE-V0-519-501-A405	General arrangement for Double Girder EOT cranes upto 100T with CT DSL details	A	3
4	PE-V0-519-501-A412	Structural calculations For Double Girder EOT cranes upto 100T (including structural calculation for crab structure)	I	4
5	PE-V0-519-501-A417	"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 Double Girder EOT cranes upto 100T"	A	5
<b>BALANCE ENGINEERING DRAWING / DOCUMENTS</b>				
1	PE-V0-519-501-A403	Data sheet of motors for Double Girder EOT cranes upto 100T	I	6
2	PE-V0-519-501-A406	Crab sub assembly for Double Girder EOT cranes upto 100T with CT wheel assembly	A	3
3	PE-V0-519-501-A408	General arrangement for PVC shrouded DSL for Double Girder EOT cranes upto 100T	I	6
4	PE-V0-519-501-A409	Main and Auxiliary hook block assembly with details of hook, nut and check plate Double Girder EOT cranes upto 100T	I	3
5	PE-V0-519-501-A410	Long travel Machinery Assembly with LT wheel assembly For Double Girder EOT cranes upto 100T	I	4
6	PE-V0-519-501-A432	Gantry Rail installation for Double Girder EOT cranes upto 100T	A	4

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7	PE-V0-519-501-A414	O & M Manual For Double Girder EOT cranes upto 100T	A	12
8	PE-V0-519-501-A427	Data sheet of Double Girder EOT cranes upto 100T with painting details	A	8
9	PE-V0-519-501-A418	General Arrangement of a) Protective panel, b) Main hoist panel c) Aux. hoist panel d) Cross Travel panel e) Long Traverse travel panel f) Pendant g) Remote Radio Control For Double Girder EOT cranes upto 100T	A	5
10	PE-V0-519-501-A419	Cable Sizing and cable schedule For Double Girder EOT cranes upto 100T	A	6
11	PE-V0-519-501-A450	Crane lubrication drawing For Double Girder EOT cranes upto 100T	I	6
<b>C Bidder to submit following additional document also.</b>				
1	PE-V0-519-501-A423	Mandatory spare parts list For Double Girder EOT cranes upto 100T	A	16
2	PE-V0-519-501-A425	Erection procedure For Double Girder EOT cranes upto 100T	I	8
3	PE-V0-519-501-A420	Crane Operational write up For Double Girder EOT cranes upto 100T	I	5
4	PE-V0-519-501-A430	Electrical load for Double Girder EOT cranes upto 100T	I	8
5	PE-V0-519-501-A460	Field Quality Plan	I	20
6	PE-V0-519-501-A421	Type test certificate (for motors) For Double Girder EOT cranes upto 100T (Applicable for above 100 KW rating motors)	A	10
7	PE-V0-519-501-AXXX	Any other documents if required during detail engineering	-	-
<b>LEGENDS</b>				
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 LOA as per the submission schedule. ii. Every revised submission incorporating comments – within 10 days. iii. BHEL & Customer Comment/ Approval -18 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.

<b>DRAWINGS &amp; DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT</b>			
SI. No.	DOCUMENT TITLE	No. of hard copy prints (sets)	No. of portable hard disk
1	APPROVED DOCUMENTS	6	2
2	AS BUILT DRAWINGS/ DOCUMENTS	6	2
3	ERECTION MANUAL	6	2
4	O&M MANUAL	6	2
5	PERFORMANCE AND FURNTIONAL GUARANTEE TEST REPORTS	6	0



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DOUBLE GIRDER EOT CRANES  
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**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 Manufacturing Quality Plan(MQP) in the event of order based on the guidelines given in the specification & reference MQP enclosed therein. MQP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing and additional inspection requirement, if any shall be marked in the MQP 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.

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-519-501-A001 REV 0



**TECHNICAL SPECIFICATION  
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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

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	<b>TECHNICAL SPECIFICATION 2X800MW DVC KODERMA TPS PHASE II DOUBLE GIRDER EOT CRANES FOR UPTO 100T CAPACITY</b>	<b>PE-TS-519-501-A001</b>
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<b>PRE QUALIFICATION REQUIREMENT (TECHNICAL)</b>		
1	The Bidder should have designed, manufactured, erected and commissioned Double Girder EOT/Gantry/Semi-Gantry crane of minimum 30T capacity with span of 10 Metres or more and having/ability to have in house facility for testing of Double girder EOT crane with actual capacity required for the tender.	
2	The Bidder has to submit following supporting documents meeting above mentioned prequalifying requirement Copy of minimum one (1) performance certificate (in English) from end user along with copy of related Purchase Order (PO) or Letter of intent (LOI) or Letter of Award (LOA) or Work Order (WO) specifying that the product/equipment is running successfully for one (1) year from date of commissioning meeting the minimum pre-qualifying requirement.	
3	Bidder shall submit design documents to substantiate technical parameters specified in clause 1 & 2 above, if the same is not mentioned in performance certificate/purchase order.	
Note		
a	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.	
b	Minimum one (1) no. Purchase order shall be submitted which should not be more than seven (7) years old as on date of bid submission, for establishing continuity in business.	
c	Notwithstanding anything stated above, BHEL/CUSTOMER reserves the right for physical assessment of the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL/CUSTOMER. Bidder to furnish details as per Annexure A- "Sub-Vendor Questionnaire".	
d	Consideration of offer shall be subject to Customer's approval of bidders, if applicable.	
e	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.	

**CORPORATE QUALITY ASSURANCE  
SUB-VENDOR QUESTIONNAIRE**

<b>i.</b>	<b>Item/Scope of Sub-contracting</b>			
<b>ii.</b>	<b>Address of the registered office</b> 	<b>Details of Contact Person</b> <b>(Name, Designation, Mobile, Email)</b> 		
<b>iii.</b>	<b>Name and Address of the proposed Sub-vendor's works where item is being manufactured</b> 	<b>Details of Contact Person:</b> <b>(Name, Designation, Mobile, Email)</b> 		
<b>iv.</b>	<b>Annual Production Capacity for proposed item/scope of sub-contracting</b>			
<b>v.</b>	<b>Annual production for last 3 years for proposed item/scope of sub-contracting</b>			
<b>vi.</b>	<b>Details of proposed works</b>			
1.	<b>Year of establishment of present works</b>			
2.	<b>Year of commencement of manufacturing at above works</b>			
3.	<b>Details of change in Works address in past (if any)</b>			
4.	<b>Total Area</b>			
	<b>Covered Area</b>			
5.	<b>Factory Registration Certificate</b>	<b>Details attached at Annexure – F2.1</b>		
6.	<b>Design/ Research &amp; development set-up (No. of manpower, their qualification, machines &amp; tools employed etc.)</b>	<b>Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design</b> <b>Details attached at Annexure – F2.2 (if applicable)</b>		
7.	<b>Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)-</b>	<b>Details attached at Annexure – F2.3</b>		
8.	<b>After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)</b>	<b>Applicable / Not applicable</b> <b>Details attached at Annexure – F2.4</b>		
9.	<b>Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any</b>	<b>Details attached at Annexure – F2.5</b>		
10.	<b>Sources of Raw Material/Major Bought Out Item</b>	<b>Details attached at Annexure – F2.6</b>		
11.	<b>Quality Control exercised during receipt of raw material/BOI, in-process, Final Testing, packing</b>	<b>Details attached at Annexure – F2.7</b>		
12.	<b>Manufacturing facilities</b>	<b>Details attached at Annexure – F2.8</b>		

**CORPORATE QUALITY ASSURANCE  
SUB-VENDOR QUESTIONNAIRE**

	<i>(List of machines, special process facilities, material handling etc.)</i>				
13.	<b>Testing facilities</b> <i>(List of testing equipment)</i>		<i>Details attached at Annexure – F2.9 &amp; Details of load testing facility of Work/s to be submitted in Annexure B</i>		
14.	<b>If manufacturing process involves fabrication then-</b>		<i>Applicable / Not applicable</i>		
	<i>List of qualified Welders</i>		<i>Details attached at Annexure – F2.10</i>		
	<i>List of qualified NDT personnel with area of specialization</i>		<i>(if applicable)</i>		
15.	<b>List of out-sourced manufacturing processes with Sub-Vendors' names &amp; addresses</b>		<i>Applicable / Not applicable</i>  <i>Details attached at Annexure. –F2.11</i> <i>(if applicable)</i>		
16.	<b>Supply reference list including recent supplies</b>		<i>Details attached at Annexure – F2.12</i> <i>(as per format given below)</i>		
<b>Project/ package</b>	<b>Customer Name</b>	<b>Supplied Item (Type/Rating/Model /Capacity/Size etc)</b>	<b>PO ref no/date</b>	<b>Supplied Quantity</b>	<b>Date of Supply</b>
17.	<b>Product satisfactory performance feedback letter/certificates/End User Feedback</b>		<i>Attached at annexure - F2.13</i>		
18.	<b>Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating)</b> <i>Note:- Reports need not to be submitted</i>		<i>Applicable / Not applicable</i>  <i>Details attached at Annexure – F2.14</i> <i>(if applicable)</i>		
19.	<b>Statutory / mandatory certification for the proposed product</b>		<i>Applicable / Not applicable</i>  <i>Details attached at Annexure – F2.15</i> <i>(if applicable)</i>		
20.	<b>Copy of ISO 9001 certificate (if available)</b>		<i>Attached at Annexure – F2.16</i>		
21.	<b>Product technical catalogues for proposed item (if available)</b>		<i>Details attached at Annexure – F2.17</i>		
<b>Name:</b>		<b>Desig:</b>		<b>Sign:</b>	
					<b>Date:</b>

**Company's Seal/Stamp:-**

## Details of Testing facility of Works

## Annexure -B

PACKAGE		DOUBLE GIRDER EOT CRANES UPTO 100T		
Bidder name				
Bidder works address				
S. NO.	FACILITY	DETAILS REQUIRED	DATA TO BE FURNISHED	REMARKS
1 a)	Handling facilities in the test bay/ shop	Number & capacity of cranes available		Layout drawing of the testing / bay shed to be furnished.
1 b)		Maximum capacity of load that can be handled with shed/testing bay cranes handle (individually or in tandem)		
1 c)		Clear height from floor level to the Hook level of the crane of testing bay/ shed		
2 a)	Stand/frame for supporting the crane bridge girders during load/ overload testing of crane at works	Number of stands available		Documentary proof i.e previous load testing report of similar capacity and span or structural calculations for justifying the load bearing capacity of the crane.
2 b)		Load bearing capacity of each stand		
2 c)		Height of stand		
3 a)	Load Pit	Dimensions		Pit drawing/photograph to be furnished.
3 b)		Maximum capacity of the load that can be accommodated in load pit		Calculations / drawing to be furnished for justification of maximum load claimed to be accommodated in the available test pit dimensions.
4 a)	Calibrated Dead Load	Maximum dead load (calibrated) along with cradle available		In case of unavailability of sufficient calibrated dead load, whether supplier makes any alternate arrangement i.e type of dead load, availability of suitable capacity load cells with display etc.
4 b)		Dimensions		Dimensions of individual load block, as available, to be furnished.
Note: Details of testing facility shall be submitted for justification of capability of testing.				

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**PRE QUALIFICATION REQUIREMENT (FINANCIAL)**



## PRE - QUALIFYING REQUIREMENTS

**PROJECT:** 2 X 800 MW DVC KODERMA

**PACKAGE:** D/G EOT CRANES UP TO 100T

### CRITERIA FOR EVALUATION - FINANCIAL :

	Amount (in Rs.)
Average annual financial turnover value during any three out of last six Financial Years as on tender due date should not be less than	<b>73,00,000.00</b>

**Rs. Seventy Three Lakh only**

#### Notes:-

a) The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for any three out of last six Financial Years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-

i) If the accounts are available for  $\leq 1$  Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).

ii) If the accounts are available for  $>1$  but  $\leq 2$  Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).

iii) If the accounts are available for  $>2$  but  $\leq 3$  Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).

b) Foreign bidder is to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. in addition to the documents mentioned at point (a) above for review of above criteria.

c) Other Income shall not be considered for arriving at Annual Turnover/Sales. For evaluation purpose, turnover figure excluding taxes shall be considered.

d) For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered.

e) Bidder who is 50% or above subsidiary of any other company including those registered outside India and does not meet any of the above Financial Criteria, such bidder may be qualified based on credentials of its holding company provided such holding company meets the above PQR criteria. In such case, the Bidder would be required to furnish a Letter of Support from its Holding Company, pledging unconditional and irrevocable financial support for the execution of the Contract by the Bidder in case of award.

f) In cases where audited results for the last financial year as on the date of Techno Commercial bid opening are not available, a Certificate would be required from CEO/CFO stating that the financial results of the Company are under audit as on the date of Techno-commercial bid opening and are not available.