

RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD


**2X660 MW SURATGARH SUPER CRITICAL TPS,
STAGE - V UNIT 7& 8**

**PROJECT SPECIFIC
TECHNICAL SPECIFICATION FOR ELECTRIC WIRE
ROPE HOISTS**

SPECIFICATION NO.: PE-TS-392-563-A002



**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA
INDIA**

	Title TECHNICAL SPECIFICATION FOR WIRE ROPE ELECTRICAL HOIST 2X660 MW SURATGARH SUPER CRITICAL TPS, STAGE - V UNIT 7& 8	Specification no.: PE-TS-392-563-A002
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1.0 SCOPE OF INQUIRY

- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site as required on FOR site basis, performance and guarantee testing at vendor's works (as mentioned elsewhere in the specification) of **WIRE ROPE ELECTRICAL HOIST** as per details in different sections / volumes of this specification for **2X660 MW SURATGARH SUPER CRITICAL TPS, STAGE - V UNIT 7&8**.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. **Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply of WIRE ROPE ELECTRICAL HOIST.**
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, 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.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.



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- 1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or **RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.** including their consultant as interpreted by BHEL in the relevant context.



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Miscellaneous Requirements

- a) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- b) 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.
- c) Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.
- d) Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per dwg/ document distribution schedule. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end

- *Internet explorer version – Minimum Internet Explorer 7*
- *Internet speed – 2 mbps (Minimum preferred)*
- *Pop ups from our external DMS IP (124.124.36.198) should not be blocked*
- *Vendor's Internal proxy setting should not block DMS application's link (http://124.124.36.198/wrenchwebaccess/login.aspx)"*

DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.

*For quick access bidder may refer the link
<http://bhelpem.com/DMSManuals/DMSManuals.html>*

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME II SECTION – B
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan GENERAL PROJECT INFORMATION		SHEET 1 OF 3

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	Climatic conditions	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

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	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

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		supply (For all instrumentation and control system equipment and solenoid valves)
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g) Lighting fixtures and space heaters 240 V, 1 phase, 2 wire, 50Hz, solidly earthed system

h) Construction supply 415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply	Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$
DC supply	Combined voltage & frequency variation 10% Voltage variation $+10\%$, -15%

j) For instrument and control system of steam generator and steam turbine generator. 230 V $\pm 5\%$ AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

10.0 All the electrical equipment shall be designed for 50° C reference ambient temperature.

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11.0 LOCATION :

The proposed power project shall be located in the state of Rajasthan, in Shriganganagar Distt. The proposed power project is located within 393 km from Jaipur 169 km from Bikaner and 367 Km from Delhi.

Major road distances of the project site are as follows:

<u>Between</u>	<u>Distance in KMs.</u>
Project - Suratgarh Junction	31 km (Nearest Railhead)
Project - Jaipur (State Capital)	393 km
Project - Delhi	367 km
Project – Jaipur	393 km (Nearest Airport in Rajasthan)
Amritsar	378 km (Nearest Airport)
Project – Bikaner	169 km

SPEC. NO. TCE.M4-906	TATA CONSULTING ENGINEERS LIMITED	SECTION: E
	PACKING, MARKING AND TRANSPORT INSTRUCTIONS FOR EQUIPMENT	SHEET 1 OF 5
1.0	<u>PACKING</u>	
1.1	All equipment and material shall be protected for ocean shipment, inland transport, and storage at the site, according to applicable Indian Standards (IS) and to the instructions given in this specification.	
1.2	The PURCHASER/CONSULTANT may require inspecting and approving the packing before the items are despatched. However, the VENDOR/CONTRACTOR shall be entirely responsible for ensuring that the packing is suitable for the mode of shipment and such inspection will not exonerate the VENDOR/CONTRACTOR from any loss or damage due to faulty packing.	
1.3	The VENDOR/CONTRACTOR shall be responsible for any damage to the equipment and materials during transit due to improper and inadequate packing.	
1.4	Any material found short upon opening the intact packing cases shall be supplied by the VENDOR/CONTRACTOR at no extra cost to the PURCHASER.	
1.5	Only packages constructed out of sound material and of dimensions proportional to the size and weight of contents shall be used.	
1.6	All packing cover and packing material shall become the property of the PURCHASER.	
1.7	In the case of large and bulky equipment, the VENDOR/CONTRACTOR shall be responsible for ascertaining transport limitations and supply the equipment in the minimum number of components or sub-assemblies, within the framework of transport limitations.	
1.8	For ocean transport, containers shall be used as far as possible. Dimensions of packages and kind of packaging must be chosen to fully utilise the size of containers.	
1.9	All equipment shall be protected for the entire period of despatch, storage and erection, against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage in open including possible delays in transit. Material and equipment shipped across the sea shall be packed to withstand without damage, the effects of saline atmosphere. All machined and plated parts shall be protected with anti-rust grease. Precautions shall be taken to protect shafts and journals where they rest on wooden or other supports likely to contain moisture. At such points, wrappings impregnated with anti-rust composition or vapour phase inhibitors shall be used. These shall have sufficient strength to resist chafing and indentation due to the movement, which is likely to occur in transit. The protective wrappings and impregnation shall last for a minimum period of three months or transport time whichever is more.	
1.10	All openings in the equipment shall be tightly covered, plugged or capped to prevent foreign material from entering into the equipment.	
1.11	The contents of the packages shall be sealed in thick polythene sheets. The inside walls of the packages shall be lined with waterproof material to protect	
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<p>the equipment from damage due to dust and moisture.</p> <p>1.12 Adequate provision of skids or pallets shall be made to keep the packages above the ground drain water. Crates and other large containers should have drain holes in the bottom to prevent collection of water within the packing. This is especially important where the cargo itself is subjected to condensation (cargo sweat).</p> <p>1.13 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.</p> <p>1.14 All cases shall be provided with suitable cut-outs, closed by bolted wooden planks to facilitate inspection by custom authorities. Waterproof transparent papers shall be provided at the cut-out locations to prevent water ingress into the casing through the cut-out.</p> <p>1.15 The contents of the package shall be punched on non-corrosive metal plate and nailed to the package on a prominently visible place. If the number of items in the package is too many, a typed list in transparent waterproof bag shall be kept inside a galvanised sheet steel pocket nailed on to the outside of package at prominently visible location.</p> <p>Copies of the packing list, in triplicate, shall be forwarded to the PURCHASER prior to despatch. All items of material shall be clearly marked for easy identification against the packing list.</p> <p>1.16 Fragile materials shall be securely braced within the package or otherwise amply fastened and packed to prevent shifting or rattling. Soft non-hygroscopic packaging materials shall be placed between the hard packing materials and the fragile equipment. Articles, which do not completely fill the selected package/container, must be cushioned, braced, fastened or blocked to prevent damage to the article itself or destruction of the package. Inner bracing or blocking must be such that the content's weight is distributed over interior surfaces rather than concentrated at one or two points.</p> <p>1.17 Components containing glass shall be carefully covered with shock absorbing protective material such as expanded polystyrene ('Thermo Cole').</p> <p>1.18 All flanges, etc., which are prone to scratching shall be provided with either metal or wooden or plastic blanks bolted in place. Metal blanks should have a minimum thickness of 3 mm and wooden blanks should be made from two layers of wood, each of 10 mm thickness, nailed together with the grain of each layer located at right angles to one another.</p> <p>1.19 Loose material, e.g. bolts, nuts, etc. shall be packed and sealed in polythene bags with proper tagging and packed in cases.</p> <p>1.20 All spare parts shall be packed and treated for long storage conditions at site.</p> <p>2.0 <u>MARKING</u></p>		
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	PACKING, MARKING AND TRANSPORT INSTRUCTIONS FOR EQUIPMENT	SHEET 3 OF 5

2.1

All packages shall be clearly, legibly and durably marked with uniform block letters (preferably with waterproof paint) on at least three sides with:

- (a) Purchaser's Name and destination address
- (b) Purchase Order/Contract Number and Date
- (c) Vendor's/Contractor's or Sub-Vendor's/Sub-Contractor's Name
- (d) Consignment Serial Number
- (e) Overall Dimensions
- (f) Net and gross weights
- (g) Sign showing 'side up'
- (h) Sign showing 'fragile' marks in case of delicate equipment
- (i) Sign showing slinging and sling position
- (j) Any handling and unpacking instructions, if considered necessary
- (k) Identification markings relating to the appropriate shipping documents
- (l) In case of spare parts, each spare part shall be clearly marked and labelled on the outside of its packing with its description and catalogue/ part number and item number of main equipment to which it relates.

2.2

ERECTION MARKS

All equipment comprising multi part assemblies, e.g. steel frameworks, piping, etc., shall be marked with identifying numbers and/or letters corresponding to those of the approved drawings or material lists. These erection marks shall be clearly readable.

Colour banding to an approved code shall be employed to identify members of similar shape or type but of different strengths or grades.

3.0

TRANSPORT

3.1

No equipment or material shall be despatched without prior consent (acceptance certificate) of the PURCHASER/CONSULTANT or his representative. On receipt of the acceptance certificate, the equipment shall be packed up and made ready for despatch either on Free On Board (FOB), (Free Alongside Ship (FAS), Free On Road (FOR), Free On Truck, (FOT), Free Alongside Road (FAR), or free alongside Truck (FAT) basis as per the PURCHASE ORDER/CONTRACT. If it is on FOB basis, the VENDOR/ CONTRACTOR is responsible for loading the equipment on the board of ship. On FAS basis, another agency takes over from the VENDOR/CONTRACTOR

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for loading. The same applies to FOR, FOT and FAR, FAT.

3.2 Depending upon the equipment and the mode of transport the VENDOR/ CONTRACTOR may propose to deliver the equipment in container or as Break Bulk i.e. in components or sub-assembly form.

3.3 In the event of VENDOR/CONTRACTOR proposing to deliver the equipment in Break Bulk form, he shall furnish full particulars of the quantity and approximate size of each item. All sub-assemblies shall be match-marked to facilitate assembly at site.

3.4 In case of ocean shipment, the VENDOR/CONTRACTOR shall send an advance 'Advice of Shipment' to the PURCHASER and site separately, so as to reach at least seven (7) days in advance for foreign supply and three (3) days in advance for domestic supply. This advice shall state the Cost including Freight and Insurance (CIF) value of the consignment, the details of the transport and the probable date of its departure and arrival. Copies of packing list shall also be sent along with the advance intimation.

3.5 The VENDOR/CONTRACTOR shall ship the equipment on behalf of the PURCHASER by the first available vessel belonging to a recognised shipping line. He shall ensure that the freight rates charged are not higher than the conference rates applicable to the shipping route at the time of shipment and all rebates and refunds available for such consignments are duly taken into account. The VENDOR/CONTRACTOR shall be responsible for the correct appraisal of freight rates (structural or machinery as the case may be), weights and volumes. In no case, the PURCHASER will pay any warehouse or wharf charges.

3.6 Immediately after the shipment has been effected, the shipping documents, comprising Bill of Lading, Freight Invoice, FOB/FAS/FOR/FOT/FAT/FAR Invoice, Packing List, Certificate of Origin, Letter to Insurers and Certificates of Inspection shall be issued by the VENDOR/CONTRACTOR in accordance with the instructions of the PURCHASER/CONSULTANT. These documents shall reach the PURCHASER before the arrival of ship. Responsibility for delays, loss or damages of shipping documents shall rest with the VENDOR/ CONTRACTOR.

3.7 In case of inland despatch by rail or truck, similar equivalent procedures as applicable to rail or truck transportation shall be adopted.

3.8 All Equipment manufactured by the VENDOR/CONTRACTOR shall be under his charge. The PURCHASER shall arrange for insurance coverage during shipment and till delivered at site, if necessary.

4.0 **TRANSPORT OF ELECTRICAL EQUIPMENT AND INSTRUMENTATION ITEMS**

4.1 Transformers rated 2000 kVA and less shall be shipped filled with oil. Transformers rated above 2000 kVA shall be shipped without oil but with the

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tank filled with nitrogen or equivalent inert gas. A gas cylinder with suitable reducer connection and pressure gauge shall be supplied. These accessories shall become the property of the PURCHASER. The required quantity of oil shall be supplied separately in non-returnable drums.

4.2 Switchgear cubicles and instrument control panels shall be packed and shipped in separate and convenient sections. All withdrawable equipment like circuit breakers and circuit breaker arc-chutes shall be packed and shipped separately. All relays and panel-mounted instruments shall be packed and shipped separately with their operating mechanisms temporarily arrested from movement during transport.

4.3 Batteries shall be shipped to site in dry, uncharged condition. Appropriate quantity of acid of the correct specific gravity shall be shipped separately in non-returnable porcelain jars packed in steel wire baskets.

4.4 Cables shall be shipped on non-returnable drums, adequately braced, and with cable ends adequately sealed to prevent ingress of moisture.

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1.0.0 SCOPE OF WORK

1.1.0 SUPPLIES

1.1.1 Equipment and services to be furnished by the bidder for the **WIRE ROPE ELECTRIC HOIST** with accessories as per the details given in Annexure A, Commissioning spares as per Annexure B and Mandatory spares as per Annexure C. Any equipment / accessories not specified in the specification but required to make the hoist units complete and efficient shall also be under the bidder's scope of work.

Each hoist shall include all necessary items but shall not be limited to the following: -

1. Travelling Trolley
2. Hoisting mechanism (motor and gear box, wire rope, load hook and hook block)
3. VVVF drives for travel and hoist.
4. Electrical equipment (control panel, motor, limit switches)
5. Flexible trailing cable for motor, brake, limit switches, etc.
6. Painting of hoist.
7. Power supply thru' DSL including current collector, brackets etc.
8. O & M Manual, drawings and documents.
9. Testing of hoist.
10. Main isolating switch and power cable from 1.5M above ground / operating floor.
11. Any equipment / accessories not specified here but required to make the equipment complete and efficient shall be under bidder's scope of work.
12. Commissioning spares
13. Mandatory Spares

1.1.2 Maintenance Tools and Tackles

One (1) complete unused new set of special purpose tools, tackles and accessories along with detailed instructions and maintenance manual shall be supplied. **Tools shall be of suitable sizes for maintenance of electric hoist of each type and capacity.** Each tool and wrench shall be stamped so as to be identified easy for its use. The tools shall be supplied in steel toolbox and with a copy of instruction manual. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement:



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S-No.	Description	Qty.
1	Complete set of ring spanners (Indicate the sizes offered)	1 Set**
2	Complete set of screwdrivers (Indicate the sizes)	1 Set**
3.	Adjustable Spanner	1 No.
4.	Insulated plier	1 No.
5.	Grease gun	1 No.
6.	Oil gun	1 No.
7.	Line tester	1 No.
8.	Any other tool and tackle.	

(**) – Set shall comprise of complete range of spanners suiting requirement for various capacities of electric hoists.

Note: - Bidder to include additional tool, if required over and above specified.

1.2.0 Services to be provided by the bidder

1.2.1. Packing and forwarding and transportation to site.

1.2.2. Erection and commissioning procedure shall be submitted by successful bidder for carrying out the erection and commissioning at site by customer.

1.3.0. Inspection and Testing

As per enclosed BHEL standard quality plan / Customer approved QAP. Prime inspection agency shall be BHEL/End Customer. Equipment supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement/ CHP(Customer Hold Point) at any stage of inspection deemed necessary by Customer/BHEL during detailed engineering shall be carried out without any commercial or technical implication.

1.4.0. Drawing / design document for submission

As per submission schedule in Volume III.

2.0.0. Works Excluded

2.1.0 Supply of ISMB monorail.

2.2.0 Purchaser shall provide single point 415V, 3 phase, and 50Hz power feeder at any point of the bay or in the middle of the bay. Vendor shall provide main isolating switch at 1.5 M above the ground / operating floor level and cable required from isolating switch to DSL.



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Any other supply required by the bidder shall be arranged by the bidder himself, using suitable transformer as per the specification.

3.0.0. **Deviations**

If the offer submitted has got any deviation from the technical stipulations in the tender document, bidder shall tabulate the same in the appropriate "Schedule of Deviations" furnishing full particular of such deviations. Deviations are to be furnished with mention to specific clause number. Reasons / explanations for such deviations shall be furnished. If there are no deviations from the tender document, bidder shall furnish NO DEVIATION CERTIFICATE regarding the same in the format attached with unpriced bid (also attached in Volume-III).

4.0.0. **Demonstration Guarantee**

Refer Customer specification in Volume II B, Section-C.

Hoist along with its drives, controls and other accessories shall be guaranteed for the rated capacity against the rated speed of motions and for the service conditions specified. The bidder shall have the full responsibility for the safe and efficient operation of the hoist with associated accessories as a single unit. If the shop performance tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good at bidder's cost.

Performance tests shall be carried out each time after the rectification /modification is carried out.

5.0.0. **Make of Sub - Vendor items**

The make of bought out items shall be considered as per Annexure-I, section C, Volume II-B of the specification.

6.0.0 **Packing**

Refer attachment "Packing, Marking & Transport Instructions" in Volume-IIB, Section-B.

7.0.0 **Painting**

Refer attachment – "Painting Requirements" in Volume-IIB, Section-C.



TITLE

TECHNICAL SPECIFICATION FOR WIRE ROPE ELECTRICAL HOIST

2X660 MW SURATGARH SUPER CRITICAL TPS,

STAGE - V UNIT 7&8

SPECIFICATION NO. PE-TS-392-563-A002

VOLUME II B

SECTION C

REV 00

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SCOPE OF ELECTRIC HOISTS

Annexure - A

BHEL DOC NO PE-DC-392-563-A002

2X660 MW SURATGARH STPS								
S.No.	AREA / EQUIPMENT DESCRIPTION	Type	QTY (nos.)	CAPACITY (T)	LIFT RANGE (M)	TRAVEL (M)	PATH	Length of Pendent cable from hoist-mounted control panel (shall be considered as minimum) (M)
1	VACUUM PUMP MOTOR HANDLING AT EL+0.00M (MAINTENANCE TG BAY)	EH	2	5	7.5	22	Straight	8
2	DMCW PUMPS MOTOR HANDLING (AB BAY, EL+0.0M)	EH	2	5	7.5	24	Straight	8
3	DMCW PUMP MOTOR HANDLING (AB BAY, EL+0.0M)	EH	2	5	7.5	10	Straight	8
4	TDBFP CARTRIDGE HANDLING AT EL 6.0M (BC BAY)	EH	4	3	15	5	Straight	17
5	CONDENSATE TRANSFER PUMP HOUSE	EH	1	3	6	32	Straight	6
6	HANDLING OF PANELS AT 3.7M FLOOR IN ESP BUILDING	EH	2	8	7	4	Straight	7
7	HANDLING OF PANELS AT 9.7M FLOOR IN ESP BUILDING	EH	2	5	13.7	4	Straight	14
8	ELEVATOR MACHINE ROOM - TG HALL, SERVICE BUILDING, ADMINISTRATIVE BUILDING	EH	3	3	9	7	Curved	4
9	FIRE WATER BOOSTER PUMP HOUSE	EH	1	3	4.5	18.5	Curved	6
10	FOAM PUMP HOUSE	EH	1	3	4.5	8	Straight	6
11	HFO UNLOADING** (HAZARDOUS AREA)	EH	1	3	8.5	30	Straight	9



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TECHNICAL SPECIFICATION FOR WIRE ROPE ELECTRICAL HOIST

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12	AC PLANT ROOM	EH	1	5	6.5	40	Curved	7
13	GATES HANDLING IN DESILTING CHAMBER	EH	2	5	10	14	Straight	7
14	UAF HANDLING	EH	2	2	6	15	Straight	9
15	AIR WASHER ROOM	EH	4	2	6.5	20	Straight	8
16	HANDLING CW BUTTERFLY VALVE AT EL (-)3.0M (APPROX.)	EH	4	10	12	11	Straight	9
17	HANDLING CW BUTTERFLY VALVE AT EL (-)3.0M (APPROX.)	EH	2	10	12	10.5	Straight	9
18	HANDLING OF PANELS AT 27.5M FLOOR IN BOILER MCC ROOM (TG HALL)	EH	2	10	31.2	4	Straight	4
19	One (1) set of Maintenance tools and tackles for Electric Hoists		1 set					
Note: EH - Electric Hoist								

Note: Monorails shall be in BHEL's scope. Further, each hoist shall run on individual monorail. Monorail size details shall be provided during detailed engineering after award of contract.

()Hazardous Area - Zone 1 as per IS 5572**



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TECHNICAL SPECIFICATION FOR
WIRE ROPE ELECTRICAL HOIST

2X660 MW SURATGARH SUPER CRITICAL TPS,

STAGE - V UNIT 7&8

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List of Commissioning Spares – Annexure-B

Sl.no	Description	Total quantity required	Unit
A	for 2T capacity electric hoist.	3	Sets
I)	Overload Relay		
ii)	Limit Switch		
iii)	Fuse Link		
B	for 3T capacity electric hoist.	9	Sets
I)	Overload Relay		
ii)	Limit Switch		
iii)	Fuse Link		
C	for 5T capacity electric hoist.	6	Sets
I)	Overload Relay		
ii)	Limit Switch		
iii)	Fuse Link		
D	for 8T capacity electric hoist.	1	Sets
I)	Overload Relay		
ii)	Limit Switch		
iii)	Fuse Link		
E	for 10T capacity electric hoist.	5	Sets
I)	Overload Relay		
ii)	Limit Switch		
iii)	Fuse Link		



TITLE

**TECHNICAL SPECIFICATION FOR
WIRE ROPE ELECTRICAL HOIST**

2X660 MW SURATGARH SUPER CRITICAL TPS,

STAGE - V UNIT 7&8

SPECIFICATION NO. PE-TS-392-563-A002

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Annexure-C**List of Mandatory Spares to be repeated for each capacity - 2T, 3T, 5T, 8T and 10T**

Sl.no	Description	LOT	Total quantity required
A	(To be repeated for each Type, rating, Make)		
1	All Bearings of each type and size used in all Gear Assemblies, lifting hook, trolley wheels etc	Sets	2
2	Hoist brake liners with rivets for each size of brake	Pair of each size	4
3	Brake shoes with lining for each size of brake	Pair of each size	2
4	Brake springs for each size of the brake	Sets	2
5	All oil seals for all gear boxes in each hoist	Sets	4
6	Spare solenoid for each size of electromagnet brake	Nos.	1
7	Spare coil for each size of electromagnet brake	Nos.	2
8	Overload relay of each type and size used	No.	1
9	Contactors of each Type & rating used	Nos.	2
10	Coil of each type and rating of contactors	Nos.	2
11	Main contacts for each type and rating of contactors	Nos.	2
12	Auxiliaries contacts for each type and rating of contacts	Nos.	2
13	Spare Motor each type	No.	1
14	Bearing of each type and size used in motors	Sets	2
15	Limit Switch (MH & CT)	Nos.	2
16	VVVF drive	No.	1



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TECHNICAL SPECIFICATION**WIRE ROPE ELECTRIC HOIST**

2X660 MW SURATGARH SUPER CRITICAL TPS,

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ANNEXURE-I**Rev. 00****MAKES OF SUB VENDORS ITEMS (**)****BIDDER TO REFER ITEMS AS APPLICABLE TO ELECTRIC HOIST**

S.N.	ITEM	MAKES
1.0	STEEL	SAIL/IISCO/TATA STEEL / JINDAL/MUKAND/ESSAR
2.0	HOOKS	MOOZUMDAR / SIMRITI FORGING / HARMAN MOHTA / KARACHIWALA
3.0	GEAR COUPLINGS	ALLIANCE / HICLIFF / OEM
4.0	WIRE ROPE	USHA MARTIN / BOMBAY WIRE ROPES / SOUTH INDIA /FORT WILLIAMS / UNITED WIRE ROPE/BHARAT WIRE ROPES.
5.0	BEARINGS	SKF/ FAG/ TATA/ NORMA / NBC
6.0	MOTORS	SIEMEN / ABB / NGEF / CROMPTON / KIRLOSKAR / BHARAT BIJLI / MARATHON / LHP (UPTO7.5kW) / GE-POWER / RAJINDRA ELECT INDUSTRIES.
7.0	BRAKES	STROM CRAFT/ ELECTROMAG /SPEED-O- CONTROL / EMCO LENZE / PETHE /BCH
8.0	CONTACTOR	SIEMENS / L&T /TELE MECHANIQUE / BCH
9.0	OVER LOAD RELAYS	SIEMENS / L&T / TELE MACHANIQUE / BCH
10.0	HRC FUSES	SIEMENS / L&T/ GEPC
11.0	ISOLATING SWITCH	SIEMENS/ L&T / CONTROL & SWITCH GEAR
12.0	SWITCH FUSE UNITS	SIEMENS/ L&T/ CONTROL & SWITCH GEAR/ GEC A
13.0	TIME DELAY RELAYS	SIEMENS/ L&T/ ABB/ BCH/ GEC A
14.0	TRANSFORMERS	INDCOIL/AE / LOGICSTAT/ JYOTI / PRAGATI / PRAYOG KAPPA / SOUTHERN ELECTRIC
15.0	BULB & FITTINGS	PHILIPS/ BAJAJ/ CROMPTON
16.0	CABLE LUGS (HEAVY DUTY)	DOWELLS
17.0	CABLES	
a)	POWER CABLES	NICCO / UNIVERSAL / INCAB / TORRENT / FINOLEX/ POLYCAB/KEI/IMT / UNITED CABLE
b)	CONTROL CABLES	NICCO / UNIVERSAL / INCAB / TORRENT / FINOLEX/ POLYCAB/KEI/IMT / UNITED CABLE



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TECHNICAL SPECIFICATION**WIRE ROPE ELECTRIC HOIST**

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c)	TRAILING CABLE	UNIVERSAL/ NICCO.
18.0	CABLE GLAND	COMMET / SIEMEN / SUNIL&CO.
19.0	PUSH BUTTONS	SIEMENS/L&T/BCH/TEKNIC/VAISHNO/TELEMECHANIQUE/ C & S
20.0	LIMIT SWITCHES	SPEED-O-CONTROL / ELECTROMAG / JAI BALA JI / KAYCEE /_BCH
21.0	SELECTOR SAFETY SWITCHES	KAYCEE/ SULZER/SIEMENS
22.0	PENDENT PUSH BUTTON STATION	OEM/ L & T/Siemens/Vaishno
23.0	INDICATING LAMPS	TECKNIC / BCH / SIEMENS / VAISHNO
24.0	MCB	MDS / INDO COPP
25.0	PANELS	OEM/BCH
26.0	DSL	SUSHEEL/STROMAG
27.0	TERMINAL BLOCKS	ELMEX/CONNECTWELL/WAGO (FOR CONTROL ONLY)

(**) The sub-vendor list is indicative. The lists of acceptable makes in customer specification have also been attached in the following pages. All the lists in toto will be subject to customer approval during detail engineering of the package without any commercial implication on account of the same.

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 1 OF 10

1.0 **LIST OF SUB VENDORS FOR ELECTRICAL EQUIPMENT / SYSTEMS**

BIDDER shall note that no deviation from this list is acceptable after finalisation of this contract.

Sl. No.	EQUIPMENT	VENDOR
1.	POWER TRANSFORMERS (GT, ST, UT)	BHEL, BHOPAL ABB AREVA T & D CROMPTON GREAVES, MUMBAI SIEMENS (APPROVED FOR TRANSFORMERS UPTO 100MVA)
2.	POWER TRANSFORMERS (UAT,SAT,RWT)	BHEL EMCO ABB AREVA T & D CROMPTON GREAVES, MUMBAI BHARAT BIJILEE TELK SIEMENS (VA TECH)
3.	400kV SWITCHYARD EQUIPMENT	ABB AREVA SIEMENS
4.	SWITCHYARD SHIELD WIRE	RAM SWAROOP ELECTRICALS, BHARAT WIRES AND ROPES.
5.	400kV SF6 CIRCUIT BREAKERS	BHEL, BHOPAL ABB, BARODA SIEMENS CGL AREVA T&D

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 2 OF 10

Sl. No.	EQUIPMENT	VENDOR
6.	LIGHTNING ARRESTER	ELPRO INTERNATIONAL, PUNE OBLUM ELECTRICALS PVT LTD, HYDERABAD WS INDUSTRIES LTD, CHENNAI CGL AREVA T & D
7.	ISOLATORS	GR POWER SWITCHGEAR, HYDERABAD ABB, BARODA ELPRO INTERNATIONAL HEVELM SWITCHGEAR & STRUCTURES MULLER ELECTROLITE
8.	CTs/CVTs/PTs	BHEL, BHOPAL ABB, BARODA WS INDUSTRIES LTD, BANGALORE TELK CGL AREVA
9.	SWITCHYARD HARDWARE	RASTRA UDYOG, KOKATA KLEMMEN ENGINEERING, CHENNAI AARPEE ASSOCIATES PVB ENTERPRISES
10.	DISC INSULATORS & POST INSULATORS	WS INDUSTRIES LTD, BANGALORE AREVA T & D IEC, BHOPAL BIRLA NGK BHEL, BANGALORE MODERN INSULATORS, ABUROAD

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 3 OF 10

Sl. No.	EQUIPMENT	VENDOR
11.	SWITCHYARD CONDUCTOR & EARTHWIRES	DIAMOND WIRES, BARODA MODERN MALLEABLE, CALCUTTA APAR INDUSTRIES RAM SWAROOP ELECTRICALS BHARAT WIRES & ROPES
12.	GENERATOR CIRCUIT BREAKER (GCB)	SIEMENS ABB AREVA
13.	SCADA	SIEMENS ABB AREVA
14.	PA SYSTEM	PHILIPS ABB SIEMENS
15.	TELECOMMUNICATION EQUIPMENT	ALCATEL PHILIPS SIEMENS HONEYWELL BOSCH TATA TELECOM BPL ABB
16.	PLCC	ABB BHEL
17.	NEUTRAL GROUNDING RESISTORS	S. R. NARKHADE ENGG. PVT. LIMITED, PUNE AMP CONTROL EQUIPMENT PVT. LTD, PUNE BHARATIYA CUTLER HAMMER, MUMBAI RSI SWITCHGEAR

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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 4 OF 10

Sl. No.	EQUIPMENT	VENDOR
18.	RELAY PANELS	AREAVA T&D ASEA BROWN BOVERI LIMITED, BARODA SIEMENS LIMITED, NEW DELHI EASUN REYROLLE
19.	SWITCHYARD CONTROL & RELAY PANELS	AREAVA T&D ASEA BROWN BOVERI LIMITED, BARODA SIEMENS LIMITED, NEW DELHI
20.	CONTROL PANELS	SIEMENS ABB AREVA BHEL
21.	HT POWER CABLES	UNIVERSAL CABLES LIMITED, SATNA TORRENT CABLES NICCO CABLES RPG CABLES CCI POLYCAB KEI FGIL INDUSTRIAL CABLES GEMSCAB

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 5 OF 10

Sl. No.	EQUIPMENT	VENDOR
22.	LT POWER & CONTROL CABLES	FINOLEX CABLES, PUNE POLY CAB INDUSTRIES, BARODA RPG CABLES TORRENT CABLES NICCO CABLES UNIVERSAL CABLES KEI DELTON CCI ISHWAR METAL INDUSTRIES ISHWAR CABLES PVT LTD DAKSHA (only for Control cables) TIRUPATI (only for Control cables) ROMESH CABLES ROLLEX ALPHA COMMUNICATION GEMSCAB
23.	INSTRUMENTATION CABLES	ASSOCIATED CABLES (P) LTD. POLYCAB WIRES PVT LTD. GEMSCAB DELTON CABLES LTD. CORDS CABLES INDS. PVT. LTD SKYtone ELECTRICALS (INDIA) LTD. NICCO CORP.LTD
24.	220 V DC LEAD ACID BATTERIES	EXIDE BATTERIES, CALCUTTA HOPPECKE BATTERIES, GERMANY

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 6 OF 10

Sl. No.	EQUIPMENT	VENDOR
25.	220 V BATTERY CHARGERS	CHABBI ELECTRICAL LIMITED, MUMBAI HBL NIFE POWER SYSTEMS LIMITED, HYDERABAD CALDYNE AUTOMATICS LTD, KOLKATA EMERSON NETWORK POWER(INDIA) PVT,LTD MASSTECH CONTROL PVT. LTD, MUMBAI SABNIFE POWER SYSTEMS LTD, HYDERABAD STATCON UNIVERSAL EXPO FINE, JAIPUR
26.	LIGHTING SYSTEM	PHILLIPS INDIA LTD, MUMBAI CROMPTON GREAVES LTD, MUMBAI BAJAJ ELECTRICALS LTD, MUMBAI WIPRO LTD GE LIGHTING
27.	SEGREGATED/ NON SEGREGATED PHASE BUS DUCT	C&S LTD NEW DELHI SPACEAGE POWER GEAR GE BHEL
28.	LV SWITCHGEAR –PMCCs, MCCs, PROCESS DBs	L&T LTD, MUMBAI SIEMENS LTD., MUMBAI CONTROL SWITCHGEAR CO., NEW DELHI SCHNEIDER AREVA

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 7 OF 10

Sl. No.	EQUIPMENT	VENDOR
29.	LV SWITCHGEAR- Non draw out DBs such as Space heater DBs, Lighting DBs, AC & DC distribution boards (TVDB & BVDB excluded), Workshop MCC, Admin building PCC, Welding DBs, Receptacle DBs)	L&T LTD, MUMBAI SIEMENS LTD., MUMBAI CONTROL SWITCHGEAR CO., NEW DELHI SCHNEIDER GE POWER SPACE AGE
30.	MV SWITCHGEAR (11kV & 6.6kV)	ABB, NASIK SIEMENS LTD., MUMBAI BHEL AREAVA, T&D
31.	ELECTRIC MOTORS (HT & LT)	BHEL CGL KEC ABB SIEMENS AREVA (MARATHON)
32.	CABLE END TERMINATION KITS	RAYCHEM LTD, MUMBAI
33.	CABLE GLANDS	COMET DOWELS
34.	ELECTRIC ACTUATORS	AUMA LTD., BANGALORE ROTORK LTD., MUMBAI LIMITORQUE LTD., FARIDABAD
35.	LV/MV CTS /PTS	PRAGATHI INDUSTRIES, KOLKATTA JYOTHI LTD., BARODA GILBERT & MAXELL, BARODA PRECISE ELECTRICALS PRAYOG ELECTRIC BOMBAY

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 8 OF 10

Sl. No.	EQUIPMENT	VENDOR
36.	RELAYS FOR SWITCHGEARS	SIEMENS LTD ABB LTD AREAVA T&D
37.	NEUTRAL GROUNDING TRANSFORMERS	VOLTAMP LTD, BARODA INDCOIL LTD. PRAYOG ELECTRIC BOMBAY
38.	UPS	EMERSON DB POWER ELECTRONICS LTD HI-REL ELECTRONICS LTD KELTRON NUMERIC
39.	ELECTRICAL WORKS OF CONSTRUCTION POWER SUPPLY	ISHWAR METAL INDUSTRIES, JAIPUR VEDANSII IB ELECTRICALS, CHITIARGARH
40.	AVR	BHEL LTD ABB LTD SIEMENS LTD
41.	IPBD & LAVT	REEP INDUSTRIES PVT LTD POWERGEAR INDIA LTD CONTROL AND SWITCHGEAR LTD BHARAT HEAVY ELECTRICALS LTD
42.	DC STARTERS	AMTECH ELECTRONICS LARSEN & TOUBRO
43.	ELEVATOR	OTIS ELEVATORS CO.(INDIA) LTD SCHINDLER INDIA PVT.LTD KONE ELEVATOR INDIA LTD JOHNSON LIFTS LTD MITSUBISHI THYSEEN KRUPP ELEVATOR OF INDIA

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 9 OF 10

Sl. No.	EQUIPMENT	VENDOR
44.	VFD	TOSHIBA INDIA SIEMENS LIMITED LARSEN AND TOUBRO LTD ALLAN BRADLEY ABB LTD HI-REL ELECTRONICS LTD DANFOSS INDUSTRIES LTD HITACHI
45.	CABLE TRAY	SHRENIK AND COMPANY PREMIER POWER PRODUCTS RELIANCE CABLE TRAY PATNI CABLE TRAY SADHNA CABLE TRAYS SHRUTI INDUSTRIES STEELITE ENGINEERS LTD INDIANA ENGINEERING LTD SAMISTHY PROFAB
46.	ELECTRICAL INSTALLATION WORK	CROMPTON GREAVES LTD SIEMENS LTD LARSEN AND TOUBRO LTD AREVA

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D26
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan LIST OF SUB VENDORS / SUB CONTRACTORS	SHEET 10 OF 10

Sl. No.	EQUIPMENT	VENDOR
47.	SERVICE TRANSFORMERS	EMCO TRANSFORMERS LTD., MUMBAI BHARAT BIJLEE LIMITED, MUMBAI KIRLOSKAR ELECTRICALS LIMITD, BANGALORE VOLTAMP, BARODA CROMPTON GREAVES LIMITED, MUMBAI VIJAY ELECTRICAL HYDRABAD. UTTAM BHARAT JAIPUR. ABB AREVA
48.	LT ELECTRIC MOTORS (WORKSHOP)	SIEMENS CGL KIRLOSKAR
49.	ELECTRICAL LABORATORY INSTRUMENTS	APURV TECHNOLOGY PRODUCT SCOPE TINSLEY
50.	ALTERNATOR FOR DG SET	JYOTHI LTD, BARODA KIRLOSKAR ELECTRIC LTD, BANGALORE STAMFORD

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 1 OF 16

The list of acceptable makes for I&C equipment / system are as listed below: -

AIR FILTER REGULATORS

PLACKA
Shavo – Norgan (India) Pvt Ltd.
ABB Ltd.
BELLS CONTROLS LTD.
Schrader – Schorill Duncan Ltd., Mumbai.
Vel jan Hydrair Pvt Ltd., Hyderabad.

GAS ANALYSERS

Emerson Process Management
ABB Ltd.
Teledyne
Novatel
Codel
Land Combustion
Fuji.
Yokogawa Bluestar Ltd.
Chemtrols.
Siemens.

NITRIC OXIDE (NOX) ANALYSER

Land Combustion Ltd.
Emerson Process Management
Horiba
Chemtrols
Siemens
ABB Ltd.

OXYGEN MEASUREMENT (ZIRCONIUM PROBE)

ABB Ltd.
H & B (HARTMANN & BRAUN)
Emerson Process Management
Seco Controls
Land Combustion.

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 2 OF 16

PARTICULATE EMISSION

Land Combustion Ltd.
Emerson Process Management
Siemens
Durag.
Fireye.
Sintrol – oy – Finland.
Erwin – Sick (Germany)
Oldham (France)

SMOKE DENSITY

Skil
Teledyne / Honeywell
Codel
Land Combustion
EMERSON PROCESS MANAGEMENT
Durag

SULPHUR-DI-OXIDE (SO₂)

ABB
Land Combustion Ltd.
Emerson Process Management
Horiba,
Fuji.

COMPENSATING CABLE

Industrial Instrumentation Consortium
General Instruments
Toshiniwal Industries Pvt. Ltd.
Polycab.
Udey Pyro Cables.
REL

INSTRUMENT CABLES

Incab
Delton
Fort Globster Industries

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 3 OF 16
<p>Universal Cables Ltd Reliance Cables</p> <p>Gems Cab</p> <p>CONTROL CABLES Delton Incab Universal Cables Ltd Reliance Cables Gems Cab.</p> <p>CONDUCTIVITY MEASUREMENT Emerson Process Management Honeywell ABB Ltd. Polymetron. Yokogawa Bluestar Ltd</p> <p>DISSOLVED OXYGEN MEASUREMENT Honeywell Polymetron Emerson Process Management ABB Yogokawa Bluestar Ltd.</p> <p>HYDRAZINE ANALYSER Hach ABB Polymetron Emerson Process Management</p> <p>PH Hach Polymetron Forbes Marshall Honeywell Emerson Process Management ABB Ltd</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 5 OF 16

General Instruments (GIC)

~~PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER~~

~~Honeywell
Emerson Process Management
ABB
Yokogawa
Fuji
Yamatake
Endress & Hauser
SIEMENS~~

~~DIGITAL DISPLAY UNIT~~

~~Laxsons
Yogokawa Bluestar Ltd.
Tata Honeywell Ltd.
Gossien Metrawatt~~

~~DISPLACEMENT TYPE LEVEL TRANSMITTERS~~

~~Dresser Masoneilan
Emerson Process Management
Magnetrol
Yamatake
Endress & Hauser~~

~~ELECTRIC METERS~~

~~AE
MECO
Gossien
ABB~~

~~E/P CONVERTERS~~

~~Bells Controls Ltd.
ABB
Emerson Process Management
Sical Yamatake~~

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 6 OF 16
<p>FLOW ELEMENT</p> <p>Starmech Micro precision products Engineering Specialities Pvt Ltd. Mech Engg General Instruments (GIC) Teleflow Emerson Dag Process Instruments Hydropneumatic</p> <p>FLOW GLASSES</p> <p>Eureka General Instruments Levcon V.Automat & Instrument (p) Ltd. Bliss Anand</p> <p>FLOW INTEGRATORS</p> <p>Lectrotek Nishko ABB Ltd. Rockwin</p> <p>ILLUMINATED PUSH BUTTONS</p> <p>EAO H & B L & T Ronan Honeywell Siemens</p> <p>STANDALONE SER</p> <p>Hathaway (Imported) Ronan (Imported)</p>		
		ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 9 OF 16
<p>RELAYS</p> <p>Jyothi ABB Paramount Omron SIEMENS</p> <p>SAMPLE COOLER</p> <p>Polymetron Emerson Process Management Sentry Lowe</p> <p>SAMPLING RACK</p> <p>Emerson Process Management Polymetron</p> <p>SOLENOID VALVES</p> <p>Asco Avcon Rotex Schrader Herion-Norgren Schovill Duncan Ltd.</p> <p>TEMPERATURE INDICATORS</p> <p>G.I.Consortium Bells Controls Waaree instruments ltd Dresser-USA</p> <p>TEMPERATURE SWITCH</p> <p>Ashcroft Switzer Instruments Ltd. Waaree Instruments Ltd Dresser-USA</p>		
		ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
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TEMPERATURE TRANSMITTERS

ABB Ltd.
Emerson Process Management
Camille-Baur
P & F.

THERMO COUPLE ASSEMBLY

Industrial Instrumentation
General Instruments
Nagman Sensors (p) Ltd
Pyro Electric instruments
Toshniwal Industries Pvt. Ltd.
Altop
Temsens
Waaree

THERMOWELL

General Instruments
Nagman Sensors (p) Ltd.
Pyro Electric Instruments
Detriev Instrumentation
Toshniwal Industries Ltd.
Altop
Temsens
Waaree

RTD

Industrial Instrumentation
Nagman Sensors (p) Ltd.
Toshniwal Industries Pvt. Ltd
Pyro Electric Instruments
Altop
Temsens
Waaree

UNIT CONTROL PANELS

Industrial Controls & Appliances (P) Ltd.
J & H

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 11 OF 16
<p>Chemin Rittal</p> <p>LOCAL CONTROL PANELS</p> <p>Industrial Controls & Appliances (P) Ltd. J & H Pyrotech Rittal Chemin</p> <p>VARIABLE AREA FLOWMETERS</p> <p>Eureka Krone – Marshall Scientific Devices Chemtrols Trac Instrument Engineers</p> <p>CONDITION MONITORING SYSTEM</p> <p>Bently Nevada Schenk Avery SPM Instruments Ltd. Rockwell Automation. Shinkawa.</p> <p>ANNUBAR</p> <p>Dietrich Emerson Process Management</p> <p>ASSIGNABLE TREND RECORDER</p> <p>Honeywell Yokogawa Penny & Guile</p> <p>DESUPERHEATER</p> <p>Fisher Dresser Masoneilan</p>		
		ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
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RF Level Switch.

EIP Bulk Controls Pvt Ltd.
EIP Enviro Controls.

TERMINAL BLOCKS

Phoenix
Weidmueller
Wago

MINIATURE CIRCUIT BREAKERS

Siemens
ABB
L & T.

LARGE VIDEO SCREENS / PLASMA VIDEO WALLS

Barco
Synelec
SONY
SAMSUNG
LG

DCS

ABB
BHEL
Tatahoneywell
Emerson Process Management
Invensys
Siemens
Yokogawa Bluestar Ltd

PLC

AllenBradley
ABB
Honeywell

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME V SECTION:TABLE17
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT LIST OF SUB VENDORS	SHEET 16 OF 16

~~PADO~~

STEAG encotec (India) Pvt. Ltd. (Evonics)
Honeywell
Invensys
Emerson

~~CMMS~~

Honeywell
InvensysABB
TCS


~~AAQMS & MMS~~


Chemtrols
Campbell scientific canda corp
Honeywell (Teledyne)
Techmark engineers and cosultants (Horiba)
Nevco engg pvt. Ltd. (LSI lastern)


NOTES

1. The final make selected out of the recommended makes listed above shall be subject to purchaser / consultant's approval during detailed Engineering.
2. Wherever the make is not specified for any item, the Bidder shall indicate 2 or 3 reputed makes, out of which Purchaser / Consultant shall select any one which is acceptable suggest an acceptable make. This shall have no price implication.

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		MANUFACTURERS NAME & ADDRESS		STANDARD QUALITY PLAN				PROJECT		2X660 MW SURATGARH STPS			
		AS PER APPROVED VENDOR LIST		ITEM:	ELECTRIC WIRE ROPE	QP NO	PE-TS-392-563-A002	PACKAGE		WIRE ROPE ELECTRIC HOIST			
							REV	0	CONTRACT No				
							DATE	13.05.14	CONTRACTOR		BHEL-PEM		
Sl.No	COMPONENT & OPERATIONS	CHARACTERISTICS	CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS	
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
1.0	RAW-MATERIALS									**	10		
1.1	a) STRUCTURAL MATERIAL b) RAW MATERIAL FOR HOIST AND GEAR BOX HOUSEING, TROLLEY PLATE, ROPE DRUM IF FABRICATED	Physical & , CHEM. PROPS	MA	Lab analysis	100%	APPD. DRG./ DATA SHEET		Mill.s TC	√	V	V	V	
1.1 A	ROPE DRUM (SEAMLESS PIPE)	CHEMICAL , MECHANICAL	MA	Lab analysis	1/pipe	Approved drg/ASTM A Grade A or B		LAB report	√	V	V	V	
		Flattening & Acid Etching test	MA	Mech test	1/pipe	No cracks, pitting, rusting , damage etc		IR	√	V	V	V	
		SURFACE DEFECTS	MA	Visual	100%								
1.2	GEARS,PINIONS, SHAFT/AXLES, WHEELS #	MECH , CHEM. PROPS	MA	CHEMICAL COMPOSITION, HARDNESS (DURING IN-PROCESS)	I / LOT	APPD. DRG./ DATA SHEET	APPD. DRG./ DATA SHEET / IS:3938	LAB. REPORT / MANUFACTURER'S TEST CERTIFICATE	√	P	V	V	# If wheel, gears, pinions, shafts & axle diameter / thickness is equal to or more than 50 mm UT shall be carried out, ref & acceptance norm at S.no.1.4(UT of hook) to be
		U.T FOR DIA/THK > 50mm	CR	NDT	100%	ASTM A 388	NOTE 4	INSPN. REPORT	√	P	V	V	
		Hardness , surface defects after machining	MA	DPT	100%	ASTM E -165 , No linear indication		MTC	√	P	V	V	
1.3	WIRE ROPE	Dimensional, type, constrction ,	MI	measurement	100%	APPD. DRG./ DATA SHEET	APPD. DRG./ DATA SHEET	MFRS' TEST CERT.	√	P	V	V	
		EXAMINATION OF REPORT OF BREAKING LOAD CAPACITY	CR	Review of TC	100%	IS: 2266		MFRS' TEST CERT.	√	P	V	V	
1.4	HOOKS	MECH. , CHEM. PROPS.	MA	Lab analysis	100%	APPROVED DRG/DATA SHEET IS:15560		MFRS' TEST CERT.	√	P	V	V	
		U.T IF SHANK DIA > 50mm	CR	NDT	100%	ASTM A 388	NOTE 1	INSPN. REPORT	√	P	V	V	SHANK PORTION ONLY
		Dimension & PROOF LOAD CAPACITY	CR	Measurment , PROOF LOAD TEST	100%	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560		QCR	√	P	V	V	
		DP AFTER PROOF LOAD	CR	NDT	100%	ASTM E-165	NO CRACKS	INSPN. REPORT	√	P	V	V	
1.5	Sheaves	Mech	MA	Tensile & hardness	1/lot	Approved drgs		MTC	√	P	V	V	
2.0	IN-PROCESS				Page 44 of 169								

<div></div>		MANUFACTURERS NAME & ADDRESS		STANDARD QUALITY PLAN				PROJECT		2X660 MW SURATGARH STPS			
		AS PER APPROVED VENDOR LIST		ITEM:	ELECTRIC WIRE ROPE	QP NO	PE-TS-392-563-A002	PACKAGE		WIRE ROPE ELECTRIC HOIST			
						REV	0	CONTRACT No					
						DATE	13.05.14	CONTRACTOR		BHEL-PEM			
Sl.No	COMPONENT & OPERATIONS	CHARACTERISTICS	CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
									D*	M	C	N	
1	2	3	4	5	6	7	8	9		**	10		11
2.1	WPS, PQR & WPQ	Verification of approval	MA	SCRUTINY	100%	WPS,PQR & WPQ qualified by NTPC		WPS,PQR & WPQ		P	V	V	NTPC approved WPS to be used. Procedure & welders qualified by NTPC to be used
2.2	Welding of trolley, rope drum etc	DPT if welds (all)	MA	LPI	100% on Butt & 10% on	ASTM E165 or Eq/ No cracks or linear indication		INSPN. REPORT	√	P	V	V	
		RT of butt welds	MA	RT	100%/10%	ASME SEC VIII, DIV 1, UW 51/52		RT FILM & REOPRT	√	P	V	V	100% RT for butt weld in tension and 25 % in compression. 100% RT on butt weld of rope drum
2.3	GEAR BOXES												
	COMPLETE ASSEMBLY	OVERALL DIMENSIONS	MA	MEAS.	100%	MFG. DRG.	MFG. DRG.	INSPN. REPORT	√	P	V		
		No load run test , back lash & contact pattern ,CHECK FOR OIL LEAKAGE, VIBRATION, NOISE TEMP. RISE	MA	performace	100%	apprvdr dg Noise 85dba max, vibration 75 microns max, oil temp rise 30 deg above ambient max		- DO -	√	P	V	V	
3.0	ELECTRICALS												
1	MOTORS & Cables	Make, type , rating	MA	Visual /measurment	100%	Apprvdr dg	IS:3938	IR, STC	√	P	V	V	For motor refer Note: 2
		ROUTINE TESTS											
3	LIMIT SWITCHES,SFU, RELAY, MCB, FUSES,PUSH BUTTONS etc	Make , type , rating, functional, Continuity	MA	Review of TC	100%	Approved drgs		QCR/ Routine TC	√	P	V	V	
4	BRAKES	Make , type , rating, HV/IR, Functional test	MA	Review of TC	100%	Approved drgs		IR, STC	√	P	V	V	
5	DSL	Make , type , rating, dimension	MA	Review of TC	100%	Approved drgs		QCR/ Routine TC	√	P	V	V	
6	Control transformer	Make , type , rating, input/output	MA	Review of TC	100%	Approved drgs		QCR, Routine TC	√	P	V	V	
7	CONTROL PANEL, PENDANT SWITCH	* FIXING OF COMPONENTS WIRING MARKING CONTINUITY * FUNCTIONAL TEST * IR & H.V. TEST * IP - PROTECTION TEST * PAINT SHADE, THICKNESS, SHEET THICKNESS	MA	VISUAL	100%	APPD.DRG. WIRING DIAGRAM,	APPD. DRG. WIRING DIAGRAM,	INSPN. REPORT	√	P	V	V	BOUGHT OUT ITEMS AS PER BHEL / CUSTOMER APPROVAL LIST
4.0	FINAL INSPECTION												

<div><div>बीएसईएल</div><div></div></div>		MANUFACTURERS NAME & ADDRESS		STANDARD QUALITY PLAN			PROJECT			2X660 MW SURATGARH STPS			
		AS PER APPROVED VENDOR LIST		ITEM:	ELECTRIC WIRE ROPE	QP NO	PE-TS-392-563-A002	PACKAGE		WIRE ROPE ELECTRIC HOIST			
						REV	0	CONTRACT No					
						DATE	13.05.14	CONTRACTOR		BHEL-PEM			
Sl.No	COMPONENT & OPERATIONS	CHARACTERISTICS	CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
								D*	M	C	N		
1	2	3	4	5	6	7	8	9		**	10		11
4.1	COMPLETELY ASSEMBLED HOIST	1. COMPLETENESS, CORRECTNESS, OVERALL DIMENSIONS	MA	VISUAL, MEAS	100%	APPD. DRG.	APPD. DRG.	MNFRS' TEST CERT.	√	P	W	W	CHP
4.2	ASSEMBLED HOIST PERFORMANCE along with control panel and pendent	1. LOAD TEST	CR	LOAD TEST at SWL	100%	IS:6547 / IS:3938	IS:6547 / IS:3938	MNFRS' TEST CERT.	√	P	W	W	CHP
		2. HOISTING & LOWERING SPEED, PERFORMANCE OF CONTROLLERS SWITCHES CONTRACTORS, RELAYS AND OTHER CONTROL DEVICES CORRELATIONS OF CIRCUITS AND INTERLOCKS AND SEQUENCES OF OPERATION , CURRENT MEASUREMENT, Limit	CR	MEAS & VISUAL	100%	IS:3938, TECH SPEC.	TECH SPEC.	MNFRS' TEST CERT.	√	P	W	W	CHP
		3. OPERATION OF ALL PROTECTIVE DEVICES	CR	VISUAL	100%	TECH SPEC	TECH SPEC.	MNFRS' TEST CERT.	√	P	W	W	CHP
4.3	OVER LOAD TEST	1. OVER LOAD	CR	TEST AT 125 % OF-SWL	100%	IS:3938	IS:3938	INSPN. REPORT	√	P	W	W	CHP
5	PAINING												
5.1	PRIMER & FINISHING AND SHADE	Examination - Shade	MI	visual	100%	DRG. & DATA SHEET & RELV. IS SPEC.		MNFRS' TEST CERT.		P	V		
		DFT	MA	measurement	Sample					P	V		
	NOTE:												
	1.0 Less than 30 KW. Acceptance of motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows : It is hereby confirmed that the above mentioned motor/motors was/were manufactured taking care of specific requirement regarding ambient temp, voltage & frequency variation, hot start, pull out torque, starting KVA/KW, temp rise, distance between center of stud and gland plate and tested in accordance with approved drawing/data sheet.												
	2.0 When back wall echo is set to 100% in sound area then, a) defect echo shall not exceed 20% b) Back echo shall be minimum 80% in any area												
			LEGND		Page 46 of 169								

		MANUFACTURERS NAME & ADDRESS		STANDARD QUALITY PLAN			PROJECT		2X660 MW SURATGARH STPS			
		AS PER APPROVED VENDOR LIST		ITEM:	ELECTRIC WIRE ROPE	QP NO	PE-TS-392-563-A002	PACKAGE		WIRE ROPE ELECTRIC HOIST		
						REV	0	CONTRACT No				
						DATE	13.05.14	CONTRACTOR		BHEL-PEM		
Sl.No	COMPONENT & OPERATIONS	CHARACTERISTICS	CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS
								D*	M	C	N	
1	2	3	4	5	6	7	8	9		**	10	11
			* RECORDS IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION									
		** M: MANUFACTURER/SUBCONTRACTOR										
MANUFACTURER/ SUB CONTRACTOR		CONTRACTOR	INSPECTION AGENCY(BHEL) N: CUSTOMER									
SIGNATURE			INDICATE 'P' PERFORM"W" WITNESS AND "V" VERIFICATION AS APPROPRIATE " CHP" CUSTOMER SHALL IDENTIFY IN COLUMN"N"				REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY &SEAL				

D10

CRANES & HOISTS SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 1 OF 7

1.0 SCOPE

1.1 Contractor shall provide cranes and hoists to facilitate the lifting and transporting of various pieces of equipment during construction, maintenance, or replacement of the plant components.

1.2 The crane or hoist shall be complete with its accessories, supporting structure, power supply, safety devices, and controls and shall conform to local statutory rules and regulation.

1.3 Equipment to be supplied:

- Two (2) nos. EOT crane for TG Building.
- One (1) no. EOT crane for CW pump house
- One (1) no. EOT crane for Raw Water pump house
- One (1) no. Crane at DG set room.
- One (1) no. Semi Gantry crane for CW pump house stop log gates and screens.
- One (1) no. Semi Gantry crane for Raw Water pump house stop log gates and screens
- One (1) no. EOT crane of minimum 50T capacity for Loco maintenance shed.
- One (1) no. Double Girder EOT crane of 25/5 Tonnes capacity is to be provided in workshop with wireless Radio Remote Control System.
- Other miscellaneous cranes, monorails, trolleys and hoists, as required for the following systems/area.
 - i) Fuel oil Pump House
 - ii) DM Plant – CPU Regeneration Building
 - iii) Clarified Water / Blowdown water Pump houses
 - iv) A/C and Ventilation System
 - v) Compressed Air System
 - vi) One (1) No. Electric hoist shall be provided in HFO unloading area in Fuel Oil Pump house.
 - vii) One (1) No. Electric hoist shall be provided in LDO unloading area in Fuel Oil Pump house.
 - viii) Fire water pumps house
 - ix) Raw water pump hose
 - x) CW chlorination area
 - xi) Coal handling system.
 - xii) Ash Handling system.
 - xiii) And other miscellaneous areas / buildings.

2.0 EQUIPMENT SIZING AND DESIGN CRITERIA

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SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 2 OF 7
<p>2.1 EOT Cranes</p> <p>Following double girder EOT cranes of suitable capacity is included in bidder scope of work.</p> <p>2.1.1 Two (2) Nos. double girder E.O.T Crane of minimum 150/40 T capacity with accessories and associated drives, motors and other auxiliaries required for erection and maintenance of main steam turbine components, condensers, generators, coolers, condensate pumps, lube oil units and boiler feed water pumps etc located within the station building. The auxiliary hoists will be used to handle smaller components more rapidly.</p> <p>2.1.2 The CW pump house EOT crane shall be rated for the heaviest component to be handled in the CW pump house (viz. Drive motor of the pump).</p> <p>2.1.3 The height of lift for the Circulating Water Pump house EOT crane shall be based on lifting the circulating water pump out of the pump suction flume onto the maintenance floor area. Dedicated monorails and lifting arrangements shall be provided for the chlorine tonner area.</p> <p>2.1.4 The EOT cranes shall be of the plate box girder construction.</p> <p>2.1.5 The EOT cranes shall be able to be operated from pendant push button station hanging from the crane. TG building crane shall be able to operate from radio remote control and cabin</p> <p>2.1.6 BIDDER's scope of supply shall essentially include but not limited to the following:</p> <ul style="list-style-type: none"> a) Shrouded type copper bus bars for LT motion with insulators and fixtures for the crane runway length specified in Datasheet-A including current collectors. b) Crane runway rails with associated fixtures comprising of fixing clamps, bolts, Nuts, etc., for the crane runway length specified in Datasheet-A c) Hand or foot operated brakes operable from operator's cabin shall be adequately arranged in such a way that a force exceeding 12 kg at the handle or 20 kg at the foot pedal is required for effective operation. d) Essential spares as per Section D20. e) Crane buffer stops, these shall include the buffers on the crane itself as well as the buffers to be fixed (by BIDDER) on the building frame, and wheel stops at either end of the crane runway. f) One set of Maintenance tools and tackles including special tools which shall be Included in the base price for the crane. 		
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SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 3 OF 7
<p>g) The start up/ commissioning spares as required during the commissioning of the equipment till handing over of the crane to the PURCHASER shall be included in the base price for the crane.</p> <p>h) In addition to the spares mentioned above the BIDDER shall quote for any additional spare parts recommended for a period of 3 years of trouble free operation of the crane.</p> <p>i) The height of lift of the TG building EOT crane shall be based on lifting the tallest piece from the operating floor to grade, with consideration of sufficient clearances over other equipment on operating floor.</p> <p>j) All the necessary electrical equipments including but not limited to Isolating switch, all power, control and instrumentation cabling from isolating switch to various EOT crane services including lighting and industrial sockets, Squirrel Cage induction motors, Control & Protection circuits, 12 pulse VFD drives for speed control and direction of rotation reversal of motors, 24V AC and 400V 3 phase and 230V single phase AC industrial sockets, 24V AC hand lamp, 400/24V AC transformer for providing supply to the socket, 230V AC under bridge lighting including 400/230V AC lighting transformer etc. shall be in the scope of the bidder. The bidder shall submit cable sizing calculations for LT power cables and technical particulars of all major electrical items used, for PURCHASER'S/ENGINEER'S approval during detailed engineering.</p> <p>k) Slings required for the crane shall be included in the bidder's scope.</p> <p>l) The BIDDER's scope of work shall include painting, testing at shop, proper packing, loading, transport to site, transit insurance, unloading from carriers/wagons, inspection, storing at site, storage and erection insurance, transport to site of erection and complete erection, testing at site, painting and commissioning of the cranes and accessories as specified.</p> <p>m) Painting of cranes, hoists and chain pulley block shall be as specified in Volume II.</p> <p>2.1.7 <u>Crane Classification</u></p> <p>The EOT cranes shall be designed as per Class M5 for Mechanical and structural components and Class M7 for all electrical components (IS: 807)</p> <p>2.1.8 <u>Speeds of EOT Cranes</u></p> <p>10% of main speed shall be creep speed and shall be provided for all motions of the EOT crane viz. long travel, cross travel, auxiliary hoist and main hoist through VVVF Drives.</p> <p>2.1.9 <u>PERFORMANCE, AND LAYOUT REQUIREMENTS</u></p>		
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SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 4 OF 7
<p>a) <u>Performance Requirements</u></p> <p>1.0 The equipment is normally expected to operate intermittently in all three shifts.</p> <p>2.0 Fluctuations in Power Supply Conditions Although the rated frequency is 50 Hz. it is expected that reduced frequencies will prevail over sustained periods of time owing to possible shortage of power in the region. All motor driven auxiliary equipment and accessories shall be capable of continuously delivering the rated outputs for a voltage variation of +/- 10% and frequency variation of +/- 5% occurring separately or combined voltage and frequency variation of 10%.</p> <p>b) <u>Layout Requirements</u></p> <p>1.0 The location of cabin, shrouded bus bars and the orientation of main and auxiliary hooks with respect to powerhouse columns shall be indicated in the crane clearance diagram.</p> <p>2.0 Hook approaches for main and auxiliary hooks shall be as indicated in the crane clearance diagram with adequate space around the equipment.</p> <p>3.0 Access walkways with safety hand railing shall be provided along the full span length on both sides of the crane bridge girders.</p> <p>4.0 The span of EOT cranes shall be derived based on the building layout with considerations to clearances and hook approach.</p> <p>2.1.10 <u>Other Features</u></p> <p>The EOT crane main hook shall be Ramshorn type. The auxiliary hoist hook shall be plain shank type with safety latch.</p> <p>The EOT cranes shall be designed to operate at 100% of rated load. The overload testing of the crane shall be at 125% of rated load without any permanent deformation.</p> <p>The EOT cranes are designed with a maximum deflection of 1/900 of crane span at rated load.</p> <p>2.2 <u>Hoists and Trolleys with Monorails</u></p> <p>For items weighing 500 kg and above, hoists and trolleys along with monorails shall be provided throughout the plant where cranes cannot be utilised. For items weighing less than 1000 kg, manual hoists shall be provided. For items weighing 1000 kg, and more, electric hoists shall be provided. In case the lifting height is more, than 10 m, electric hoist shall be provided.</p>		
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2.3 **Capacity of Cranes & Hoists**

Capacity of cranes & hoists shall be selected considering a minimum margin of 10% over the maximum weight of the heaviest equipment / Component to be handled by the Crane / Hoist.

3.0 **PERFORMANCE GUARANTEES & TESTS**

3.1 **Performance Guarantees**

The performance of the cranes / hoists in regard to the following items/features shall be guaranteed as specified below:

a) <u>Hoist</u>		Tolerance Limit
i. Safe working load (SWL)	:	(-) 0.00%
ii) With 125% of safe working load, the cranes / hoists shall be able to operate without any permanent deformation. During this test, the specified speeds need not be attained		
b) Hoist lift	:	(-) 0.00%
c) Hook approaches	:	(+) 0.00%
d) Specified speeds for all motions with full load	:	± 10% of the value indicated by the BIDDER and accepted by the PURCHASER / ENGINEER
e) Deflection of main girder with safe working load	:	Maximum 1/900 of crane span
f) Cranes shall be capable of operating satisfactorily with full load for the following conditions		
i. Rail span	:	+/- 10 mm
ii. Difference in level (vertical) of rails	:	+/- 15 mm
iii. Deviation of crane rail from its true centre	:	1/1300 subject to Max. 30 mm
iv. Slope of rail	:	1/1000
g) Distance between centre line of main hook to end of buffers	:	(+) 0.00

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h) Energy consumption of motors for different motions for EOT crane	:	(+) 0.00
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3.2 Performance Test

3.2.1 Performance tests shall carried out to prove the guarantees indicated as above.

3.2.2 The BIDDER shall conduct at shop and site tests on the cranes as indicated in Datasheet-A

3.2.3 Control interlock and sequential operation of the control schemes shall be demonstrated both at shop and at site.

3.2.4 100% radiographic test shall be carried for butt welds in tension zone.

3.2.5 Energy consumption of motors at different motions while handling safe working loads at the rated speed

Data / Drawings to be submitted after Award of Contract

The following documents and drawing shall be submitted after award of contract.

1.1 List of drawings/documents to be submitted for review, approval and information with scheduled submission dates.

1.2 Quality assurance plan (QAP)

1.3 Motor power calculations, Wire rope, Rope drum Calculation.

1.4 Girder deflection calculations.

1.5 Brake selection calculations

1.6 Detailed to-scale dimensioned GA drawing of crane showing all the components like bridge girder, end carriages, travelling trolley, rope drums, wire ropes, sheaves, hooks, rails, end stops, buffers etc. Drawing shall also include part list of all the crane components along with materials and codes of construction.

1.7 GA drawing of long travel & cross travel arrangement.

1.8 GA drawing indicating crane rail fixing arrangement.

1.9 GA drawing of runway conductors.

1.10 Flexible trailing cable arrangement drawing.

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PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 7 OF 7
<p>1.11 Write-up & recommended logic schemes for interlock protection and sequential controls for Crane and its auxiliaries.</p> <p>1.12 Characteristic of temperature elements included under VENDOR's scope.</p> <p>1.13 List of alarm and trip settings,</p> <p>1.14 Installation, operation and maintenance manual with lubrication schedule.</p> <p>1.15 General arrangement of lifting beam with all details.</p> <p>1.16 Detailed explanatory functional write-up of control scheme, wiring diagrams and control cabinet drawings.</p> <p>1.17 Component drawings for (a) rope drums (b) sheaves (c) wheel assembly (d) Hooks (e) End stops (f) buffers (g) wheel stops (h) rail clamps. etc</p>		
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ISSUE NO. R3	TCE.M4-113-54		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	ENQ.SPEC.NO. TCE.5750A-H-500-001		DATA SHEET -A ELECTRICALLY OPERATED HOIST		SECTION : D10 SHEET : 1 OF 2	
	PART : B					
GENERAL	1. DESIGNATION: HOIST AND TROLLEY FOR BY BIDDER			DESIGN DATA (CONTD.)	22. METHOD OF OPERATION : PENDANT PUSH BUTTON	
	2. NUMBER REQUIRED: BY BIDDER				23. HOISTING SPEED: 2.5-3 m/min	
	3. TAG NOS: BY BIDDER				24.TROLLEY TRAVEL SPEED: 7-10 m/min	
	4. LOCATION IN HAZARDOUS AREA: BY BIDDER				25. CREEP SPEED REQUIRED FOR:	
	5. HAZARDOUS AREA CLASSIFICATION AS PER IS 5572 ZONE 0/1/2 NA				25.1 HOIST: YES	
	6. LOCATION: BY BIDDER				25.2 TROLLEY: YES	
	7. APPLICABLE STANDARD: IS 3938				26. FLEXIBLE TRAILING CABLE FOR TRAVEL BY : BY BIDDER	
	8. DUTY CLASS: 2				27.	
	9.				28.	
DESIGN DATA	10. CAPACITY: BY BIDDER			MATERIALS AND CODES OF CONSTRUCTION	29.	
	11. RANGE OF LIFTING: BY BIDDER				30. HOIST : AS PER IS 3938	
	12. OPERATING FLOOR ELEVATION: BY BIDDER				31. TROLLEY FRAME: ROLLED STRUCTURAL STEEL WITH SIDE PLATES EXTENDED BEYOND WHEEL FLANGES TO PROTECT WHEELS	
	13. BOTTOM OF MONORAIL ELEVATION: BY BIDDER				32. TROLLEY WHEELS: HEAT TREATED CARBON STEEL/ LOW ALLOY STEEL/ GRADED CAST IRON. SINGLE FLANGED WITH TAPERED TREAD	
	14. MONORAIL LENGTH: BY BIDDER				33. ROPE DRUM AND SHEAVES: CAST IRON/ CAST STEEL/ MILD STEEL AS PER IS 3177	
	15. MONORAIL TRACK: CURVED / STRAIGHT				34. WIRE ROPE: CONSTRUCTION 6 x 37 AS PER IS 2266. MINIMUM FACTOR OF SAFETY 5	
	16. RADIUS OF CURVATURE OF MONORAIL: BY BIDDER				35. SHAFTS AND AXLES: CARBON STEEL	
	17. MONORAIL BY: BY BIDDER				36. GEARS AND PINIONS: SPUR/ HELICAL AS PER IS 4460/ BS 436/ BS 721/ AGMA STANDARDS	
	18. SIZE OF MONORAIL (IF PROVIDED BY PURCHASER): BY BIDDER					
	19. TYPE OF HOIST: WORM / SPUR GEAR					
	20. TYPE OF TROLLEY: MOTOR DRIVEN					
	21.					
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV 09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE:MAY'12	5750A	SURATGARH, RAJASTHAN
						ISSUE R1

ISSUE NO. R3	TCE.M4-113-54		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	ENQ.SPEC.NO. TCE.5750A-H-500-001		DATA SHEET -A ELECTRICALLY OPERATED HOIST		SECTION : D10 SHEET : 2 OF 2	
	PART : B					
MATERIALS AND CODES OF CONSTRUCTION (CONTD.)	37. LIFTING HOOK: HOOK WITH STANDARD DEPRESS SAFETY LATCH AND LOCK TO PREVENT HOOK FROM SWIVELING. HOOK SHALL BE FORGED ALLOY STEEL/ CARBON STEEL AS PER IS 2758/ IS 2759/ IS 3813/ IS 15560 IS 4164/BS 2903			PAINTING	43. FINISH PAINT: REFER VOLUME - II	
	38. BEARINGS: BALL OR ROLLER AS PER IS 5669/ IS 5692/ IS 5932/ IS 5935				44.	
	39. BRAKES: ONE EACH FOR HOIST AND TROLLEY MOTOR OF ELECTROMAG- NETIC TYPE, DESIGNED TO HOLD 125 % OF LOAD TORQUE				45.	
	40. LUBRICATION: CENTRALISED GREASE LUBRICATION WITH HAND OPERATED GREASE PUMP			TESTS AND INSPECTION	46.	
	41.				47.	
	42.				48. OVERLOAD TEST WITH 125 % OF SPECIFIED LOAD	
					49. BRAKE/ BRAKE COIL HIGH VOLTAGE FLASH TEST	
					50.	
					51.	
				52.		
			53.			
			54.			
			55.			
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV'09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE:MAY'12	5750A	SURATGARH, RAJASTHAN

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TCE FORM NO. 330 R3

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION : D10	
	PART : B		ELECTRICALLY OPERATED HOISTS		SHEET : 1 OF 3	
	ENQUIRY/ SPECIFICATION NO. TCE.					
	SL. NO.	ITEM	BIDDER			
GENERAL	1.	DESIGNATION		ELECTRICALLY OPERATED HOIST FOR		
	2.	NUMBER OFFERED				
	3.	TAG NUMBERS				
	4.	CAPACITY	T			
HOIST	5.	MANUFACTURER				
	6.	MAKE				
	7.	MODEL NUMBER				
	8.					
	9.					
TROLLEY	10.	MANUFACTURER				
	11.	MAKE				
	12.	MODEL NUMBER				
	13.					
ELECTRICAL REQUIREMENTS	14.	HOIST MOTOR :		MAIN	CREEP	
	14.1	MAKE				
	14.2	TYPE				
	14.3	RATING	KW			
	14.4	SPEED	RPM			
	15.	TROLLEY MOTOR :		MAIN	CREEP	
	15.1	MAKE				
	15.2	TYPE				
	15.3	RATING	KW			
	15.4	SPEED	RPM			
	16.	LIMIT SWITCHES FOR :				
	16.1	HOISTING : MAKE, TYPE AND NUMBERS PROVIDED				
	16.2	TRAVELLING: MAKE, TYPE AND NUMBERS PROVIDED				
NOTES TO BIDDER			SIGNATURE OF BIDDER			
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE		<div style="border: 1px solid black; padding: 2px;">ISSUE R1</div>	

TCE FORM NO. 294 R3

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION : D10	
	PART : B		ELECTRICALLY OPERATED HOISTS		SHEET : 2 OF 3	
	ENQUIRY/ SPECIFICATION NO. TCE.					
	SL. NO.	ITEM	BIDDER			
ELECTRICAL REQUIREMENTS (CONTD.)	17.	TYPE OF DOWN SHOP LEAD				
	17.1	MAKE				
	17.2	SIZE				
	17.3	LENGTH	M			
	17.4	SUPPORTING ARRANGEMENT				
	17.5	IF CURVED MONORAIL, NUMBER OF CABLE TROLLEYS PROVIDED AND WIDTH OF EACH TROLLEY	NO./ mm			
	18.					
	19.					
	20.					
	21.					
DIMENSIONS	22.	MONORAIL IF PROVIDED BY VENDOR : INDICATE BEAM SIZE MINIMUM/ MAXIMUM SUITABLE FOR TROLLEY MOVEMENT	mm	ISMB	/ ISMB	
	23.	MONORAIL IF PROVIDED BY PURCHASER : IS SIZE SPECIFIED IN DATA SHEET A SUITABLE FOR TROLLEY MOVEMENT		YES/ NO	IF NO, INDICATE SUITABLE SIZE ISMB	
	24.	DISTANCE BETWEEN HIGHEST HOOK POSITION TO BOTTOM OF MONORAIL	mm			
	25.	IF MONORAIL IS CURVED, MINIMUM RADIUS TROLLEY CAN NEGOTIATE	mm			
	26.					
MATERIALS OF CONSTRUCTION	27.	IF HOIST IS IN HAZARDOUS AREA :				
	27.1	TROLLEY WHEELS				
	27.2	ROPE DRUM AND SHEAVES				
	27.3	GEARS AND PINIONS				
	28.					
29.						
NOTES TO BIDDER			SIGNATURE OF BIDDER			
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A.			DATE			
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.					ISSUE R1	

TCE FORM NO. 294 R3

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III						
	TCE.5750A-H-500-001		DATA SHEET B		SECTION : D10						
	PART : B		ELECTRICALLY OPERATED HOISTS		SHEET : 3 OF 3						
	ENQUIRY/ SPECIFICATION NO. TCE.										
MISCELLANEOUS	SL. NO.	ITEM	BIDDER								
	30.	WIRE ROPE DIAMETER	mm								
	31.	WIRE ROPE BREAKING LOAD	KN								
	32.	WEIGHT OF COMPLETE HOIST AND TROLLEY ASSEMBLY	Kg								
	33.	WEIGHT OF HOIST	Kg								
	34.	WHEEL LOAD WITH IMPACT AND WITHOUT IMPACT	Kg		/						
	35.	PRELIMINARY DIMENSIONED GENERAL ARRANGEMENT DRAWING OF ELECTRICALLY OPERATED HOIST ALONG WITH WHEEL STOP DETAILS TO BE FURNISHED			WHETHER FURNISHED YES/ NO						
	36.										
	37.										
	38.										
	39.										
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				SIGNATURE OF BIDDER							
				DATE		ISSUE R1					

TCE FORM NO.294 R3

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13												
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 1 OF 14												
<p>PAINTING</p> <p>13.0</p> <p>13.0.1 This section defines the technical requirements for surface preparation selection and application of paints on equipment, vessels, machinery, piping, ducts etc. However, manufacturers shall follow their standard procedures for painting their equipment. The Bidder shall submit a detailed painting procedure for approval of OWNER / OWNER'S representative after the award of contract.</p> <p>13.0.2 The following surface and material shall require painting:</p> <ol style="list-style-type: none"> All un-insulated carbon steel and alloy steel equipment like columns, vessels, drums, storage tanks, heat exchangers etc. All un-insulated carbon steel and low alloy piping, fitting and valves (including painting of identification marks) All pipe structural steel supports, walkways, platforms, hand rails, ladders etc. <p>13.0.3 The following surfaces and material shall not require painting:</p> <ol style="list-style-type: none"> Non-ferrous materials Austenitic stainless steel Plastic and / or plastic coated materials Insulated surface of equipment and pipes except colour coating wherever required Painted equipment like blowers, pumps, valves, etc., with finishing coats in good condition and with matching colour-code <p>13.1.0 Codes and Standards</p> <p>13.1.0.1 Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.</p> <p>13.1.0.2 The following Indian Standards may be referred to carrying out the painting job.</p> <table> <tr> <td>IS : 5</td> <td>:</td> <td>Colours for ready mixed paints and enamels</td> </tr> <tr> <td>IS : 1303</td> <td>:</td> <td>Glossary of terms relating to paints</td> </tr> <tr> <td>IS : 2379</td> <td>:</td> <td>Colour code for identification of pipelines.</td> </tr> <tr> <td>IS : 1477</td> <td>:</td> <td>Code of practice for painting of ferrous</td> </tr> </table>			IS : 5	:	Colours for ready mixed paints and enamels	IS : 1303	:	Glossary of terms relating to paints	IS : 2379	:	Colour code for identification of pipelines.	IS : 1477	:	Code of practice for painting of ferrous
IS : 5	:	Colours for ready mixed paints and enamels												
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IS : 1477	:	Code of practice for painting of ferrous												
		ISSUE R0												

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 2 OF 14
<p>metals in buildings (Parts I & II)</p> <p>IS: 2524 : Code of practice for painting of non-ferrous metals in buildings (Parts I & II)</p> <p>IS : 2395 : Code of practice for finishing of concrete, masonry and plaster surfaces (Parts I and II)</p> <p>IS : 2338 : Code of practice for finishing of wood and wood based materials (Parts I & II)</p> <p>IS : 158 : Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting</p> <p>IS : 2074 : Ready mixed paint, air drying, red oxide zinc chrome, and priming.</p> <p>IS : 104 : Ready mixed paint, brushing, zinc chrome, priming</p> <p>IS : 2932 : Enamel, synthetic, exterior</p> <p>(a) undercoating (b) Finishing.</p> <p>SIS : 55900 : Swedish standard for blasting</p> <p>IS: 14506 : Epoxy Red oxide Zinc Phosphate Weldable Primer, Two Component Specification</p> <p>IS: 14209 : Epoxy Enamel, Two Component, Glossy Specification</p> <p>IS: 14589 : Zinc priming paint, Epoxy based, Two-pack-specification</p> <p>13.2.0 SURFACE PREPARATION</p> <p>The surface shall be prepared in a manner suitable for coatings. Chemical de-rusters or rust converters shall not be applied. Acid cleaning is subject to approval of PURCHASER / PURCHASER'S representative.</p> <p>13.2.1 Blasting</p>		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 3 OF 14
<p>The surface of the part / component shall be blasted before the coating material is applied. Unless otherwise specified in the documents, the surface shall satisfy the following requirements after blasting: Primer paint shall be zinc silicate of approved brand. Dry film thickness of each primer coat shall be 15 – 25 µm</p>		
13.2.2	Manual Rust Removal	
	Manual rust removal shall be allowed for welded zones and for touching up installed components.	
13.2.3	Cleaning	
	Removal of impurity	
	Impurity	Removal
(a)	Dust, loose deposits	Vacuum-cleaning, brushing
(b)	Adhesive deposits	Power brushing
(c)	Oils, greasy impurities	Wet blasting, use of detergent additives by agreement
(d)	Salt deposits	Rinsing
(e)	Markings (e.g., felt tip pen)	Organic solvents to manufacturer's specifications e.g., Trichloro- trifluoro -ethane and solvents containing acetone (renew solvent and rag frequently).
13.3.0	PROCESSING	
13.3.1	General	
13.3.1.1	Application Conditions	
	<p>The primer shall be applied to properly prepared surfaces only. The specifications of the coating material manufacturers shall be observed. The minimum temperature shall be +5°C and the relative humidity shall not exceed 80%. The temperature of the work piece shall be at least 3 °C above dew point.</p>	
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 4 OF 14
13.3.1.2	<p>Application Procedure The primer shall be applied by means of brush or by spray. The top coats shall be applied by means of brush, roller or by spray. At points where coating application is interrupted, the individual layers shall be adequately stepped to ensure proper layer sequence when coating operations are resumed</p>	
13.3.1.3	<p>Touching Up Before each layer is applied, previous coating shall be touched up where necessary by way of rust removal and cleaning, according coating MANUFACTURER'S specifications. The final top coat shall be reapplied completely, if required.</p>	
13.3.1.4	<p>Uncoated Surfaces Moving parts of machines (e.g., stems, shafts, sliding and locating bearings), nameplates, instruments and sealing surface shall not be coated. Welds shall be left free of coating up to a distance of 30 mm on each side of the weld edge until erection and weld examinations, if any, have been completed.</p>	
13.3.1.5	<p>Bond Strength The pull-off stress determined using the pull-off test method for adhesion shall be not less than 1.5 N/mm², according to ISO 4624.</p>	
13.3.1.6	<p>Surface Conditions of Coating Surfaces The coating surface shall have a uniform film thickness, shade and gloss and shall be free from inclusions, sags and wrinkles.</p>	
13.3.1.7	<p>Coating Systems</p>	
13.3.1.7.1	<p>General Requirements for Coating Systems Coating materials according to SSPC, BS 5493 or DIN 55 928 shall be used. Intermediate coats are to be pigmented with micaceous iron oxide. The materials shall be matched with each other so that they are compatible. Coatings deviating from this specification shall be subject to approval. Standards of surface preparation and painting shall give a time to first maintenance of 10 years. The colour and gloss of top coats shall be in accordance with sub-clause suggested colour codes for painting (Sub-clause 13.10).</p>	
13.3.1.7.2	<p>Standard Coating System (External Coatings)</p>	
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 5 OF 14
<p>a) Steel Structures</p> <ul style="list-style-type: none"> i. All steel structures shall receive two primer coats and two finish coats of painting. First coat of primer shall be given in shop after fabrication before dispatch to erection site after surface preparation as described below. The second coat of primer shall be applied after erection and final alignment of the erected structures. Two finish coats shall also be applied after erection. ii. Steel surface which is to painted shall be cleaned of dust and grease and the heavier layers of rust shall be removed by chipping prior to actual surface preparation. The surface shall be abrasive blasted to Sa-2½ finish as per SIS05-5900. Primer paint shall be zinc silicate of approved brand. Dry film thickness of each primer coat shall be 40 microns. iii. Finish paint shall be 2 coats of High built epoxy finish of approved brand. Dry film thickness of each finish coat shall be 90 microns. The undercoat and finish coat shall be of different tint to distinguish the same from finish paint. The total dry film thickness shall be 300 microns. All paints shall be of approved brand and shade as per the OWNER'S requirement. iv. Joints to be site welded shall have no paint applied within 100 mm of welding zone. Similarly where Friction grip fasteners are to be used no painting shall be provided. On completion of the joint the surfaces shall receive the paint as specified. v. Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly. Surfaces inaccessible after erection including top surfaces of floor beams supporting gratings or chequered plate shall receive one additional coat of finish paint over and above number of coats specified before erection. Portion of steel member embedded / to be encased in concrete shall not be painted. <p>b) Galvanised iron and steel requiring paint finish at site At site</p> <p><u>Surface Treatment</u> Mechanical cleaning from contaminants by means of washing or steam jetting and sweep blasting with fine sand or etching (T-Wash).</p> <p><u>Touch-up mechanical damages:</u> De rusting St 3 and application of high build epoxy primer DFT 80 µm.</p> <p><u>Finish coating:</u> Analogous to standard painting scheme</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 6 OF 14
13.3.1.7.2.1	<p>Painting of indoor components such as valves, pumps, motors, electrical parts, tanks etc.</p> <p>a) At works</p> <p><u>Surface preparation:</u> Blasting according to SIS 055900: grade SA 2 ½. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15 – 25 µm, may be used.</p> <p><u>Prime coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm.</p> <p>b) At site</p> <p>Thorough cleaning to remove oil, grease, dirt and any other contaminants. De-rusting of all mechanical damages according to SIS 055900 Grade ST3. Touch up with dry film thickness 50 µm.</p> <p><u>Finish coat:</u> Application of two finishing coats of Chlorinated rubber paint in approved shades at 30-40 microns DFT each coat in approved shades.</p>	
13.3.1.7.2.2	<p><u>Remarks:</u> Equipment coated with a standard application system can be accepted if the quality of this application system is corresponding with the quality of the above mentioned system.</p>	
13.3.1.7.2.3	<p>Painting of Outdoors equipment (external surfaces) such as piping, valves, pumps, motors, electrical parts, tanks etc.</p> <p>Weather exposure, weather resistance, temperature up to 120⁰C as per 13.7.1 and 13.7.3.</p> <p><u>Surface Preparation:</u> Blasting according to SIS 055900: grade Sa 2 ½. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15-25 µm, may be used.</p> <p><u>Prime Coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm.</p> <p><u>Intermediate Coat:</u> One (1) layer 2 pack high build epoxy polyamide Mio, dry film thickness 100 µm.</p>	
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 7 OF 14
<p><u>Finish Coat:</u> Application of two finishing coats of Chlorinated rubber paint in approved shades at 50 microns DFT each coat in approved shades.</p> <p>13.3.1.7.2.4 Special Coating System (External Coatings)</p> <p>Parts exposed to temperatures above 120⁰C, up to 200⁰C, not insulated</p> <p>a) At works</p> <p><u>Surface Preparation:</u> Blasting according standard SIS 55900 Grade Sa 2¹/₂ and ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm, may be used</p> <p><u>Prime coat</u> Inorganic ethyl zinc silicate, dry film thickness 75 µm.</p> <p>b) At site</p> <p><u>Pre-treatment:</u></p> <p>De-rusting of all mechanical damages, according to ISO 8501-1: 1989, grade St 3 Touch-up with 1 pack inorganic ethyl zinc silicate, dry film thickness 50 µm. Removal of all decontaminants from prime coat.</p> <p><u>Intermediate Coat:</u> 1 pack silicon acrylic, dry film thickness 35 µm.</p> <p><u>Final coat</u> 1 pack silicon acrylic, dry film thickness as 35 µm.</p> <p>Total system dry film thickness 145 µm. Final coat according to colour code.</p> <p>Parts exposed to temperatures above 200⁰C, up to 400⁰C, not insulated</p> <p>At works</p> <p><u>Surface Preparation:</u></p> <p>Blasting according to ISO 8501-1: 1988 grade Sa 2¹/₂. Depending on</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 8 OF 14
<p>production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film 15-25 µm, shall be used.</p> <p><u>Prime coat:</u></p> <p>Inorganic ethyl zinc silicate, dry film of thickness 75 µm.</p> <p>At site</p> <p><u>Pre-treatment:</u> De-rusting of all mechanical damages, according standard Sa 2 1/2 to ISO 8501-1: 1988. Touch-up with coating system according to MANUFACTURER'S recommendations.</p> <p>Insulated Parts, continuously exposed to condensing water or parts exposed to temperatures</p> <p>For parts that are provided with insulation on site.</p> <p>a) Insulated parts, exposed to condensing water</p> <p>At works</p> <p><u>Surface Preparations:</u></p> <p>Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm shall be used.</p> <p><u>Prime coat:</u></p> <p>Inorganic ethyl zinc silicate, dry film thickness 75µm.</p> <p>b) Insulated parts exposed to temperatures Parts, exposed to temperatures up to <400⁰C at works</p> <p><u>Surface Preparation:</u></p> <p>Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm shall be used.</p> <p>Parts, exposed to temperatures above 400⁰C at works (Steam pipes, pressure tubes and parts for the HRSG, such as heating surfaces, heaters and super heaters reheaters, etc.)</p> <p><u>Surface preparation:</u></p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 9 OF 14
<p>Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988.</p> <p><u>Temporary primer:</u></p> <p>Varnish.</p> <p>c) Intermittent exposure due to condensing water / chemicals (Indoors) At works</p> <p><u>Surface Preparation:</u> Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm may be used.</p> <p><u>Prime Coat:</u> Two layers of zinc phosphate epoxy primer total dry film thickness greater than or equal to 75 µm.</p> <p>At site <u>Pre-treatment:</u></p> <p>De-rusting of all mechanical damages, according standard Sa 3 to ISO 8501-1: 1988, touch-up with 2 pack high build epoxy with volume solid content of more than 85%, 75 µm.</p> <p><u>Intermediate Coat:</u> 2 pack high build epoxy, dry film thickness 80 µm.</p> <p><u>Finish coat:</u></p> <p>2 pack epoxy according to colour appearance, dry film thickness of 50 µm.</p> <p>Total system dry film thickness 205 µm.</p> <p>When exposed to weathering, weather resistance finish coat shall be applied.</p> <p>d) Water exposure</p> <p>Surfaces permanently or predominantly in contact with water.</p> <p>At site / works</p> <p><u>Pre-treatment:</u></p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 10 OF 14
<p>Removal of all welding pearls. Blasting according standard Sa 3 to ISO 8501-1: 1988.</p> <p><u>Coat:</u></p> <p>4 coats 2 pack coal-tar-epoxy, dry film thickness 125 µm each. Total system dry film thickness 500 µm. Touch-up after erection as required.</p> <p>13.3.1.7.2.5 Buried / underground piping system (except for sea water piping) Where pipelines are buried, underground protection shall be provided for the piping system as indicated in any one of the methods given below: Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre glass. Total thickness of coating shall not be less than 4.0 mm. With anti-corrosive tape of minimum 4 mm thick conforming to IS-10221 and AWWA C 203-93.</p> <p>Pipe surfaces shall be cleaned by shot or sand blasting before application.</p> <p>Tests to be carried out after application Bond / Adhesion test Holiday test</p> <p>13.3.1.7.3 INTERNAL COATINGS</p> <p>13.3.1.7.3.1 Tanks (Internal Surfaces) as specified in relevant sections of specification Industrial, deionised, demineralised and potable water up to 60°C pH range: 4.5 – 9.5. Blasting according to ISO 8501-1: 1988, grade Sa 2¹/₂.</p> <p><u>Prime coat:</u> Two layers of zinc phosphate epoxy primer total DFT greater than or equal to 75 µm.</p> <p><u>Pre-treatment:</u> De-rusting of all mechanical damages, according to standard Sa 3 to ISO 8501-1:1998, touch up with 2 pack high build epoxy with volume solid content of more than 85%, 75 µm.</p> <p><u>Intermediate coat:</u> 2 pack high build epoxy, dry film thickness 80 µm.</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 13
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Finish coats:
2 pack solvent free epoxy paint dry film thickness 150 µm per coat.
In case of service or potable water tanks, the coating material selected shall not taint the water.
QA / QC procedure, including pinhole inspection, for shall be submitted for approval by Owner / Owner's Representative.

13.3.1.7.3.2 **Rubber Lining of Pipes, Valves and Tanks as specified in relevant sections.**

At works

Pre-treatment:

Blasting according standard 2¹/₂ to ISO 8501-1: 1988.

Rubber lining:

Hard-rubber 5mm for DM water applications, thickness greater than or equal to 3 mm for others. In case of failure of rubber lining for both pipes and vessels, the rubber lining shall be replaced by COROCOAT

13.4.0 **Painting for Electrical Items**

13.4.1 All the steel work shall be thoroughly cleaned of rust, scale, oil, grease, dirt and scarf by pickling, emulsion cleaning, etc. The sheet steel shall be phosphated / oven dried and then painted with two coats of zinc rich primer paint. After application of the primer, two coats of finishing synthetic enamel paint shall be applied. The colour of the finishing coats inside shall be glossy white and exterior of the treated sheet steel shall be shade 631 of IS-5 / RAL 7032 for all switchboard/MCC/ Distribution boards, control panels, etc.

13.4.2 All electrical equipment shall be given tropical and fungicidal treatment and outdoor equipment shall be provided with rain hood to prevent entry of rain water into the equipment.

13.5.0 **Painting for I & C equipment: Epoxy coating required for all I&C equipment.**

13.5.1 **Suggested Colour Codes for Painting**

Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS - 5

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED				VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS				SHEET 12 OF 14
13.5.1	Structures, platforms, galleries, ladders and handrails.	Dark Admiralty Grey	632	-	-
13.5.2	Boiler casing, ducting	Nut Brown	413	-	-
13.5.3	Crane				
(a)	Crane structure	Golden Yellow	356	Black	-
(b)	Trolley and hook	Crimson	540	-	-
13.5.4	Pump motors, compressors	Light Grey	631	-	-
13.5.5	Tanks (without insulation and cladding)				
(a)	Outdoor	Aluminium	-	-	-
(b)	Indoor	Light Grey	631	-	-
13.5.6	Vessels and all other proprietary equipment (without insulation and cladding)	Light Grey	631	-	-
13.5.7	Switchgear	Light Grey	631	-	-
13.5.8	Control and relay panels	Light Grey	631/ 7078 of IS1650	-	-
13.5.9	Turbines	Light Grey	631	-	-
13.5.10	Generators and exciter	Light Grey	631	-	-
13.5.11	Transformers	Aluminium	-	-	-
13.5.12	Machinery guards	Signal red	537	-	-
13.5.13	Piping (Without insulation and cladding)				
(a)	Water System				
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED				VOLUME II SECTION – C 13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS				SHEET 13 OF 14
(i)	Boiler feed	Sea Green	217	-	-
(ii)	Condensate	Sea Green	217	Light Brown	410
(iii)	DM Water	Sea Green	217	Light Orange	557
(iv)	Soft Water	Sea Green	217	French Blue	166
(v)	Bearing cooling water	Sea Green	217	French Blue	166
(vi)	Potable and filtered water	Sea Green	217	French Blue	166
(vii)	Service and clarified water	Sea Green	217	French Blue	166
(viii)	Cooling water	Sea Green	217	French Blue	166
(ix)	Raw water	Sea Green	217	White	-
(b)	Air system				
(i)	Station air	Sky Blue	101	-	-
(ii)	Control air	Sky Blue	101	White	-
(c)	Oil system				
(i)	Light oil (HSD)	Light Brown	410	French blue	166
(ii)	Lubricating oil	Light Brown	410	Light grey	631
(iii)	Transformer oil	Light Brown	410	Light Orange	557
(d)	Gas system				
(i)	Fuel gas (Re-gassified LNG)	Canary Yellow			
(ii)	Carbon dioxide	Canary Yellow	309	Light grey	631
(iii)	Hydrogen	Canary Yellow	309	Signal red	537
(e)	Fire Services	Fire red	536	-	-
(f)	Effluent pipes	Black	-	-	-
(g)	Vacuum pipes	Sky Blue	101	Black	-
(h)	Drainage	Black	-	-	-
NOTES					
1.	This colour code basically refers to IS: 2379 for piping with necessary modifications.				
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	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan PAINTING REQUIREMENTS	SHEET 14 OF 14
<p>2. Where band colour is specified, same shall be provided at 10 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.</p> <p>Note: Bidder shall furnish his painting specification to suit corrosive atmosphere of coastal area along with the bid. The specification shall in general be in line with the above requirements.</p> <div data-bbox="1382 2018 1495 2101" style="border: 1px solid black; padding: 5px; text-align: center;"> ISSUE R0 </div>		

**RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.
2 x 660 MW SURATGARH SUPER CRITICAL TPS
UNIT # 7 & 8**

**ELECTRIC HOISTS
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT,
NOIDA, U.P., INDIA**

	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR ELECTRIC HOISTS 2 X 660 MW SURATGARH STPS	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION: C
		REV NO. : 00 DATE: 06/05/2014
		SHEET: 1 OF 1

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NOTE : Customer specification shall prevail in case of stringent requirement.



TECHNICAL SPECIFICATION FOR
ELECTRIC HOISTS
(ELECTRICAL PORTION)

SPECIFICATION NO.
VOLUME II B
SECTION-C
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SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER/ PURCHASER

- 1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure-I to Section – C [Scope of Work (Electrical)].
- 1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.
- 1.3 Bidder shall furnish all AC as well as DC loads required for the system at different voltage levels (e.g. 415V AC, 240 V AC, 220 V DC etc.) of all types, such as motor feeders, supply feeders in PEM format along with the offer. However AC supply provided by BHEL shall be 3phase, 3wire only. Any requirements of 3phase, 4 wire or 1 phase, 1wire shall be derived by vendor using BHEL supply of 3phase, 3wire.
- 1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions indicated in project information enclosed with the specification.
- 1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.
- 1.6 Technical requirements shall be as per specifications listed in Clause 3.1, 3.2, 3.3, 3.4 & 3.5 below.
- 1.7 As motor duty cycle is applicable as **S4** so Clause 1.2 of motor spec. (customer spec) to be read as: Conventional motors as per IS:325

2.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 2.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
 - a) A copy of this sheet "Electrical Equipment Specification for Electrical Hoists" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
 - b) Electrical load requirement in the load data format.
- 2.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

3.0 LIST OF ENCLOSURES

- 3.1 Electrical scope between BHEL & vendor (Annexure-I).
- 3.2 Technical specification no. PE-SS-999-506-E101 including motors Data Sheets C & Datasheet-A for 415V Electric Motors.
- 3.3 Technical specification no. PES-507-27 for conduits and pipes.
- 3.4 Quality Plan for motors below 55kw.
- 3.5 Load data format (Annexure-II).
- 3.5 TCE spec for Suratgarh project for following packages:

SECTION D13: MOTOR AND ACTUATOR

SECTION D15: CONTROL PANEL/STARTER PANEL/JB/PB

SECTION D16: CABLES AND CABLE CARRIER SYSTEM

ANNEXURE – I TO SECTION – C: STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR
PACKAGE: ELECTRIC HOISTS
PROJECT: 2X660 MW SURATGARH STPS)

S.NO	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415V Switchgear (incoming supply upto vendor's isolator/changeover switch)	BHEL	BHEL	BHEL will provide only 415V, 3-phase supply. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Control Panel	Vendor	BHEL	
3	Power cables, ordinary control cables between equipment supplied by vendor.	Vendor	BHEL	
4	Supporting system/arrangement for cables between vendor's equipments and for vendor supplied cables if any.	Vendor	BHEL	
5	Motors	Vendor	---	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	---	Cable listing for C & I systems for vendor supplied equipment shall be furnished during detail engineering by vendor in soft copies in the BHEL cable schedule format.
8	Equipment layout drawings	Vendor	---	
9	Electrical Equipment GA drawing	Vendor	---	For necessary interface review.



TITLE

LV MOTORS

DATA SHEET-A

SPECIFICATION NO.

VOLUME II B

SECTION

C

REV NO. 00

DATE 06.05.2014

SHEET 1 OF 1

- | | | | |
|------|--|---|---|
| 1.0 | Design ambient temperature | : | 50 °C |
| 2.0 | Maximum acceptable kW rating of LV motor | : | <160KW |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required |
| 4.0 | Degree Of Protection | : | IP55 - Outdoor
IP54 – Indoor |
| 5.0 | Cooling | : | TEFC |
| 6.0 | Details of supply system | | |
| | a) Rated voltage (with variation) | : | 415V ± 10% |
| | b) Rated frequency (with variation) | : | 50 Hz (Variation: +5% TO –5%) |
| | c) Combined voltage & freq. variation | : | 10% (sum of absolute values) |
| | d) System fault level at rated voltage | : | 50 kA for 1 sec |
| | e) Short time rating for terminal box | : | 50 kA for 0.25 sec |
| | f) LV System grounding | : | Solidly |
| 7.0 | Class of insulation | : | Class 'F', with temp rise limited to class B. |
| 8.0 | Minimum voltage for starting
(As percentage of rated voltage) | : | 85% of rated voltage |
| 9.0 | Power cables data | : | Shall be given during Detailed engg. |
| 10.0 | Earth Conductor Size & Material | : | Shall be given during Detailed engg. |
| 11.0 | Rating up to which Single phase motor | : | Acceptable below 0.20 Kw |
| 12.0 | Locked rotor current | | |
| | a) Limit as percentage of FLC | : | 600% (inclusive of tolerance) |
| | b) Permissible tolerance, if any | : | - |
| 13.0 | Additional tests | : | As per QP |
| 14.0 | Flame-proof motor | | |
| | a) Enclosure suitable (As per IS:2148) | : | As per requirement |
| | b) Classification of Hazardous area
(As per IS: 5572 part-I) | : | As per requirement |
| | c) Degree of protection | : | IP65 |
| 15.0 | Makes | : | AS PER ANNEXURE-I |
| 16.0 | Terminal box | : | Suitable to rotate at 90 degrees |



TITLE

LV MOTORS**DATA SHEET-A**

SPECIFICATION NO.

VOLUME II B

SECTION

C

REV NO. 00

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SHEET 2 OF 1

17.0 Paint shade

:

Shade 631 of IS-5

All LT motors shall be controlled as follows:

- a) Up to 50kW: - MPCB + Contactor (MPCB shall be with adjustable S/C and O/L protection).
- b) 50kW to 90kW shall have MCCB+ contactor+ bimetallic relay.
- c) 90Kw to 160kW shall have ACB +motor protection relay (MPR).



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS


SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : **II-B**
SECTION : **D**
REV NO. : **00** DATE : 29/08/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 1 OF 4

1.0

INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0

CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0

DESIGN REQUIREMENTS

3.1

Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2

Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3


Starting Requirements


3.3.1


Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.


3.3.2


Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
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		SHEET : 2 OF 4
<p>The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.</p>		
<p>3.3.3 The following frequency of starts shall apply</p> <p>i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.</p> <p>ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)</p> <p>iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor</p>		
<p>3.4 Running Requirements</p>		
<p>3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.</p>		
<p>3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.</p>		
<p>3.5 Stress During bus Transfer</p>		
<p>3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.</p>		
<p>3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.</p>		
<p>3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.</p>		
<p>3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.</p>		
<p>4.0 CONSTRUCTIONAL FEATURES</p>		
<p>4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy</p>		
<p>4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.</p>		
<p>Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled</p>		
<p>4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.</p>		

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4.4.	Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.	
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	<p>In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.</p> <p>In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.</p>	
4.7	Terminals and Terminal Boxes	
4.7.1	<p>Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.</p> <p>Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".</p>	
4.7.2	unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	General	

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<p>4.9.1 Motors provided for similar drives shall be interchangeable.</p> <p>4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.</p> <p>4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.</p> <p>4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.</p> <p>4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.</p> <p>4.9.6 Name plate with all particulars as per IS: 325 shall be provided</p> <p>4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.</p> <p>5.0 INSPECTION AND TESTING</p> <p>5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.</p> <p>5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.</p> <p>5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.</p> <p>5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.</p> <p>6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT</p> <p>a) OGA drawing showing the position of terminal boxes, earthing connections etc.</p> <p>b) Arrangement drawing of terminal boxes.</p> <p>c) Characteristic curves: <i>(To be given for motor above 55 kW unless otherwise specified in Data Sheet).</i></p> <p>i) Current vs. time at rated voltage and minimum starting voltage.</p> <p>ii) Speed vs. time at rated voltage and minimum starting voltage.</p> <p>iii) Torque vs. speed at rated voltage and minimum voltage. For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.</p> <p>iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.</p>		

		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :				
				BIDDER/ VENDOR :		TITLE		NUMBER :				
		SHEET 1 OF 2		SYSTEM		QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01		SPECIFICATION TITLE			SECTION VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									

		QUALITY PLAN		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
		SHEET 2 OF 2		VENDOR		NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION :			
		SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			TITLE :			SECTION VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
<p>NOTES:</p> <p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER</p> <p>2. VENDOR (MOTOR MANUFACTURER)</p> <p>3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM</p> <p>W. WITNESS</p> <p>V. VERIFY</p>												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

SECTION D13

MOTOR AND ACTUATOR

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 1 OF 7
<p>1.0 <u>AC & DC MOTORS</u></p> <p>1.1. HT motors of rating above 1500kW shall be suitable for 11kV, 3 phase, 50Hz power supply. Motors above 160kW and up to 1500kW shall be suitable for 6.6kV, 3 phase, 50Hz. Motors rated 160kW and below shall be suitable for 415V, 3 phase, 50 Hz power supply.</p> <p>1.2. All LT motors shall be energy efficient class – I in line with IS: 12615. However, the starting current shall be limited to 600% (inclusive of 20% tolerance) of full load current.</p> <p>1.3. The motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment, whichever is higher, considering highest system frequency. Motors shall be capable of starting and accelerating the load with the applicable method of starting without exceeding acceptable winding temperatures when supply voltage is 80% of the rated voltage for HT motors and 85% for LV motors. HT motors shall also be capable of satisfactory operation at full load at a supply voltage of 80% of the rated voltage for 5 min. commencing from hot condition. DC motors shall be suitable for the DC system voltage of 220V. Motor shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range of 85% to 110% of rated motor voltage.</p> <p>1.4. Motors shall be capable of running for one second if the supply voltage drops to 70% of the rated voltage. If such operation is envisaged for a period of one second, the pull out torque of the motor shall be at least 205% of full load torque.</p> <p>1.5. Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 150% of the rated voltage during fast changeover of buses.</p> <p>1.6. Locked rotor current of the HT motors rated 1500 kW and below shall be limited to 600% (inclusive of 20% tolerance) of the full load current of the motors and motor rated above 1500 kW shall be limited to 450% (inclusive of 20% tolerance) of full load current of the motor.</p> <p>1.7. The locked rotor withstand time under hot condition at 110% rated voltage shall be more than the starting time at minimum permissible voltage specified above by at least three seconds or 15% of the accelerating time whichever is greater. Provision of speed switch shall be avoided to the extent possible.</p> <p>These motors shall be designed to withstand at least 5% harmonics in the supply voltage.</p> <p>1.8. The degree of protection for the motor enclosure (including terminal box) shall be IP-55 for outdoor. For single core cable termination, gland plates shall be of non-magnetic material. All motors located in hazardous area shall have flame proof enclosure.</p>		
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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 2 OF 7
<p>1.9. All HT motors shall be provided with vibration pads for mounting vibration detectors. Vibration monitoring devices shall be provided on DE and NDE side in X & Y direction with remote DCS monitoring, alarms and tripping</p> <p>1.10. Motors rated 1000kW and above shall be provided with differential protection. These motors shall be provided with star connected stator windings. The 3 nos. current transformers, one for each phase shall be mounted in a separate compartment in the neutral side terminal box. The three phases shall be connected to form the star point after they pass through the CTs. The CTs shall be of relay accuracy and the CT characteristics shall be compatible with the differential relay. The additional 3 nos. CTs of identical characteristics shall be provided in the 11kV/6.6 kV switchgear panel.</p> <p>1.11. The terminal box of motor shall be of suitable size, suitable to terminate and maintain the cables easily. Terminal box shall be suitable to rotate at 90 degrees.</p> <p>1.12. The ring oiling system shall be adequate for starting and continuous operation of the motor for at least one half hour without pressure oiling system in operation.</p> <p>1.13. For 11kV & 6.6 kV motors, 6-nos. duplex RTD s for winding shall be provided for remote monitoring, alarm and tripping at DCS. Each bearing shall be provided with one duplex RTD for temperature remote monitoring, alarm and tripping at DCS. 6 nos. spare RTDs shall be provided for winding in HT motors.</p> <p>1.14. The maximum double amplitude vibrations for motors shall be as per IS 12075.</p> <p>1.15. Maximum noise level measured at a distance of 1.5 meter from the outer surface of the motor shall not exceed 85 db (A).</p> <p>1.16. Cable boxes of all 11kV & 6.6 kV motors shall be Phase segregated & shall be provided with quick disconnecting type terminal connectors to facilitate easy disconnection and removal of the motors without requiring unsealing or otherwise disturbing the external cable connections and leaving the phase segregated terminal box intact. The terminal boxes shall have fault withstand capacity equal to at least rated short circuit level of system voltage for 0.25 sec. The terminal boxes shall be reversible to suit cable entry from top or bottom and suitable for termination of FRLS, XLPE armoured cables.</p> <p>1.17. The star connection side terminal box should have sufficient capacity to accommodate CT's for differential protection for motor above 1000kW.</p> <p>1.18. The insulation system for 11000 V AC & 6600 V AC motors shall withstand the negative or positive 0.3 / 3.0 microsecond wave (2.7 pu rated peak line to earth operating voltage) switching surges originating from non-effectively earthed power system. All 11000V AC & 6600 V AC motors shall have BIL and power frequency withstand voltage as per relevant standards.</p> <p>1.19. Motor bearing shall be insulated wherever required.</p> <p>1.20. All HT motors shall be with VPI insulation or better</p>		
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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 3 OF 7
<p>1.21. All HT motors / LT motors 15 kW and above shall be provided with external greasing arrangement</p> <p>1.22. CACW motor shall be provided with water leakage detector with remote alarms and tripping.</p> <p>1.23. All HT motors / LT motors 30 kW and above shall be provided with space heaters using 240 V AC supply. However, for all the actuators, irrespective of its rating, space heaters shall be provided using 240V AC supply.</p> <p>1.24. All motors below 15 kW shall be provided with sealed ZZ bearings</p> <p>1.25. Each motor shall have two earthing terminals.</p> <p>1.26. All motors for outdoor duty shall have detachable metal canopy.</p> <p>1.27. HT motors shall be designed for operation as follows:</p> <ol style="list-style-type: none"> Upto 1000kW – Vacuum circuit breakers/SF6. Above 1000kW-Vacuum circuit breakers/SF6. All motors shall be suitable for DOL starting. <p>1.28. Separate terminal boxes to be provided for space heater, RTDs for windings/bearings, vibration monitors etc. All terminal boxes shall be provided with two earth studs for termination of protective earth conductor. Double compression type brass cable glands and crimping type copper lugs shall be provided for termination.</p> <p>1.29. Provision shall be made at DCS to monitor, integrate running hours, nos. of starts and stop recording for all motors.</p> <p>1.30. The terminals of all motors shall be suitable for terminating Aluminium conductor, XLPE insulated, armoured cables, the sizes of which will be intimated by the Purchaser.</p> <p>2.0 <u>ACTUATOR</u></p> <p>2.1. GENERAL TECHNICAL REQUIREMENT</p> <p>2.1.1. Actuator shall be weatherproof type with enclosure conforming to IP-64 degree of protection. It should be suitable for out-door use without the need for canopy. If the IP-68 degree of protection is required due to occasional submergence, the purchaser shall specify the depth and duration of such submergence.</p> <p>2.1.2. The actuator shall be suitable for installation in any position without lubrication leakage or other operational difficulty.</p> <p>2.1.3. All actuators shall be supplied with non integral starters for open & close. The main gearbox of the actuator shall be special grease filled.</p> <p>2.1.4. Each actuator should have a hand wheel for emergency manual operation. Clockwise operation of hand wheel shall cause clockwise movement of the</p>		
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<p>output drive. The hand wheel shall be clearly marked with an arrow and the word CLOSE.</p> <p>2.1.5. The hand wheel shall automatically disengage when the power to the motor is restored i.e. power drive shall have a preference over manual drive.</p> <p>2.1.6. The manual effort should not exceed 400 N (push / pull). A top bevel gear set (side mounted hand wheel) shall be employed to reduce the manual effort.</p> <p>2.1.7. Each actuator shall have a local mechanical position indicator. It should be suitable to indicate 0 - 100% position of the valve (continuous type).</p> <p>2.1.8. In order to minimise the amount of spare parts required, parts and sub-assemblies limit / torque switches, limit switch counter gear assembly, torque switch drive assembly, mechanical position indicator assembly etc. individually interchangeable / replaceable throughout the models selected.</p> <p>2.1.9. The actuator shall be painted with corrosion resistant epoxy resin paint. Paint shade shall be Grey (Shade 631) as per IS-5.</p> <p>2.1.10. In order to prevent condensation, a space heater shall be provided in the switch compartment, suitable for continuous operation. Actuator mounting dimensions shall be according to ISO-5210. For rising stem applications, the design must allow the removal of actuator from the output drive without disturbing the function of valve.</p> <p>2.2. LIMIT AND TORQUE SWITCHES</p> <p>2.2.1. Independent torque and limit switches shall be provided in the actuator. A minimum of two position limit switches and two torque switches, one each for each direction of travel, having 4 NO + 4 NC potential free contacts, shall be supplied. If called for in the data sheet, two additional limit switches shall be provided for intermediate positions.</p> <p>2.2.2. Torque switch dial shall be graduated directly in "kg-m" for easy setting to desired value within the range specified. Separate dials shall be provided for CLOSE and OPEN torque switches.</p> <p>2.2.3. Two additional limit switches with 2NO + 2NC contacts, each adjustable at any intermediate position, shall be provided in the actuator.</p> <p>2.2.4. The rating of both torque and limit switches shall be 240 V AC, 5 Amps. The switches shall individually be enclosed to a minimum of IP-64 protection class.</p> <p>2.2.5. Torque and limit switches shall have only stainless steel flaps for better protection against environmental condition.</p> <p>2.2.6. Limit switches shall be operated by gear driven cams, which are mechanically linked to the driving devices. The counter gear used for counting and tripping the limit switches shall be of metallic construction like brass etc. No plastic gearing shall be allowed.</p>		
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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 5 OF 7
<p>2.2.7. To guarantee proper function under high ambient temperatures, torque and limit switch sensing shall be of mechanical type.</p> <p>2.3. ELECTRIC DRIVE FOR ACTUATOR (MOTOR)</p> <p>2.3.1. All motors shall be specifically designed for valve actuator operation, which is characterised by high starting torque, low stall torque & low inertia. All motors shall be high starting torque type to facilitate 'unseating' of valve.</p> <p>2.3.2. Motor shall be suitable for power supply of 415 V, 3 ph, 50 Hz, AC.</p> <p>2.3.3. Motor shall be squirrel cage induction type and shall generally conform to IS-325.</p> <p>2.3.4. Motor shall have minimum class 'F' insulation with temperature rise restricted to class 'B' under the design ambient temperature.</p> <p>2.3.5. Motor shall be of totally enclosed surface cooled (TESC) type with IP-67 protection class after mounting on actuator.</p> <p>2.3.6. Motor shall have three thermostats connected in series, one in each phase of stator winding, for protection against overheating.</p> <p>2.3.7. Motor shall be suitable for operation under voltage variation of + 10%, frequency variation of + 5% and combined voltage & frequency variation of 10% absolute.</p> <p>2.3.8. Motor shall be suitable for direct on-line (DOL) starting and starter shall be non integral to the motor.</p> <p>2.3.9. It should be possible to separate the motor from the lubricant filled gearing of the actuator allowing easy replacement of motor without losing any lubricant regardless of mounting position.</p> <p>2.3.10. Finish shall be provided on the motor body to ensure better heat dissipation.</p> <p>2.3.11. It shall be possible to change the output rpm of the actuator, if required, at the site at a later date, without hampering the mounting arrangement and loss of any lubricant.</p> <p>2.4. CODES & STANDARDS</p> <p>All the equipment specified herein shall comply with the requirements of the latest issue of the relevant National & International standards.</p> <p>The design and materials used for the components shall also comply with the relevant National & International standards.</p> <p>As a minimum requirement, the following standards shall be complied with :</p> <p>Electric motor operated actuators:IS 9334</p>		
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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 6 OF 7
<p>Degrees of protection provided by enclosures at low:IS 2147 voltage switch gear and control gear</p> <p>Flame Proof enclosure at electrical apparatus:IS 2148 Specification for three phase induction motors:IS 325</p> <p>AC contactor for voltages not exceeding 1000 V:IS 2959</p> <p>Degree of protection provided by enclosures for :IS 4691 Rotating electrical machinery</p> <p>Specification for rotating electrical machines:IS 4722 For other code refer Section D28.</p> <p>2.5. OTHER REQUIREMENTS OF ACTUATOR.</p> <p>2.5.1. Common potential free contact shall be available to annunciate the fault condition to the remote control station or DCS.</p> <p>2.5.2. The following individual relay / potential free contacts shall be provided for the remote indication:-</p> <ul style="list-style-type: none"> – Actuator OPEN. – Actuator CLOSE – Actuator fault feed-back – Thermal overload relay shall be provided to trip the actuator in case of overload <p>2.6. The DC and AC actuator shall be provided with accessories viz., Torque limit switch, end of travel switch, adjustable limit switch, hand wheel motor, thermostat, etc. Complete actuator shall be tested at factory as per IS 9334. All actuators should have minimum 2 limit switches for each position, and should have position transmitters wherever required.</p> <p>3.0 TESTS</p> <p>3.1. All routine & acceptance tests as per relevant IS shall be conducted on motors. For all AC and DC motors of rating below 100kW, type test certificates shall be furnished. If the test reports are not found in order by Purchaser then these tests shall be conducted by the Vendor without any cost implication.</p>		
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<p>3.2. Type test shall be carried out on one no. of each type and rating of motor of rating 100kW and above, which shall be witnessed by Purchaser.</p> <p>3.3. Efficiency and loss measurements shall be done for all LT motors as per relevant standard (Being energy efficient motors.) as routine test.</p> <p>3.4. For 11000V AC & 6600V AC motors, in addition to all the tests specified above, polarisation index test shall be carried out as a routine test on each motor (the minimum value of polarisation index for all motors shall be 2 when determined according to IS: 7816).</p> <p>3.5. Noise level measurement test shall be conducted on one motor of each type.</p> <p>3.6. Vibration measurement shall be taken for each motor of 45kW & above.</p> <p>3.7. Dielectric tests to establish the insulation withstand level of motors as indicated above shall be performed on a sample coil (identical to those to be used in the motor quoted for) for each type of motor. These tested sample coils shall not be used in the motors to be supplied.</p> <p>4.0 For technical particulars refer datasheet-A.</p>		
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Sr. No.	Descriptions	Unit	Client specification
1.	Applications		*
2.	Manufacturer		*
3.	Frame Size		*
4.	Quantity		*
5.	Model No. of motor		*
6.	Supply Conditions		*
	(a) Allowable variation in		*
	(i) Voltage AC/DC	%	$\pm 10/ +10\%$ to -15%
	(ii) Frequency	%	± 5
	(iii) Combined	%	10
	(b) Permissible unbalance in supply voltage		*
7.	Speed	rpm	*
8.	Rated voltage a)HT motors b)LT motors c)UPS supplied d)Single phase e)DC motors		a)11000V & 6600V AC b)415V AC c)230V AC d)240V AC e)220V DC
9.	Number of phase		3-Phase
10.	Rated frequency for AC motor	Hz	50
11.	Normal winding connection	Star / Delta	*
12.	Method of starting a)AC motors b) DC motors		a)DOL (preferably) b) Resistance start
13.	Temperature rise above ambient of 50 deg. by Resistance method	Deg. C	HT motors – Shall be limited to Class B LT motor – Class B

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A MOTOR & ACTUATOR	SHEET 2 OF 6

Sr. No.	Descriptions	Unit	Client specification
14.	Type of rotor (Slip ring/ squirrel cage)		Squirrel cage
15.	Type of duty		*
16.	Duty designation		*
17.	Synchronous speed a) Constant speed b) Variable speed (for VFD)		*
18.	Starting time at specified minimum starting voltage	Sec	*
19.	Starting torque	% of FLT	*
20.	Pull out torque	% of FLT	*
21.	Class of insulation		HT motors- Class F LT motors including actuator motors-Class F.
22.	Ref. Ambient temperature	deg. C	50
23.	Location considered – Hazardous area division		*
24.	Installation		
24.1.	Location		Indoor/Outdoor
24.2.	Hazardous area division (IS:5572 or equivalent)		*
24.3.	Atmosphere considered- Chemical/Dusty/Salt laden		*
25.	Type of cooling (IS: 6362) LT motors HT motors		TEFC TEFC / TETV / CACW

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A MOTOR & ACTUATOR	SHEET 3 OF 6

Sr. No.	Descriptions	Unit	Client specification
26.	Degree of protection		IP 55 – Outdoor IP 54 - Indoor
27.	Rotation as seen from Non-drive end		Clockwise/Anti-Clockwise
28.	Main terminal box		
28.1.	Terminal box Short time rating a) HT for 0.25 sec b) LT for 0.25 sec Dynamic rating a) HT b) LT	KA KA KA peak KA peak	40 (minimum) 50 (minimum) 102 (minimum) 127.5 (minimum)
28.2.	Location as seen from non- drive end:		TOP/RIGHT/LEFT
28.3.	Phase Segregated	YES/N O	*
28.4.	Terminal box degree of rotation	Degree	90
29.	Weather motor is suitable for VFD drive		*
30.	Details of bearing		*
31.	Color shade of paint		Shade 631 of IS-5
32.	Whether CT for differential protection required		*
32.1.	C.T. PARTICULARS :		
32.2.	3 CTs, one in the neutral lead of each phase		
32.3.	Ratio		
32.4.	Class	PS	

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A MOTOR & ACTUATOR	SHEET 4 OF 6

Sr. No.	Descriptions	Unit	Client specification
32.5.	Knee point voltage	KPV	*
32.6.	MAX. R.C.T. secondary winding resistance	OHMS	*
32.7.	MAX. exciting current AT 1/2 KPV		*
32.8.	Class of Insulation		*
33.	Whether vibration detectors required		*
34.	Details of winding / space heaters		*
35.	Guaranteed Efficiency of motor a) At full load b) At duty point c) At no load		*
36.	Guaranteed Power factor of motor a) At full load b) At duty point c) At no load		*
37.	Current at a) Starting b) Full load c) Duty point d) Full load & 70 % of rated supply voltage.		*
38.	Quantity & type of temperature detectors for all HT motors a) Winding hot spot b) Bearing		Minimum 6 Duplex RTD Minimum two thermocouple per bearing.
39.	Details of accessories a) Fans		*

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A MOTOR & ACTUATOR	SHEET 5 OF 6

Sr. No.	Descriptions	Unit	Client specification
	b) Temperature gauge c) Bearing d) Cooling motors e) Cooling water parameters f) Heaters g) Lube oil system details		
40.	Maximum size & number of cables that can be accommodated in motor terminal box.		*
41.	Thermal capability curve to be attached		*
42.	Relay co-ordination guide to be attached.		*
43.	Min. voltage required under starting conditions to accelerate driven equipment to rated speed.	Volts	*
44.	Locked rotor current withstand time (safe stall time) at 110 % rated voltage a) At rated temp. (hot) b) When cold	sec sec	*
45.	Stator thermal time constant	sec	*
46.	Permissible no. of equally spread starts per hour a) Normal service conditions b) In quick succession with cold M/C at room temp. c) Hot restarts		*
47.	Method of Starting and maximum starting current inclusive of tolerances AC HT Motors a) DOL		450 % above 1500 kW & 600 % all other.

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A MOTOR & ACTUATOR	SHEET 6 OF 6

Sr. No.	Descriptions	Unit	Client specification
	b) Soft starters		*
	AC LT Motors		
	c) DOL		600 %
	d) Star Delta		200 %
	e) Star Delta with series resistance		200%
	f) Soft Starters		*
	DC Motors		
	a) Resistance starting		200%
	b) Soft starters		200%
	c) Any other		*

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION:D13	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-B MOTORS & ACTUATORS			SHEET 1 OF 6
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
SL. NO.	DESCRIPTION	UNITS	BIDDERS DATA		
1.0	Application				
2.0	Manufacturer				
3.0	Country of Origin				
4.0	Applicable Standards				
5.0	Efficiency Category(For Energy Efficient Motors only)				
6.0	Rated a) Output b) Speed c) Frame size	kW RPM			
7.0	Type of Duty (IS 325 or equivalent)				
8.0	Supply Conditions				
	(a) Allowable variation in				
	(i) Voltage AC/DC				
	(ii) Frequency				
	(iii) Combined				
	(b) Permissible unbalance in supply voltage				
NOTES TO BIDDER 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; width: 100px; height: 100px; margin-left: auto; margin-top: 20px; display: flex; align-items: center; justify-content: center;"> ISSUE R1 </div>		

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION:D13	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-B MOTORS & ACTUATORS			SHEET 2 OF 6
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
9.0	Guaranteed Efficiency of motor a) At full load b) At duty point At no load				
10.	Guaranteed Power factor of motor a) At full load b) At duty point At no load				
11.0	Current at a) Starting b) Full load c) Duty point Full load & 70 % of rated supply voltage.				
12.0	Rated voltage a)HT motors b)LT motors c)UPS supplied d)Single phase e)DC motors				
13.0	Number of phase				
14.0	Rated frequency for AC motor	Hz			
15.0	Normal winding connection	Star / Delta			
NOTES TO BIDDER 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; padding: 5px; width: 100px; float: right;"> ISSUE R1 </div>		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION:D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-B MOTORS & ACTUATORS		SHEET 5 OF 6
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
39.0	Permissible no. of equally spread starts per hour a) Normal service conditions b) In quick succession with cold M/C at room temp. c) Hot restarts		
40.0	Method of Starting and maximum starting current inclusive of tolerances AC HT Motors a) DOL b) Soft starters AC LT Motors c) DOL d) Star Delta e) Star Delta with series resistance f) Star Delta with rotor resistance g) Soft Starters DC Motors a) Soft starters b) Any other	450 % above 1500 kW & 600 % all other. 200 % .600 % 200 % 200% 200% 200% 200% 200%	
<u>NOTES TO BIDDER</u> 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; width: 100px; height: 100px; margin-left: auto; margin-top: 20px; position: relative;"> <div style="position: absolute; top: 0; right: 0; width: 50px; height: 50px; border: 1px solid black; text-align: center; font-size: 10px;"> ISSUE R1 </div> </div>	

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATASHEET-C MOTORS & ACTUATORS	SHEET 1 OF 1

**DATA TO BE FURNISHED BY THE CONTRACTOR DURING DETAIL
ENGINEERING**

- Motor outline dimension drawing
- Type test certificates
- Speed torque curve at rated & minimum starting voltage superimposed with the speed-Torque
- characteristic of the load.
- Current - speed curve.
- Current - time curve.
- Efficiency, power factor, slip, current against output curve
- Thermal withstand characteristic for motors of 100 kW & above - Hot & Cold
- Negative sequence current Vs time curve for motor of 100 kW & above.
- Motor Data sheet
- GA of all Terminal Boxes

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SECTION D15

CONTROL PANEL/STARTER PANEL/JB/PB

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan CONTROL PANELS / STARTER PANEL /JB / PB	SHEET 1 OF 4

1.0 **CONTROL PANELS & CABINETS AND MISCELLANEOUS ELECTRICAL EQUIPMENT**

- 1.1. Indoor control panels provided for control of miscellaneous systems in the plant viz., CW System, Coal Handling System, Ash Handling System, RW System, DM Plant, Compressor control, cooling control system, lube oil system, EOT crane and Hoist electrics, trolley lines and power supply arrangement, Electrics for ventilation, air-conditioning, DG AMF Panel, etc. as applicable shall comply with the requirements outlined under clause 1.8 below.
- 1.2. All the meters provided on the panel shall be digital type meters in 96 W x 48H with accuracy class better than 1.
- 1.3. For motor circuits, ammeters shall have a suppressed extended scale to indicate the motor starting current.
- 1.4. The facia annunciation windows if provided on the panel, shall conform to requirements outlined under instrumentation and control section.
- 1.5. All live parts shall be provided with at least phase to phase & phase to earth clearances in air of 25mm & 20mm respectively.
- 1.6. The required 240 V, 1 phase AC supply required for panel illumination and receptacle shall be derived in the control panel itself. However 240V, 1 Phase AC supply for space heating of panel shall be fed from a separate 1-Phase ACDB.
- 1.7. **Technical Requirements**

SI. NO.	DESCRIPTION	REQUIREMENTS
1.0	Location	Indoor/Outdoor depending on location
2.0	Type of mounting	Wall/Floor
3.0	Cable entry	Top/bottom depending on layout
4.0	Paint Finish: Outside/Inside	Siemens Grey RAL 7032/ /Glossy white.
5.0	Supply voltage	415V, 3 phase, 3 wire/4 wire
6.0	Control transformer	By Vendor to derive 110V control supply
7.0	Space heater, lighting supply voltage	240V, 1 phase AC
8.0	Degree of protection of	Non-AC rooms-IP 54 class

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan CONTROL PANELS / STARTER PANEL /JB / PB		SHEET 2 OF 4

	Enclosure for Electrical panels/cabinet enclosure	AC rooms- IP 42 class Outdoor-IP 55 class plus canopy
9.0	Sheet steel thickness	Cold rolled sheet steel not less than 2.5mm for front & rear & 2mm for side, top & bottom portion with gland plate of 3mm thick.
10.0	Name plate	Black letter engraved on stainless steel plate. Should indicate the tag number and description of the service.
11.0	Door/Cover	Shall be pad lockable.
12.0	Safety	All live parts shall be shrouded. No live parts shall be accessible after opening the door/cover. Danger warning plates to be provided. Doors shall be pad lockable and interlocked with Power switch.
13.0	Earthing	2 earthing terminals to be provided for connection to the grid.
14.0	Wiring	Refer specification , Section on panel wiring

2.0 Following miscellaneous equipment shall be included in BIDDER's scope.

2.1 Starter Panel for DC Motors

2.2 Local push button stations.

2.3 Junction boxes (JBs)

2.4 Danger boards

2.5 Rubber mats

3.0 **STARTER PANEL FOR DC MOTORS**

3.1 Starter panel when included in motor Bidder's scope shall meet the following requirements.

3.2 The constructional features of these panels shall be as per cl.no.1.8 above. Please also refer to Section D.10.

4.0 **LOCAL PUSH BUTTON STATIONS (LPB)**

4.1 Local push button station shall be provided for all the drive motors of the plant (415V motors & 6.6kV/11kV motors) (start / stop push buttons for unidirectional motors, start/stop/reverse push buttons for bi-directional motors & only start push button for emergency motors) as per scheme requirement.

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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan CONTROL PANELS / STARTER PANEL /JB / PB	SHEET 3 OF 4
<p>4.2. Start/ Forward/ Open PBs shall have green coloured actuator and Stop/Reverse/Close PBs shall have Red coloured actuator.</p> <p>4.3. The degree of protection of LPBs shall be IP65 with both canopy and lid for outdoor and IP54 with lid and hinged door for indoor applications.</p> <p>4.4. All PBs shall be push to actuate type.</p> <p>4.5. Emergency local stop push button should be lockable in the STOP position. Emergency push buttons shall be stay put type</p> <p>4.6. All push buttons shall be provided with 2 nos. NO and 2 nos. NC contacts for various interlocking purposes. One contact of stop PB shall be directly wired to the switchgear module for direct tripping and another contact to control system.</p> <p>4.7. Terminal block of stud type are to be provided in the LPB station. Terminals to be suitable for 2 cores of 2.5 sq mm conductors with 20% spare terminals.</p> <p>4.8. All LPBs shall be of Poly Carbonate/ FRP/Di-cast aluminium.</p> <p>4.9. Name plate with Tag number and description of the service controlled by the LPB shall be provided on the front.</p> <p>4.10. LPBs shall be suitable for wall/column mounting. Covers shall be provided with captive screws.</p> <p>4.11. The Cable size to be used for LPB connection shall take in to account the voltage drop in the cable between the LPB and the Switchgear/MCC/DCS.</p> <p>5.0 <u>JUNCTION BOXES (JBs)</u></p> <p>5.1. Junction boxes as required for the power plant shall be supplied :</p> <p>5.2. The JBs used in outdoor areas shall be weatherproof type and coated with epoxy paint. enable running a large core cables from (JB/MB) to control panels, terminal cabinets, etc.</p> <p>5.3. All JBs, shall be of polycarbonate /FRP/ Di-cast aluminium.</p> <p>5.4. Danger boards shall be provided in line with the statutory requirements.</p> <p>5.5. Rubber mats shall be provided to meet the safety and other statutory requirements.</p> <p>5.6. Spacing of 250 MM between two rows of Terminal blocks and between the gland plate and the bottom most terminal block to be provided.</p> <p>5.7. Gland plate to be of removable type and made out of 3 mm thick sheet steel.</p> <p>6.0 <u>TESTING</u></p> <p>The following testing shall be conducted on all equipments at works and necessary test certificates shall be furnished.</p> <p>(a) IR (Insulation resistance) test before and after HV test.</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan CONTROL PANELS / STARTER PANEL /JB / PB	SHEET 4 OF 4
<p>(b) HV test at 2.5kV for 1 Minute.</p> <p>(c) Electrical Functional test.</p> <p>(d) Mechanical operation of the components.</p> <p>(e) Visual check for compliance as per approved drawings.</p> <p>Note: The international standards such as IEC, which are equivalent to IS, may also be applicable for the above mentioned testing.</p> <p>7.0 <u>DATA TO BE FURNISHED BY THE BIDDER</u></p> <p>7.1 Experience list for the Control panels, JBs offered.</p> <p>7.2 Descriptive literature/pamphlets on the equipment offered.</p> <p>8.0 For technical particulars refer datasheet-A.</p>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION:D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET B CONTROL PANELS		SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
9.0	(a) Material of conductor and size (b) Conductor – Panel details (a) Mounting (b) Weight (c) Dimension (approx.) L X B X M (d) Cable entry	Cu/Al mm ² solid/Stra nded Wall/floor Kg Mm Top/ bottom	
NOTES TO BIDDER 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; width: 100px; height: 100px; margin-left: auto; margin-top: 20px; text-align: center;"> ISSUE R1 </div>	

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D 15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATASHEET-C CONTROL PANEL	SHEET 1 OF 1

DATA TO BE FURNISHED BY THE VENDOR AFTER AWARD OF CONTRACT

- 1.0 Following data shall be submitted within 3 months after placing the order.
- 1.1 Schematic diagram indicating terminal numbers for external connections and with a Bill of Material for all the equipment.
- 1.2 Control cabinet drawing showing outline dimensions, cable entry openings, floor / wall / pedestal fixing arrangements, padlocking arrangement, weights.
- 1.3 MANUFACTURER'S technical literature on various equipments mounted on control cabinet.
- 1.4 Cabinet internal wiring diagram (This drawing shall be submitted only for information and records and shall be based on a approved schematic drawing. The correctness of this drawing shall be the responsibility of the VENDOR).
- 1.5 Test certificates for the control cabinet and the various equipments.
- 1.6 General Arrangement and Mounting arrangement drawing clearly indicating openings for cable entry, details of terminations etc.
- 1.7 Calculations for the resistor in the starter panel (for DC motor) shall be submitted

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SECTION D16

CABLES AND CABLE CARRIER SYSTEM

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D16
PART B	RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan CABLE & CABLE CARRIER SYSTEM	SHEET 1 OF 9
<p>1.0 <u>CABLES</u></p> <p>1.1 H T POWER CABLES</p> <p>System cables shall be 11kV (UE) and 6.6 kV (UE) grade suitable for use in medium resistance earthed system, stranded & compacted aluminium conductor, extruded semi conducting screen over conductor, XLPE insulated, semi-conducting followed by copper tape screened, extruded PVC Type ST – 2 inner sheathed, aluminium/GS wire armoured, overall FRLS PVC outer sheathed, conforming to IS 7098 (Part II), IEC-502 for constructional details and tests.</p> <p>1.2 L T POWER CABLES</p> <p>LV Power Cables shall be 1100 V grade, single / multi core, stranded aluminium conductor, XLPE insulated, with PVC inner sheath, armoured and outer sheath made of FRLS PVC compound, generally conforming to IS 7098 (for XLPE). The cables used for DC system shall be of single core type. Minimum conductor cross section of power cables shall be 6-sq. mm for aluminium cables.</p> <p>1.3 CONTROL CABLES</p> <p>Control cables shall be 1100 V grade, multi core, minimum 1.5 sq. mm cross section, stranded copper conductor having minimum 7 strands, PVC insulated, PVC inner sheathed / galvanised steel wire armoured, overall FRLS PVC outer sheathed generally conforming to IS 1554 Part-I. In situations where accuracy of measurement or voltage drop in control circuit warrants, higher cross sections as required shall be used.</p> <p>1.4 INSTRUMENTATION CABLES</p> <p>The instrumentation cables shall be Annealed, tinned stranded copper conductor, 0.5 sq mm , twisted into pairs, overall screened (I1 type) for digital signals, individual and overall screened (for I2 type) for low level analog signals, individual triplet and overall screened (type I3), PVC insulated , inner PVC sheathed, GS wire armoured and overall sheathed with FRLS PVC. The insulation shall be strippable manually as well as by mechanical stripping devices without damage to the conductor.</p> <p>1.5 TRAILING POWER AND CONTROL CABLES FOR MOBILE EQUIPMENT.</p> <p>11 kV(UE) and 6.6 kV (UE) and 1100V-(E) grade power & control flexible trailing, annealed tinned copper conductor, EPR insulated, EPR inner sheathed, CSP outer sheathed and shall have conductor screen of rubber. Cables shall conform to IS requirements and any other applicable standards.</p> <p>1.6 FIRE SURVIVAL CABLES</p> <p>1.6.1 Power and control, single/multi, stranded copper conductor fire survival cables complying with IEC-60331 shall be provided for following systems as per CEA guidelines.</p>		
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SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D16
PART B	RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan CABLE & CABLE CARRIER SYSTEM	SHEET 2 OF 9
<p>(a) DC emergency lube oil pumps</p> <p>(b) DC seal oil pumps</p> <p>(c) DC emergency lighting cables for main building</p> <p>(d) Batteries to chargers and DC distribution boards</p> <p>(e) Turbine lube oil pumps</p> <p>(f) Jacking oil pumps</p> <p>(g) Emergency turbine trip by pushbutton in control room</p> <p>(h) Boiler Turbine: Generator inter trip which includes the interconnecting cables between:</p> <ul style="list-style-type: none"> – Boiler master fuel trip and turbine trip relays – Generator trip relays and turbine trip relays – Generator trip relays and 400kV breakers – Generator trip relays and generator field breakers – Generator trip relays and ST and UT breakers <p>1.6.2 FS cables shall have following properties:</p> <p>(a) Excellent fire resistance characteristics</p> <p>(b) Cables shall have features of nontoxic and low smoke generation</p> <p>(c) Flame non-propagation property</p> <p>(d) Ability to withstand burning & continue to function during and after fire</p> <p>(e) Low smoke emission & low halogen property to maintain circuit integrity to essential services under severe fire condition.</p> <p>1.6.3 Construction of FS cables</p> <p>(a) Conductor- Copper stranded</p> <p>(b) Fire proof layer- heat barrier based</p> <p>(c) Insulation- elastomer rubber</p> <p>(d) Fire proof layer- same as 2 above but optional – natural or synthetic, fibre or elastomer</p> <p>(e) Filler- suitable filler optional</p> <p>(f) Binder tape – two layers of glass fibre tape</p> <p>(g) Inner sheath- HOFR FRLS elastomer (heat & oil flame retardant)</p> <p>(h) Armouring/screening – suitable wire</p> <p>(i) Over all sheath – HOFR FRLS</p>		
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<p>1.7 Cables for the fire detection and alarm system and communication system shall be as described else where.</p> <p>2.0 <u>CABLE PROPERTIES</u></p> <p>2.1 All single core power cables shall have wire / strip armouring of aluminium, whereas multi core power cable shall have galvanised steel wire / strip armouring.</p> <p>2.2 The sheath shall be resistant to water, UV radiation, fungus, termite and rodent attack.</p> <p>2.3 The outer sheath of FRLS PVC compound shall meet the following performance requirements:</p> <p>(a) The critical oxygen index value shall be minimum 29 when tested at 27± 2°C as per ASTM-D-2863-77 and the temperature index shall be minimum 250°C at oxygen index value of 21 when tested as per ASTM-D-2863.</p> <p>(b) The maximum acid gas generation as determined by titration method shall be less than 20% by weight when tested as per IEC-60754-1 (1994). Halogen acid content in outer sheath in FS cables shall not be more than 2%.</p> <p>(c) Flammability</p> <p>(i) Cables shall pass tests under fire condition as per IS-10810-Part-53.</p> <p>(ii) Cables shall also pass tests as per IS-10810 Part-61 & Part-62. Category group shall be considered as Category 'A'.</p> <p>(iii) Fire survival cables in addition to tests (i) and (ii) above shall pass tests as per IEC-331.</p> <p>(d) The smoke generation under fire shall have maximum smoke density rating of 60% when tested as per ASTM-D-2843-77 (1977). Smoke density in FS cables shall not exceed 20%.</p> <p>(e) The cables shall pass the ultraviolet tests as per DIN 53387.</p> <p>(f) The cables shall pass the tests for Water absorption tests as per IS 10810.</p> <p>2.4 The finished cable shall pass the flammability test as per IEC-322-1 (1993) and IEEE-383. In addition, it shall also pass flammability test as per Class F3 of Swedish Standard SS-424-1475 (1977).</p> <p>2.5 In addition, cables for devices mounted on or near hot surfaces of Steam Generators, Turbine Generators, Main steam etc shall have heat resistance type outer sheath.</p> <p>2.6 All LT cable shall have embossing at interval of 1 meter for owner name, size/ core type and length.</p>		
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<p>2.7 All cables shall be embossed with the name of RVUNL in addition to what is specified in the standards.</p> <p>3.0 <u>DESIGN CRITERIA FOR CABLE SIZING</u></p> <p>3.1 POWER CABLES</p> <p>Power cable sizes shall be selected on the following basis:</p> <p>3.1.1 Power cables shall carry the full load current of the circuit continuously under site conditions considering the condition listed below:-</p> <ul style="list-style-type: none"> (a) Ambient design temperature 50 deg. C. (b) Maximum allowable temperature under normal full load condition and under short circuit condition based on material selected (XLPE). (c) Maximum short circuit fault current. (d) Ambient temperature for underground cables, 50 deg. C. (e) De-rating factors as per IS/IEC and manufacturer's standard catalogues. <p>3.1.2 Power cables shall withstand the fault current of the circuit for the duration not less than the maximum time taken by the primary protective system to isolate the fault. Fault clearing times for ties between two 6.6 kV switchgears shall be considered as 1 sec. Fault clearing times for ties between two 415V switchgears shall be considered as 0.5 sec.</p> <p>3.1.3 For the cables to 415 V motors and feeders protected by fuses, the cross section shall be chosen according to the cut-off current of the fuse and its fusing time.</p> <p>3.1.4 Voltage drop from transformer secondary to motor terminals during starting of motors will be limited to the following values:</p> <ul style="list-style-type: none"> (a) For HV motors (except MDBFP motor) – 15% of the rated voltage (b) For MDBFP motors – 20% of the rated voltage (c) For LV motors – 15% of the rated voltage. <p>3.1.5 Voltage drop in feeder cables shall be limited to 3% during full load running condition. Voltage drop from transformer secondary to motor terminals during full load running of motors shall be limited to 5 % of rated voltage.</p> <p>3.1.6 For power supply to valve actuator motors, actuators of various isolating and regulating dampers and exhaust fans, 3 core 2.5 sq. mm stranded copper conductor cable may be used in view of ease of termination. These cables shall be in other respects similar to cables described in Clause 1.2 above.</p> <p>3.1.7 Design Calculation for arriving at cable size shall be submitted for purchaser's approval.</p> <p>3.1.8 DC System Cables:-</p>		
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<p>3.1.8.1 1100 V grade, single core cables as specified in LT power cables shall be used from batteries/ battery chargers to main DCDB, between main Distribution Board, from main Distribution Board to sub distribution board, main DC supply to various system cabinets/panels, Switchgears etc and for critical auxiliaries. Flexible cables with PVC insulation shall be used where termination of XLPE/PVC insulated cables is difficult.</p> <p>3.1.8.2 Voltage drop in cables between battery to DCDB and battery charger to DCDB shall be limited to 2%. Voltage drop in cables between DCDB and loads shall be limited to 3%.</p> <p>3.1.8.3 Design Calculation for arriving at cable size shall be submitted for purchaser's approval.</p> <p>3.2 CONTROL CABLES</p> <p>3.2.1 Current transformer leads shall be checked for the lead burden vis-a-vis the current transformer VA capacity. In case 2.5 sq. mm conductor impose unacceptably high burden on CTs, 4.0-sq. mm conductor shall be used. The conductor material shall be copper.</p> <p>3.2.2 Voltage transformer leads shall be checked for voltage drop which shall be limited to within 1% for all cases other than tariff metering. For tariff metering the voltage drop shall be limited to 0.2%. In case the voltage drop with 2.5 sq. mm conductors exceed this value, higher conductor sizes shall be used.</p> <p>3.3 INSTRUMENTATION CABLE</p> <p>3.3.1 Element identification : As per IEC-60189-2</p> <p>3.3.2 Core wrapping : By non-hygroscopic material by taping or by extrusion</p> <p>3.3.3 Element screening : By copper tape of minimum 0.04mm thickness or by copper laminated plastic tape</p> <p>3.3.4 Rip cord : Non-metallic rip cord under the core wrapping</p> <p>3.3.5 Drain wire : A tinned copper drain wire of minimum 0.05 mm² cross section in contact with each screen of cabling element.</p> <p>Cabling elements shall be any one of the following:</p> <p>A 'Pair' of two insulated conductors twisted together designated by alphabet 'p' printed on a binding tape at 200 mm intervals.</p> <p>A 'Triple' of three insulated conductors twisted together designated by alphabet 't', printed on a binding tape at 200 mm intervals.</p> <p>Maximum length of lay in the finished cable shall be 120 mm.</p> <p>3.3.6 <u>Units</u></p> <p>Cables shall be bunched together in units of twenty cabling elements or sub units of five or ten elements, stranded in concentric layers. The units or sub</p>		
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<p>units shall be designated by p1, p2, p3,. t1, t2, t3..,q1, q2, q3, .., or Q1, Q2, Q3 ..., etc. depending on the combination.</p> <p>3.3.7 <u>Overall screening and armouring</u></p> <p>Cables shall have an overall screen made up of copper/aluminium tape of 0.04 mm thickness or copper/aluminium of 0.008 mm thickness laminated with plastic tape with a minimum overlap of 15%.A drain wire of tinned copper with minimum 0.5 mm² cross section shall be provided in continuous contact with the screen.</p> <p>3.3.8 <u>Inner and Outer Sheath</u></p> <p>The inner and outer sheaths shall consist of black PVC compound.</p> <p>3.3.9 <u>Insulation Resistance</u></p> <p>Minimum insulation resistance per km shall be 500 mega Ohm.</p> <p>3.3.10 <u>Mutual Capacitance</u></p> <p>Mutual capacitance of any pair of conductors shall not exceed 120 nF/km.</p> <p>3.3.11 <u>Capacitance Unbalance</u></p> <p>The capacitance unbalance between any two pairs shall not exceed 400 pF for 500 metre length of cable.The construction, performance and testing of cables except as mentioned above shall generally comply with the following standards :</p> <p>IEC-60189 - Part-1 : Low frequency cables and wires with PVC insulation and sheath. General test and measuring methods</p> <p>IEC-60189 - Part-2: (-do- Cables in pairs and triples).</p> <p>4.0 <u>CABLE TERMINATIONS</u></p> <p>4.1 Cables shall be laid in trays /trenches/ conduits by the Bidder. Also joint markers shall be provided at each joint.</p> <p>4.2 All 1100V termination for XLPE/PVC power cables and control cables shall be by Double compression weather proof type cable glands. Heavy duty, tinned, long barrel copper lugs shall be used for termination.</p> <p>5.0 <u>CABLE JOINTS</u></p> <p>Cable joints shall be avoided to the extent possible. If joints are unavoidable due to circuit length, in excess of permissible maximum drum length, they shall be heat shrinkable types having a short circuit with stand capacity value as specified in clause 3.1.2 above. Lugs shall be heavy duty, tinned copper, long barrel type. All cable glands shall be double compression, weather proof.</p> <p>6.0 <u>POWER RECEPTACLES</u></p>		
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<p>3 phase, 5 pin, 63A power receptacles with switch shall be provided . The receptacle shall be industrial heavy duty type and shall have suitable interlock facility for safety. The receptacle shall conform to IS 1293 and the switch to IS 4064.</p> <p>7.0 <u>CABLE CARRIER SYSTEM</u></p> <p>7.1 The cable carrier system shall be designed considering the following :</p> <ul style="list-style-type: none"> (a) Facility for easy laying of cables. (b) Access to maintenance. (c) Neat and aesthetic appearance. (d) Safety of equipment & personnel. (e) Ground water seepage. (f) Drainage system for oil and water. <p>7.2 Cables shall be laid in prefabricated ladder (for power and control) / perforated (instrumentation) type trays and in conduits. Also joint markers shall be provided at each joint. The cable trays shall be laid vertical in boiler and ESP area, coal handling and ash handling area.</p> <p>7.3 Cable trays and supporting structures in chemically corrosive area like battery room and water treatment plant shall be mild steel painted trays finished with chlorinated rubber based paint/epoxy paint.</p> <p>7.4 Cable trenches will be avoided to the extent possible inside Fuel oil pump house, water treatment plan where possibility of oil and water collection exists and Boiler & ESP areas.</p> <p>7.5 No direct underground burial cables shall be laid except lighting tower, street lighting. For some exceptional case like isolated individual equipments it shall be allowed after approval by the owner /consultant.</p> <p>8.0 <u>CABLE INSTALLATION AND ACCESSORIES</u></p> <p>8.1 All material and accessories required for cable installation like cable trays, tray covers, support steel, etc., shall be hot dip galvanized. Conduits/pipes shall also be hot dip galvanized steel. The racks/trays, conduits/pipes, trenches required to route the cables to individual equipment shall be supplied and installed by the BIDDER.</p> <p>8.2 Separate trays shall be provided for LV Power (AC&DC)/Control & Instrumentation cables.</p> <p>8.3 After laying all the cables, BIDDER shall dress all cables by clamping at every metre, so that the cables are securely held and aesthetically good.</p> <p>8.4 Cable trays shall be avoided very close to the pipes carrying high temperature steam. When they are inevitable, it shall be laid after OWNER approval and</p>		
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<p>suitable insulation material shall be provided between the cable trays and pipes.</p> <p>8.5 1100 V cables up to 120-sq. mm. can be laid in two layers. Control and Instrumentation cables can be laid in three layers.</p> <p>8.6 One spare conduit shall be provided for cable of center / outer drive in clarifier.</p> <p>8.7 Power and control cables for critical / emergency drives / equipment like DC EOP / JOP shall be kept away and routed in separate cable trays</p> <p>8.8 All cable entries to the buildings to be sealed by fire proof & water proof cement after cable installation.</p> <p>8.9 One drum (500m) spare LT power/control of each size of cable shall be included.</p> <p>9.0 CABLE TRAYS AND COVERS</p> <p>9.1 All outdoor cable trays are to be provided with covers. All vertical cable tray race ways are to be provided with covers all round. Cable trays shall be of ladder / perforated type complete with all necessary coupler plates, elbows, tees, bends, reducers, stiffeners and other accessories. Cable trays of ladder and perforated types and the associated accessories such as coupler plates, tees, elbows, etc., shall be fabricated from 12 gauge (2.5 mm thick) mild steel sheets. Cable tray covers shall be provided for all cable trays and raceways. The cable tray accessories like trays, elbows, bends, etc., shall be fabricated and galvanized before bringing to site. Cable tray covers shall be fabricated from 16 gauge (1.7 mm thick) MS sheets. All the sheet steel shall be hot dip galvanized.</p> <p>9.2 1100 V rated cables of sizes 120-sq. mm and above shall be laid in single layer. Single core cables used for 3-phase AC power circuits shall be laid in Trefoil form with suitable PVC aluminum clamps to hold the cables.</p> <p>9.3 The sizing of cable trays from TG building to other areas shall consider para 9.2 above an additionally to avoid crowding and criss crossing of cables, especially in boiler area where vertical risers are to be provided for various power, control and instrumentation cables to higher elevations of boiler.</p> <p>9.4 Slotted angles shall not be used for cabling. In all locations smaller size cable trays of 50 mm / 100 mm wide shall be used for one or two cables.</p> <p>10.0 FIRE-PROOF SEALING OF CABLE PENETRATION</p> <p>Cables / cable tray openings in walls and floors or through pipe sleeves from one area to another or one elevation to another, between the units and within the same unit, shall be sealed by a fire-proof sealing system. The fireproof sealing system (FPSS) shall effectively prevent the spread of fire from the flaming to the non-flaming side, in the event of a fire. The FPSS shall conform to the following requirements:</p>		
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<p>(a) FPSS shall have a fire rating of two hours.</p> <p>(b) The FPSS shall be subjected to fire endurance test, hose stream test, temperature measurement of non-flaming side as per ASTM-E119. 'Standard method of fire tests of building construction and materials'.</p> <p>(c) The FPSS will also conform to the in-combustibility test carried out in accordance with IS: 3144-1992.</p> <p>(d) Under fire condition, the FPSS material shall not emit excessive smoke or any corrosive or toxic fumes.</p> <p>(e) FPSS shall have minimum life of 25 years.</p> <p>11.0 FIRE BREAK</p> <p>11.1 Fire break shall be provided by applying a suitable fire-resistant coating on cables for the required length to meet the fire rating of 30 minutes.</p> <p>11.2 Fire break shall be provided at an interval of 15 metres in the straight portion of each of the cable tray above ground, at intervals of 30 metres in cable trenches and at 5M for all vertical trays. All cable inter section and tee offs shall be provided with firebreaks.</p> <p>11.3 When pipe sleeves are provided for cables from outdoor areas to indoor areas, the pipe opening at the outdoor side shall be sealed by fire proof sealing material, which is also continuously waterproof. The indoor side of the pipe opening shall also be sealed by continuous fire proof sealing materials. The duct banks in outdoor areas also need to be sealed by water proof seals. It is necessary to explore possibility of applying waterproof coating on fireproof sealing.</p> <p>12.0 TESTS</p> <p>All routine tests and FRLS tests as per relevant standard shall be performed on each size of cable. If same size is supplied in different lots, inspection shall be done for each lot. If same cable is supplied by different agencies, test shall be carried out on cables supplied by each agency. These tests shall be carried out as per relevant standards as applicable.</p> <p>Routine and acceptance test shall be carried out on FPSS.</p> <p>Type test certificates for type tests conducted on identical design and size of the Cables shall be submitted for review. If type tests have not been done or the certificates are found to be not in order by purchaser then these type tests shall be conducted on Cables to be supplied for this project at no extra cost to Purchaser.</p> <p>13.0 For technical particulars refer datasheet-A.</p>		
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Sr. No.	Description	unit	Client specification
1.0	Name of manufacturer		*
2.0	Make of cable		
3.0	Conductor No. core x Size Form- circular/segmented Effective cross sectional area sq. mm		*
4.0	Whether cores identification numbers for cables with 5 cores and above to be provided		Yes
5.0	Whether incremental running lengths are marked on cable		Yes
6.0	Finished cable a) Diameter under armour in mm b) Diameter over armour in mm c) Overall diameter in mm		*
7.0	Cable drums a) Whether cable drums confirm to IS : 10417 b) Length of cables in drum & tolerance c) Weight of cable drum without cables d) Weight of cable drum with cables e) Type of end sealing		*
8.0	FRLS cables a) Critical oxygen index value at 250 deg C when tested for temperature index test as per ASTM-		Ref. Clause 2.3

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D16
PART B	RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET-A CABLE & CABLE CARRIER SYSTEM	SHEET 2 OF 2

Sr. No.	Description	unit	Client specification
	<p>D-2863</p> <p>b) Total acid gas generation by weight when tested as per IEC – 754-1 in %</p> <p>c) Percentage of light transmission under fire for assessment of smoke generation when tested as per ASTM – D – 2843-77</p> <p>d) Will the cables offered against this specification pass the flammability tests as per</p> <p>1) Class – F3 – Swedish standard S5-424- 1475</p> <p>2) IEC 60332 – 1C</p> <p>3) IEC 60331 – 1</p>		
9.0	Maximum dielectric loss of cable per KM at normal voltage and frequency	Watt/km	*
10.0	Short circuit capability for 1 Sec (HT & LT Power Cable)	kA rms	Minimum 40kA and 50 kA for HT and LT respectively and shall be in line with requirements of the switchgear and protection.
11.0	Maximum dielectric stress at core screen	KV/cm	*
12.0	Max. overall diameter of cables	mm	*

“*” indicated above shall be filled by BIDDER.

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV «Section»:D16																																	
PART B		RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET B CABLES AND CABLE CARRIER SYSTEM			SHEET 1 OF 6																																
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ENQUIRY/SPECIFICATION NO.:			BIDDER:		
	IS : 10417				
	b) Length of cables in drum & tolerance				
	c) Weight of cable drum without cables				
	d) Weight of cable drum with cables				
	e) Type of end sealing				
1.7	FRLS cables				
	a) Critical oxygen index value at 250 deg C when tested for temperature index test				
	b) Total acid gas generation by weight				
	c) Percentage of light transmission under fire for assessment of smoke generation				
	d) Will the cables offered against this specification pass the flammability tests				
1.8	maximum dielectric loss of cable per KM at normal voltage and frequency	Watt/km			
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ENQUIRY/SPECIFICATION NO.:		BIDDER:	
1.9	Short circuit capability for 1 Sec (HT & LT Power Cable)	kA rms	
1.10	Maximum dielectric stress at core screen	KV/cm	
1.11	Max. overall diameter of cables	mm	
2.0	Cable Terminations & Joints		
2.1	Name of manufacture		
2.2	Applicable standards		
2.3	Nominal (Ph -Ph) system voltages	kV	
2.4	AC Withstand voltage (Ph-ground)	kV	
	<ul style="list-style-type: none"> Time duration 	Min.	
2.5	Partial discharge at 2 Uo	pC	
2.6	Impulse withstand, 1.2 / 50 µs	kV	
2.7	Load cycle test		
a)	Each cycle – heating duration	Hrs	
b)	Temperature	deg. C	
c)	Cooling duration	Hrs	
d)	No. of cycles		
<u>NOTES TO BIDDER</u> 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; width: 100px; height: 40px; float: right; text-align: center; line-height: 40px;"> ISSUE R1 </div>	

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV «Section»:D16	
PART B	RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATA SHEET B CABLES AND CABLE CARRIER SYSTEM	SHEET 4 OF 6	
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
e)	Continuous phase to ground voltage withstand	kV	
2.8	Thermal withstand short circuit current 1 sec	kA	
2.9	Dynamic short circuit withstand	kAp	
2.10	Type test report for all the tests enclosed as specified	Yes / No	
2.11	Kit Particulars		
a)	Material of the tubing / moulded party		
b)	Method of stress control		
c)	Method of environmental seal		
d)	List of items included in the kit		
	<ul style="list-style-type: none"> For terminations 		
	<ul style="list-style-type: none"> For joints 		
e)	Whether heating device included	Yes/No	
	<ul style="list-style-type: none"> How many such device included 	Qty	
f)	Allowable kit storage temperature	deg. C	
g)	Kit shelf life	Years	
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ENQUIRY/SPECIFICATION NO.:		BIDDER:	
2.12	Cable terminations/joints instruction manual enclosed	Yes/No	
3.0	Fire Proof Sealing System/Fire stops		
3.1	Manufacturers name		
	Type of FPSS provided		
3.2	Duration for which the FPSS will retain its guaranteed properties (Life expectancy)	Yrs.	
3.3	Minimum shelf life of the materials used in the fire stops	Months	
3.4	Applicable standard		
3.5	Performance tests		
3.5.1	Whether type test certificates for the following tests enclosed		
	• Fire rating test	Yes/No	
	• Hose stream test	Yes/No	
4.0	Fire Breaks		
4.1	Manufacturers name		
<u>NOTES TO BIDDER</u> 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		SIGNATURE OF BIDDER & DATE <div style="border: 1px solid black; padding: 5px; width: fit-content; float: right;"> ISSUE R1 </div>	

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ENQUIRY/SPECIFICATION NO.:		BIDDER:																													
<table border="1"> <tr> <td>4.2</td> <td>Applicable standard</td> <td></td> <td></td> </tr> <tr> <td>4.3</td> <td>Duration for which the FPSS will retain its guaranteed properties (Life expectancy)</td> <td>Yrs.</td> <td></td> </tr> <tr> <td>4.4</td> <td>Minimum shelf life of the materials used in the fire stops</td> <td>Months</td> <td></td> </tr> <tr> <td>4.5</td> <td>Type test certificates of the following tests enclosed</td> <td></td> <td></td> </tr> <tr> <td></td> <td>• Ampacity test</td> <td>Yes/No</td> <td></td> </tr> <tr> <td></td> <td>• Flame test</td> <td>Yes/No</td> <td></td> </tr> <tr> <td></td> <td>• Water proof test</td> <td>Yes/No</td> <td></td> </tr> </table>				4.2	Applicable standard			4.3	Duration for which the FPSS will retain its guaranteed properties (Life expectancy)	Yrs.		4.4	Minimum shelf life of the materials used in the fire stops	Months		4.5	Type test certificates of the following tests enclosed				• Ampacity test	Yes/No			• Flame test	Yes/No			• Water proof test	Yes/No	
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DATA TO BE FURNISHED BY THE VENDOR AFTER THE AWARD OF CONTRACT

- 1.0 Construction details including type of material used and thickness of each material for each type of cable in a tabular form.
- 2.0 Instruction Manuals
- 2.1 Two (2) number of copies of instruction manuals, descriptive bulletins etc. shall be furnished prior to despatch of cables. The manual shall include amongst others, the following particulars.
- 2.2 General information.
- 2.3 Principal technical data.
- 2.4 Description of insulation, sheathing and screening. This should include data on resistance to attack by chemicals, fungus, termites, rodents, water and ultra-violent radiation.
- 2.5 Installation and termination instructions.
- 3.0 Test Certificates
- 2.6 Type test certificates for all types of cables included in the order and special tests on FRLS/FS cables.
- 4.0 Any other information specifically called for by PURCHASER or ENGINEER subsequent to order.
- 5.0 **DATA FOR APPROVAL**
- 5.1 Technical particulars of all cables, Termination kits/joints, FPSS & Fire breaks.
- 5.2 Cable Sizing Calculations for both HT & LT cables.
- 5.3 QAP for all cables.

ISSUE
R1



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**GENERAL TECHNICAL REQUIREMENTS
OF
CONDUITS AND PIPES
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1.0 GENERAL

- 1.1 This specification covers the manufacture, inspection & testing at vendor's works and delivery to site of conduits, pipes and their fittings for electrical installation.

2.0 CODES AND STANDARDS

- 2.1 The material, constructional features and various processes involved in manufacture shall comply with currently applicable Indian Standards.
- 2.2 The following Indian Standards shall be applicable, in general. However if Data Sheet A specifies conformance to other international standards, the equivalent IEC/BS/other standards shall be considered.

- a) IS:9537 (All Parts) Conduits for electrical installation.
- b) IS:3480 Flexible steel conduits for electrical wiring.
- c) IS:6946 Flexible non-metallic conduits for electrical installation.
- d) IS:1239 Mild steel tubes, tubulars and other wrought steel fittings.
(for size above 63mm dia of rigid conduits)
- e) IS:2667 Fittings for rigid steel conduits for electrical wiring.
- f) IS:3837 Accessories for rigid steel conduits for electrical wiring.
- g) IS:3419 Fittings for rigid non-metallic conduits.
- h) IS:6005 Code of practice for phosphating iron & steel.
- i) IS:2629 Recommended practice for hot dip galvanizing on iron and steel.
- j) IS:4759 Specification for hot dip zinc coatings on structural steel and allied products.
- k) IS:6745 Methods for determination of mass of zinc coating on zinc coated iron and steel articles.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

The conduit and conduit accessories shall include conduit plugs & caps, gaskets and box cover etc in addition to any specific requirement given in Data Sheet A. The diameter of conduits and accessories shall be uniform throughout the length.

3.1 Rigid Conduits and Fittings

- 3.1.1 Rigid conduits shall generally conform to the requirements of IS:9537 (Part I & Part II). However conduits above 63mm diameter shall conform to the requirements of IS:1239. Unless specified otherwise in Data Sheet A, all conduits and pipes shall be of medium duty.



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- 3.1.2 The rigid conduits shall be hot dip galvanized inside and outside. Weight of zinc shall be as per IS:4759. Conduits shall be thoroughly cleaned and pretreated, conforming to IS:6005.
- 3.1.3 Conduits shall be supplied in approximate length as specified below
- a) Rigid Conduits 5 metres
 - b) Flexible Conduits 10 - 30 metres
- 3.1.4 Each end of conduit length shall be threaded. The ends of conduits shall be sealed with protective caps to prevent damage to threaded portions and entrance of moisture and foreign material.
- 3.1.5 The inside surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.
- 3.1.6 Conduit fittings shall be made out of tube or cast to the shape as to match with corresponding conduit sizes and meet their purpose without any special adjustment.
- 3.1.7 All fittings shall be screwed type and hot dip galvanized inside and outside.
- 3.2 Flexible Metallic Conduits and Fittings
- 3.2.1 Flexible metallic conduits shall generally conform to the requirements of IS:3480.
- 3.2.2 Flexible conduits shall be made of strip steel which shall be of cold rolled mild steel. The strip shall be of uniform width and thickness throughout.
- 3.2.3 The strip shall be electro galvanized to a minimum thickness of 25 microns as specified in IS:3480. The surface of the strip shall be thoroughly cleaned before application of protective coating. Pretreatment, before galvanization, shall conform to IS:6005.
- 3.2.4 The strip for making flexible conduit shall be wound tightly and so overlapped in subsequent helicals that no openings are seen in normal position.
- 3.2.5 Flexible conduits shall be lead coated for application in high temperature zones, if specifically mentioned in Data Sheet A.
- 3.2.6 The conduit shall have uniform diameter throughout its length. The internal surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.
- 3.3 PVC Conduits
- 3.3.1 PVC conduits shall generally conform to the requirements of IS:9537(Part I & Part III).
- 4.0 INSPECTION
- 4.1 The following stages of manufacture shall be stage inspected by Purchaser or his duly authorized representative.
- 4.1.1 Inspection of manufacturing processes such as shearing, punching, bending, welding, galvanizing etc.
 - 4.1.2 Inspection of packing material and procedure.



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4.1.3 Inspection of finished product.

4.2 The inspection will be carried out as per agreed quality plan.

5.0 TESTING

5.1 Rigid Conduits

- a) Acceptance Tests
 - as per IS:9537 Part 1 & 2 upto 63mm OD
 - as per IS:1239 above 63mm OD
- i) Dimension checks
- ii) Bending test (below 32mm OD)
- iii) Compression test
- b) Special Tests (as acceptance test) as applicable to galvanizing.

5.2 Flexible Steel Conduits

- a) Acceptance Tests
 - as per IS:3480
- i) Dimension checks
- ii) Linear breaking test
- iii) Test for flexibility
- iv) Bend fracture test
- v) crushing test
- b) Special Tests (as acceptance test) as applicable to galvanizing.

5.3 PVC Conduits

- a) Type Tests
 - as per IS : 9537 (Part 1 & 3)
- i) Dimension checks
- ii) Bending test
- iii) Compression test
- iv) Impact test
- v) Collapse test
- vi) Resistance test
- vii) Resistance to burning



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viii) Electrical Characteristics

b) Acceptance tests - as per IS:9537 (Part 1 & 3)

i) Dimension checks

ii) Bending test

iii) Compression test

iv) Collapse test

v) Resistance to burning

vi) Electrical characteristics

5.4 Sampling for the tests shall be done as per applicable standards mentioned above.

5.5 The testing shall be carried out as per agreed quality plan.

6.0 PACKING

6.1 The material shall be packed as per manufacturer's standard. Packing procedure shall be to the purchaser's approval.

7.0 DRAWING, DATA AND DOCUMENTS REQUIRED

7.1 The following information shall be furnished within two weeks of award of contract, for purchaser's approval.

a) Manufacturing drawings/details.

b) Recommended Field quality plan covering site handling, storing, laying etc.

c) Final quality plan.

7.3 The following information shall be furnished after testing and inspection

Type Test, routine test and special test certificates in bound volume in requisite number.



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DATASHEET A

SPECIFIC TECHNICAL REQUIREMENTS

- 1.0 APPLICABLE STANDARDS: IS:9537,IS: 1239, IS:3480

- 2.0 RIGID STEEL CONDUITS & STEEL PIPES
 - a) Material: Cold rolled mild steel to IS:226
 - b) Applicable standard
 - i) Upto 63mm OD: IS:9537 Part I & II
 - ii) Above 63mm OD: IS:1239
 - c) Surface treatment: Hot dip galvanizing inside & outside as per IS:2629
 - d) Wt. of zinc: as per IS 4759
 - e) Duty: Medium
 - f) Fittings: Screw type as per IS:2667

- 3.0 FLEXIBLE CONDUITS:
 - a) Material: Strip steel cold rolled and annealed
 - b) Standard applicable: IS: 3480
 - c) Surface treatment: Electro galvanized as per IS: 3480
 - d) Whether lead coated: YES
 - e) Minimum thickness: 25 microns
of zinc coating

- 4.0 PVC CONDUITS
 - a) Material: PVC
 - b) Applicable standard: IS: 9537 (Part I & III)



TITLE **TECHNICAL SPECIFICATION FOR**
WIRE ROPE ELECTRICAL HOIST
 2X660 MW SURATGARH S SUPER CRITICAL TPS,
 STAGE - V UNIT 7 & 8

SPECIFICATION NO. PE-TS-392-563-A002

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1.0.0 **INTENT OF SPECIFICATION**

This specification covers the design, engineering, manufacture, inspection and testing at manufacturer's works, properly packed and delivery to site for the steel wire rope electric hoist as specified in the Data Sheet A enclosed. The equipment specified shall include all accessories required for trouble free operation.

2.0.0 **Design Particulars**

The steel wire rope electric hoist covered in this specification shall be suitable for the lift as specified in Data Sheet - A. Equipment offered shall be conforming to specification requirements as per **IS: 3938 (latest edition)** and other specified Indian Standards.

3.0.0 **Technical Particulars**

3.1.0 Quantity:

The quantity of various steel wire electric hoist shall be as mentioned in Annexure A.

3.2.0 Type - Electrically operated with trolley.

3.3.0 Capacity / Lift: **As indicated in Annexure - A**

3.4.0 Applicable IS

DESCRIPTION

i) IS: 2266

Specification for steel wire ropes for general engineering purposes.

ii) IS: 4029

Guide testing induction motor.

iii) IS: 900

Code of practice for installation and maintenance of induction motor.

iv) IS: 4237

General requirement of switchgear and control gear for voltage motor exceeding 1000 Volts.

v) IS: 694

Copper conductors PVC insulated cables for voltage up to 1000 Volts

vi) IS: 3043

Code of practice for earthing.

vii) 1S: 1822

Motor starters for Voltages up to 650V.

viii) IS: 2147

Degree of protection provided by enclosures for low voltage switch— gear and control gear.

ix) IS: 1554

PVC insulated (Heavy-duty) electric cables for working voltages and including 1100 volts.



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x) IS: 325 Three phase induction motors.

xi) IS: 15660 Point hook with shank.

xii) IS 9968 Part I Flexible trailing cables

3.5.0 **Material of Construction**

- i) Frame — M.S.Plate-IS: 2062.
- ii) Wheels — Single flanged conform to IS: 3938
- iii) Gearbox — MS fabricated IS: 2062
- iv) Hook -- As per IS: 15560.

4.0.0 **Quality Plan & Inspection**

To ensure that the equipment and services are in accordance with the specification, the vendor shall follow/adopt BHEL's STANDARD QUALITY PLAN (enclosed herewith)/Customer approved QAP to control critical activities at all essential points. The enclosed standard quality plan should be duly signed and stamped as a token of acceptance and submitted by the bidder along with the offer.

Inspection shall be carried out by BHEL/customer representative as the case may be in line with the approved drawing / document. Any necessary requirement at any stage of inspection deemed necessary by Customer/BHEL shall be carried out without any commercial or technical implication.

5.0.0 **Name Plate**

All the electric hoists shall be provided with individual nameplate indicating minimum the following data's:

Name of manufacturer

Capacity (in tons)

Lift (in meters)

Serial No.

6.0.0 **Painting Procedure**

6.1.0 All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill



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scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces.

6.2.0 Machined and bearing surface shall be protected with varnish or thick coat of grease.

Also refer "Painting Requirements" in Volume IIB, Section C.

7.0.0 DESPATCH

All the Electric hoists shall be packed to avoid any damage during transits and storage at site.

8.0.0 POST CONTRACT DRAWINGS AND DOCUMENTS

The drawings / documents shall be submitted after placement of order as per Clause 3.00 of Section C.

9.0.0 INFORMATION TO BE FURNISHED WITH THE OFFER

As per Annexure II.

10.0.0 COLOUR SCHEME

Color scheme shall be intimated by the purchaser to vendor during the contract execution stage and the same shall be strictly followed.

11.0.0 GENERAL DESIGN FEATURE

Parts requiring replacement or lubrication shall be easily accessible & without dismounting type.

Equipment shall include the devices as required and comply with applicable standards/specification requirements.

Defects in material not acceptable/allowed. Rectification of any flaw is permissible only with the approval of Purchaser.

Hoist shall be rigid in construction and all movements shall be smooth and non-jerky. Design shall provide for easy maintenance of all parts, particularly the wheel bearings.

Design shall conform to IS: 3938 and other standards as specified.

Both hoists and trolleys are driven electrically. Wheels shall be single flanged type and to suit different monorail beam sizes and the shall be intimated to purchaser during of manufacturing stage.

Hook shall be swiveling type and fitted with a safety latch.



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Hoists shall be designed for minimum headroom above the highest position of hook and for closest hook approaches.

Hoist shall be designed with the following electrical features:

11.1.0 ELECTRICAL MOTOR DESIGN

Motor shall be squirrel cage induction type, and suitable for AC supply of 415V, 3 phase, 50 HZ, 40% CDF with IP—55 degree of protection. Motors shall be class 'F' insulated with temperature rise limited 70⁰ C & suitable for 150 starts/hr. Motors shall conform to IS-325 and tested in line with enclosed Quality Plan.

11.2.0 ELECTRICAL POWER

Hoist mounted heavy duty, electrical panel, direct on reversing type Air brake contactors, electrically interlocked for safety with necessary control gears such as control transformer, **MCB** (Control and Power), limit switches, thermostat, space heater, neutral **link**, ON/OFF 3 Phase door interlock switch, wrong connection preventor, overload relays with SPP features, indicating lamps, cable glands, lugs, terminals, cables etc. housed in totally enclosed IP— 55 degree of panel. Control voltage shall be 110V.

11.3.0 LIMIT SWITCH

Limit switches to prevent over hoisting , over lowering & over travelling shall be provided.

11.4.0 Brake

The hoist and cross traverse motors are fitted with an DC electro-magnetic disc type brake designed and built to arrest, and hold safely the full load capacity of load. The brakes shall be fail-safe type wherein failure of current immediately applies the brake.

11.5.0 PUSH BUTTON STATION

Pendent push button station shall be provided with minimum 5 nos. of glow type push buttons such as hoisting/lowering, cross traverse forward/reverse and emergency stop (mushroom head type). The contactors are operated by pendent push button station suspended from the hoist for easy operation and suspension is made on steel link chain. Necessary cable glands, lugs, terminals along with connecting cable of 12C—1.5 copper flexible cable shall be provided. Emergency stop push button shall



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be mushroom head (lockable)type. Pendent push button shall return to off position when released.

11.6.0 EARTHING

All electrical equipment (motor,panel,pendent) shall be provided with proper elements like bolts, washers ,nuts etc. for proper earthing at site.

11.7.0 POWER SUPPLY TO HOIST:

- i) Shrouded Bus Bar Conductor Type DSL complete with brackets and other fixing arrangements.
- ii) Isolator and cable from isolator at 1.5 m operating floor to DSL shall be supplied by the manufacturer.



TITLE

TECHNICAL SPECIFICATION **FOR VVVF CONTROL DRIVES**

2X660 MW SURATGARH, STAGE - V UNIT 7&8

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1.0 General

- a) This part of the specification describes the general requirements for the Variable Voltage Variable frequency Drives, herein referred to as AC Drives, for use with standard IEC design AC squirrel cage induction motors. The nominal values, the standard documents and the drive's minimum performance is defined in this part. **To avoid any mismatch between the motor and its control equipment, the AC Drive shall be capable of auto adjustment by automatic measurement of the motor parameters with/without motor rotation.**

- b) Inverter construction and related devices:

Construction shall be divided in 3 broad sections. Section One converts AC Supply into DC supply. Section 2 Converts and controls DC supply into AC Supply with regulation. Section 3 shall be used for braking action of the motor and Dynamic Braking Unit (DBU) can be inbuilt or external depending upon the drive capacity. VVVF can be used in open loop (without external speed feed back) like in Travel motions or close loop (With external speed feed back) like in Hoist motions. Chokes on input supply side are generally used in crane application for power regulation. Like all other electronic / electric devices VVVF drives are also protected by MCB / MCCB / Fuses. VVVF drives are sensitive to temperature and hence drive internal as well as external cooling fans are provided.

- c) Programming of VVVF Drives.

VVVF drives shall be programmable and for that purpose detachable digital Operator display unit shall be supplied along with the VVVF having required buttons for setting the user constant, functions etc. The VVVF drive is to be fine tuned by matching the motor parameters and setting the parameters on full load.

- d) VVVF drives shall be connected with power supply and these drives generate their own low voltage control supply. Potential free contacts shall be connected to this control supply and few programmable control terminals. Starting / stopping / set speeds operations of VVVF drive shall be achieved by above control connection.
- e) VVVF shall give smooth control over acceleration and deceleration making the motion jerk free and using Variable voltage variable frequency limits the inrush current to the squirrel cage motors. VVVF provides controlled torque to the motor due to which crane operations are jerk free.

1.1 Experience

The Frequency Converter Manufacturer shall have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support.

1.2 Local support



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TECHNICAL SPECIFICATION
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The Supplier shall have a permanent representative office with a trained and skilled support staff, in the country where the goods are delivered, in order to prove his commitment for local support and to provide a channel for communication.

The engineers employed by the Supplier's regional office shall be certified by the Manufacturer and provide start-up service including physical inspection of the drive, connected wiring and final adjustments, to ensure that the AC Drive meets the required performance.

The Supplier shall be able to give basic drives training to the Customer's engineers, preferably on the site. The training shall, as a minimum, include system concepts and basic troubleshooting.

2.0 Basic requirements for the AC Drives

2.1 General requirements

The AC Drive shall comply with National(country of origin) and International standards and the recommendations for electrical industrial control devices (IEC, EN, UL, NFC, VDE).

The AC Drive shall be of the most modern design, yet user friendly and be simple to install, commission and maintain. The AC Drive shall be able to start and control the speed of a standard squirrel cage induction AC motor. The AC Drives shall be : CE marked, conforming to European Low Voltage (73/23/CEE and 93/68/CEE) and EMC (89/336/CEE) Directives, UL/CSA marked according to UL 508C.

The AC Drives have to be built to comply with the IEC standards.

The AC Drive shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control open loop(for travel) and closed loop(for hoist). It shall have diodes / thyristors in rectifier and IGBT's in the inverter section in their entire power range, and it shall have the following minimum specifications.

Rated Input Voltages	380V -15% to 480V +10%, three-phase
Rated Input Frequency	50Hz +/- 5%
Output Voltage	0 – Input voltage, three-phase
Output Frequency Range	0 to 400 Hz
Acceleration / Deceleration Time	0.01 – 999s, adjustable, linear, with S, with U or customised shapes
Overload capability (Constant Torque)	150% of nominal current for 1min.



TITLE

TECHNICAL SPECIFICATION
FOR VVVF CONTROL DRIVES

2X660 MW SURATGARH, STAGE - V UNIT 7&8

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Operating ambient Temperature	-10°C up to 50°C (shall be derated suitably if not rated at 50°C)
Storage ambient Temperature	-25°C up to 70 °C
Maximum operating altitude	1000 m without de-rating, 1000...3000 (shall be de-rated suitably)
Max. Relative Humidity	95 %, without condensation and dripping water.
Main Protections	Over current, short circuit between phase, short circuit between phase and ground, input phase loss, output phase loss, motor overload, over speed, over voltage, under voltage, drive over temperature

The AC Drive shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer shall inform the required derating, if the ambient temperature given in the project-specific specification is higher than rated ambient of the drive or if the installation altitude is more than 1000 m above the sea level. The de-rating factor shall be specified so that neither the lifetime of the AC Drive nor the unit's performance, overload capability included, nor the reliability of the AC Drive shall suffer.

Suitable encoder shall be provided for main hoist motion.

3.0 User interface

3.1 General

The user interface shall be identical throughout the power range and type to avoid confusion amongst the users and need for training in several different units.

3.2 Inputs and outputs

A. At least, the following standard Inputs and Outputs shall be provided, to be used in interface with the control system:

Analogue Inputs	:	1 x Programmable differential voltage input $\pm 10V$, 1 x Programmable current input 0(4) - 20mA 1 x Programmable voltage input 0 – 10V
Analogue Output	:	1 x Programmable analogue outputs 0(4) - 20mA or 0 – 10V
Logic inputs	:	6 x Programmable logic Inputs isolated from the mains
Relay Outputs	:	2 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.



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B. At least, it shall be possible to assigned the following functions to the I/Os:

Analogue input	Analogue outputs
Speed reference Summing reference	Motor current Motor frequency Motor torque Motor power
Logic input	Relay or logic outputs (open collector)
Forward Reverse Jog Preset speeds Reference switching Ramp switching Parameter sets selection Fast stop Freewheel stop + speed - speed External fault	Ready Drive running High speed attained Drive fault Frequency threshold attained Motor thermal state attained Torque or current limitation attained Brake control

3.4 Programming terminal

- A. The AC drive shall have a keypad /display for programming and controlling purposes. An IP54 or IP65 remote mounting shall be possible at a distance of 10m.
- B. Password protection shall be provided to avoid unauthorized tampering with the set parameters.
- C. The programming terminal shall be able to display the commercial reference of the AC drive and of the options, the software version, the serial number
- D. Direct keypad entry shall be provided to observe the following actual parameters. Any one of the following parameters or actual values shall be selected to be always displayed :-
- Input Voltage
 - Input Frequency
 - Output Frequency
 - Output Power
 - Output Current
 - Motor Speed
- The following parameters shall always be displayed during normal operation: -
- Drive Status



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TECHNICAL SPECIFICATION
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- The following drive control functions at least shall be available from the keypad :-
- i) Run
 - ii) Stop
 - iii) Local / Remote selection.
 - iv) Forward/Reverse (if function enabled)
 - v) Accelerate
 - vi) Decelerate
 - vii) Parameter setting

3.5 Application programming

The AC Drive shall be designed for both simple and the most complicated applications, yet it shall be user friendly. It shall be possible to reset the parameter settings back to the original factory settings through the keypad.

3.6 PC Tools

The AC Drive Supplier shall have Windows based PC software available for monitoring and controlling the AC Drives, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the AC Drives. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software.

4.0 Software features

A. Restart

In the event of a fault trip due to over voltage, over current or loss of analogue signal, the AC DRIVE shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be within a selectable time. If the fault does not clear after the attempts, the drive shall lock out.

B. Brake logic control

The AC Drive shall have a built-in function to control a mechanical brake in order to move the load in a smooth and safe way. The brake logic control shall be adapted to the different movements: hoisting, travel, orientation.

5. Preferred makes:

Schneider Electric, L&T-YASKAWA, Siemens, ABB, Allen Bradley (Rockwell Automation)



TITLE

DATA SHEET – A**ELECTRIC HOIST WITH ELECTRICALLY OPERATED TROLLEY****2X660 MW SURATGARH S SUPER CRITICAL TPS,****STAGE - V UNIT 7 & 8**

SPECIFICATION NO. PE-TS-392-563-A002

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Sl.no	DESCRIPTION	TECHNICAL PARTICULARS
1.0	Type	Steel wire electric hoist with electrically operated trolley
2.0	Scope (Qty., Capacity, Lift, Travel Length)	Refer the separate Annexure A.
3.0	Type of service	Indoor
4.0	Overload test	125% of SWL
5.0	Design Ambient temperature	50° C
6.0	General Design	As per IS: 3938 / 1983 or latest, Class-II duty
7.0	Operating speed	
7.1	Hoisting speed/ Creep speed (thru' VVVF drive)	2.5 to 3 Mtr per min/ creep speed 10% of main speed.
7.2	Trolley speed / Creep speed (thru' VVVF drive)	7 to 10 Mtrs per min / creep speed 10% of main speed.
8.0	Type of transmission	Through Electric motor and gear box.
9.0	Wire Rope	
9.1	Construction / core	6 x36 construction, steel core/Fibre core
9.2	Code	IS:2266
9.3	Number of falls	Min. 4
9.4	Factor of safety	Not less than 5
10.0	Load Hook and block	NORMALISED HOOK ONLY
10.1	Type of load hook	Plain shank trapezoidal section with safety latch.
10.2	Load hook Code	IS: 15560
10.3	Load hook Material	Alloy steel/carbon steel as per IS:15560
10.4	Hook suspension	Thrust bearing
10.5	Material of block suspension	Fabricated from steel plate, Material: IS: 2062
11.0	Gearing	
11.1	Type	Spur / Helical, hardened and tempered with machine cut teeth
11.2	Gear material	Forged steel as per IS 3938
11.3	Lubrication	Oil splash/ grease lubricated
11.4	Bearing type	Antifriction Ball / Roller
12.0	Trolley drive	
12.1	Wheel	Single flange taper thread
12.2	Wheel conform to (Std. / code)	IS: 3938



TITLE

DATA SHEET – A**ELECTRIC HOIST WITH ELECTRICALLY OPERATED TROLLEY****2X660 MW SURATGARH S SUPER CRITICAL TPS,****STAGE - V UNIT 7 & 8**

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12.3	Wheel material	Heat treated carbon steel/ low alloy steel, graded cast iron.
12.4	Bearing type	Antifriction Ball / Roller
12.5	Trolley type	Rolled structural steel with side plates extended beyond wheel flanges to protect wheels.
12.6	Hardness	Max hardness 200 BHN
13.0	SHEAVE	
13.1	Material	Cast iron, cast steel or mild steel.
13.2	Bearing type	Antifriction Ball / Roller.
14.0	BRAKE (HOIST)	
14.1	Type	DC EM brakes disc type (fail to safety).
14.2	Capacity	As per IS 3938.
14.3	Number	One number for each motor.
15.0	BRAKE (TROLLEY)	
15.1	Type	DC EM brakes disc type (fail to safety).
15.2	Capacity	As per IS 3938.
15.3	Number	One number for each motor
16.0	ROPE DRUM	
16.1	Material	Cast iron, cast steel or mild steel.
16.2	Flange / Flangeless	Flanged
16.3	Type of groove	As per manufacturers standard to suit the layout requirement.(Shall be decided during detail engineering)
17.0	TYPE OF DSL	
17.1	CT travel	Shrouded bus bar Cu/AL conductor type DSL
18.0	MOTORS	
18.1	Type	Sq. Cage induction, TEFC, S4 duty, 40% CDF.
18.2	Number of start	150 starts / hr, Motors shall be suitable for direct on-line (DOL) starting
18.3	Voltage , Phase and Frequency	415V \pm 10%, 3 phase, 50 Hz
18.4	Class of insulation	Class "F" and temperature rise limited to class B.
18.5	Type of enclosure	TEFC
18.6	Degree of protection provided for enclosure	IP-55
18.7	Margin	The motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment, whichever is higher, considering highest



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DATA SHEET – A**ELECTRIC HOIST WITH ELECTRICALLY OPERATED TROLLEY****2X660 MW SURATGARH S SUPER CRITICAL TPS,****STAGE - V UNIT 7& 8**

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			system frequency.
19.0	LIMIT SWITCHES	Hoisting	Trolley
19.1	Type	Snap action, self actuating type	One (1) no. two way limit switch
20.0	Control panel		<ul style="list-style-type: none"> * Fabricated from Cold rolled sheet steel not less than 2.5mm for front & rear & 2mm for side, top & bottom portion with gland plate of 3mm thick. * Degree of protection shall be IP 54. * Power on indicating lamps shall be provided * Panel illumination lamps operated by door switch. * 2 nos earthing terminals on panel. * 20 % spares terminals (clip on type) shall be provided. * Power and control terminals (clip on type) shall be on separate channels. * Gland plate thickness shall be minimum 3mm. * Gland plate shall be double brass compression type.
20.1	Qty		1 No.
21.0	Pendent Push buttons		Up /down / forward / Reverse push buttons. Indicative marking for easy operation shall be provided.
22.0	Power cables		1.1KV grade PVC power cables shall have conductor (compacted type for sizes above 10 sq.mm), XLPE Insulated, PVC inner sheathed, unarmoured, FRLS PVC outer sheathed conforming to IS:1554 (Part-I). Minimum size 2.5 mm sq for Cu.
23.0	Control cable		Control cables shall have stranded copper conductor multicore PVC insulated, PVC inner-sheathed, unarmoured, PVC outer-sheathed conforming to IS:1554. (Part-I). Minimum size 1.5 mm sq.
24.0	Flexible trailing cable		1.1KV grade XLPE power cables shall have Cu conductor, XLPE insulated, PVC inner sheathed (as applicable), armoured/ unarmoured, FRLS PVC outer sheathed conforming to IS:7098.(Part-I).
25.0	Control Voltage		110 V

NOTE: Bearing life shall be 20 years minimum.

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LT MOTORS


A. GENERAL

1. Manufacturer & Country of origin.
(Shall be as per approved QA make)
2. Equipment driven by motor
3. Motor type
4. Quantity

B. DESIGN AND PERFORMANCE DATA

1. Frame size
2. Type of duty
3. Type of enclosure /Method of cooling/Degree of protection
4. Applicable standard to which motor generally conforms
5. Efficiency class as per IS 12615
6. (a) Whether motor is flame proof Yes/No
(b) If yes, the gas group to which it conforms as per IS:2148
7. Type of mounting
8. Direction of rotation as viewed from DE END__
9. Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)
10. Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)
11. Maximum continuous load demand of driven equipment in KW
12. Rated Voltage (volts)
13. Permissible variation of :

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- a. Voltage (Volts)
 - b. Frequency (Hz)
 - c. Combined voltage and frequency
14. Rated speed at rated voltage and frequency(RPM)
15. At rated Voltage and frequency:
 - a. Full load current
 - b. No load current
16. Power Factor at
 - a. 100% load
 - b. NO load
 - c. Starting.
17. Efficiency at rated voltage and frequency,
 - a. 100% load
 - b. 75% load
 - c. 50% load
18. Starting current (amps) at
 - a. 100 % voltage
 - b. 85% voltage
 - c. 80% voltage
19. Minimum permissible starting Voltage (Volts)
20. Starting time with minimum permissible voltage
 - a. Without driven equipment coupled
 - b. With driven equipment coupled

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21. Safe stall time with 100% and 110% of rated voltage
 - a. From hot condition
 - b. From cold condition
22. Torques :
 - a. Starting torque at min. permissible voltage(kg-mtr.)
 - b. Pull up torque at rated voltage.
 - c. Pull out torque
 - d. Min accelerating torque (kg.m) available
 - e. Rated torque (kg.m)
23. Stator winding resistance per phase (ohms at 20 Deg.C.)
24. GD^2 value of motors
25. No of permissible successive starts when motor is in hot condition
26. Locked Rotor KVA Input
27. Locked Rotor KVA/KW
28. Vibration limit :Velocity (mm/s)
29. Noise level limit (dBA)

C. CONSTRUCTIONAL FEATURES

1. Stator winding insulation
 - a. Class & Type
 - b. Winding Insulation Process
 - c. Tropicalised (Yes/No)

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- d. Temperature rise over specified maximum ambient temperature of 50 deg C
 - e. Method of temperature measurement
 - f. Stator winding connection
2. Main Terminal Box
 - a. Type
 - b. Location (viewed from NDE side)
 - c. Entry of cables(bottom/side)
 - d. Recommended cable size (To be matched with cable size envisaged by owner)
 - e. Fault level (MVA), Fault level duration (sec)
 - f. Cable glands & lugs details (shall be suitable for power cable)
3. Type of DE/NDE Bearing
4. Motor Paint shade
5. Weight of
 - a. Motor stator (KG)
 - b. Motor Rotor (KG)
 - c. Total weight (KG)

D. List of accessories.

1. Space Heaters (Applicable for 30 KW & above motor)
(Nos./Power in watts/supply voltage)
2. Terminal Box for Space Heater (Yes/No)
3. Speed switch (Yes/No)
No of contacts and contact ratings of speed switch

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4. Insulation of bearing (Yes/No)

5. Noise reducer(Yes/No)

6. Grounding pads

i) No and size on motor body

ii) Nos on terminal Box

7. Vibration pads

i) Nos and size

ii) Location

8. Any other fitments

E. List of curves.

1. Torque speed characteristic of the motor

2. Thermal withstand characteristic

3. Starting. current Vs. Time

4. Starting. current Vs speed

5. P.F. and Effi. Vs Load

F. Additional Data to be filled for each rating of DC Motor

1. Rated armature voltage (Volt)

2. Rated field excitation (Amp)

3. Permissible % variation in voltage


4. Minimum Permissible Starting voltage (volt)

5. At rated voltage

i) Full load Armature current.(Amp)


ii) Full load Field current (Amp)

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- iii) No load Armature current (Amp)
6. Full load Field current (Amp)
7. No load Armature current (Amp)
8. Minimum permissible field current(Amp) to avoid overspeeding at
 - i) Maximum permissible voltage
 - ii) Rated voltage
 - iii) Minimum Permissible Voltage
9. Resistance (indicative Values) in ohm
 - i) Armature winding (Arm + IP + Series) at 25 deg.C
 - ii) Field Winding at 25 deg. C
10. Inductance (indicative values)
 - i) Armature winding
 - ii) Field winding
11. Value of trimmer resistance (ohm) to be connected in series with the shunt field to obtain rated speed at
 - i) 220 V DC
 - ii) 250 V DC
 - iii) 187 V DC
12. Value of the external resistance (ohm) required to be connected in series with armature during starting only
13. Technical data sheet for external resistance box
14. GA drawing of motor
15. Starting time calculation

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16. Starter resistance design calculation
17. Electrical connection diagram of motor

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Fold-3

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DRG NO	
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OWNER	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD
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STATUS IRG/REF. NO. (INTERNAL)	2X660 MW SURATGARH SUPER CRITICAL TPS, STAGE - V UNIT 7& 8
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PRINT SCALE		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI	DEPT CODE DRN DESN CHD APPD	NAME SIGN DATE
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REV.	DATE	ALT.D	CHD	APPD	REV.	DATE	ALT.D	CHD	APPD

TITLE	DEPT.	SCALE	BHEL DRG. NO :
	SIGN		
	DATE		

SUB-CONTRACTOR	SHEET 1	OF	1	REV
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Fold-2



TITLE

TECHNICAL SPECIFICATION FOR WIRE ROPE ELECTRICAL HOIST

2X660 MW SURATGARH SUPER CRITICAL TPS,
STAGE - V UNIT 7&8

SPECIFICATION NO. PE-TS-392-563-A002

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REV 00

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Master drawing list and submission schedule

			2X660 MW SURATGARH STPS		REV 00	
-	-	-	PE-TS-392-563-A002	-		
Sl. No.	SI-NO	BHEL DRG.NO	DRAWING TITLE	CATEGORY	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF PO	Remarks
ELECTRIC HOISTS (EH)						
1	563	PE-V0-387-563-A100	Manufacturing Quality Plan with Sub vendor list	APPROVAL	2	
2	563	PE-V0-387-563-A101	GA Drawing for Electric Hoist, DSL arrangement and painting details.	APPROVAL	3	
3	563	PE-V0-387-563-A102	Schematic Circuit Diagram	APPROVAL	3	
4	563	PE-V0-387-563-A103	Mechanism Sizing Calculation	APPROVAL	3	
5	563	PE-V0-387-563-A104	Detailed BOM/BOQ for crane	INFORMATION	4	
6	563	PE-V0-387-563-A105	O & M Manual	INFORMATION	6	
7	563	PE-V0-387-563-A106	Mandatory spare parts list	APPROVAL	4	
8	563	PE-V0-387-563-A107	Erection procedure	INFORMATION	6	
NOTE:	1	VENDOR SHALL RESUBMIT THE REVISED DRAWINGS WITHIN 7 DAYS OF RECEIPT OF COMMENTS.				
	2	INCOMPLETE DRAWINGS/DOCUMENTS SHALL NOT BE TREATED AS SUBMITTED.				
	3	MANUFACTURING SHALL BE STARTED ON RECEIPT OF CAT II APPROVED DRAWINGS.				

DRAWING AND DOCUMENTS FOR SUBMISSION

S.N.	Drawings and documents	Tentative number of prints / copies
1.0	DRAWING FOR APPROVAL	
1.1	For approval	4
1.2	For customer approval	6
1.3	For final distribution	15
2.0	DRAWING FOR REFERENCE	
2.1	For reference	4



TITLE

TECHNICAL SPECIFICATION FOR WIRE ROPE ELECTRICAL HOIST

2X660 MW SURATGARH SUPER CRITICAL TPS,
STAGE - V UNIT 7&8

SPECIFICATION NO. PE-TS-392-563-A002

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2.2	For final distribution	15
3.0	CERTIFICATE, REPORTS ETC.	6
4.0	AS BUILD DRAWINGS (IF REQUIRED)	15
5.0	O&M MANUAL	
5.1	Draft for approval	2
5.2	For final distribution	12
6.0	QUALITY PLAN / Field quality plan / PG test	6

Note:

- 1.0 Quantity of prints are general and subject to increase or decrease during engineering stage.
- 2.0 Soft copies shall also be submitted of all the documents.
- 3.0 All final drawings and documents shall also be submitted in 2 sets of CD.
- 4.0 In case the drawings for approval are required to be submitted in soft copies, the vendor shall submit all the drawings / documents in soft.

VOLUME III
DEVIATION SHEET (COST OF WITHDRAWAL)



PROJECT:- 2x660MW Suratgarh STPS

PACKAGE:- Electric Hoists, SPECIFICATION NO.: PE-TS-392-563-A002

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE
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NOTES:

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given seperately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



TITLE

TECHNICAL SPECIFICATION FOR
WIRE ROPE ELECTRICAL HOIST

2X660 MW SURATGARH SUPER CRITICAL TPS,
STAGE - V UNIT 7&8

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Annexure-II

**VENDOR HAS TO SUBMIT ONLY FOLLOWING DOCUMENTS ALONG WITH THE OFFER,
FOR TECHNICAL EVALUATION OF THE BID:-**

- 1) SCHEDULE OF TECHNICAL DEVIATION (IF ANY)
OR

'NO DEVIATION CERTIFICATE' – Clearly mentioning that bidder has considered 'No - Deviation' from the technical specification provided by BHEL.

- 2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.
- 3) Unpriced format, duly mentioned 'Quoted' against each Sl.no. below each column.
- 4) A copy of the sheet "Electrical Equipment Specification for Electrical Hoists" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
- 5) Electrical load requirement in the load data format.

Note1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / Crane clearance diagram/ GA Drawing/ QAP etc. shall not be taken in to consideration for evaluation.

Note 2:- Bidder to note that if the bidder does not submit the documents mentioned in Sl. No. 1, 2, and 3 along with their offer then their offer is liable to be rejected.



TITLE:
TECHNICAL SPECIFICATION
COMPLIANCE CUM CONFIRMATION
CERTIFICATE

SPEC. NO.: PE-TS-392-563-A002
VOLUME: III
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SHEET 1 OF 2

COMPLIANCE CUM CONFIRMATION CERTIFICATE

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

- a) 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" in section C and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.
- e) 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.

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- h) The EQUIPMENT'S functional guarantees shall stand valid till at least eighteen (18) months from PERFORMANCE GUARANTEE test of equipment as per technical specification or commercial terms and conditions, whichever is later.
- i) 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. 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.
- j) 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.



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- k) As built drawings shall be submitted as and when required during the project execution.
- l) 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.