

RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD

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

**TECHNICAL SPECIFICATION FOR SINGLE GIRDER
CRANES**

SPECIFICATION NO.: PE-TS-392-524-A001



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

	Title TECHNICAL SPECIFICATION FOR SINGLE GIRDER CRANES 2X660 MW SURATGARH SUPER CRITICAL TPS, STAGE - V UNIT 7&8	Specification no.: PE-TS- 392-524-A001
		Rev. 00
		Date:
		Sheet 1 of 1

INDEX

S.N.	VOLUME	SECTION	DESCRIPTION	PAGES
1.0	Volume II B	Section-A	Scope of Enquiry and Misc. requirements	3
2.0	Volume II B	Section-B	Project Information	4
3.0	Volume II B	Section-C	Scope of Work and Annexure A	3
4.0	Volume II B	Section-C	Makes of sub vendor's items-Annexure I and customer's sub-vendor list	16
5.0	Volume II B	Section-C	Mandatory spares list-Annexure II	1
6.0	Volume II B	Section-C	Procedure for load /overload testing of EOT cranes at Manufacture's works.- Annexure III	1
7.0	Volume II B	Section-C	Painting & color coding procedure. - Annexure IV and Customer's Painting Specification	15
8.0	Volume II B	Section-C	Document Distribution Schedule, Drawing and Instruction Manual, Master Drawing List, Title block. Annexure V	10
9.0	Volume II B	Section-C	Data sheet-A/B with crane clearance diagrams	17
	Volume II B	Section-C	Customer Specification, Shop Inspection and Test Procedures, and Packing, Marking & Transport Instructions for equipment	34
10.0	Volume II B	Section-C	Quality plan – Single girder EOT crane.	5
	Volume II B	Section-C	Electrical Specification of Single Girder EOT Crane	95
11.0	Volume II B	Section-D	Technical Requirements for EOT crane.	10
12.0	Volume II B	Section-D	Technical Specification for VVVF drives.	5
13.0	Volume III		Schedule of deviation	1
14.0	Volume III		Documents to be submitted along with offer Annexure VI including compliance cum confirmation certificate required from bidder.	3



TITLE TECHNICAL SPECIFICATION FOR SINGLE GIRDER CRANES 2X660 MW SURATGARH SUPER CRITICAL TPS, STAGE - V UNIT 7&8	SPECIFICATION NO. PE-TS-392-524-A001	
	VOLUME II B	
	SECTION A	
	REV 00	DATE
	SHEET 1	OF 2

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 testing and demonstration at vendor's works (as mentioned elsewhere in the specification) of **SINGLE GIRDER CRANES** 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 SINGLE GIRDER CRANES.**
- 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.



TITLE

TECHNICAL SPECIFICATION FOR
SINGLE GIRDER CRANES

2X660 MW SURATGARH SUPER CRITICAL TPS,

STAGE - V UNIT 7&8

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II B

SECTION A

REV 00

DATE

SHEET 2 OF 2

- 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. If there are no deviations from the tender document, bidder shall indicate 'NO DEVIATION' in the deviation schedule.
- 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.



TITLE

TECHNICAL SPECIFICATION FOR SINGLE GIRDER CRANES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II B

SECTION A

REV 00

DATE

SHEET 1 OF 1

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	

ISSUE R1

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 2 OF 3

	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

ISSUE R1

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 3 OF 3

		supply (For all instrumentation and control system equipment and solenoid valves)
--	--	---

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.

ISSUE
R1

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

**TECHNICAL SPECIFICATION FOR****SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION -C

REV. 00

DATE:

Page 1 of 5

1.0.0 SCOPE OF WORK**1.1.0 SUPPLIES**

1.1.1 Equipment and services to be furnished by the bidder for the Single Girder EOT with accessories as per the details given in data sheet A. Any equipment / accessories not specified in the specification but required to make the crane units complete and efficient shall also be under the bidder's scope of work.

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

1. Bridge girder.
2. End carriages complete with wheels
3. Electric Hoist with VVVF drive for hoisting.
4. CT / L T arrangement with VVVF drive
5. Electrical equipments
6. PVC Shrouded Conductor Bus Bar Type DSL with accessories for entire bay length
7. Rail, as applicable
8. Earthing arrangement.
9. Painting of crane.
10. First fill of lubricant.
11. O & M Manual, drawings and documents.
12. Main isolating switch and power cable from 1.5M above ground / operating floor to down shop lead.
13. End stoppers

1.1.2 Maintenance Tools and Tackles

A complete unused new set of tools & tackles and accessories along with detailed instructions and maintenance manual for each capacity of crane shall be supplied. Each tool and wrench shall be stamped, so as it can be easily identified for 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 and specially protected against rusting in tropical climate and minimum the following shall be provided.

S. No.	Description	Qty.
1	Complete set of ring spanners (Indicate the sizes offered)	1 Set
2	Complete set of screwdrivers (Min. 6 nos. Indicate the sizes)	1 Set
3.	Adjustable Spanner	1 No.

**TECHNICAL SPECIFICATION FOR****SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION -C

REV. 00

DATE:

Page 2 of 5

- | | | |
|-----|----------------------------|-------|
| 4. | Insulated pliers | 1 No. |
| 5 | Wrench spanner | 1 No. |
| 6. | Grease Gun | 1 No. |
| 7. | Oil Gun | 1 No. |
| 8. | Hand Lamp | 1 No. |
| 9 | Line tester | 1 No. |
| 10. | Any other tool and tackle. | |

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

1.1.3 Erection and commissioning spares.

1.1.4 Mandatory Spares (as specified elsewhere in specification)

1.2.0 Services to be provided by the bidder

1.2.1. Packing, 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

1.3.1. Inspection and testing at Manufacturer's works

A. Shop inspection and tests will include but not limited to the following -

- i. Identification, co -relation and verification of material test certificates for the important components like girders, major load carrying components, hooks, gears, shafts, wheels, wire rope drum, wire rope, gear box etc. For other components supporting test certificates or random check tests shall be conducted.
- ii. Qualification of welder and welding procedure as per ASME section IX of ASTM -7.1
- iii. 100% radiography of tension zone & 25% radiography of compression butt welds of load bearing members shall be carried over and all butt welds as per ASME- 165/ASTME 109 and acceptance norm as per ASME Section viii Div.1.
- iv. For fillet welds visual inspection on all welds. Die penetration test (DPT) for fillet welds in the load bearing members as per ASME-165/ASTME 109 and acceptance norm as per ASME section VIII Div. 1.
- v. Ultrasonic test on forgings and casting of critical components like hook, shafts, axles, gears, wheels, pulleys, etc. Ultrasonic test for casting as per ASME Section III NB 2572 & for forging as per ASTM A388.

Unacceptable defects in forgings are as given below: -

1. Cracks, flaws, seams and laps.
2. Defects giving indication larger than 4mm diameter equivalent flaw.

**TECHNICAL SPECIFICATION FOR****SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION -C

REV. 00

DATE:

Page 3 of 5

3. Groups of defects with maximum indication less than that from a 4mm dia, equivalent flaw, which can not be separated at testing sensitivity if the back echo is reduced by 50%.
4. Defects giving indication of 2 to 4 mm diameter equivalent flaw separated by a distance less than 4 the size of the larger of the adjacent flaws.
- vi. PT/MT on component with surface hardening as per ASTM E -165 and ASTM E 138 respectively with no surface defects.
- vii. Gearbox trial run test as per AGMA standards.
- viii. Verification of type test certificates and enclosure for electrical and electro mechanical items. If type test certificates of the similar items are not available, arrangement shall be made to conduct the same in the presence of BHEL/ Customers representative.
- ix. Acceptance and routine tests (HV and insulation) for all electrical and electromechanical components and system as per governing specification
- x. Functional and simulated operation test, sequencing, interlocks, safety, protection and alarm system. Test on CRANE / CRAB motors and other mechanical, electrical, electro-mechanical as per BHEL technical specification and or as per applicable code
- xi. Cranes shall be completely assembled at manufacturers' works to check the misalignment of gears, shafts and other items. Gear box shall have the idle run for minimum two (2) hours.

B. Testing At Works

- i. Deflection test of bridge girder at rated load.
- ii. No load / load (SWL) / Over load test (running of CT & Hoisting mechanism at 125% of rated load.)
- iii. Electrical tests for brakes, panel, electrical equipment etc as per IS - 3177
- iv. No load run test of LT mechanism.
- v. Measurement of speed of CT & Hoisting (lowering & raising) at rated load.
- vi. All Other tests as per IS-3177.

Note: Refer Annexure-III, Section-C, Volume II-B for "Shop test Procedure for Load/Overload testing of EOT cranes at Manufacturer's Works.

1.3.2 Testing at site

The following tests shall be carried out at site by **BHEL** as a part of Erection and Commissioning: -

- a) All the tests as mentioned against S.N. 1.3.1 (B) above, with actual hook and wire rope.
- b) Speed test at rated load for hoisting / CT and LT mechanism.

**TECHNICAL SPECIFICATION FOR****SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION -C

REV. 00

DATE:

Page 4 of 5

c) Brake test and working of electric hoist.

d) Any other test as per IS-3177-1999.

The successful bidder shall furnish their recommended procedure for carrying out the Erection and Commissioning.

1.4.0 SURFACE PREPARATION, PAINTING & COLOUR SCHEME

Detailed painting procedure has been attached as Annexure IV , Section C, Volume IIB. Bidder shall follow the same.

1.4.1. Color Scheme

Color-coding procedure shall be as per enclosed Annexure-IV , Section C, Volume IIB.

1.5.0. Drawing / design document for submission & number of drawing and documents for submission

As per Annexure V. section-C, volume II-B of this specification. Any other design document/ drawing as required by customer/ BHEL shall be submitted by bidder during detail engineering without any implication.

1.6.0. INFORMATION TO BE FURNISHED BY BIDDER ALONG WITH THE OFFER

As detailed in Annexure VI.

2.0.0. Works Excluded

2.1.0 Supply of steel gantry girders

2.2.0 For EOT crane:

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

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

3.0.0. Performance and Demonstration Test

EOT crane along with its drives, controls and other accessories shall be demonstrated for the rated capacity against the rated speed of motions. The bidder shall have the full responsibility for the safe and efficient operation of the crane with associated accessories as a single unit. If the shop demonstration tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good by the bidder at his own cost.


TECHNICAL SPECIFICATION FOR
SINGLE GIRDER CRANES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION -C

REV. 00

DATE:

Page 5 of 5

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

4.0.0. Make of Sub - Vendor items

The makes of bought out items will be as per Annexure-I, section C, volume II-B of the specification. No other make will be acceptable, until and unless specifically got approved by BHEL/Customer during detail engineering. Acceptance/non acceptance of same shall not have any impact on manufacturing & delivery schedule and on cost of crane.

Annexure - A

2X660 MW SURATGARH STPS

S.No.	AREA / EQUIPMENT DESCRIPTION	Type	QTY (nos)	CAPACITY (T)	LIFT (M)	TRAVEL(M)	SPAN (M)
	SCOPE OF SINGLE GIRDER CRANES						
1	Screens and gates handling outside CWPH	SEMI GANTRY	1	8	14	64	11.6
2	AIR COMPRESSOR HOUSE	UNDERSLUNG	1	8	6	47.7	10.1
3	RAW WATER PUMP HOUSE	UNDERSLUNG	1	5	16.8	18.5	5.5
4	Screens and gates handling outside Raw Water Pump House	SEMI GANTRY	1	5	15.8	13.5	5.8
5	FILTERED WATER PH	UNDERSLUNG	1	5	11.5	21	9.3
6	RIVER WATER INTAKE PUMP HOUSE	UNDERSLUNG	1	5	13	19.35	5.5
7	FIRE WATER/BLOWDOWN PUMP HOUSE	UNDERSLUNG	1	8	4.5	62	5.4
8	Screens and gates handling outside River Water Intake Pump House	SEMI GANTRY	1	5	12	21	4.2

Note: 1) Any variation in span or lift within the range of (+/-) 1m during detailed engineering shall be accommodated by the bidder without any price implication

2) All semi-gantry cranes shall be of outdoor duty type.



TITLE

**TECHNICAL SPECIFICATION
FOR SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

REV No.: 00

DATE

Page 1 of 2

ANNEXURE-I

MAKES OF SUB VENDORS ITEMS ()**

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-MUMBAI/ABB-FARIDABAD/NGEF/ CROMPTON-AHMEDNAGAR/KIRLOSKAR-HUBLI, BANGALORE/ BHARAT BIJLI-MUMBAI / MARATHON-KOLKATA / LHP(UPTO 7.5kW)- SOLAPUR.
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



TITLE

TECHNICAL SPECIFICATION
FOR SINGLE GIRDER CRANES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

REV No.: 00

DATE

Page 2 of 2

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

ISSUE
R1

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

ISSUE R1

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 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

ISSUE
R1

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

ISSUE R1

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

ISSUE R1

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

SI. 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

ISSUE
R1

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

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 1 OF 16
<u>The list of acceptable makes for I&C equipment / system are as listed below: -</u> 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.		
		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 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		
		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 3 OF 16
Universal Cables Ltd Reliance Cables Gems Cab CONTROL CABLES Delton Incab Universal Cables ltd Reliance Cables Gems Cab. CONDUCTIVITY MEASUREMENT Emerson Process Management Honeywell ABB Ltd. Polymetron. Yokogawa Bluestar Ltd DISSOLVED OXYGEN MEASUREMENT Honeywell Polymetron Emerson Process Management ABB Yogokawa Bluestar Ltd. HYDRAZINE ANALYSER Hach ABB Polymetron Emerson Process Management PH Hach Polymetron Forbes Marshall Honeywell Emerson Process Management ABB Ltd		
		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 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		
		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 8 OF 16
A.N. Instruments Gauges Bourdon Industrial Eqpt. co. Waaree Instruments Ltd. Odion Druck India Wika Instruments PRESSURE SWITCHES Indfoss (India) Ltd. Switzer Instruments Ltd. Varma Trafag A.N. Instruments Waaree Instruments Ltd Dag Process Instruments Chemtrols PUSH BUTTONS Honeywell Larsen & Toubro Ltd. Siemens Ltd. Tele Mechanic RECEIVER INDICATOR (BAR GRAPH) Laxons Masibus Industrial Instrumentation Yokogawa Teletherm Instruments co. RECEIVER RECORDER / MULTIPOINT RECORDER Laxons Engg. & Electronic Pvt. Ltd. Yokogawa Tata Honeywell ABB Digital Electronics. Penny & Guile		
		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 10 OF 16
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		
		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 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) <u>NOTES</u> 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.		
		ISSUE R1



TITLE

TECHNICAL SPECIFICATION
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-393-524-A001

VOLUME II - B

SECTION -C

REV 00

DATE

SHEET 1 OF 1

ANNEXURE II
MANDATORY SPARES PARTS

S.NO.	DESCRIPTION	TOTAL QUANTITY INCLUDED FOR THE COMPLETE PROJECT (To be repeated for each type and capacity of crane)	
	Cranes		
1	MECHANICAL SPARES:		
1.1	CT Wheel bearing	4	Nos.
1.2	LT Wheel bearing	4	Nos.
1.3	Oil seal for hoist gear box	2	Set
1.4	Oil seal for CT gear box	2	Set
1.5	Oil seal for LT gear box	2	Set
1.6	Cable trolleys	6	Nos.
1.7	Brake drum for CT	2	Nos.
1.8	Brake drum for LT	2	Nos.
1.9	Brake drum for hoist	2	Nos.
2	ELECTRICAL SPARES:		
2.1	BRAKE COILS FOR:		
2.2	Hoist brake	2	Nos.
2.3	CT brake	2	Nos.
2.4	LT brake	2	Nos.
2.5	Contactors	1	No. each for main, hoist, LT & CT
2.6	Push buttons with contact	2	Nos.
2.7	Hoist limit switch	2	Nos.
2.8	Lever type limit switch for CT	2	Nos.
2.9	Lever type limit switch for LT	2	Nos.
2.10	Overload relay for hoist	2	Nos.
2.11	Overload relay for LT	2	Nos.
2.12	Overload relay for CT	2	Nos.

Note:

- One (1) set means complete (100%) replacement of that particular item for one crane.



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER EOT CRANES**

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

SPECIFICATION NO. PE-TS- 392 -524-A001

VOLUME II - B

SECTION -C

REV No.: 00

DATE

Page 1 of 1

ANNEXURE III**Procedure for Load/Overload testing of Single Girder EOT crane at Manufacturer's Works**

Objective: To demonstrate final NO load / Load / Overload / Deflection / Functional tests of assembled Crane for the purpose of acceptance in line with IS 3177.

Basic Assumptions / Inputs for testing at Works:

- Actual job hook shall be used for load / overload tests for hoisting.
- Actual wire ropes shall be used for load / overload testing.
- Shop cables can be used for temporary power supply for the purpose of showing various functional tests at shop.
- Interlock and limit switch operation check will be shown for hoisting and CT motion.

Procedure for Load / Overload testing:

The cranes shall be tested for no load and load /overload test at works generally in conformance with the IS – 3177 (1999). Specifically with respect to the load / overload testing of crane, the following tests as per the outlined procedures shall be done at works.

- Deflection of the girder will be measured at SWL when the trolley with load is at the middle of the girder.
- No load and full load current of the motors will be measured to verify whether it is as per the approved data sheet of the motor. Resistors in the circuit will be checked for any overheating of the element.
- The load will be gradually raised to 125 percent of the rated capacity (SWL) with actual hook. The load will be lifted upward to about 1 meter height above its support and stop again. Check for any undue drift in the load. If load drifts, check the adjustment of brakes and repeat the above procedure. Then lower the load to rest on support/ground.
- For checking the cross travel, raise the load up to one (1) meter height above supports and then move the trolley with load about one (1) meter in either direction of the bridge. Then lower the load to rest on support/ground.
- Creep speed motions shall be checked over a distance of about 500 mm.

	TITLE		TECHNICAL SPECIFICATION SINGLE GIRDER CRANES 2X660 MW SURATGARH, STAGE - V UNIT 7&8	
		SPECIFICATION NO. PE-TS-392-524-A001		
		VOLUME II B		
		SECTION-C		
		REV. 00	DATE:	

PAINTING PROCEDURE / COLOR SCHEME ANNEXURE IV

Crane, structure, equipment	Primer	All Steel surfaces shall be provided with self -curing Inorganic Zinc Silicate Primer Coat (Solid by Volume Minimum 60%) of Minimum 75 Micron Dry Film Thickness (DFT) applied over blast cleaned surface to near white metal conforming to Sa 2 ½ finish of Swedish standard SIS-05-5900. The Primer Coat shall be applied in Shop immediately after blast cleaning by Airless spray technique. Primer Coat shall be followed with the application of Intermediate Coat of Polyamide Cured pigmented Titanium Dioxide (TiO2) or Micaceous Iron Oxide (MIO) Epoxy based Paint (Solid by Volume Minimum 60%) of Minimum 75 Micron DFT. This Coat shall be applied in Shop after an interval of Minimum overnight (from the application of Primer Coat) by Airless spray technique.
	Intermediate	Primer Coat shall be followed with the application of Intermediate Coat of Polyamide Cured pigmented Titanium Dioxide (TiO2) or Micaceous Iron Oxide (MIO) Epoxy based Paint (Solid by Volume Minimum 60%) of Minimum 75 Micron DFT. This Coat shall be applied in Shop after an interval of Minimum overnight (from the application of Intermediate Coat) either before Erection by Airless spray technique or after Erection by brush and spray. Colour and shade of the Coat shall be as approved by the Employer. The Finish Coat thickness of 75 Micron can be built up either in Single application at shop or in two applications one at Shop and the other at Site.
	Finish Paint	Intermediate Coat shall be followed with the application of Finish Coat of Polyamide Cured colour pigmented Epoxy based Paint (Solid by Volume Minimum 60%) of Minimum 75 Micron DFT. This Coat shall be applied after an interval of Minimum overnight and maximum indefinite (from the application of Intermediate Coat) either before Erection by Airless spray technique or after Erection by brush and spray. Colour and shade of the Coat shall be as approved by the Employer. The Finish Coat thickness of 75 Micron can be built up either in Single application at shop or in two applications one at Shop and the other at Site.
	Seven Tank Process	Finish Coat shall be followed with the application of Final Finish Coat of Polyurethane based colour pigmented Paint (Solid by Volume Minimum 40%) of Minimum 25 Micron DFT. This Coat shall be applied within Seven (7) days (from the completion of Finish Coat), after Erection by brush and spray.
Panel	Seven Tank Process	Primer-Zinc phosphate (alkyd medium) 2coats DFT 25-35 microns per coat Finish -Synthetic Enamel 3 coats (alkyd medium) as per IS 2932 per coat DFT 20-25 microns Total DFT 90-120 microns.

Colour Shade:

1. For structure, platform, Galleries, ladders & Hand rails: Shade Golden Yellow RAL 1004.
2. For Motor: RAL 5012
3. Electrical control panel: RAL 9002 for front & rear and RAL 5012 for side covers.
4. Black zebra strips 100 mm wide on Hook, Black strip on Bottom block assembly & End carriage sweep to be applied.

NOTE: Customer’s Painting Requirements have also been attached. In case of any discrepancy in the requirements given in the technical specification, the more stringent of the two as per the interpretation of purchaser shall be applicable.

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												
PAINTING 13.0 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. 13.0.2 The following surface and material shall require painting: - 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. 13.0.3 The following surfaces and material shall not require painting: - 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 13.1.0 Codes and Standards 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. 13.1.0.2 The following Indian Standards may be referred to carrying out the painting job. <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												
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												
		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
metals in buildings (Parts I & II) IS: 2524 : Code of practice for painting of non-ferrous metals in buildings (Parts I & II) IS : 2395 : Code of practice for finishing of concrete, masonry and plaster surfaces (Parts I and II) IS : 2338 : Code of practice for finishing of wood and wood based materials (Parts I & II) IS : 158 : Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting IS : 2074 : Ready mixed paint, air drying, red oxide zinc chrome, and priming. IS : 104 : Ready mixed paint, brushing, zinc chrome, priming IS : 2932 : Enamel, synthetic, exterior (a) undercoating (b) Finishing. SIS : 55900 : Swedish standard for blasting IS: 14506 : Epoxy Red oxide Zinc Phosphate Weldable Primer, Two Component Specification IS: 14209 : Epoxy Enamel, Two Component, Glossy Specification IS: 14589 : Zinc priming paint, Epoxy based, Two-pack-specification 13.2.0 SURFACE PREPARATION 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. 13.2.1 Blasting		
		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
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		
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	
	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.	
		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	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	
13.3.1.3	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.	
13.3.1.4	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.	
13.3.1.5	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.	
13.3.1.6	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.	
13.3.1.7	Coating Systems	
13.3.1.7.1	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).	
13.3.1.7.2	Standard Coating System (External Coatings)	
		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
a) Steel Structures 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. b) Galvanised iron and steel requiring paint finish at site At site <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). <u>Touch-up mechanical damages:</u> De rusting St 3 and application of high build epoxy primer DFT 80 µm. <u>Finish coating:</u> Analogous to standard painting scheme		
		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 6 OF 14
13.3.1.7.2.1	Painting of indoor components such as valves, pumps, motors, electrical parts, tanks etc. a) At works <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. <u>Prime coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm. b) At site 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. <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.	
13.3.1.7.2.2	<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.	
13.3.1.7.2.3	Painting of Outdoors equipment (external surfaces) such as piping, valves, pumps, motors, electrical parts, tanks etc. Weather exposure, weather resistance, temperature up to 120°C as per 13.7.1 and 13.7.3. <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. <u>Prime Coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm. <u>Intermediate Coat:</u> One (1) layer 2 pack high build epoxy polyamide Mio, dry film thickness 100 µm.	
		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 7 OF 14
13.3.1.7.2.4	<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. Special Coating System (External Coatings) Parts exposed to temperatures above 120°C, up to 200°C, not insulated a) At works <u>Surface Preparation:</u> Blasting according standard SIS 55900 Grade Sa 2^{1/2} 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 <u>Prime coat</u> Inorganic ethyl zinc silicate, dry film thickness 75 µm. b) At site <u>Pre-treatment:</u> 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. <u>Intermediate Coat:</u> 1 pack silicon acrylic, dry film thickness 35 µm. <u>Final coat</u> 1 pack silicon acrylic, dry film thickness as 35 µm. Total system dry film thickness 145 µm. Final coat according to colour code. Parts exposed to temperatures above 200°C, up to 400°C, not insulated At works <u>Surface Preparation:</u> Blasting according to ISO 8501-1: 1988 grade Sa 2^{1/2}. Depending on	
		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 8 OF 14
production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film 15-25 µm, shall be used. <u>Prime coat:</u> Inorganic ethyl zinc silicate, dry film of thickness 75 µm. At site <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. Insulated Parts, continuously exposed to condensing water or parts exposed to temperatures For parts that are provided with insulation on site. a) Insulated parts, exposed to condensing water At works <u>Surface Preparations:</u> Blasting according standard Sa 2¹/2 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. <u>Prime coat:</u> Inorganic ethyl zinc silicate, dry film thickness 75µm. b) Insulated parts exposed to temperatures Parts, exposed to temperatures up to <400⁰C at works <u>Surface Preparation:</u> Blasting according to standard Sa 2¹/2 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. 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.) <u>Surface preparation:</u>		
		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 9 OF 14
Blasting according standard Sa 21/2 to ISO 8501-1: 1988. <u>Temporary primer:</u> Varnish. c) Intermittent exposure due to condensing water / chemicals (Indoors) At works <u>Surface Preparation:</u> Blasting according to standard Sa 21/2 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. <u>Prime Coat:</u> Two layers of zinc phosphate epoxy primer total dry film thickness greater than or equal to 75 µm. At site <u>Pre-treatment:</u> 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. <u>Intermediate Coat:</u> 2 pack high build epoxy, dry film thickness 80 µm. <u>Finish coat:</u> 2 pack epoxy according to colour appearance, dry film thickness of 50 µm. Total system dry film thickness 205 µm. When exposed to weathering, weather resistance finish coat shall be applied. d) Water exposure Surfaces permanently or predominantly in contact with water. At site / works <u>Pre-treatment:</u>		
		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 10 OF 14
Removal of all welding pearls. Blasting according standard Sa 3 to ISO 8501-1: 1988. <u>Coat:</u> 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. 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. Pipe surfaces shall be cleaned by shot or sand blasting before application. Tests to be carried out after application Bond / Adhesion test Holiday test 13.3.1.7.3 INTERNAL COATINGS 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 2^{1/2}. <u>Prime coat:</u> Two layers of zinc phosphate epoxy primer total DFT greater than or equal to 75 µm. <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. <u>Intermediate coat:</u> 2 pack high build epoxy, dry film thickness 80 µm.		
		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 11 OF 14												
<u>Finish coats:</u> 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 <u>Pre-treatment:</u> Blasting according standard 2¹/₂ to ISO 8501-1: 1988. <u>Rubber lining:</u> 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 <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Item / Service</th> <th>Colour</th> <th>IS-5</th> <th>Colour (Band)</th> <th>IS - 5</th> </tr> </thead> <tbody> <tr> <td colspan="6" style="height: 20px;"></td> </tr> </tbody> </table>			Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS - 5						
Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS - 5									
		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 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					

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 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.				
					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 14 OF 14
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. 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. ISSUE R0		

TITLE

**TECHNICAL SPECIFICATION****FOR SINGLE GIRDER EOT CRANE**

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

SPECIFICATION NO. PE-TS- 393-524-A001

VOLUME II - B

SECTION -C

REV 00

DATE

ANNEXURE-V**DOCUMENT DISTRIBUTION SCHEDULE**

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED				VOLUME II SECTION – E 2
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan				SHEET 1 OF 1
		DOCUMENT DISTRIBUTION SCHEDULE				
SL. NO	PARTICULARS	Owner Office	Owner Site	Consultant's Design Office	Consultant's Site Office	Vendor
<u>CORRESPONDENCE</u>						
1.	RRVUN TO VENDOR	S	1*	1	1*	O
2.	CONSULTANT TO VENDOR	1	1*	S	1*	O
3.	VENDOR TO RRVUN	O	1*	1	1*	S
4.	VENDOR TO CONSULTANT	1	1*	O	1*	S
<u>VENDOR DRAWINGS FOR APPROVAL</u>						
1.	FIRST ISSUE	SC+2P	-	SC + 4P	-	S
2.	COMMENTS ON DRAWINGS	SC or 1P	-	S	-	SC or 1P
3.	FINAL APPROVED	SC + 1P	2P	SC + 4P	2P	S
<u>VENDOR DRAWINGS FOR INFORMATION</u>						
1.	FIRST ISSUE	SC	-	SC + 4P	-	S
2.	COMMENTS ON DRAWINGS, IF ANY	SC or 1P	-	S	-	SC or 1P
3.	FINAL DRAWING	SC + 1P	2P	SC + 4P	2P	S
<u>MANUFACTURING</u>						
1.	TEST REPORTS	O+1	-	2	-	S
<u>INSTRUCTION MANUALS</u>						
1.	PRELIMINARY	2	1	2	1	S
2.	FINAL	4	4	1	1	S
<u>LEGEND</u>						
1.	O : ORIGINAL					
2.	S : SOURCE					
3.	P : PRINT					
4.	SC : SOFT COPY					

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 1 OF 7
1.0 DRAWINGS 1.1 All drawings submitted by the VENDOR/CONTRACTOR including those submitted at the time of bid shall be with sufficient details to indicate the type, size, arrangement, weight of each component, breakdown for packing and shipment, the external-connections, fixing arrangements required, the dimensions required for installation and inter-connection with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the specifications. The term "CONTRACTOR" used hereafter in this specification shall mean "VENDOR" also wherever applicable. 1.2 Each drawing submitted by the CONTRACTOR shall be clearly marked with the following details: i. Name of the OWNER ii. Name of the CONSULTANT iii. Project Title including (if applicable) number of units and unit numbers iv. Purchase Order No./Contract Number v. Title of the Drawing clearly identifying the system, equipment or part vi. Drawing, Revision Number and Date vii. Space for CONSULTANT'S Drawing Number viii. Name of the CONTRACTOR (In case of SUB-CONTRACTOR or MANUFACTURER'S drawing, name of the CONTRACTOR and SUB-CONTRACTOR or MANUFACTURER shall be incorporated.) ix. Drawings duly signed in "checked" and "approved" columns x. Scale to which the drawing is drawn xi. Cross references to all relevant drawings xii. All relevant notes to the drawing (All notes necessary for understanding and execution of work shown on a drawing shall be presented on the same drawing.) xiii. All legends to all notations		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 2 OF 7
xiv. Details of revisions carried out xv. Bill of materials shall be tabulated, wherever required xvi. All titles, notings, markings and writings on the drawing shall be in English xvii. All the dimensions shall be in metric units (If standard catalogues are submitted, the applicable items shall be highlighted therein.) 1.3 Categorisation Of Contractor Documents 1.3.1 The CONTRACTOR documents are generally categorised under the following three heads: (a) Documents which are to be reviewed and approved (Category FA) (b) Documents which are to be reviewed and commented but not for approval (Category FR) (c) Documents which are for information and records only (Category FI) 1.3.2 The category of each contractor document shall be decided by the CONSULTANT ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 3 OF 7
1.4 List of Contractor Documents On award of contract, the CONTRACTOR shall furnish a detailed document schedule with descriptive title and expected dates of submission within the time as specified in the specification. The categorisation of documents as per clause 1.3.1 will be marked by the CONSULTANT on the Contractor Document/Drawing Schedule. The CONTRACTOR shall incorporate these details and submit revised schedules. This schedule shall be revised and documents added, as necessary, during the progress of work with the concurrence of the CONSULTANT. 1.5 Quality of Drawings 1.5.1 The CONTRACTOR shall prepare all necessary detailed drawings, designs, etc., giving full and complete information to enable the CONSULTANT to properly review the design of work. 1.5.2 Drawings shall be fully legible and drawn in ink and all writing shall be clearly printed or stencilled. 1.5.3 Reproduced drawings shall be clear and legible with no background shade. Sections and details of points of the work shall be shown on the same drawing of the work to which they relate. 1.5.4 Drawings and their title blocks shall be properly drawn, prepared and printed to the approval of the CONSULTANT. 1.5.5 Drawings poorly drafted or engineered or without signatures in checked and approval columns will be returned to the CONTRACTOR without review for necessary action. 1.6 Drawings by SUB-CONTRACTORS Drawings to be provided by the SUB-CONTRACTORS shall be checked thoroughly by the CONTRACTOR with special regard to measurements, size of components, material and details to satisfy himself that they conform to the requirements and to the intent of Specification and the CONTRACTOR shall place thereon his signature and the date of his approval before submitting the same to the CONSULTANT. Drawings found to be inaccurate or otherwise in error shall be returned to the SUB-CONTRACTOR for correction before submitting them to the CONSULTANT. 1.7 Design Calculations The CONTRACTOR shall generally furnish the following information. ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 4 OF 7

1.7.1 Manual Design Calculations

The following information shall be furnished at the appropriate place in each calculation, as applicable:

- (a) Input data and source of information
- (b) Design criteria to satisfy statutory requirements
- (c) Formulae used and references for the same.
- (d) Design assumptions made. Assumptions based on experience shall be clearly mentioned.
- (e) Latest applicable National/International Standards and Codes. The Codes and Standards shall be referred to with year of publication, revision number, amendment/addenda.
- (f) Reference Drawings and Documents along with their revision numbers
- (g) Final results/conclusions/recommendation.

1.7.2 Analysis/Design calculations by Computers

Following shall be complied by Contractor:

- i. CONTRACTOR shall use accredited/validated software and the same shall be indicated.
- ii. Modelling, wherever applicable.
- iii. All information as called for in CI.No.1.7.1

ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 5 OF 7
1.8 Sequence of Drawing submission 1.8.1 Drawings shall be submitted without delay in line with the agreed Schedule as per clause 1.4. No. of copies submitted to the CONSULTANT/OWNER shall be as per the distribution schedule in Section-F of the specification. 1.8.2 The sequence of submission of all drawings shall be such that all information or data is available for reviewing each drawing when it is received. 1.8.3 Revised drawings shall be immediately re-submitted for approval unless otherwise directed by the CONSULTANT. 1.8.4 Drawings submitted out of sequence will be returned to the CONTRACTOR without review for resubmission as per the sequence of drawing submission. 1.9 The OWNER shall have the right at all reasonable times to see at the factory of the CONTRACTOR, all drawings of any portion of the work. 1.10 The drawings submitted by the CONTRACTOR shall be reviewed by the CONSULTANT as far as practicable within agreed period and shall be marked up with comments if any. One print of such drawings will be returned to the CONTRACTOR duly signed by the CONSULTANT clearly identifying the review status of the drawing. The CONTRACTOR shall incorporate such modifications and/or corrections and submit the final drawings for approval. If the CONTRACTOR is unable to incorporate comments in his drawings, he shall clearly state in his forwarding letter such non-compliance along with valid reasons. Any delays arising out of failure by the CONTRACTOR to rectify the drawings to the satisfaction of the CONSULTANT in good time, shall not alter the Contract completion date. 1.11 Further work by the CONTRACTOR shall be in strict accordance with these drawings and no deviations shall be permitted without the written approval of the CONSULTANT/OWNER. 1.12 The CONSULTANT'S approval of the CONTRACTORS and SUB-CONTRACTORS drawings shall not relieve the CONTRACTOR from his responsibility for errors or omissions which may exist, even though Work is done in accordance with such approved drawings. When such errors or omissions are		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 6 OF 7
discovered later, they shall be made good by the CONTRACTOR at his expense irrespective of any approval of the CONSULTANT/OWNER. 1.13 Revision of Drawings 1.13.1 For all revisions of the drawing, CONTRACTOR shall ensure that all revisions are clearly encircled with revision numbers marked on the drawing. 1.13.2 CONTRACTOR shall also ensure that general details of revisions are indicated for each revision in the revision block of the drawing alongwith the date and signed by the approving authority. 1.14 Any manufacturing and fabrication work carried out prior to the approval of the drawings will be at the CONTRACTOR'S own risk and expenses. 1.15 Final drawings of the work as completed ('As-Built' drawings) shall be prepared by the CONTRACTOR and forwarded to the CONSULTANT/OWNER. 'As-Built' drawings shall be submitted within three (3) months of the issue of the Provisional Acceptance Certificate. 1.16 Reproducibles 1.16.1 Reproducibles, where called for in the distribution schedule in Section-F shall be submitted after the approval of drawings. 1.16.2 Upon completion of the installation, the CONTRACTOR shall furnish a complete set of drawings on reproducible tracing. The CONTRACTOR shall make in a neat and accurate manner, a complete record of all changes and revisions to the original design, as installed in the completed work. These drawings shall be submitted to the CONSULTANT/OWNER for records and these become the property of the OWNER. 1.16.3 In case the drawings are prepared using drafting software, original floppy shall be submitted. In addition drawings on Kilburn reproducible tracings film or equivalent shall be submitted as called for in the specification. 2.0 ENGINEERING DATA 2.1 The furnishing of engineering data by the CONTRACTOR shall be in accordance with the schedule for each set of equipment as specified in the technical specifications and the same shall be in English Language and in metric units unless otherwise specified. The review of these data by the CONSULTANT will cover only general conformance of the data to the specifications and documents, interfaces with the equipments provided under the specifications, external connections, and of the dimensions which might affect plant layout. This review by the CONSULTANT may not indicate a thorough review of all dimensions.		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – E 3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DRAWINGS AND INSTRUCTION MANUALS	SHEET 7 OF 7
quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the CONSULTANT shall not be construed by the CONTRACTOR, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents. 2.2 All engineering data submitted by the CONTRACTOR after final process including review and approval by the CONSULTANT shall form part of the Contract Documents and the entire works covered under these specifications shall be performed in strict conformity, unless otherwise expressly advised by the CONSULTANT/OWNER in writing. 3.0 INSTRUCTION MANUALS 3.1 The CONTRACTOR shall submit to the CONSULTANT/OWNER for their review, the preliminary instruction manuals for all the equipments, covered under the Contract within the time agreed upon between the OWNER and the CONTRACTOR. The final instruction manuals complete in all respects shall be submitted by the CONTRACTOR within thirty (30) days before the first shipment of the equipment. The instruction manuals shall contain full details and As-Built drawings for all the equipments furnished, the erection procedures, testing procedures, operation and maintenance procedures of the equipment and the same shall be written in English Language unless otherwise specified. Each manual shall also include a complete set of approved/as-built drawings together with performance/ rating curves of the equipment and test certificates where applicable. These instruction manuals shall be submitted in the form of one (1) reproducible original and number of copies shall be as per Section-F of the specification. 3.2 If, after the commissioning and initial operation of the plant, the instruction manuals require any modification/additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted in the form of one (1) reproducible original and number of copies shall be as per Section-F of the specification. ISSUE R0		

2X660 MW SURATGARH, STAGE - V UNIT 7&8 PE-TS-392-524-A001					
SI. No.	BHEL DRG.NO	DRAWING TITLE	REMARKS	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF P.O	Drawing Size
SINGLE GIRDER CRANES					
1	PE-V0-393-524-A100	Manufacturing Quality Plan with sub vendor list	APPROVAL	2	A4
2	PE-V0-393-524-A101	Data sheet of Single Girder Crane with painting details	APPROVAL	2	A4
3	PE-V0-393-524-A102	G.A. of Single Girder CRANE with CT DSL arrangement	APPROVAL	2	A3
4	PE-V0-393-524-A103	Mechanism Sizing Calculation	APPROVAL	2	A4
5	PE-V0-393-524-A104	G.A. drg of Hoist with trolley wheel assembly	INFORMATION	3	A3
6	PE-V0-393-524-A105	Bottom Block assembly	INFORMATION	3	A4
7	PE-V0-393-524-A106	General arrangement for LT cable trailing for Single Girder crane	INFORMATION	3	A4
8	PE-V0-393-524-A107	Schematic Circuit Diagram for following a) Main Protective panel & BOM b) Main hoist panel & BOM c) Cross Traverse and Long Travel panel & BOM d) Pendant and earthing.	APPROVAL	3	A4
9	PE-V0-393-524-A108	Long travel Machinery Assembly with LT wheel assembly	INFORMATION	4	A4
10	PE-V0-393-524-A109	Detailed BOM/BOQ for crane	INFORMATION	6	A4
11	PE-V0-393-524-A110	General arrangement of panel & pendant push button	INFORMATION	4	A3
12	PE-V0-393-524-A111	Cable sizing calculation and schedule.	APPROVAL	3	A4
13	PE-V0-393-524-A112	O & M Manual	INFORMATION	8	A4
14	PE-V0-393-524-A113	Mandatory spare parts list	APPROVAL	6	A4
16	PE-V0-393-524-A115	Erection procedure	INFORMATION	8	A4
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.				

CUSTOMER'S DRAWING No.										DRAWING No.									
6										5									
4										3									
A										B									
C										D									
E										F									
G										H									
I										J									
K										L									
M										N									
O										P									
Q										R									
S										T									
U										V									
W										X									
Y										Z									
AA										AB									
AC										AD									
AE										AF									
AG										AH									
AI										AJ									
AK										AL									
AM										AN									
AO										AP									
AQ										AR									
AS										AT									
AU										AV									
AW										AX									
AY										AZ									
BA										BB									
BC										BD									
BE										BF									
BG										BH									
BI										BJ									
BK										BL									
BM										BN									
BO										BP									
BQ										BR									
BS										BT									
BU										BV									
BW										BX									
BY										BZ									
CA										CB									
CC										CD									
CE										CF									
CG										CH									
CI										CJ									
CK										CL									
CM										CN									
CO										CP									
CQ										CR									
CS										CT									
CU										CV									
CW										CX									
CY										CZ									
DA										DB									
DC										DD									
DE										DF									
DG										DH									
DI										DJ									
DK										DL									
DM										DN									
DO										DP									
DQ										DR									
DS										DT									
DU										DV									
DW										DX									
DY										DZ									
EA										EB									
EC										ED									
EE										EF									
EG										EH									
EI										EJ									
EK										EL									
EM										EN									
EO										EP									
EQ										ER									
ES										ET									
EU										EV									
EW										EX									
EY										EZ									
FA										FB									
FC										FD									
FE										FF									
FG										FH									
FI										FJ									
FK										FL									
FM										FN									
FO										FP									
FQ										FR									
FS										FT									
FU										FV									
FW										FX									
FY										FZ									
GA										GB									
GC										GD									
GE										GF									
GG										GH									
GI										GJ									
GK										GL									
GM										GN									
GO										GP									
GQ										GR									
GS										GT									
GU										GV									
GW										GX									
GY										GZ									
HA										HB									
HC										HD									
HE										HF									
HG										HH									
HI										HJ									
HK										HL									
HM										HN									
HO										HP									
HQ										HR									
HS										HT									
HU										HV									
HW										HX									
HY										HZ									
IA										IB									
IC										ID									
IE										IF									
IG										IH									
II										IJ									
IK										IL									
IM										IN									
IO										IP									
IQ										IR									
IS										IT									
IU										IV									
IW										IX									
IY										IZ									
JA										JB									
JC										JD									
JE										JF									
JG										JH									
JI										JJ									
JK										JL									
JM										JN									
JO										JP									
JQ										JR									
JS										JT									
JU										JV									
JW										JX									
JY										JZ									
KA										KB									
KC										KD									
KE										KF									
KG										KH									
KI										KJ									
KK										KL									
KM										KN									
KO										KP									
KQ										KR									
KS										KT									
KU										KV									
KW										KX									
KY										KZ									
LA										LB									
LC										LD									
LE										LF									
LG										LH									
LI										LJ									
LK										LL									
LM										LN									
LO										LP									
LQ										LR									
LS										LT									



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 1 of 8

TECHNICAL DATA SHEET FOR SINGLE GIRDER EOT CRANE

Sr. No.		DESCRIPTION	TECHNICAL PARTICULARS	
1.0.0		Design, fabrication and testing of the crane confirm to standard / code number	Mechanical and Electrical as per IS: 3177-1999 (Reaffirmed 2006), IS 3938 & Structure design in accordance to IS 807:2006.	
1.1.0		Number of cranes	As per Annexure A	
1.2.0		Crane classification	M5 for Mechanical, Structural & M7 for Electrical.	
1.3.0		Suitable for outdoor or indoor duty	As specified in Annexure A. *All semi-gantry cranes shall be of outdoor duty type.	
1.4.0		Capacity and lift		
1.4.1		Main hoist	SWL = Safe working load	
	a.	Rated SWL – tonnes	As per Annexure A	
	b.	Test load SWL – tonnes	Rated SWL and over load test : 125% of SWL	
1.4.2		Deflection test of crane	Shall be carried out at SWL	
1.5.0		Span	As per Annexure A	
1.6.0		Operation from	Fixed type pendent push button station	
2.00		CRANE PERFORMANCE		
2.1.0		Crane speed with full load	Full speed M/Min	Creep speed M/Min
	a.	Main hoist	2	10% of main speed (thru' VVVF drives)
	b.	Trolley travel (CT)	6	10% of main speed (thru' VVVF drives)
	c.	Longitudinal bridge travel (LT)	8	10% of main speed (thru' VVVF drives)
2.2.0		Acceleration values	LT motion (bridge travel)	CT motion (trolley travel)
			As per IS: 3177	As per IS: 3938
2.3.0		Lift in Metres	The lifting rope shall be of sufficient length to permit the main hook to reach the zero level.	
	a.	Main Hoist	As per Annexure A	
2.4.0		Hook Approaches		
	a.	Main hook (DSL end)	As per attached CCDs.	
	b.	Main hook (Other end)		



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 2 of 8

3.0.0		COMPONENT DETAILS	
3.1.0		Trolley	
	a.	Type	Fabricated
	b.	Material	Rolled Structural steel.
	c.	Whether jacking pads for lifting trolley provided or not	No
3.2.0		Rope drums	
	a.	Material (Indicate IS)	Rope drums shall be made of seamless pipe or cast or welded as per IS 3177.
	b.	Flange / flangeless	Flanged
	c.	Numbers provided	One
	d.	Type of grooves	Machined grooved identical Right hand and Left hand
3.3.0		Rope details	
	a.	Construction	Extra flexible plough steel , 6 x 36 / 6 x 37 construction, Right Hand Ordinary (RHO) lay construction.
	b.	Standard conforming to	IS: 2266
	c.	Tensile designation	1960
	d.	Factor of safety	5.25 as per IS 3177
	e.	Type of core	Steel/lubricated hemp core
3.4.0		Sheaves details	
	a.	Material	As per IS 3177
	b.	Type of guards provided	Fabricated from Sheet steel
3.5.0		Gear box details	Fabricated steel gear boxes which shall be dust proof and firmly sealed to prevent oil leakages. Gearboxes shall have covers split horizontally and arranged such that top half can be removed for inspection. The gear boxes shall be fitted with bolted type machined inspection covers.
3.5.1		Hoist Motions	
	a.	Type of mounting of gear box	Horizontal / Vertical
	b.	Classification	Suitable for M5 duty
	c.	Type of gears	Helical / spur
	d.	Type of lubrication	Grease / splash
	e.	Hardness (BHN) – gear	217-255 BHN for carbon steel and 568+/-20BHN for alloy steel.
	f.	Hardness (BHN) – pinion	266-300 BHN for carbon steel and 568+/-20BHN for alloy steel.



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 3 of 8

	g.	Difference in Gear and pinion hardness	Min 20 BHN	
	h.	Materials (gear/pinions)	All gears shall be of cast or wrought steel or forged from low or medium carbon alloy steel and suitably heat treated. Gears and pinions shall be hardened,ground finished, machine cut and profile ground.	
	i.	Casings	Fabricated steel gear boxes	
	j.	Noise level	85 db	
	k.	Standard conforming to	IS: 4460	
3.5.2		Travel Motions	CT	LT
	a.	Type of mounting gear box	Horizontal / Vertical	
	b.	Classification	M5 duty	
	c.	Type of gears	Helical / spur	
	d.	Type of lubrication	Grease / splash	
	e.	Hardness (BHN) – gear	217-255 BHN for carbon steel and 568+/-20BHN for alloy steel.	
	f.	Hardness (BHN) – pinion	266-300 BHN for carbon steel and 568+/-20BHN for alloy steel.	
	g.	Difference in Gear and pinion hardness	Min 20 BHN	
	h.	Materials (gear / pinions)	All gears shall be of cast or wrought steel or forged from low or medium carbon alloy steel and suitably heat treated. Gears and pinions shall be hardened ,ground finished, machine cut and profile ground.	
	i.	Casings	Fabricated steel gear boxes which shall be dust proof and firmly sealed to prevent oil leakages. Gearboxes shall have covers split horizontally and arranged such that top half can be removed for inspection. The gear boxes shall be fitted with bolted type machined inspection covers.	
	j.	Standard conforming to	IS: 4460	
3.6.0		Wheels details	Cross travel	Long travel
	a.	Material	EN-8/9	
	b.	Hardness	Wheels for under-slung crane shall have hardness of 200 BHN (max) as per IS 3938. In case of overhead cranes and semi-gantry cranes the long travel wheels shall have hardness of 300-350 BHN (max) as per IS 3177. For cross travel motion the wheel hardness shall be 200 BHN (max) as per IS 3938.	
	c.	Type	Single flanged taper/straight tread.	
	d.	Numbers provided	As per manufacturer's standard.	



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 4 of 8

	e.	Specification conforming to	In case of Overhead cranes and semi-gantry cranes the long travel wheels shall confirm to IS 3177. However in case of cross travel of overhead and semi - gantry cranes, all travel wheels of under-slung cranes shall be as per IS 3938.	
	f.	Arrangement of lubrication	Grease	
3.7.0		Lifting hooks		
	a.	Type	'C' type	
	b.	Safe lifting capacity	As per Annexure A	
	c.	Material	Solid, forged, heat treated alloy steel /carbon steel of rugged construction and provided with a standard depress type safety latch.	
	d.	Standard conforming to	IS: 15560	
	e.	Hook can swivel	Yes	
	f.	Safety latch on hook provided	Yes	
	g.	Locking device on swivelling hook	Provided	
3.8.0		Buffers	Cross travel	Long travel
	a.	Type	Spring or rubber buffers shall be provided on the trolley & end carriage	
	b.	Numbers provided	4	4
	c.	Details of end stop	Suitable end stops welded to the bridge girder shall be provided to contact the buffers.	
3.9.0		Brakes		
3.9.1		Hoist Motions		
	a	Type of brake (ac / dc / thruster)	DCEM	
	b.	Number provided per motor	1	
	c.	Braking capacity (% of full load torque)	150%	150%
3.9.2		Travel Motions	CT	LT
	a.	Type of brake (ac / dc / thruster)	DCEM	
	b.	Number provided per motor	1	1



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 5 of 8

	c.	Braking capacity (% of full load torque)	125%			125%		
3.10.0		Drive system for hoisting						
	a.	Arrangement of drive from motor to rope drum (main)	Through geared steel coupling and gear box					
3.11.0		Bearings	Crane hook	Trolley wheels	Rope drum	Gear box	Any other assembly	
	a.	Type	Antifriction ball / roller bearings					
	b.	Lubrication	Grease lubrication					
	c.	Bearing life	10,000 working hours.					
3.12.0		Bridge girder						
	a.	Type & Quantity	Rolled sections. One no for each crane.					
	b.	Vertical Deflection	Span / 900 (maximum)					
	c.	Type of connection to end carriage	As per manufacturer's standard.					
3.13.0		End carriage span material	Structural steel.					
3.14.0		Motors						
3.14.1		Hoist Motions	MH					
	a.	Type	Three phase squirrel cage induction motors operated from VFD system and suitable for speed range and torque without exceeding temperature rise limits. Micro speed shall be thru' VVVF drive. Pull out torque shall be minimum 215% of rated torque.					
	b.	Enclosure	TEFC					
	c.	Numbers furnished	One					
	d.	Voltage, phase and frequency	Suitable for rated frequency of 50 Hz with a voltage variation of +/-10% and frequency variation of +/-5% occurring separately or combined voltage and frequency variation of 10%.					
	e.	Class of protection	IP – 55					
	f.	Rated capacity (KW)	Maximum continuous motor ratings shall be 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.					
	g.	Duration factor/duty	40 % CDF / S-4					



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 6 of 8

	h.	Class of insulation	Class 'F' for sq. cage motors with temp rise limited class B .		
	i.	Number of starts/ hour	150 starts / hr		
	j.	Overload protection for motors provided	In built feature of VVVF drives.		
	k	Space heater requirements	For motors of rating 30 KW and above		
3.14.2		Travel Motions	CT & LT		
	a.	Type	Three phase squirrel cage induction motors operated from VFD system and suitable for speed range and torque without exceeding temperature rise limits. Micro speed shall be thru' VVVF drive.		
	b.	Enclosure	TEFC		
	c.	Numbers furnished	Minimum One (1)		
	d.	Voltage, phase and frequency	Suitable for rated frequency of 50 Hz with a voltage variation of +/-10% and frequency variation of +/-5% occurring separately or combined voltage and frequency variation of 10%.		
	e.	Class of protection	IP – 55		
	f.	Rated capacity (KW)	Maximum continuous motor ratings shall be 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.		
	g.	Duration factor/duty	40 % CDF / S-4		
	h.	Class of insulation	Class 'F' for sq. cage motors with temp rise limited class B.		
	i.	Number of starts/ hour	150 starts / hr		
	j.	Overload protection for motors provided	In built feature of VVVF drives		
		Space heater requirement	For motors of rating 30 KW and above		
3.15.0		Limit switches	Main hoist	Cross Travel	Long Travel
	a.	Type	Rotary gear + Snap action type	Two way lever type/ One way lever type	
	b.	Number provided	1 + 1	1/2	1/2
	c.	Material of contacts	Double break Silver Cadmium		
	d.	Control voltage	110V		
3.16.0		Power conductors (DSL)			



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

REV. 00

Page 7 of 8

	a.	Type	LT: PVC shrouded conductor bus bar. CT: Flexible trailing cable ERP insulated Cu conductor as per IS: 9968 in festoon cable trolley arrangement.
	b.	Size	Shall be sized with a margin of 10% over load requirement. Voltage drop at motor terminal shall be limited to 2% at extreme positions of cranes. Protective cover over DSL shall be provided.
	c.	Length	Suitable for entire bay length.
3.17.0		Control Panel	Shall be provided with isolating switch, power contactor control and indication to switch ON/OFF power to starter panels, control transformer. All control equipment for the crane shall be housed in dust light, sheet steel cabinets (Control Cabinets). Separate panels shall be provided for the following: a) 415V, 4 pole gang operated, manual air break isolating switch together with a set of three (3) suitably rated HRC fuses for the incoming power supply to crane. b) Red and green indicating lamps with series resistors to indicate 'ON' and 'OFF' conditions of the main power. c) Suitably rated 415V / 100V single phase transformer for the crane control supply. d) 110V double pole, air break isolating switch across the secondary of the control transformer. e) Set of HRC fuses across the secondary of the control transformer. f) 415V triple pole air break isolating switch, and a set of three suitable rated thermal overload relays for each motor serving as drive for all driven on the crane. g) Small wiring upto terminal blocks.
	a.	Material & size	Cold rolled sheet not less than 2.5mm for front & rear & 2mm for side, top & bottom portion with gland plate of 3mm thick.
	b.	DOP	IP 54 / IP 55 for outdoor duty
3.18.0		Control for Hoisting /CT/LT operations	
	a.	Speed control	Thru' VVVF with 6 pulse design
	b.	Starting torque of VVVF	Up to 400%
	c.	Starting current	Less than 150 % of rated torque.
	d.	Temperature	VVVF system shall be capable of withstanding upto 50 ° C without derating.



TITLE

DATA SHEET – A / B
SINGLE GIRDER EOT CRANES

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

SPECIFICATION NO. PE-TS-392 -524-A001

VOLUME II - B

SECTION -C

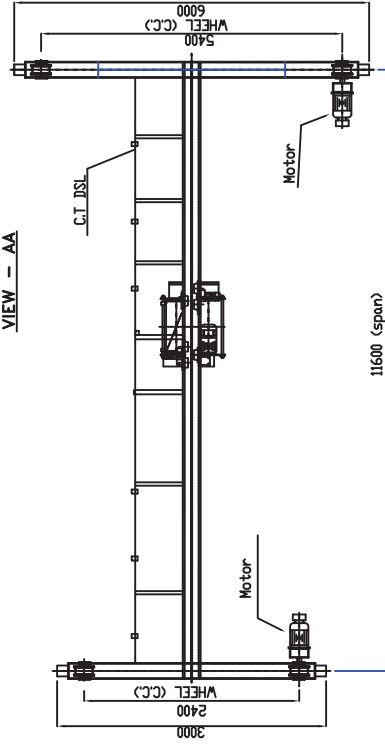
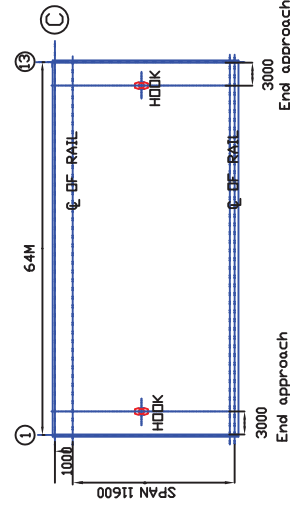
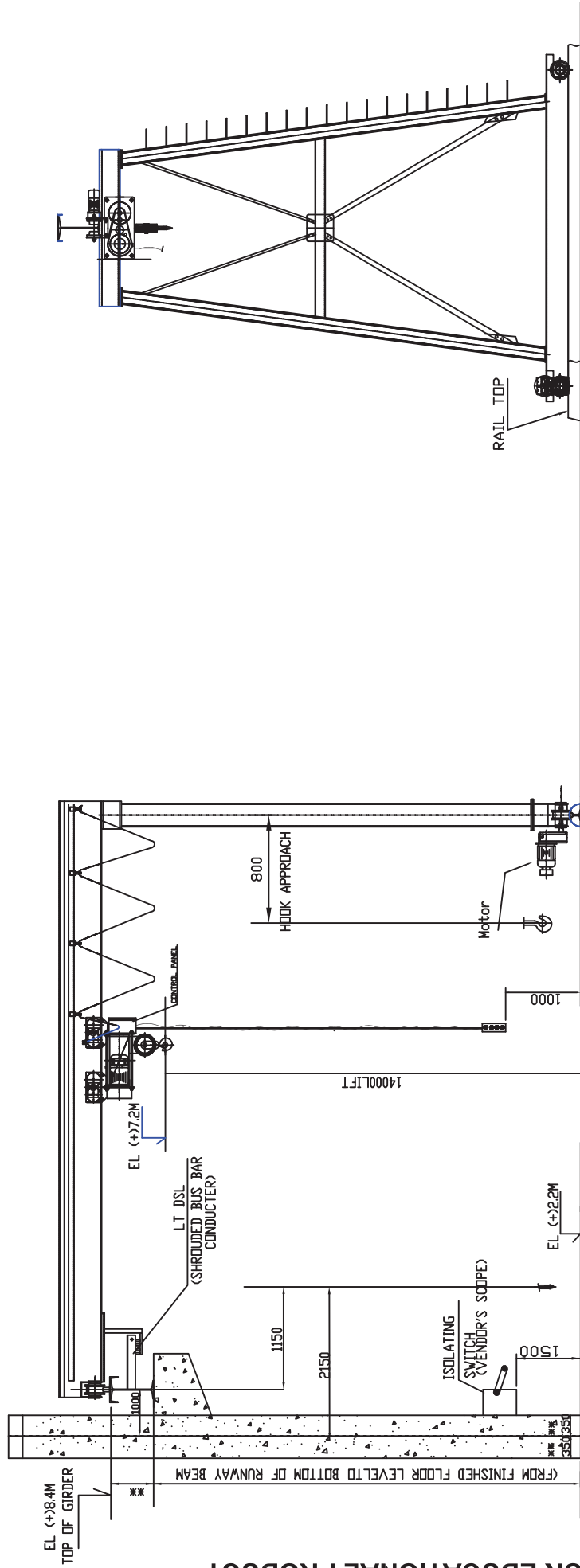
REV. 00

Page 8 of 8

3.19.0		Cable	Power	Control
	a.	Material	Copper / Aluminium	Copper
	b.	Type	XLPE insulated for fixed type power cable from isolating switch to DSL.	Extruded PVC insulated
	c.	Size	Min 2.5 mm ² for copper Min. 6 mm ² for Aluminium	Min 2.5 mm ²
	d.	Voltage grade	1100 V	
	e.	Voltage drop	Cable from main isolating switch (1.5M above operating floor) to motor terminal shall be so sized that the voltage drop does not exceed 2% of rated voltage with cranes at extreme position.	
3.20.0		Earthing	Crane structures, motor frames and metal cases of all electrical equipment including metal conduit and cable guards shall be effectively earthed.	
	a.	Material of earthing	G.I / Copper	
3.21.0	a.	Contactors	AC 4 duty for reversing application. AC 3 duty for non -reversing application. In case the feature of reversing no reversing is inbuilt in VVVF drives then the contactors shall not be required.	
	b.	Switches	AC 23 for motor application, AC 22 for other application.	
	c.	Fuses	HRC	
	d.	Overload relays	Overload protection inbuilt in VVVF drives.	
3.22.0		Power supply	415 V, 3 phase, 3 wire supply at 1.5m above operating floor.	
3.23.0		Transformer	Dry type, with insulation class B or better.	
	a.	Quantity	2 X 100 % for control	
	b.	Voltage Rating	Control 415/110V	
	c.	KVA rating	20% over loading to be considered while sizing the rating	

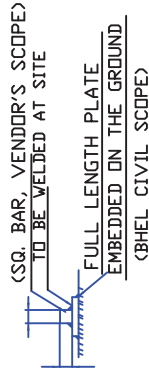
Note:

- Bidder to confirm the compliance of technical details as mentioned against each item. Deviation, if any shall be brought out clearly.
- The bidder shall fill Technical details against each item marked (*), during detailed engineering only.
- Customer's datasheet is also attached elsewhere in the specification. In case of discrepancy in the requirements given in the technical specification, the more stringent of the two as per the interpretation of purchaser shall be applicable.



- 1 - ALL DIMENSIONS ARE IN MM.
- 2 - DSL(CT) => SHROUDED BUS BAR CONDUCTOR
- 3 - BAY LENGTH - 64 M.
- 4 - ~~THE~~ SUBJECT TO FINALISATION OF STRUCTURE
- 5 - DIMENSION MARKED AS(=O) IS TO BE GIVEN BY
- 6 - CRANE SHALL BE OUTDOOR TYPE

1. MECHANICAL GA OF CW AND ACW PUMP HOUSE
(DRG. NO. -PE-DG-392-165-N004)



CUSTOMER	RAJASTHAN KAIYA VIDYUT UTPADAN NIGAM LTD.											
	2 X 660 MW SUPER CRITICAL TPS, STAGE-V, UNITS #7 & 8 AT SURATGARH, RAJASTHAN.											
CUSTOMER'S CONSULTANT	TATA CONSULTING ENGINEERS LIMITED											
	MUMBAI											
JOB NAME	2 X 660 MW SUPER CRITICAL TPS,											
STATUS	SURATGARH, STAGE V, UNIT # 7 & 8											
DRAWING NO. ORDERED												
PROJECT SCALE												
	DATE 15-11-11											
REV	DATE	ALT	CHG	APP	SUB-CONTRACTOR							
					TITLE							
CRANE CLEARANCE DIAGRAM OF SEMI GANTRY CRANE 8T FOR CWPB SCREENS AND GATES												
DPT.	SCALE		DRAWING NO.		SHEET NO.		PAGE		REV.			
	1:1		PB-DG-392-624-A001/01		1		OF 1		REV. 01			

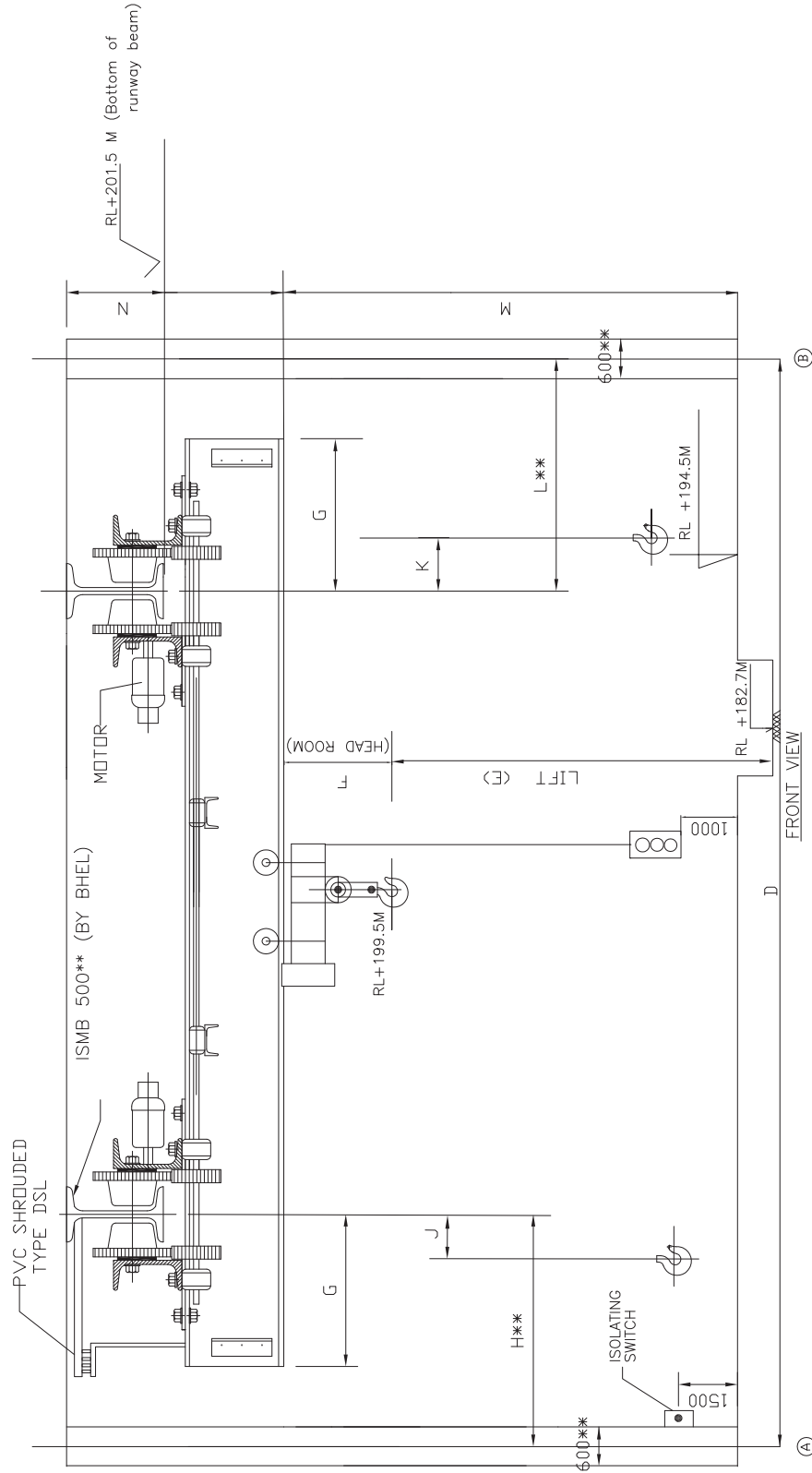
COPY RIGHT AND CONFIDENTIAL



BAYLENGTH = 47.7M
CAPACITY = 8.0 T

- NOTES:
1. DIMENSIONS MARKED (*) SHALL BE FURNISHED DURING DETAIL ENGS
 2. ALL DIMENSIONS ARE IN MM.
 3. DIMENSIONS MARKED (**) DEPENDS ON FINAL CIVIL DRAWING.
 4. BIDDER TO FURNISH LT WHEEL LOAD.
 5. TOTAL CRANE WT. HOIST WT.

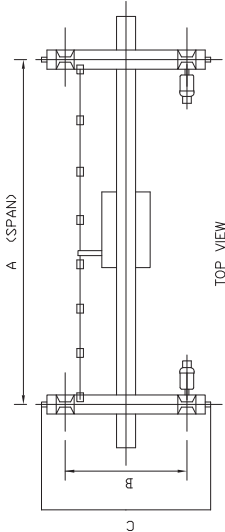
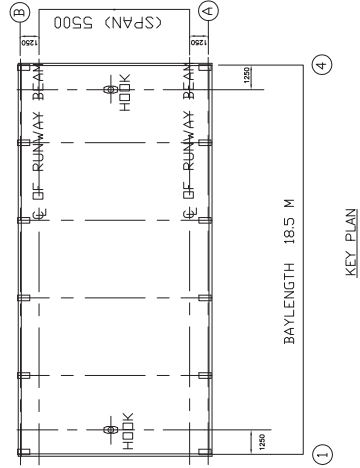
CUSTOMER	RAJASTHAN RAIYA VIDYUT UTPADAN NIGAM LTD.									
	2 X 660 MW SUPER CRITICAL TPS STAGE-V, UNITS # 7 & 8 AT SURATGARH RAJASTHAN									
CUSTOMER'S CONSULTANT	 TATA TATA CONSULTING ENGINEERS LIMITED RAJASTHAN									
	32 X 660 MW SUPER CRITICAL TPS, SURATGARH, STAGE V, UNIT # 7 & 8 BBHARTY HEAVY ELECTRICALS LTD RAJASTHAN POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW RAJASTHAN									
JOB NO/20	CONTRACT									
	PROJECT NO. (OPTIONAL)									
PROFIT SCALE										
REV	DATE	BY	CHK	APP						
					SUB-CONTRACTOR					
TITLE CRANE CLEARANCE DIAGRAM OF AIR COMPRESSOR HOUSE 8T SINGLE GIRDER UNDERSLINGING CRANE										
										ISSN SCALE DATE DRAWING NO PRJ-DC-302-824-A/001/02 SHEET 1 OF 1 
										REV. NO.

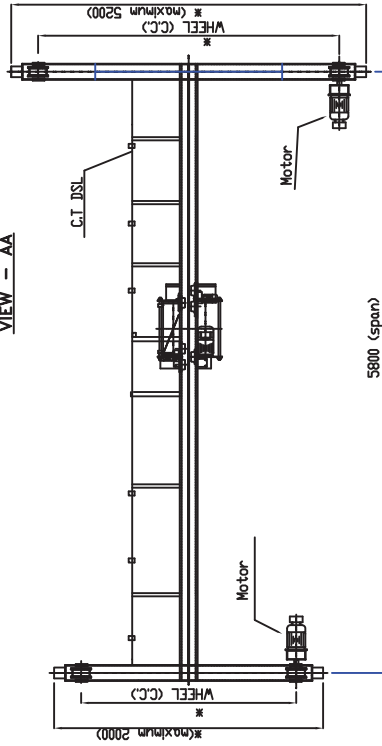
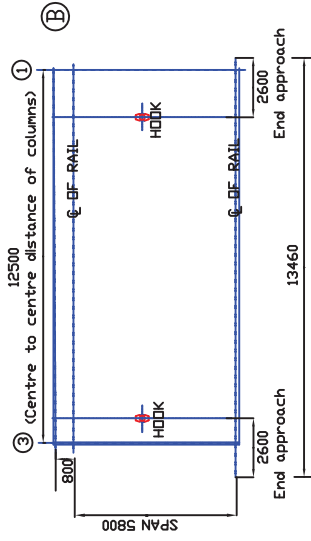
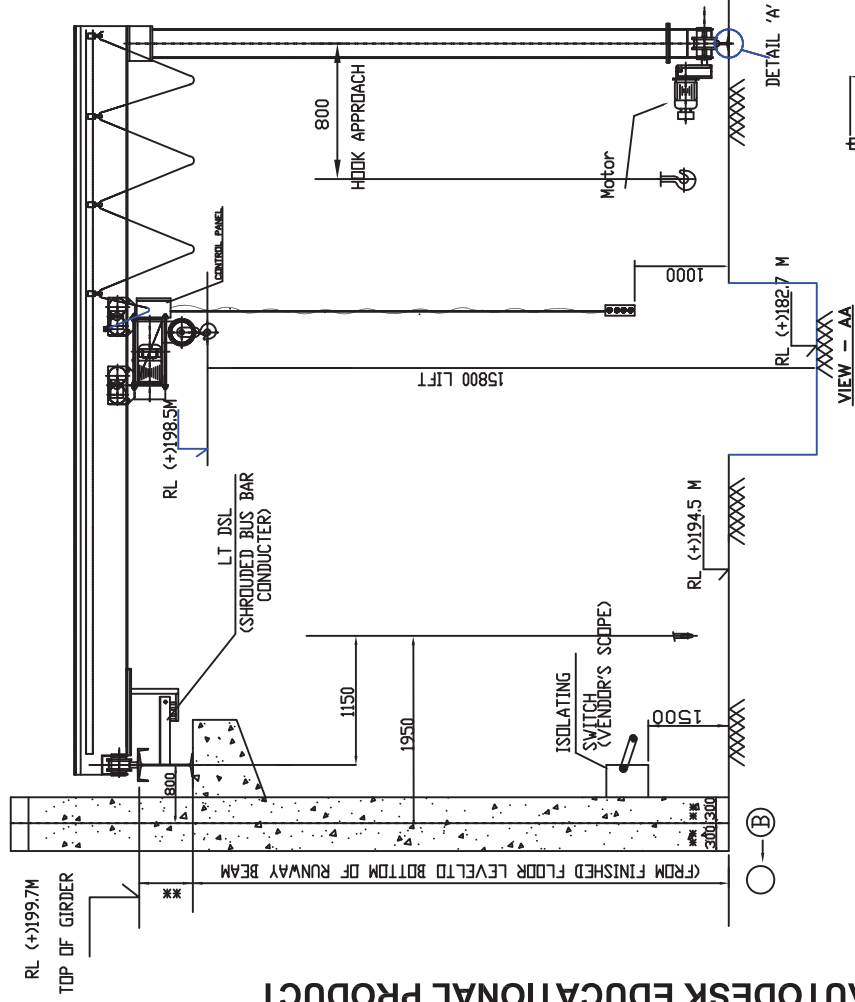


NOTES:

1. DIMENSIONS MARKED (*) SHALL BE FURNISHED DURING DETAIL ENGINEERING.
2. ALL DIMENSIONS ARE IN MM.
3. DIMENSIONS MARKED (**) DEPENDS ON FINAL CIVIL DRAWING.
4. ALL ELEVATIONS ARE REFERRED TO THE LOCAL F.O.L OF RW RESERVOIR AND PUMP HOUSE WHICH CORRESPONDS TO RL+194 M.
5. BIDDER TO FURNISH LT WHEEL LOAD.
6. TOTAL CRANE WT.*
HOST WT.

CUSTOMER	RAJASTHAN RAYYA VIDYUT UTPADAN NIGAM LTD. 2 X 660 MW SUB CRITICAL TPS, STAGE-V, UNITS # 8 AT SURATGARH, RAJASTHAN.									
	CUSTOMER'S CONSULTANT									
JOB NUMBER		CONTRACT		 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI						
STATUS		SHEET NO. OF TOTAL								
PROJECT SCALE										
REV.	DATE	AS	BY	DATE	DATE	DATE	DATE	DATE	DATE	DATE
SUB-CONTRACTOR										
TITLE										
CRANE CLEARANCE DIAGRAM OF RAW WATER PH 5T SINGLE GIRDER UNDERSLINGING CRANE										
DRAWING NO PR-DC-392-0001/03										
SHEET 1 OF 1										

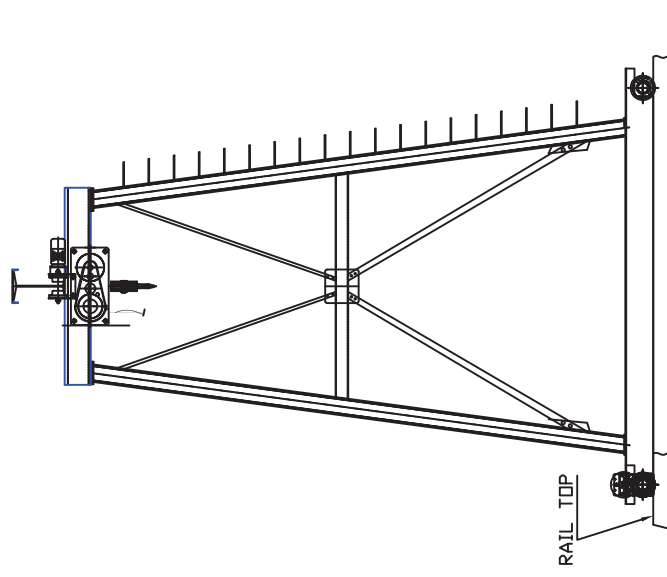




- 1 - ALL DIMENSIONS ARE IN MM.
- 2 - DSL(CT) => SHROUDED BUS BAR CONDUCTOR
- 3 - BAY LENGTH - 12.5 M.
- 4 - BE SUBJECT TO FINALISATION OF STRUCTURE
- 5 - DIMENSION MARKED AS(40) IS TO BE GIVEN BY
- 6 - CRANE SHALL BE OUTDOOR TYPE

7 - ALL ELEVATIONS ARE REFERRED TO THE LOCAL FGL OF RV RESERVOIR AND PUMP HOUSE WHICH CORRESPONDS TO RL+194 M

BIHEL REF. DRG.: -
1. MECHANICAL GA OF RAW WATER PUMP HOUSE
(DRG. NO. -PE-DG-392-171-N004)



(SQ. BAR, VENDOR'S SCOPE)
TO BE WELDED AT SITE

FULL LENGTH PLATE
EMBEDDED ON THE GROUND

BHESCOPE

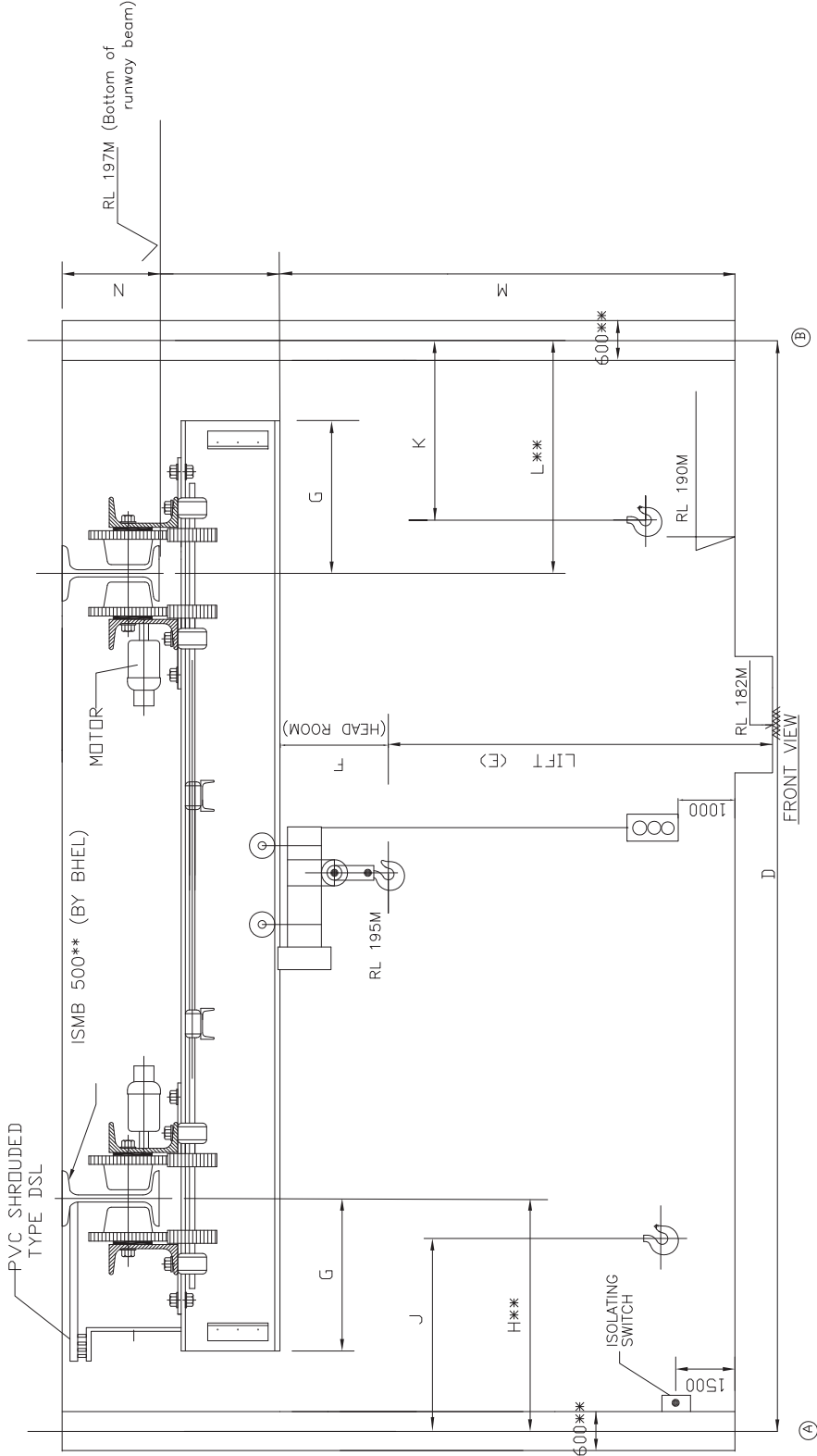
DETAIL - A

DETAIL - A

[illegible]

DRAWING No.
PE-DG-367-524-A001/01

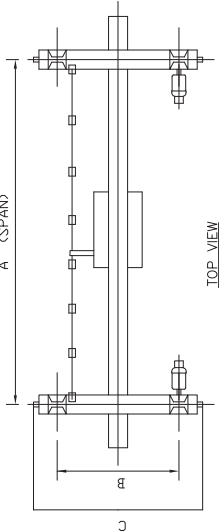
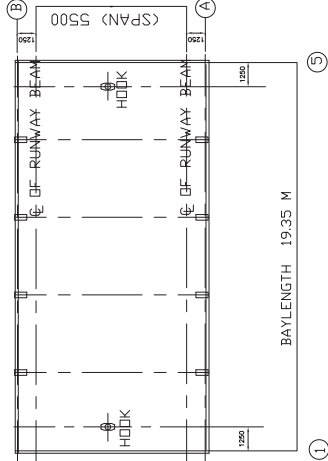
CUSTOMER'S DRAWING No.	
DESIGN PARAMETERS	
A	5500
B	*
C	*
D	8000
E	13000
F	*
G	750
H	1250
J	1200
K	1200
L	1250
M	*
N	*



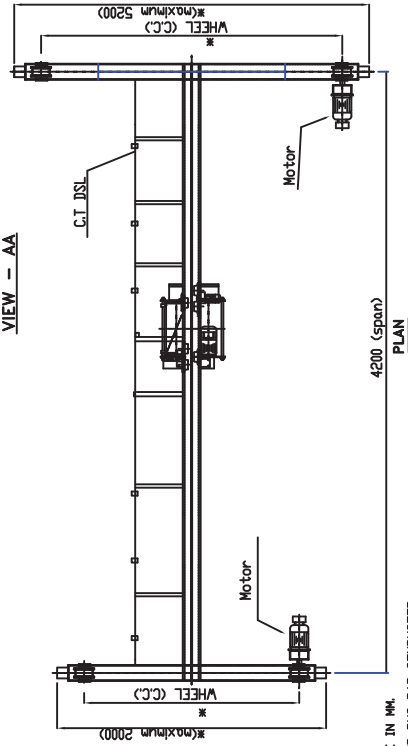
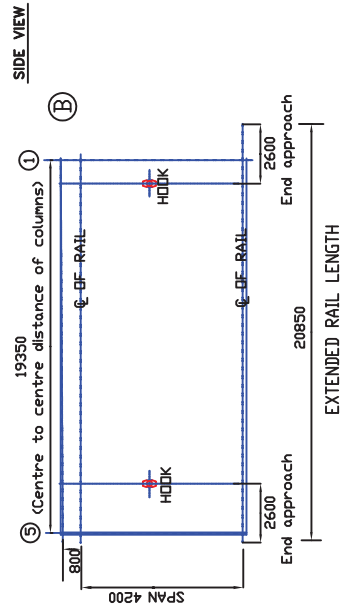
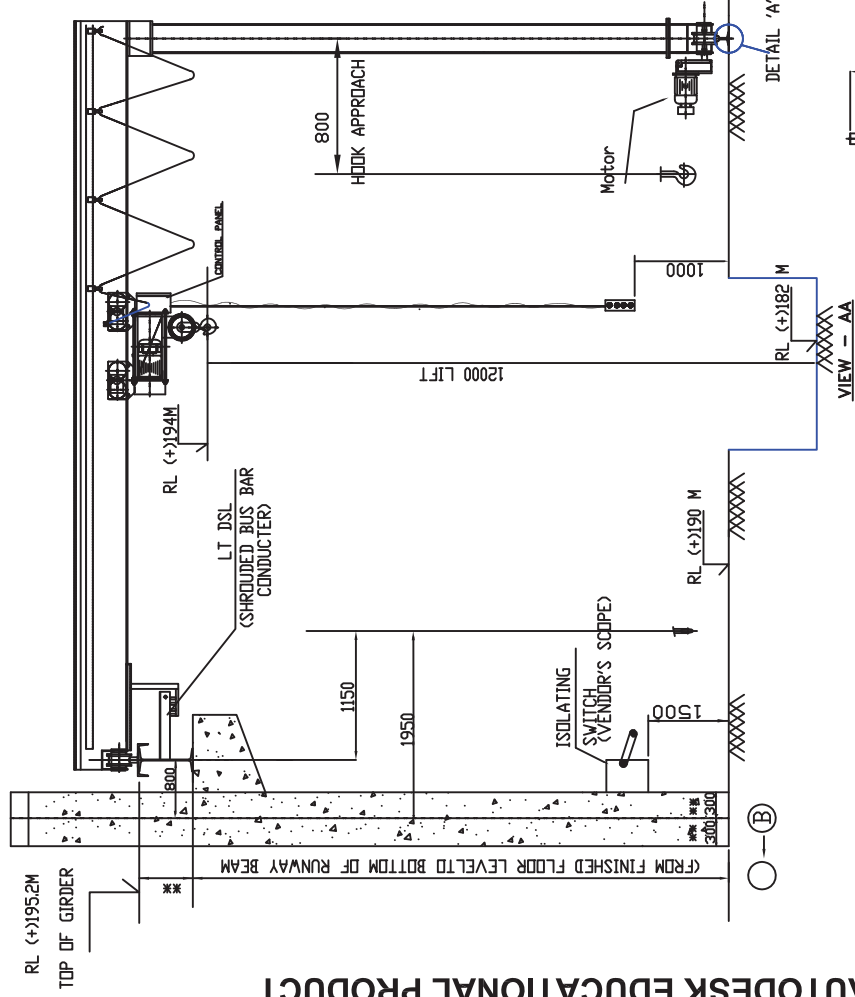
BAYLENGTH = 19.35M
CAPACITY = 5.0 T

NOTES:

1. DIMENSIONS MARKED (*) SHALL BE FURNISHED DURING DETAIL ENGG.
2. ALL DIMENSIONS ARE IN MM.
3. DIMENSIONS MARKED (**) DEPENDS ON FINAL CIVIL DRAWING.
4. ALL ELEVATIONS ARE REFERRED TO THE LOCAL FGL OF RIVER WATER INTAKE PUMP HOUSE WHICH CORRESPONDS TO RL+189.5 M
5. BIDDER TO FURNISH LT WHEEL LOAD.
6. TOTAL CRANE WT.* HOIST WT.



CUSTOMER	RAJASTHAN RAIYA VIDYUT UTPADAN NIGAM LTD.
CUSTOMER'S CONSULTANT	2 X 660 MW SUPER CRITICAL TPS-STAGE-V, UNITS #7 & 8 AT SURATGARH, RAJASTHAN.
APPROVED BY	TATA CONSULTING ENGINEERS LIMITED
PROJECT NAME	2 X 660 MW SUPER CRITICAL TPS.
PROJECT NO.	SURATGARH, STAGE V, UNIT # 7 & 8
PROJECT LOCATION	RAJASTHAN
PROJECT TYPE	POWER SECTOR
PROJECT STATUS	PROJECT ON GOING
PROJECT START DATE	2010
PROJECT END DATE	2012
PROJECT MANAGER	PROJECT MANAGER
PROJECT ENGINEER	PROJECT ENGINEER
PROJECT SUPERVISOR	PROJECT SUPERVISOR
PROJECT ASSISTANT	PROJECT ASSISTANT
PROJECT OFFICE	PROJECT OFFICE
PROJECT PHONE	PROJECT PHONE
PROJECT FAX	PROJECT FAX
PROJECT E-MAIL	PROJECT E-MAIL
PROJECT WEBSITE	PROJECT WEBSITE
PROJECT ADDRESS	PROJECT ADDRESS
PROJECT CITY	PROJECT CITY
PROJECT STATE	PROJECT STATE
PROJECT COUNTRY	PROJECT COUNTRY
PROJECT ZIP CODE	PROJECT ZIP CODE
PROJECT TITLE	CRANE CLEARANCE DIAGRAM OF RIVER WATER INTAKE PH
PROJECT NO.	ST SINGLE GIRDER UNDERSLUNG CRANE
PROJECT SCALE	PROJECT SCALE
PROJECT DATE	PROJECT DATE
PROJECT REV.	PROJECT REV.

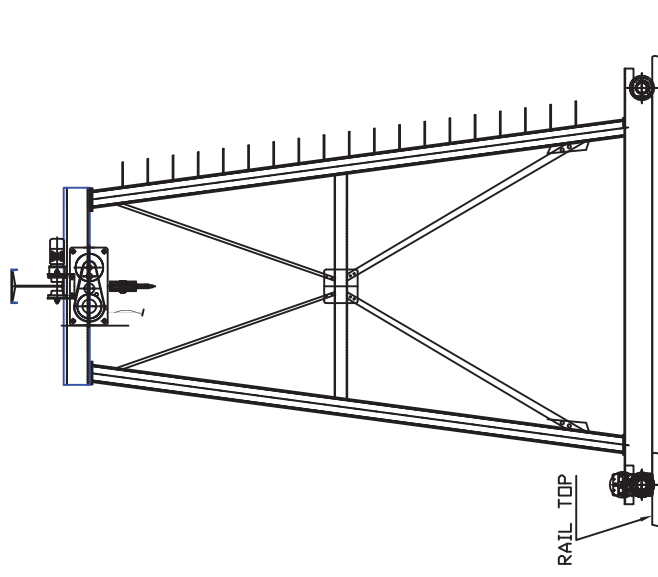


NOTE-

- 1 - ALL DIMENSIONS ARE IN MM.
- 2 - DSL(LT) => SHROUDED BUS BAR CONDUCTOR
- 3 - BAY LENGTH - 19.35 M.
- 4 - ~~BE~~ SUBJECT TO FINALISATION OF STRUCTURE
- 5 - DIMENSION MARKED AS(*) IS TO BE GIVEN BY THE VENDOR
- 6 - CRANE SHALL BE OUTDOOR TYPE
- 7 - ALL ELEVATIONS ARE REFERRED TO THE LOCAL FG OF RISE

BHEL REF. DRG.: -

1. MECHANICAL GA OF RAW WATER PUMP HOUSE
(ORG. NO. -PE-DG-392-171-N004)



SIDE VIEW

⑤ (Centre to centre distance of columns)

ⓑ

(SQ. BAR, VENDOR'S SCOPE)
TO BE WELDED AT SITE

FULL LENGTH PLATE
EMBEDDED ON THE GROUND
BHELSCOPE

DETAIL - A

CUSTOMER	RAJASTHAN RAYYA VIDYUT UTPADAN NIGAM LTD. 2 X 600 MW SUPER CRITICAL TPS, STAGE-V, UNITS #7 & 8 AT SURATGARH, RAJASTHAN.					
CUSTOMERS CONSULTANT	TATA CONSULTING ENGINEERS LIMITED MUMBAI					
JOB NAME	2 X 600 MW SUPER CRITICAL TPS, SURATGARH, STAGE V, UNIT # 7 & 8					
STATUS	CONTRACT AWARDED, NO. OUTSTANDING					
PROJECT SCALE	 BEHRATH HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI					
DRAWN BY	DATE	ALT	CSB	APPD		
DESIGN	DATE	SIGN	DATE	APPR		
CHKD	DATE	CHKD	DATE	CHKD		
APPD	DATE	APPD	DATE	APPD		
SUB-CONTRACTOR						
TITLE					CRANE CLEARANCE DIAGRAM OF SEMI GANTRY CRANE 5T FOR RIVER WATER INTAKE PH SCREENS AND GATES	
					DRAWING NO. PPE-DG-382-524-A001/08	
					SHEET 1 OF 1	

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 1 OF 14

1.0

SCOPE

This specification covers the general design, materials, construction features, manufacture, shop inspection and testing at the manufacturer’s works, delivery at site, handling at site, erection, testing, commissioning, performance testing and handing over of Electrically Operated Travelling Crane (Overhead and Underslung), other than steelworks cranes.

2.0

CODES AND STANDARDS

2.1

The design, materials, construction, manufacture, inspection, testing and performance of the crane shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The equipment shall also conform to the latest applicable Indian or equivalent standards. Other international standards are also acceptable, if these are established to be equal or superior to the listed standards. Nothing in this specification shall be construed to relieve the CONTRACTOR of this responsibility.

2.2

The following are some of the codes and standards relevant to this specification.

IS 807	Design, Manufacture, Erection and Testing (Structural Portion) of Cranes and Hoists
IS 3177	Electric Overhead Travelling Cranes and Gantry Cranes other than Steel Works Cranes
IS 3938	Electric Wire Rope Hoists
IS 13834	Cranes – Classification

3.0

CONSTRUCTION FEATURES

3.1

The crane shall be a complete unit with bridge girder, end carriages for long travel, travelling trolley for cross travel, rope drums, wire ropes, sheaves, drive units, brakes, rails and fixtures, rail clamps, end stops, buffers, conductors, all electrical etc. to make the equipment complete in all respects. The steel used for the crane construction shall be of standard quality. All materials used shall be of recent manufacture, free from defects, mill scales, laminations, pittings, flakes, rust etc. All welds shall be free from defects like blowholes, lack of penetration, slag intrusions etc.

3.2

BRIDGE GIRDER

3.2.1

The crane bridge shall consist of single or double girder as specified in data sheet A. In case of overhead crane, bridge girder shall be mounted on runway rails above the PURCHASER’S structure. In case of underslung crane, bridge girder shall be mounted on the bottom flanges of PURCHASER’S structure (I-section). In case of double girder crane each

ISSUE
R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 2 OF 14
girder shall carry a rail on which a wheeled trolley shall run. In case of single girder crane the trolley shall move on the bottom flange of the girder. 3.2.2 The bridge girder shall have enough strength to carry the rated load without causing undue stress or deflection. 3.3 <u>END CARRIAGES</u> 3.3.1 End carriages connected with bridge girder at the two (2) ends shall be made from structural steel. 3.3.2 End carriage design shall be such that it facilitates easy removal of the wheels for maintenance. Suitable jacking pads shall be provided for maintenance and easy removal of crane wheels. 3.3.3 The wheels shall be double flanged for overhead crane and single flanged for underslung crane. The wheels shall be machined on their treads to match the runway rail section for overhead crane and profile of the I-section for underslung crane. 3.3.4 Wheel base and structural frame of the end carriages shall be designed and connected with bridge girder in such a way that the crane remains square and skewness is prevented. The ratio between wheelbase and crane span shall be as stipulated in IS 807. 3.4 <u>TRAVELLING TROLLEY</u> 3.4.1 Trolley frames shall be fabricated from rolled structural steel sections. 3.4.2 For double girder crane, the trolley shall be provided with chequered plate platforms with openings for ropes, sheaves etc. Hand railings shall be provided all around the platform. 3.4.3 Suitable jacking pads shall be provided for maintenance and easy removal of wheels. 3.4.4 In case of single girder cranes, the side plates of the trolley shall extend beyond wheel flanges, thus providing bumper protection for the wheels. The two side plates shall be connected by means of an equalising pin. The wheels shall be machined on their treads to match the profile of the monorail. 3.5 <u>OPERATOR'S CABIN</u> 3.5.1 The operator's cabin shall be open or closed type as specified in data sheet A with ample space for mounting of all control panels and adequate clearance.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 3 OF 14
for the safety of operator and maintenance personnel. The main control panel and associated resistors may be located outside the cabin on the trolley or bridge platform with adequate clearance for the safety of operator and maintenance personnel. 3.5.2 The platform shall be of a non-slip surface and cabin size shall not be less than 2.5 M x 1.85 M x 2.0 M clear height. 3.5.3 The cabin shall be provided with a swing way operator's seat and a protected ladder to access the crane walkway. It shall be adequately illuminated. The cabin and its access ladder shall be so arranged as to prevent personnel from making accidental contact with runway conductors. A permanent frame indicating complete instructions covering the crane operation, maintenance and lubrication shall be mounted in the cabin for convenient reference. A non-oscillating ventilation fan of 240 V AC, single phase and with suitable guard shall be provided in the cabin. The fan shall have 300 mm sweep and equipped with toggle switch and an independent regulator. 3.5.4 The cabin shall be fitted with a 300 mm diameter hand operated brass gong. The gong shall be securely suspended outside the cabin and operated by the cabin driver through a hammer tied by a flexible steel wire. In addition to this an electrical horn shall be provided and mounted on under side of the cabin, operated by foot switches as and when required by the driver. Horn shall be heavy-duty howler to produce 95 dB at 3.5 M, double bell projector suitable for 240 V AC operation. 3.5.5 A 3 Kg CO₂ type fire extinguisher conforming to IS 2878 and with TAC approval shall be provided in the cabin. A sand bucket with sand shall also be provided in the cabin for minor fires. 3.6 <u>ROPE DRUMS</u> Rope drums shall be as per IS 3177. Rope drums shall be made of seamless pipe or cast or welded to sustain concentrated loads resulting from rope pull. In case of welded drum, same shall be stress relieved. Drums shall be machine grooved right and left with grooves of a proper shape for the rope used. Grooving shall be of proper length to handle entire rope required to make the specified lift plus the two dead laps at each anchor point, without overlapping. 3.7 <u>WIRE ROPES</u> Wire ropes shall be extra flexible with well lubricated hemp core having six (6) strands of thirty-seven (37) or thirty-six (36) wires per strand with ultimate tensile strength of 1.6×10^6 kN/M². Wire ropes shall be of Right Hand Ordinary (RHO) lay construction. The rope shall be fastened to the drum with an attachment having strength equal to that of the rope. The rope fastening at		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 4 OF 14
the swinging end shall be aligned so as to prevent rope coming off its reeving. Rope shall be of sufficient length so that two (2) full laps shall remain on the drum at extreme low position of the hook. Reverse bends or cross bends and bird caging shall be avoided. The breaking loads for the hoist ropes shall not be less than the factor specified in IS 3177. The load shall include rated load on hooks, weight of the bottom block and the weight of rope. 3.8 <u>SHEAVES</u> Sheaves shall be as per IS 3177. These shall be equipped with anti-friction bearings and shall be fully guarded to prevent the rope coming off. Equalising sheaves, if provided, shall also be as per IS 3177. Grooves shall be machined to proper shape for the rope used. 3.9 <u>GEARS</u> All gears shall be machine cut and profile ground. All gears shall be of cast or wrought steel or forged from low or medium carbon alloy steel and suitably heat treated. All gears and pinions shall be hardened and ground finished. Strength, quality of steel, heat treatment, face, pitch of teeth and design shall conform to IS 4460. Split gears shall not be used. Gears and pinions shall be pressed on and keyed to shafts. All gears and pinions shall be totally enclosed type upto last stage of reduction in all motions and shall be carried in fabricated steel gear boxes which shall be dust proof and firmly sealed to prevent oil leakages. Gearboxes shall have covers split horizontally and arranged such that top half can be removed for inspection. The gearboxes shall be fitted with bolted type machined inspection covers. Cast steel cartridge housings shall be provided for carrying roller bearings. Dipsticks or indicator shall be provided for indicating oil level. No overhanging gears shall be used. Drain plugs shall be provided on all gearboxes. Lifting lugs shall be provided for handling purposes. For long and cross travels, creep speed shall be achieved by one of the following methods: (a) Planetary gearbox integral with main gearbox (b) Planetary gearbox independent with motor (c) Worm reducer with clutch However, for hoisting motion, creep speed shall be achieved only by methods (a) or (b) indicated above. 3.10 <u>BEARINGS</u> Bearings may be ball, roller or removable bronze bushing type except that motor bearings shall be of ball or roller type only. Babbitt bearings can be used for bridge and trolley drive shafts. All anti-friction bearings shall be of approved make, which are interchangeable with corresponding size bearings of other make. Bearing housings shall be of split type or so designed to permit easy removal of the shaft. The design shall be such that there is no		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 5 OF 14
ingress of dust and oil or grease does not leak out. Drip pans shall be provided to accept accidental leakage and drippings. Bearings shall have minimum life expectancy of 10,000 working hours. 3.11 <u>SHAFTS, AXLES, COUPLINGS, KEYS AND SPLINES</u> 3.11.1 Shafts and axles shall be of forged steel and shall have ample strength, rigidity and adequate bearing surface for intended duties. Shafts and axles shall be accurately machined and properly supported. Shafts shall, as far as possible, be furnished straight. If shouldered, these shall be provided with fillets of ample radius or shall be tapered to avoid loss of strength and stress concentration. These shall be designed considering allowances for keys and splines. 3.11.2 All couplings shall be of steel. 3.11.3 Keys and keyways shall conform to IS 2048 / 2291 / 2292 / 2293 as applicable. Splines and serrations shall be of involute or straight-sided form. Straight-sided splines shall comply to IS 2327/ 2610 as applicable 3.12 <u>BRAKES</u> All brakes shall be of 'fail-safe' design and shall operate automatically in case of power failure. Hoisting motion shall be provided with two brakes. Out of the two (2) brakes, one shall be provided at the gearbox input shaft and other on motor side. For cross travel and long travel, brakes shall be provided on the high speed side of the gearbox. Hoisting brakes shall be designed to hold 1.5 times full load torque while cross travel and long travel brakes shall be designed to hold 1.25 times full load torque. Type of brakes shall be as specified in data Sheet A. Separate brakes shall be provided for creep motions. All brakes shall have weatherproof enclosures. Coupling halves shall not be used as brake drums. 3.13 <u>LIFTING HOOKS</u> The lifting hooks shall be plain shank or rams-horn type as indicated in data sheet A. The hooks shall be solid, forged, heat treated, of rugged construction and provided with a standard depress type safety latch. Lifting hooks shall have swivels and operate on ball or roller thrust bearings with hardened races. Lock to prevent hook from swivelling shall be provided. 3.14 <u>WHEELS AND RAILS</u> 3.14.1 Bridge and trolley track wheels shall be of forged or cast steel with cylindrical straight tread. The minimum hardness of the wheel rim shall be maintained between 300 and 350 BHN with minimum depth of 10 mm. Steel used for wheels shall not contain more than 0.060 per cent of either sulphur or		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 6 OF 14
phosphorus. The wheels shall be mounted in such a manner as to facilitate easy removal and placement. 3.14.2 The wheel diameter and rail sizes shall be suitably selected so as to meet the requirements of wheel loading for the specified duty class of crane. The rail fasteners shall be suitably machined to ensure full contact with the rail flanges. The bridge and trolley track wheel bearings shall be anti-friction roller bearing and shall be carried on specially designed bearing support blocks of 'L' type design (commonly known as 'L' type bearing housings). 3.14.3 In case of overhead crane, the required runway rails along with rail clamps and other accessories for mounting the rail on the PURCHASER's structure shall be provided. Runway rails shall have adequate strength and rigidity. Hardness of the rail shall be marginally lower than wheel hardness. 3.14.4 In case of double girder crane, cross travel rails of required strength and rigidity along with rail clamps and other accessories shall be provided. 3.14.5 In case of outdoor installation of overhead travelling crane, suitable rail clamps shall be provided for locking the crane on the runway when not in use or during storm condition. The rail clamps shall be capable of preventing the movement of crane under storm conditions. 3.15 <u>WALKWAYS AND LADDERS</u> 3.15.1 Access walkways of minimum 500 mm clear inside width with hand railings on both sides of bridge girders for the full span length for inspection and maintenance of the crane shall be provided. Walkways shall be of chequered plate or non-slip steel surface of minimum 6 mm thick. Walkways shall be of rigid construction and designed to sustain a distributed live load of not less than 3 KN/M². 3.15.2 Walkway platform shall be complete with hand railings, posts and toe plate all around. The hand railings shall consist of 32 mm NB pipe in two (2) tiers. Top pipe shall be at about one (1) M and middle pipe shall be at about 450 mm height from the walkway platform level. Posts shall be spaced at 1.5 M maximum centres. Toe plate shall be 6 mm thick and shall project 100 mm above the walkway platform. 3.15.3 Ladder shall be provided to reach the walkway platform from the operating floor. Ladder shall be at least 450 mm clear width with 20 mm diameter rungs spaced at 300 mm centres and shall be equipped with safety cages when the ladder is more than three (3) M high. 3.15.4 One ladder for access from the crane girder walkway to long travel walkway on each side of crane span shall be provided, if long travel walkway is provided as per data sheet A .		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 7 OF 14
3.15.5 For cabin operated cranes an access ladder shall be provided from the crane girder walkway to the operator's cabin. 3.16 <u>BUFFERS, STOPS AND SWEEPS</u> 3.16.1 Spring or rubber buffers shall be provided on the trolley. Suitable end stops welded to the bridge girder shall be provided to contact the buffers mounted on the trolley. Spring or rubber buffers shall also be provided on the end carriages. Suitable end stops welded to the long runway girder shall be provided to contact the buffers mounted on the end carriages. 3.16.2 Bridge and trolley wheel stops shall be provided before the end stops. These shall match to wheel radius. Wheel stops to prevent rails from creeping and trolley from running off the bridge shall be abutted against ends of rails. Wheel stops shall be welded to the girder. 3.16.3 Sweeps shall be attached to the end carriages and to the trolley, to remove foreign material from the rails. 3.17 <u>GUARDS</u> 3.17.1 All exposed couplings, shafts, gear wheels, pinions, drives etc. shall be safely encased and guarded. 3.17.2 The sheaves of hook blocks shall be guarded to prevent trapping of hand between a sheave and the in-running rope. 3.18 <u>LUBRICATION</u> 3.18.1 Centralised grease lubrication unit with hand operated grease pump shall be provided for anti-friction bearings. One unit shall be provided on bridge platform for line shaft anti-friction bearings and another unit shall be provided on trolley for top sheave and drum anti-friction bearings. 3.18.2 All other anti-friction bearings shall be lubricated manually by hand operated grease pump through respective grease nipples. Accessibility shall be such that parts may be safely lubricated from the walkways or ladders. 3.19 <u>NAME PLATE</u> A nameplate showing rated capacity and year of manufacture shall be placed on either side of the girder in such a manner as to be legible from the ground or operating floor. Manufacturer's name, make, model number etc. may appear on the nameplate.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 8 OF 14
3.20 A steel box with hinged cover shall be provided. It shall be conveniently located and permanently secured in the operator's cabin or fastened to the bridge girder side of the walkway for storing of tools, oil tins, grease and waste. It shall contain proper tools necessary for minor repairs and maintenance work. 4.0 <u>ELECTRICAL EQUIPMENT</u> 4.1 All accessories and auxiliary electrical equipment including drive motors, electrically operated brakes, controllers, resistors, conductors, protective devices, operating devices, cables, conduits, etc. necessary for the safe and satisfactory operation and maintenance of the crane shall be included in the CONTRACTOR's scope of supply. Electrical equipment shall be adequately rated to permit simultaneous operation of any combination of motions of the crane for its duty service. 4.2 All electrical equipment and systems shall be suitable for operation for supply systems as described in section-B. 4.3 <u>MOTORS</u> 4.3.1 Drive motors shall be as per IS 325 and companion specifications indicated in respective data sheet. Motors for long travel and cross travel, main and auxiliary hoist shall be totally enclosed, squirrel cage type induction motors with VVVF drives. Motors shall be suitable for frequent reversal, braking and acceleration. Pull-out torque shall be 2.15 times the rated torque. 4.3.2 In case motors with synchronous speed above 1000 rpm are selected; it shall be subject to PURCHASER's approval. 4.4 <u>SOLENOIDS</u> All solenoids shall be provided with class E or better insulation. 4.5 <u>CONTROLS</u> All motors and control circuit components for the long and cross travel motions shall be suitable for plugging control. Speed control of various motors shall be achieved by adjusting the resistance in the rotor circuit of the drive motors. Resistors shall be suitable for speed control duty cycle and inching operation. Relays and controllers shall be suitable for start-stop operation of around 150 times per hour. 4.6 <u>CONTROLLERS</u> 4.6.1 Controller for crane motors shall comprise reversing type magnetic contactors. 4.6.2 Controllers shall have at least five (5) uniformly proportioned steps of control.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 9 OF 14
4.6.3 Independent controllers shall be provided to control each crane motion. Also each main and creep drive shall have independent controller. 4.6.4 Controller contact shall have ample current capacity for the duty cycle, type and number of auxiliary contacts for required electrical interlocks. 4.7 <u>PENDENT PUSH BUTTON STATION</u> 4.7.1 In case crane is operated by pendent push button station, the push button station shall be supported independently, earthed separately independent of suspension and shall comprise the following push buttons and indicating lamps : (a) 'Start' and 'Stop' (b) Long travel - 'Right' and 'Left' (c) Cross travel - 'To' and 'Fro' (d) Hook - 'Hoist' and 'Lower' Red lamp shall indicate supply 'ON' 4.8 <u>CRANE CONTROL EQUIPMENT</u> 4.8.1 All control equipment for the crane shall be housed in dust tight, sheet steel cabinets (Control Cabinets). Separate panels shall be provided for the following: <u>Main power panel comprising the following</u> (a) 415 V, 4 pole gang operated, manual air break isolating switch together with a set of three (3) suitably rated HRC fuses for the incoming power supply to the crane (b) Red and green indicating lamps with series resistors to indicate 'ON' and 'OFF' conditions of the main power (c) Suitably rated 415V / 110 V single phase transformer for the crane control supply (d) 110 V double pole, air break isolating switch across the secondary of the control transformer (e) Set of HRC fuses across the secondary of the control transformer (f) 415 V / 240 V single phase, lighting transformer to supply the crane lighting loads		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 10 OF 14
(g) 415 V double pole air break isolating switch together with suitably rated HRC fuses on the primary side of the lighting transformer (h) 415 V triple pole air break isolating switch, and a set of three suitable rated thermal overload relays for each motor serving as drive for all driven on the crane (i) Small wiring upto terminal blocks 4.8.2 415 V triple pole main contactor for controlling the incoming power supply, together with 'START' and 'STOP' push buttons. 4.8.3 Compartmentalised panel(s) for housing the control gear comprising contactors, timers, isolators switches, HRC fuses, moulded case circuit breakers all brought upto terminal blocks, etc. inside the panel and push buttons, indicating lamps, operating handles, etc. brought out on the panel door. If necessary, separate compartments may be provided for various crane motions. 4.8.4 The control panel shall essentially house the following : (a) A suitable sensing device for each drive motor for stopping the drive motor at zero speed during plugging (b) Contactors to control the thruster brakes for cross travel and hoist motors (c) Two pole reversing contactors mechanically interlocked for each main as well as creep motion (d) Magnetic reversing type contact controllers as follows: (i) Two pole magnetic reversing contacts mechanically interlocked, accelerating contactors and suitable time relays for each controller (ii) Three pole contactors required for control of the lowering motion of hoisting 4.9 PROTECTION 4.9.1 Operation of the overload relays for any of the motors shall operate the main supply contactor to cut off power supply to all the motors. 4.9.2 Under voltage interlock shall be provided to operate the main supply contactor and open the main contactor contacts and its holding contact.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 11 OF 14
4.9.3 'Start' push button of the main supply shall be wired in series with the 'Off' position contacts of all the controllers, thus requiring that all controller circuits are in 'Off' position before the main supply contactor can be switched on. 4.10 OPERATING AND INDICATING DEVICE 4.10.1 In case the crane is cabin operated the following devices shall be provided : (a) 415 V, triple pole air break isolating switch across the incoming power supply to the crane (b) 'Start' push button (c) 'Stop' push button (d) 'Horn' foot switch for sounding warning horn. (e) Red and Green indicating lamps with series resistors to indicate main supply contactor 'ON' and 'OFF' conditions. (f) 240 V single phase, double pole miniature circuit breakers to control the main lighting circuit. (g) 240 V single phase, single pole miniature circuit breakers to control each of the following circuits: (i) Cabin lighting circuit (ii) Flood lights (iii) Power receptacles for hand lamps, cabin fan 4.10.2 All control equipment mounted on the crane shall be furnished with uniform indelible nameplate identifying various controls and indicating the direction wherever necessary. 4.11 RESISTORS 4.11.1 Resistors shall be adequately protected to prevent contact with live parts. 4.11.2 Resistors shall be provided with terminal boards equipped with brass or copper terminal studs. 4.11.3 Resistors shall be mounted in pressed sheet steel and plates with drip proof and louvered side covered in separate units. All resistors shall be located on alongside and adjacent to control cabinet with provision of at least 100 mm clear space at front and rear of each panel.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 12 OF 14
4.11.4 Temperature of any exposed portion of the resistor enclosure shall not exceed 353° K. 4.12 <u>LIMIT SWITCHES</u> Automatic reset type of limit switches shall be provided to prevent over-travel for each of the following motions: (a) For over-hoisting and over-lowering motions of the main hook and the auxiliary hook. (b) Long travel motion (c) Cross travel motion 4.13 <u>CONDUCTORS</u> 4.13.1 Crane shall be provided with three (3) phase power conductors and an earthing conductor for the entire length of crane runway and trolley runway complete with necessary power feed arrangement, insulators, brackets, mounting supports and access platform. 4.13.2 Crane runway conductors carried on suitable insulators shall be rigidly fixed to the structural bracket pieces. All conductors are mounted in vertical formation. Insulators shall be spaced not more than two (2) metres apart along each conductor. Design shall be such that provision shall be made for future extension of conductors and conductor joints be properly welded to ensure smooth surface to the conductors. Conductors shall be provided with protective wire mesh guard over the entire length to prevent injury to personnel and to guard against mechanical damage. Provision shall be made to access the conductors for maintenance and replacement. A suitable inspection cage shall be provided with access ladder for the collectors for maintenance purposes. Flexible trailing cable arranged in festoon configuration with festoon trolley on rollers, travel rail, supports etc. shall be used for long travel motion for short runway lengths upto forty (40) metres. 4.13.3 Cross travel motion shall be achieved by flexible trailing cable arranged in festoon configuration with festoon trolley on rollers, travel rail, supports etc. unless specified otherwise in data sheet A1. In case fixed conductors are specified for cross travel motion, all necessary feed boxes, insulators, brackets and supports for mounting shall be furnished on top of bridge girder along the cross travel side. Conductors shall be provided with protective wire mesh guard over the entire length to prevent injury to personnel and to guard against mechanical damage. 4.14 <u>COLLECTORS</u> 4.14.1 All power collectors must be properly hinged on insulated brackets provided with flexible connection of ample current carrying capacity.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 13 OF 14
4.14.2 Current carrying collectors for use with conductors shall be spring-loaded type. Provision shall be made for access to current collectors for maintenance. 4.15 <u>LIGHTING AND MISCELLANEOUS ACCESSORIES</u> 4.15.1 Cabin operated cranes shall be provided with following accessories in the cabin : (a) One (1) twin 40 W industrial type fluorescent fixture mounted in the cabin (b) Two swivel type floodlights or light with deep bowl reflector for 400w mercury vapour lamp complete with ballast, mounted conveniently in the cabin and on the bridge girder so that the lamps can illuminate the load being lifted (c) Three (3) pin, 240 V 15 A single phase polarised interlocked industrial type power receptacles located one each in the cabin, control cabinet and middle of the bridge respectively 4.16 <u>SAFETY SWITCHES</u> Four (4) non-fusible air break isolating switches of adequate rating (not less than 15 amps) shall be fitted at the four corners of the crane so as to be accessible while standing on the crane platform. These shall be wired up in series with the emergency stop to open the main power contactors. 4.17 <u>CABLES AND CONDUITS</u> 4.17.1 All wiring shall be furnished and shall be installed in rigid galvanised steel conduit with threaded type fittings, galvanised outlet and pull boxes. Pull boxes shall be located at frequent intervals to allow cable or conductors to be pulled without abrasion or injury. Conduits shall form a continuous system and shall be rigidly supported and clamped within the structural of the crane. The entire conduit system shall be installed so that any moisture is drained away from terminal boxes and electrical devices. Power wiring and control wiring shall be kept in separate conduits. Flexible conduits shall be used as required. 4.17.2 Wiring of all equipment and control devices located on the trolley bridge for the cabin shall be completed in the shop and wires shall be terminated on terminal blocks housed in a junction box. Conductors, if of open wire construction, shall be cut to length with insulators attached, assembled and packed for shipment.		
		ISSUE R7

TCE.M4-113-01	TATA CONSULTING ENGINEERS LIMITED	VOLUME III
TCE.5750A-H-500-001 PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRICALLY OPERATED TRAVELLING CRANE (OVERHEAD AND UNDERSLUNG)	SECTION : D10 SHEET 14 OF 14
4.17.3 Wiring adjacent to resistors and control panel wiring shall be of stranded 50 V grade, flame, heat and moisture resistant with proper insulation for operation at elevated temperatures. 4.17.4 Wires for motor primary and secondary circuits shall have adequate current carrying capacities to carry maximum plugging control of the motors for the duty service of the crane. Wires shall be properly connected to withstand vibrations. No splices shall be made in any wiring on the panel or in conduit. All insulation and all clearances to ground shall be designed so that the live parts will withstand a high potential test of not less than 2500 V at 50 Hz for 60 seconds. 4.17.5 Conductors for main power circuits shall be selected taking into consideration simultaneous operation of the main hoist and bridge motors. 4.18 <u>SAFETY EARTHING</u> 4.18.1 Crane structures, motor frames and metal cases of all electrical equipment including metal conduit and cable guards shall be effectively earthed. 4.18.2 All motors, brakes, limit switches, panels, drum, controllers, resistor unit sets, etc. shall be provided with two studs for earthing. 4.18.3 A separate long travel conductor rail shall be fitted on the runway gantry girder in the same plane as the three main power rails to serve as the earth bus. The earth bus shall be solidly bonded to effective earthing stations at two independent points by PURCHASER. 4.18.4 A separate collector shoe identical to the main power collector shoe shall be provided to engage runway earth conductor rail. Duplicate earthing circuits shall be tapped and taken round the bridge platform and cabin from this earth collector shoe. 4.18.5 An additional earth collector shall be provided to engage with the cross travel earthing rail located below all other rails. 4.18.6 All electrical equipment on the bridge and cabin shall be solidly bonded to the bridge earth circuit. All electrical equipment in the trolley shall be solidly bonded to earthing circuit tapped from the cross travel earth collector. CONTRACTOR shall ensure the adequacy of conductivity of collector gear components and bonding. 4.19 <u>CONTROL SCHEMATIC AND WIRING DIAGRAMS</u> One (1) set of as-built control connection diagrams shall be fitted inside the control cabinet for ready reference for the operating staff.		
		ISSUE R7

		TATA CONSULTING ENGINEERS LIMITED			VOLUME III		
ENQ.SPEC. NO. TCE.5750A-H-500-001 PART : B		DATA SHEET A ELECTRICALLY OPERATED TRAVELLING (OVERHEAD / UNDERSLUNG) CRANE			SECTION : D10 SHEET : 1 OF 3		
GENERAL	1. DESIGNATION: ELECTRICALLY OPERATED TRAVELLING CRANE FOR REFER WRITE UP			DESIGN DATA (CONTD.)	15. SPEEDS: M / MIN		
	2. NUMBER REQUIRED: BY BIDDER				15.1 MAIN HOIST		
	3. LOCATION: INDOOR				15.2 AUX. HOIST		
	4. CRANE CLASSIFICATION AS PER IS:13834:				15.3 LONG TRAVEL		
	5. MECHANICAL CLASS : M5			15.4 CROSS TRAVEL		MAIN 2.0 4.0	CREEP 0.2 0.4
	6. ELECTRICAL CLASS : M7			16. METHOD OF OPERATION: CLOSED CABIN AND PENDANT PUSH BUTTON			
	7. TYPE : OVERHEAD /UNDER SLUNG			17. LONG TRAVEL WALKWAY REQUIRED:			
	8. TYPE OF GIRDER : BOX			YES,			
	9. CAPACITY :			18. DESIGN SEISMIC COEFFICIENT FOR THE CRANE : AS PER PROJECT INFORMATION.			
	9.1 MAIN HOIST : BY BIDDER			19. DESIGN OF CRANE SHALL BE AS PER IS: 807 & IS: 3177			
	9.2 AUXILIARY HOIST : BY BIDDER			20. ROPE DRUMS AND SHEAVES : IS: 3177			
				21. WIRE ROPE : IS: 2266			
	10. SPAN : BY BIDDER			22. LIFTING HOOKS : FORGED AND HEAT TREATED ALLOY STEEL / CARBON STEEL AS PER IS 3813 / IS 3815 TABLE 2 (25 T TO 50 T) / IS 3815 TABLE 3/IS 4164/IS 5750/IS 15560			
	DESIGN DATA	11. RUNWAY LENGTH : BY BIDDER			MATERIALS AND CODES OF CONSTRUCTION	23. CRANE RAILS : IS: 3443	
12. RANGE OF LIFTING FOR :			24. LUBRICATION :				
12.1 MAIN HOIST: ELEVATION FROM BY BIDDER			GROUP LUBRICATION WITH HAND OPERATED GREASE PUMP				
12.2 AUXILIARY HOIST : ELEVATION FROM BY BIDDER							
13. OPERATING FLOOR ELEVATION : BY BIDDER			BRAKES	25. MAIN HOIST : DCEM – 2 NOS. SHALL BE PROVIDED (1 W + 1 S)			
14. TYPE OF HOOK :				26. AUXILIARY HOIST : ELECTRO HYDRAULIC – 2 NOS. SHALL BE PROVIDED (1 W + 1 S)			
14.1 MAIN : 'C' type hook with safety latch							
14.2 AUXILIARY : PLAIN SHANK WITH STANDARD DEPRESS TYPE SAFETY LATCH							
REV.NO.		R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE		NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY					DATE: MAY'12	5750A	SURATGARH , RAJASTHAN

ISSUE

R1

		TATA CONSULTING ENGINEERS LIMITED			VOLUME III		
ENQ.SPEC. NO. TCE.5750A-H-500-001 PART : B		DATA SHEET A ELECTRICALLY OPERATED TRAVELLING (OVERHEAD / UNDERSLUNG) CRANE			SECTION : D10 SHEET : 2 OF 3		
BRAKES (CONTD.)	27. LONG TRAVEL AND CROSS TRAVEL: DCEM			PAINTING	39. FINISH PAINT : REFER NOTE - 1		
	28. MOTORS : SQUIRREL CAGE MOTORS WITH VVVF DRIVES				39.1 NUMBER OF COATS : REFER NOTE - 1		
	29. STARTERS : BY BIDDER				39.2 DRY FILM THICKNESS PER COAT : REFER NOTE - 1		
	30. CONTROL PANEL MOUNTING : MOUNTED ON CRANE BRIDGE						
	ELECTRICALS	31. RUNWAY CONDUCTORS : PVC SHROUDED COPPER BUS BAR / INSULATED BUS			TESTS AND INSPECTION	40. OVER LOAD TEST	
		32. CROSS TRAVEL CONDUCTORS : FLEXIBLE TRAILING CABLE / PVC SHROUDED BUS BAR / INSULATED BUS BAR				40.1 FOR HOISTING : 125 % OF SPECIFIED LOAD : YES	
		33. POWER CONDUCTORS : MINIMUM 6 mm² ALUMINIUM				40.2 FOR CRANE MOTIONS : 125 % of SPECIFIED LOAD : YES	
		34. CONTROL CABLE : MINIMUM 1.5 mm² STRANDED COPPER				41. TEST LOADS : CONTRACTOR TO SUPPLY	
		35. LIGHTING CABLES: MINIMUM 2.5MM² SINGLE CORE STRANDED COPPER				42. DEFLECTION OF MAIN GIRDERS WITH LOAD AT THE CENTRE : MAXIMUM 1/900 OF SPAN	
	ERECTION	36. ERECTION OF CRANE RAIL WITH FIXTURES: BY BIDDER				43. SPEED CHECK FOR ALL MOTIONS: YES	
37. ERECTION OF RUNWAY CONDUCTORS WITH FIXTURES : BY BIDDER			44. INSULATION TEST FOR ALL ELECTRICAL EQUIPMENT : YES				
PAINTING	38. PRIMER : REFER NOTE - 1			PERFORMANCE GUARANTEES		45. CAPACITY : T – 0 %	
	38.1 NUMBER OF COATS : REFER NOTE - 1					46. LIFT : M – 0%	
	38.2 DRY FILM THICKNESS PER COAT : REFER NOTE – 1					47. SPEEDS FOR ALL MOTIONS : MPM ± 10 %	
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL	
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT	
REV. BY				DATE: MAY'12	5750A	SURATGARH, RAJASTHAN	
						ISSUE R1	

		TATA CONSULTING ENGINEERS LIMITED		VOLUME III		
ENQ.SPEC. NO. TCE.5750A-H-500-001 PART : B		DATA SHEET A ELECTRICALLY OPERATED TRAVELLING (OVERHEAD / UNDERSLUNG) CRANE		SECTION : D11 SHEET : 3 OF 3		
LIST OF APPROVED SUB-VENDORS	48. MOTORS					
	49. BRAKES		ELEKTROMAG, OMEGA CONTROLS, SPEED-O-CONTROL, STROM KRAFT,			
	50. BEARINGS		FAG, NTN, SKF			
	51. HOOKS		KARACHIWALA, STEEL FORGING			
	52. WIRE ROPE		FORT WILLIAM, USHA MARTIN			
	53. LIMIT SWITCHES		ELECTROMAG, OMEGA CONTROLS, STROM KRAFT			
	54. VVVF DRIVES					
		NOTE: 1. FOR PAINTING SPECIFICATION REFER SECTION VOLUME - II 2. TWO (2) NOS. LIMIT SWITCHES SHALL BE PROVIDED FOR EACH HOISTING MOTION. ONE (1) NO. ROTARY GEARED TYPE AND ONE (1) NO. GRAVITY TYPE. 3. TWO (2) NOS. SHUNT TYPE LEVER SWITCH SHALL BE PROVIDED FOR CROSS TRAVEL MOTION 4. TWO (2) NOS. LEVER TYPE LIMIT SWITCHES SHALL BE PROVIDED FOR LONG TRAVEL MOTION				
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE: MAY'12	5750A	SURATGARH, RAJASTHAN
						ISSUE R1

	ENQ.SPEC. NO TCE.5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
			DATA SHEET B ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE		SECTION : D10 SHEET : 1 OF 5	
ENQUIRY / SPECIFICATION NO.TCE						
	SL. NO.	BIDDER				
GENERAL	1.	DESIGNATION		ELECTRICALLY OPERATED TRAVELLING CRANE		
	2.	NUMBER OFFERED				
	3.	TAG NUMBERS				
	4.	TYPE OF CRANE		OVERHEAD / UNDERSLUNG SINGLE GIRDER / DOUBLE GIRDER		
	5.	TYPE OF GIRDER		BOX / LATTICE		
	6.	CRANE CLASSIFICATION AND MECHANISM CLASS OF CRANE		AS PER IS 13834		
	7.	MAKE AND MODEL NUMBER OF CRANE				
	8.	MAKE AND MODEL NUMBER OF HOIST				
	9.	CAPACITY OF MAIN HOIST	T			
	10.	CAPACITY OF AUXILIARY HOIST	T			
	11.	SPAN	mm			
	12.	RUNWAY LENGTH	mm			
	13.	RANGE OF LIFTING FOR				
	13.1	MAIN HOOK	M	ELEVATION FROM	TO	
	13.2	AUXILIARY HOOK	M	ELEVATION FROM	TO	
14.	OPERATING FLOOR ELEVATION	M				
15.	DEFLECTION OF MAIN GIRDER WITH LOAD AT THE CENTRE		1/ OF SPAN			
MECHANICAL FEATURES	16.	WIRE ROPE		MAIN HOIST	AUXILIARY HOIST	
	16.1	NUMBER OF FALLS				
	16.2	DIAMETER OF ROPE	mm			
	17.	GEAR DRIVES				
	17.1	TYPE				
	17.2	MAKE				
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET A1 HAS NOT BEEN REPRODUCED IN DATA SHEET B. IN CASE OF DEPARTURE FROM DATA SHEET A1, 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 A1. 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

	ENQ.SPEC. NO	TATA CONSULTING ENGINEERS LIMITED		VOLUME III			
	TCE.5750A-H-500-001 PART : B	DATA SHEET B ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE		SECTION : D10 SHEET : 2 OF 5			
ENQUIRY / SPECIFICATION NO.TCE							
	SL. NO.	BIDDER					
MECHANICAL FEATURES (CONTD.)	18.	COUPLINGS		HOISTING	LT	CT	
	18.1	TYPE		PIN BUSHED /GEARED	PIN BUSHED /GEARED	PIN BUSHED /GEARED	
	18.2	MAKE					
	19.	HARDNESS OF COMPONENTS					
	19.1	LT WHEELS AND CT WHEELS	BHN				
	19.2	GEARS	BHN				
	19.3	PINIONS	BHN				
	20.	LIST OF PARTS WHICH SHALL BE STRESS RELIEVED					
	21.	CRANE LUBRICATION TYPE		CENTRALISED / LOCAL			
	22.	STEEL BOX WITH TOOLS		YES / NO			
	23.						
	24.						
	MATERIALS OF CONSTRUCTION	25.	IF THE CRANE IS OPERATING IN HAZARDOUS AREA :				
		25.1	ROPE DRUMS AND SHEAVES				
25.2		GEARS AND PINIONS					
25.3		LONG TRAVEL WHEELS					
25.4		CROSS TRAVEL WHEELS					
25.6							
WEIGHTS AND DIMENSIONS		26.	LONG TRAVEL (LT) WHEEL BASE	mm			
	27.	CROSS TRAVEL(CT) WHEEL BASE	mm				
	28.	LT RAIL SIZE	mm				
	29.	CT RAIL SIZE IN CASE OF DOUBLE GIRDER CRANE	mm				
	30.	NUMBER OF LT WHEELS AT EACH END AND DIAMETER	mm	/			
NOTES TO BIDDER			SIGNATURE OF BIDDER				
1. DATA SPECIFIED IN DATA SHEET A1 HAS NOT BEEN REPRODUCED IN DATA SHEET B. IN CASE OF DEPARTURE FROM DATA SHEET A1, 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 A1.			DATE				
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.					ISSUE R1		

	ENQ.SPEC. NO	TATA CONSULTING ENGINEERS LIMITED		VOLUME III
	TCE.5750A-H-500-001 PART : B	DATA SHEET B ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE		SECTION : D10 SHEET : 3 OF 5
ENQUIRY / SPECIFICATION NO.TCE				
	SL. NO.	BIDDER		
WEIGHTS AND DIMENSIONS (CONTD.)	31.	NUMBER OF CT WHEELS AT EACH END AND DIAMETER	mm	/
	32.	WHEEL LOAD WITH IMPACT / WITHOUT IMPACT FOR LT	Kg	/
	33.	WHEEL LOAD WITH IMPACT / WITHOUT IMPACT FOR CT	Kg	/
	34.	WEIGHT OF COMPLETE CRANE WITHOUT HOIST AND TROLLEY	Kg	
	35.	WEIGHT OF THE HOIST AND TROLLEY	Kg	
	36.	CLEARANCE DIAGRAM - DATA SHEET A2 / A3 / A4 / A5 WITH DIMENSIONS DULY FILLED TO BE ENCLOSED		WHETHER ENCLOSED YES / NO
	37.	PRELIMINARY DIMENSIONED GENERAL ARRANGEMENT DRAWING OF CRANE TO BE ENCLOSED		WHETHER ENCLOSED YES / NO
	38.			
	39.			
OPERATOR'S CABIN	40.	IF THE CRANE IS CABIN OPERATED		
	40.1	SIZE OF CABIN	M	x x
	40.2	EXTRA PLUG PROVIDED		YES / NO
	40.3	ELECTRICAL HORN PROVIDED		YES / NO
	40.4	VENTILATION FAN PROVIDED		YES / NO
	40.5	FIRE EXTINGUISHER PROVIDED		YES / NO
	40.6			
	40.7			
<u>NOTES TO BIDDER</u> 1. DATA SPECIFIED IN DATA SHEET A1 HAS NOT BEEN REPRODUCED IN DATA SHEET B. IN CASE OF DEPARTURE FROM DATA SHEET A1, 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 A1. 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

	ENQ.SPEC. NO		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001 PART : B		DATA SHEET B ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE		SECTION : D10 SHEET : 4 OF 5	
ENQUIRY / SPECIFICATION NO.TCE						
	SL. NO.	BIDDER				
LIMIT SWITCHES	41.	FOLLOWING LIMIT SWITCHES ARE TO BE PROVIDED :	WHETHER PROVIDED			
	41.1	OVER HOISTING AND OVER LOWERING OF MAIN AND AUXILIARY HOISTS	YES / NO			
	41.2	LT MOTION	YES / NO			
	41.3	CT MOTION	YES / NO			
	41.4					
ELECTRICALS	42.	MOTORS : MAIN SPEED		POWER CONSUMPTION	RATING (KW)	SPEED (RPM)
	42.1	MAIN HOIST MOTOR	KW			
	42.2	AUXILIARY HOIST MOTOR	KW			
	42.3	LT MOTOR	KW			
	42.4	CT MOTOR	KW			
	43.	MOTORS : CREEP SPEED				
	43.1	MAIN HOIST MOTOR	KW			
	43.2	AUXILIARY HOIST MOTOR	KW			
	43.3	LT MOTOR	KW			
	43.4	CT MOTOR	KW			
	44.	TYPE OF CONDUCTORS				
	44.1	RUNWAY CONDUCTORS				
	44.2	CT CONDUCTOR				
	45.	FOLLOWING ELECTRICAL ITEMS ARE TO BE PROVIDED	WHETHER PROVIDED			
45.1	CONTROL EQUIPMENT AS SPECIFIED	YES / NO				
45.2	CRANE RUNWAY CONDUCTORS AND ACCESSORIES	YES / NO				
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET A1 HAS NOT BEEN REPRODUCED IN DATA SHEET B. IN CASE OF DEPARTURE FROM DATA SHEET A1, 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 A1. 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	

	ENQ.SPEC. NO		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION : D10	
	PART : B		ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE		SHEET : 5 OF 5	
ENQUIRY / SPECIFICATION NO.TCE						
	SL. NO.	ITEM	BIDDER			
ELECTRICALS (CONTD.)	45.3	CT CONDUCTORS AND ACCESSORIES		YES / NO		
	45.4	CRANE LIGHTING FIXTURE RECEPTACLES		YES / NO		
	45.5	CONTROLLERS AND RESISTORS		YES / NO		
	45.6	ELECTRICAL WIRING IN GI CONDUITS		YES / NO		
	46.					
	47.					
PERFORMANCE GUARANTEES	48.	CAPACITY	T	-		
	49.	LIFT	M	-		
	50.	SPEEDS FOR ALL MOTIONS	MPM	± %		
	51.	HOOK APPROACH	M			
	52.	ENERGY CONSUMPTION OF MOTORS FOR DIFFERENT MOTIONS OF THE CRANE	kW			
	53.					
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET A1 HAS NOT BEEN REPRODUCED IN DATA SHEET B. IN CASE OF DEPARTURE FROM DATA SHEET A1, 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 A1. 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	

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 1 OF 7
1.0 GENERAL 1.1 The following terms used in this specification shall also mean to cover other terms as shown below: OWNER-OWNER / PURCHASER / USER CONSULTANT-CONSULTANT/ENGINEER / INSPECTION AGENCY VENDOR - VENDOR / CONTRACTOR / FABRICATOR / SUPPLIER SUB-VENDOR - SUB-VENDOR / SUB-CONTRACTOR / SUB-FABRICATOR / SUB-SUPPLIER and all such agencies 1.2 The Plant and Equipment covered by this Contract shall be subjected to inspection and testing. The VENDOR shall provide all services to establish and maintain quality of workmanship in his Works and that of his SUB-VENDORS to ensure the mechanical accuracy of components, compliance with approved drawings, identification and acceptability of all materials, parts and Equipment. 1.3 For supply of systems, VENDOR shall, at the start of the 'Contract', furnish a total list of items in their scope of work. This list, giving a brief description of the item, quantity, names of probable SUB-VENDORS, and a blank column for agency for final approval of drawings / data sheets, shall be submitted for approval by CONSULTANT. (The blank column shall be filled by CONSULTANT.) The list shall be submitted within two weeks from the date of LOI.) 1.4 For systems and major items such as pressure/load bearing items, machineries etc., the VENDOR shall furnish quality plan giving details of checks / tests to be conducted by them on material, process, sub-assembly and assembly. These shall include requirements as prescribed in the applicable specifications, codes and statutory requirements. The quality plan shall be reviewed by the OWNER / CONSULTANT and the stages to be witnessed and verified shall be indicated by the OWNER /CONSULTANT in the quality plan and approved. 1.5 The VENDOR shall give the CONSULTANT written notice of any material being ready for testing as per format enclosed. The clear notice period shall be seven (7) days for local inspection and fifteen (15) days for outstation inspection. Such tests shall be to the VENDOR'S account except for the expenses of the CONSULTANT. The CONSULTANT, unless the inspection of the tests is virtually waived, shall fix a date for inspection with the VENDOR and attend such tests within fifteen (15) days of the date on which the Equipment is notified as being ready for test / inspection failing which, the VENDOR may proceed with the tests and shall forthwith forward to the CONSULTANT duly certified copies of tests in triplicate. If the VENDOR fails to offer the Equipment for inspection as per the agreed date, he is liable to pay for the time and expenses for the infructuous visit of the CONSULTANT. ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 2 OF 7
1.6 In all cases where inspection and tests are required whether at the premises or Works of the VENDOR or of any SUB-VENDOR or at laboratory, the VENDOR, except where otherwise specified, shall provide free of charge all facilities such as labour, materials, electricity, fuel, water, stores, test bed, apparatus and instruments, laboratory tests etc. as may be required by the CONSULTANT or his authorised representative to carry out effectively such tests of the Equipment in accordance with the 'Contract' and shall give facilities to the CONSULTANT or to his authorised representative to accomplish testing. 1.7 The OWNER or the CONSULTANT shall at all working hours have access to all parts of the VENDOR'S and his SUB-VENDOR'S factory where the items of the Plant are being prepared, for carrying out inspection activities as deemed necessary. A set of the relevant latest approved drawings with approval marking of the CONSULTANT and drawings for proprietary items shall be made available by the VENDOR to the OWNER or the CONSULTANT, for reference during inspection. 1.8 In the case of stage inspection hold points, the VENDOR shall proceed from one stage to another only after the component is inspected by the OWNER or his representative and written permission given to proceed further. The same procedure shall be adopted for any rectifications / repairs suggested by the OWNER or the CONSULTANT. 1.9 The OWNER or the CONSULTANT shall have the right to inspect any machinery, material, structures, Equipment or workmanship furnished or used by the VENDOR and may reject any which is defective or unsuitable for the use and purpose intended, or which is not in accordance with the intent of the Contract. The VENDOR, upon demand by the OWNER or the CONSULTANT, shall remedy or replace at the VENDOR'S expense such defective or unsuitable items of the Plant, or the OWNER or the CONSULTANT may, at the expense of the VENDOR, remedy or replace such defective or unsuitable items of the Plant. 1.10 All principal mill test reports, vendor inspection / tests reports, test certificates and test curves shall be supplied for all inspection / tests carried out including other records such as stress relieving charts, radiographic charts and other non-destructive testing records in accordance with the provisions of the Contract, duly certified by the main VENDOR. The OWNER or the CONSULTANT shall reserve the right to call for certificates of origin and test certificates for all raw material and Equipment at any stage of manufacture. 1.11 The CONSULTANT shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the VENDOR of any non-conformance pertaining to all or any Equipment and workmanship which in his opinion are not in accordance with the 'Contract'. The VENDOR shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the CONSULTANT giving reasons therein that no modifications are necessary to comply with the 'Contract'.		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 3 OF 7
1.12 When the factory tests and documentation have been satisfactorily completed at the VENDOR'S or SUB-VENDOR'S Works, the CONSULTANT shall issue acceptance note / shipping release note / certificate to this effect within fifteen (15) days after completion, but if the tests are not witnessed by the CONSULTANT, the certificate or comments thereof shall be issued within fifteen (15) days of the receipt of the VENDOR'S test certificate by the CONSULTANT. Failure of the CONSULTANT to take such an action shall not prevent the VENDOR from proceeding with the Work. The completion of these tests or the issue of the certificates shall not bind the OWNER to accept the Equipment should it, on further tests after erection, be found not to comply with the 'Contract'. 1.13 None of the Plant and the Equipment to be furnished or used in connection with the Contract shall be despatched until shop inspection, satisfactory to the OWNER or the CONSULTANT has been made. However, such shop inspection and/or certification shall not relieve the VENDOR of his responsibility for furnishing the Plant and the Equipment conforming to the requirements of the Contract nor prejudice any claim, right or privilege which the OWNER or the CONSULTANT may have because of the use of defective or unsatisfactory items. Should the OWNER or the CONSULTANT waive the right to inspect any item, such waiver shall not relieve the VENDOR in any way from his obligation under the Contract. In the event of the OWNER or the CONSULTANT'S inspection revealing poor quality of goods, the OWNER or the CONSULTANT shall be at liberty to specify additional inspection procedures, if required, to ascertain the VENDOR'S compliance with the Equipment Specifications. 2.0 SUB-ORDERS 2.1 In order to facilitate the inspection of bought-out materials and Plant, the VENDOR shall submit for approval, three (3) copies of all sub-orders placed by him as soon as they are issued. Copies of any drawings referred to in the sub-order shall also be submitted, unless otherwise agreed by the OWNER or the CONSULTANT. 2.2 The sub orders and drawings referred to above shall include all components which are subjected to electrical and mechanical pressure or stress when the Plant is in operation, and also auxiliaries and spares which are to be directly despatched to Site from the SUB-VENDOR'S Works. 2.3 All sub-orders of the main VENDOR and SUB-VENDORS shall clearly be marked with the main VENDOR'S name and the OWNER'S name and 'Contract' reference. They shall include the following statement: 2.3.1 "The Plant or the Equipment which is the subject of this order shall comply in every respect with the requirements of the CONSULTANT'S technical specifications and shall be subject to inspection and tests to the satisfaction of the CONSULTANT and ourselves". ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 4 OF 7
2.3.2 For the purpose of this clause, inter-works orders shall also be treated as sub-orders. It is obligatory on the VENDOR that he advises his SUB-VENDOR of the pertinent clauses in this Specification when ordering bought-out Plant, Equipment or materials. In particular, the VENDOR shall advise very SUB-VENDOR that he is required to supply design calculations, drawings, inspection reports and test certificates strictly in accordance with this specification and technical information for inclusion in the Instruction Manual as specified in Section-E. The SUB-VENDORS should also be reminded that they shall include with their offer all tools and appliances necessary for proper maintenance and all spare parts in accordance with Section-E of the Specification. Itemised prices of the recommended spare parts shall be submitted together with the appropriate part numbers and drawings. 2.5 Sub-ordering / sub-contracting for major items such as pressure / load bearing items, machinery etc. can be done only with the approval of the OWNER / CONSULTANT. 3.0 MATERIAL TESTS 3.1 In the event of the OWNER or the CONSULTANT being supplied with the certified particulars of tests which have been carried out for the VENDOR by the supplier of material, the OWNER or the CONSULTANT may, at his own discretion, accept the same as proper evidence of compliance with the requirements of appropriate specifications for the materials. 3.2 The VENDOR is to provide test pieces as required by the CONSULTANT to enable him to determine the quality of material supplied under the 'Contract'. If any test piece fails to comply with the requirements, the CONSULTANT may reject the entire lot of material represented by the test piece. 3.3 Critical materials used in manufacture of the Equipment and construction of the Plant covered by the 'Contract' may also be subjected to one or more of the non-destructive tests (NDT) as called for in the Specification or as mutually agreed. Salvaging of material due to unacceptable defect is to be attempted by the VENDOR only after getting specific concurrence from the OWNER or the CONSULTANT and according to the approved procedures. 4.0 WELDING 4.1 All welding involved in construction and fabrication of the Plant and items covered under the 'Contract' shall be carried out in accordance with procurement specifications and applicable codes. 4.2 Welding procedures and welders' qualifications shall be approved by the CONSULTANT. Where applicable, welders shall be tested as detailed in codes specified for pipe welding, vessel welding and structural welding and appropriate to the corresponding weld position using test pieces of appropriate parent metal ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 5 OF 7
to be used on the job. The CONSULTANT shall have the right to have any welder re-tested at any time during the 'Contract'. 4.3 Recommendations of applicable codes shall be followed for non-destructive tests, wherever applicable. 4.4 Copies of all welding procedures, procedure qualification records, welders' performance qualification certificates, post-heating / stress relieving records, NDT records and other test results shall be made available upon request of the CONSULTANT. 5.0 FABRICATION/INSPECTION Fabrication / Inspection procedures for vessels, heat exchangers, pipes, tubes, valves, etc. Shall be in accordance with procurement specifications, quality plan, applicable codes or any other approved equal. 6.0 TESTS AT MANUFACTURER'S WORKS 6.1 General The tests at Works shall include electrical, mechanical and hydraulic tests in accordance with the appropriate clauses of Statutory Regulation, relevant codes and standards and approved drawings / specifications and in addition any test called for by the OWNER or the CONSULTANT to ensure that the Plant being supplied fulfils the requirements of the Specifications. The VENDOR shall carry out all the shop tests and inspections specified under individual items of the Equipment in Section-D, in addition to those normally required as per codes / standards. For items not covered by any code or specifically mentioned in the Specifications, the tests are to be agreed with by the CONSULTANT. If considered necessary by the OWNER or the CONSULTANT, multi-part assemblies shall be fully erected and tested in the Works prior to packing and despatch to the Site. 6.2 Test Certificates Test certificates including test records, performance curves and balancing certificates shall be supplied according to the Distribution Schedule. All the tests shall be carried out in accordance with the provisions of the 'Contract'. All test certificates must be endorsed with sufficient information to identify the material or the Equipment to which the certificates refer, and must carry at the top right hand corner the identification of the OWNER and the 'Contract'. 6.3 Calibration All instruments used for critical measurement such as pressure gauges for leak tests, instruments for measuring performance parameters; instruments for		
		ISSUE R0

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 6 OF 7
precision dimension measurements shall have valid calibration certificates traceable to national standards. This means that the calibrating agency engaged by the VENDOR shall use instruments which are in turn calibrated by Government approved agencies and such an information shall be recorded in the calibration certificate issued by the calibrating agency by giving the certificate number, date and date of validity of the certificate given by the Government approved agency. <u>FORMAT FOR INSPECTION REQUEST FROM VENDOR</u> To Rajasthan Rajya Vidyut Utpadan Nigam Limited Attn: Mr. (PROJECT COORDINATOR) Dear Sirs, Items detailed below are ready for inspection. Please arrange inspection and confirm the date. 1. Client/ End user : 2. Project : 3. Client's order Ref. : 4. TCE's Ref. : 5. Sub-order Ref. : 6. Sub-Contractor's name & full address : 7. Place of inspection (Full address) : 8. Contact person, Phone, Fax and Telex Nos. : 9. Description of item & Qty. : 10. Billing Schedule No. : 11. Nature of inspection required : ISSUE R0		

SPEC.NO. TCE.5750A-H-500-001	TATA Consulting Engineers Limited	VOLUME II SECTION – E 4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan SHOP INSPECTION AND TEST PROCEDURES	SHEET 7 OF 7
12. Proposed date(s) : 13. Weekly holiday : We confirm that the items have been fully inspected / tested by us, all stages of inspection as per quality plan have been done by TCE and us and all material test certificates, Q.C. records and test reports and valid calibration reports of measuring / testing instruments with traceability to national level are ready with us. Thanking you and awaiting your confirmation, Yours faithfully, Note: 1. Following clear notice periods (date of receipt at Client's office to date of inspection) are required: (a) Local Inspection - 7 days (b) Outstation Inspection - 15 days 2. Weekly Holidays for Client - Saturday & Sunday cc: TCE cc: Sub-Vendor ISSUE R0		

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	
		ISSUE R8

SPEC. NO. TCE.M4-906	TATA CONSULTING ENGINEERS LIMITED	SECTION: E
	PACKING, MARKING AND TRANSPORT INSTRUCTIONS FOR EQUIPMENT	SHEET 2 OF 5
	the equipment from damage due to dust and moisture. 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). 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. 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. 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. 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. 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. 1.17 Components containing glass shall be carefully covered with shock absorbing protective material such as expanded polystyrene ('Thermo Cole'). 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. 1.19 Loose material, e.g. bolts, nuts, etc. shall be packed and sealed in polythene bags with proper tagging and packed in cases. 1.20 All spare parts shall be packed and treated for long storage conditions at site. 2.0 <u>MARKING</u>	
		ISSUE R8

SPEC. NO. TCE.M4-906	TATA CONSULTING ENGINEERS LIMITED	SECTION: E
	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

ISSUE
R8

SPEC. NO. TCE.M4-906	TATA CONSULTING ENGINEERS LIMITED	SECTION: E
	PACKING, MARKING AND TRANSPORT INSTRUCTIONS FOR EQUIPMENT	SHEET 4 OF 5

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

ISSUE R8

SPEC. NO. TCE.M4-906	TATA CONSULTING ENGINEERS LIMITED	SECTION: E
	PACKING, MARKING AND TRANSPORT INSTRUCTIONS FOR EQUIPMENT	SHEET 5 OF 5
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.		
		ISSUE R8

1		MANUFACTURER'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN				PROJECT: 2X660 MW SURATGARH, STAGE-V UNIT 7&8					
भारत रत्न BHEL		MANUFACTURER'S NAME & ADDRESS		ITEM: EOT CRANES - SINGLE GIRDER		REV		Rev 00		PACKAGE: Single Girder EOT Crane			
						DATE		PAGE		P.O.NO –			
						PAGE		Page 1 of 5		BHEL NO: PE-QP-392-524-A001			
						CONTRACTOR: BHEL		CUSTOMER NO:					
S.NO.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Document	Acceptance Norms	Format of Record	D	M	C	N	Remark
1	2	3	4	5	6	7	8	9	10				11
FOR EOT CRANE													
1.0	RECEIVING INSPECTION												
1.1	Structural-Plates/RSJ for Main Girders, End Carriages Trolley, Pulley, Gearbox housing , rope drum (if fabricated) etc.	Physical & Chemical	Major	Lab Analysis	100%	IS:2062 Gr. A or B / As per approved G.A.		MTC / Lab Report	/	P/V	V	V	
1.2	Rope Drum (Seamless Pipe)	Chemical Mechanical	Major	Lab Analysis	1/pipe	Approved drg/DS ASTM A106 Gr A or B		Lab Report	/	P	V	V	
		Flattening & Acid etching Test Surface defect	Major	Mech test Visual	1/pipe 100%	no cracks, pitting, rusting, damage ,etc		I.R.	/	P	V	V	
1.3	Gears, pinions, shafts, axles & wheels (#)	Chemical& Mechanical,	Major	Lab Analysis	1/lot	IS:2004 (45C8/55C8) (Relevant IS/appd drg)		MTC	/	P	V	V	
			Major	UT	100%	ASTM A388/NOTE 1		I.R	/	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 followed
1.4	Hook	Chemical & Mechanical	Major	Lab Analysis	100%	IS: 15560 Related Std. As per appd. Drg./data sheet		MTC	/	V	V	V	
		UT (above 50 mm dia)	Major	UT on shank portion only	100%	ASTM A388 / ASME Sec VIII Divn 2 – NOTE:1		MTC/ ALC/Q CR	/	P	V	V	

BHEL BARH

2		MANUFACTURER'S NAME & ADDRESS				MANUFACTURING QUALITY PLAN				PROJECT: 2X660 MW SURATGARH, STAGE-V UNIT 7&8			
						ITEM: EOT CRANES - SINGLE GIRDER				PACKAGE: Single Girder EOT Crane			
						REV / DATE				P.O.NO -			
						PAGE				BHEL NO: PE-QP-392-524-A001			
										CUSTOMER NO:			
										CONTRACTOR: BHEL			
S.NO.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Document	Acceptance Norms	Format of Record	Agency			Remark	
1	2	3	4	5	6	7	8	9	D	M	C	N	11
1.5	Wire Rope	Examination of report of breaking load Dimension & Type, construction Make/Type/Rating/ Routine test Make/ type / rating/ HV/IR functional test	Major	Review of TC Measurement	100%	IS: 2266 Appd G A drg	IS: 2266 Appd G A drg	Mfr's TC	/	P	V	V	
1.6	Motors & cables. Brakes		Major	Visual / Measurement	100%	Appd drg/DS/Tech spec/Rel IS		QCR		P	V	V	
1.7	Sheaves	Mech						I.R STC	/	P	V	V	For motor, ref. Note 2
1.8	Limit switch, SFU, Relays, MCB, Fuses, Push buttons Etc Control transformer	Make/Type/Rating Functional /continuity Make , type, rating, input/output	Major	Tensile & Hardness	1/lot	Approved Drg / Mfg drg		MTC	/	P	V	V	
1.9	DSL	Make , type, rating, Dimension.	Major	Review of TC	100%	Appd drg./DS/Scheme/NTPC Spec./Manu.Std	Appd drg./DS/Scheme /NTPC Spec./ Manu.Std	QCR Routine TC/COC of mfrg	/	V	V	V	
2	INPROCESS INSPECTION			Review of TC	100%			QCR Routine TC/COC of mfrg	/	V	V	V	

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



3

MANUFACTURER'S NAME & ADDRESS

MANUFACTURING QUALITY PLAN

ITEM: EOT CRANES - SINGLE GIRDER

Rev 00

DATE

Page 3 of 5

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

PACKAGE: Single Girder EOT Crane

P.O.NO -

BHEL NO: PE-QP-392-524-A001

CUSTOMER NO:

CONTRACTOR: BHEL

S.NO.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Document	Acceptance Norms	Format of Record				Agency			Remark
								D	M	C	N				
1				5	6	7	8	9	10			11			
2.1	WPS,PQR & WPQ	Verification of approval				WPS,PQR & WPQ / Qualified by NTPC		/	P	V	V	NTPC approved WPS to be used. Procedure & welders qualified by NTPC to be used/ deployed.			
2.2	Assembled gear box	No load run test backlash & contact pattern, noise, vibration & oil temp rise (for oil lubrictd)	Major	Performance	100%	Apprvd drg/DS/Mfg std Noise 85dba max, vibration 75 microns max, oil temp rise – 30 °C above ambient max		/	P	V	V				
2.3	Welding of end carriage, Main Girder, Trolley , rope drum (if fabricated) etc.,	DPT of Welds(all) RT of Butt weld	Major Major	LPI RT	100% on butt&10% on fillet 100%/10%	ASTM E165 or Eq. / No crack or linear indication ASME Sec.VIII,Div.1, UW 51/52	I.R.	/	P	V	V	I.R.			
2.4	Hook	Dimension	Major	Measurement	100%	Mfr's drg / Related Std. As per appd. Drg./data sheet/ IS: 15560	QCR	/	P	V	V	@RT-100%, for Butt weld in tension & 25% in compression. 100% RT on butt weld for fabricated rope drum			
		Proof Load	Major	Load Test			QCR	/	P	V	V				
		NDT after proof load	Major	LPI	100%	ASTME 165 or Eq. / No crack or linear indication	I.R.		P	V	V				
2.5	Gears, pinions, shafts, axles & wheels (#)	Hardness Surface Defect (after machining)	Major	DPT	100%	Approved Drg/ Data sheet ASTM E-165 No linear indication	MTC	/	P	V	V				

MANUFACTURER

NAME & SIGNATURE

CONTRACTOR

NAME & SIGNATURE

LEGEND: CLASS A: Critical, B: Major, C: Minor

** M: MANUFACTURER / SUB-CONTRACTOR D: Records for Data Fold
C: CONTRACTOR/NOMINATED INSPECTION AGENCY, ND: NDT LAB
N: Customer R: Test / Dim Report, IR-Inspection Report
INDICATE “p” PERFORMS, “w” WITNESS, MTC: Mfr's Test Cert.
“V” VERIFICATION, ALC: Approved Laboratory Certificate,
QCR: Quality Control Report

DOC. NO.:

NAME & SIGN OF APPROVING AUTHORITY & SEAL

BHEL BARH

4 ભારતીય રાજ BHEL		MANUFACTURER'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN						PROJECT: 2X660 MW SURATGARH, STAGE-V UNIT 7&8					
				ITEM: EOT CRANES - SINGLE GIRDER		REV	Rev 00	DATE	Page 4 of 5	PACKAGE: Single Girder EOT Crane	P.O.NO –	BHEL NO: PE-QP-392-524-A001	CUSTOMER NO:	CONTRACTOR: BHEL	
						Reference Document	Acceptance Norms								Format of Record
S.NO.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	7	8	9	D	M	C	N	10		11
3	FINAL INSPECTION														
3.1	Overall dimensions	Dimensions (span) level, alignment	Critical	Measurement	100%	Appd GA drg & IS: 3177/IS:3938	I.R.	/	P	W	W			FUNCTIONAL CHECK OF PENDENT &	
3.2a	Assembled Crane along with individual control panel & pendant station	Current & speed for Cross Travel & Hoisting, interlocking sequencing, inching operation, Limit switch operation	Critical	Measure /Verify	100%	Appd GA drg & IS: 3177/Appd data sheet	I.R.	/	P	W	W			PANEL FOR SPECIFIC CRANE	
3.2b	Overload test at 125% of SWL	Deflection at SWL Holding capacity of brakes		Measurement Lifting from mid Air	100%	Appd GA drg & IS: 3177/IS:3938/ Appd data sheet	I.R.	/	P	W	W				
3.3	Control Panel & Pendant station	1. Make/type/rating of Boils. 2.IR-HV functional &interlocks 3.DOP by paper insertion for panel	Major	Visual, Operational & Functional Measurement do	100%	Approved drawing / Data sheet / is: 3177 Paper should not go easily.	I.R.		P	W	W			HV of power circuit at 2kV and control circuit at 1kV. IR of power & control circuit with 500V Meggar with acceptance norm of 0.5 Mega Ohm.	
3.4	Painting	Examination – shade Dry FilmThickness	Minor Major	Visual & measurement Measurement	100% Sample	Customer's / Approved Painting Procedure			P	V	-				

								DOC. NO.:	

5



MANUFACTURER'S NAME & ADDRESS

PROJECT: 2X660 MW SURATGARH, STAGE-V UNIT 7&8
PACKAGE: Single Girder EOT Crane
P.O.NO –
BHEL NO: PE-QP-392-524-A001
CUSTOMER NO:
CONTRACTOR: BHEL

MANUFACTURING QUALITY PLAN

ITEM: EOT CRANES - SINGLE GIRDER

REV
DATE
PAGE

Rev 00
Page 5 of 5

S.NO.

Component & Operation

Characteristics

Class

Type of check

Quantum of check

Reference Document

Acceptance Norms

Format of Record

Agency

Remark

1	2	3	4	5	6	7	8	9	10	11
---	---	---	---	---	---	---	---	---	----	----

NOTE1:***' 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

Note 2:- 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 NTPC 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.

		LEGEND: CLASS A: Critical, B: Major, C: Minor		DOC. NO.:	
		** M: MANUFACTURER / SUB-CONTRACTOR D: Records for Data Fold C: CONTRACTOR /NOMINATED INSPECTION AGENCY, ND: NDT LAB N: Customer R: Test / Dim Report, IR-Inspection Report INDICATE “p” PERFORMS, “w” WITNESS, MTC: Mfr’s Test Cert. “V” VERIFICATION, ALC: Approved Laboratory Certificate, QCR: Quality Control Report			
MANUFACTURER		CONTRACTOR			
NAME & SIGNATURE					

BHEL BARH

NAME & SIGN OF APPROVING AUTHORITY & SEAL

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

**SINGLE GIRDER CRANES
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)**



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



TITLE:	ELECTRICAL EQUIPMENT SPECIFICATION FOR SINGLE GIRDER CRANES 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

CONTENTS

SECTION	TITLE	NO OF SHEETS
C	SPECIFIC TECHNICAL REQUIREMENTS	1
C	ELECTRICAL SCOPE BETWEEN BHEL & VENDOR	1
C	ELECTRICAL LOAD DATA FORMAT	1
C	DATASHEET-A	2
C	TECHNICAL SPECIFICATION FOR MOTORS	14
D	QUALITY PLAN (FOR MOTORS BELOW 55 KW)	2
D	SECTION D13: MOTOR AND ACTUATOR	21
D	SECTION D15: CONTROL PANEL/STARTER PANEL/JB/PB	8
D	SECTION D16: CABLES AND CABLE CARRIER SYSTEM	19
D	GENERAL TECHNICAL REQUIREMENTS FOR CONDUIT AND PIPES	6



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

SPECIFICATION NO.
VOLUME II B
SECTION-C
REV 0 DATE 06.05.2014
PAGE 1 OF 1

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 'Single Girder Cranes' and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
 - b) Signed and stamped Electrical 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 and DATA SHEET-A for 415V Electric Motors.
- 3.3 Technical specification no. PES-507-27 for conduits and pipes.
- 3.4 Quality Plan for motors below and above 55kw.
- 3.5 Load data format (Annexure-II).
- 3.6 TCE spec for Suratgarh project for following packages:
 - i. SECTION D9: 415V SWITCHGEAR/POWER DISTRIBUTION BOARD/MCC
 - ii. SECTION D13: MOTOR AND ACTUATOR
 - iii. SECTION D15: CONTROL PANEL/STARTER PANEL/JB/PB
 - iv. SECTION D16: CABLES AND CABLE CARRIER SYSTEM

ANNEXURE – I TO SECTION – C: STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE: SINGLE GRIDER CRANES

PROJECT 2X660 MW SURATGARH STPS

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415V Local Control Panel and Isolating Switch	Vendor	BHEL	BHEL will provide one number 415 V(3ph, 3W) supply feeder only up to isolating switches for cranes. Any requirements of 3phase, 4 wire or 1 phase, 1wire shall be derived by vendor using BHEL supply of 3hase, 3wire.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	BHEL	
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	BHEL	
4	Equipment Earthing	Vendor	BHEL	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL / customer.
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 tinned copper heavy duty lugs for power cables. 3 Solderless 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.

Note:

- 1) Cable schedule in prescribed format to be provided in soft after award of contract.
- 2) Make of all electrical equipment/items supplied shall be as per attached bought out items list.
- 3) All QPs shall be subject to approval of BHEL/Customer after award of contract.
- 4) Supply of any other item for completeness of electrical work (although not mentioned specifically but required for trouble free and efficient operation of the system) shall be deemed to be included in the scope of vendor without any extra charge.



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 | Space heater supply(30KW & ABOVE) | : | 240 V, 1Φ , 50 Hz |
| 12.0 | Rating up to which Single phase motor | : | Acceptable below 0.20 Kw |
| 13.0 | TYPE OF STARTER PROVIDED IN MCC | : | DOL |
| 14.0 | Locked rotor current | | |
| | a) Limit as percentage of FLC | : | 600% (inclusive of tolerance) |
| | b) Permissible tolerance, if any | : | - |
| 15.0 | Additional tests | : | As per QP |
| 16.0 | 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 |
| 17.0 | Makes | : | AS PER ANNEXURE-I |
| 18.0 | Terminal box | : | Suitable to rotate at 90 degrees |



TITLE

LV MOTORS**DATA SHEET-A**

SPECIFICATION NO.

VOLUME II B

SECTION C

REV NO. 00 DATE 06.05.2014

SHEET 2 OF 1

19.0 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
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 2 OF 4
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.		
3.3.3 The following frequency of starts shall apply		
i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.		
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)		
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		
3.4 Running Requirements		
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.		
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.		
3.5 Stress During bus Transfer		
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.		
3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.		
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.		
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.		
4.0 CONSTRUCTIONAL FEATURES		
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		
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.		
Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled		
4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.		

	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 : 3 OF 4
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	In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. 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.	
4.7	Terminals and Terminal Boxes	
4.7.1	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. 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".	
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	

	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 : 4 OF 4
4.9.1 Motors provided for similar drives shall be interchangeable. 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors. 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above. 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956. 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. 4.9.6 Name plate with all particulars as per IS: 325 shall be provided 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. 5.0 INSPECTION AND TESTING 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. 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. 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan. 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A. 6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT a) OGA drawing showing the position of terminal boxes, earthing connections etc. b) Arrangement drawing of terminal boxes. c) Characteristic curves: (To be given for motor above 55 kW unless otherwise specified in Data Sheet). i) Current vs. time at rated voltage and minimum starting voltage. ii) Speed vs. time at rated voltage and minimum starting voltage. 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. iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.		

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.		
		VOLUME		II B
		SECTION D		
		REV NO.00		DATE 08/09/2010
		SHEET 1		OF 7

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 :

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.		
		VOLUME		II B
		SECTION D		
		REV NO.00 DATE 08/09/2010		
		SHEET	2	OF

- 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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO.00 DATE 08/09/2010	
		SHEET	3 OF 7

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)

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00 DATE 08/09/2010	
		SHEET	4 OF 7

- 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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.		
		VOLUME		II B
		SECTION D		
		REV NO.00 DATE 08/09/2010		
		SHEET	5	OF

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)

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00 DATE 08/09/2010	
		SHEET	6 OF 7

- 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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.	
		VOLUME	II B
		SECTION D	
		REV NO. 00 DATE 08/09/2010	
		SHEET	7 OF 7

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

		CUSTOMER :		PROJECT		SPECIFICATION :					
								TITLE			
QUALITY PLAN		BIDDER/ VENDOR		QUALITY PLAN		SPECIFICATION					
SHEET 1 OF 2		SYSTEM		NUMBER PED-506-00-Q-006, REV-01		TITLE					
COMPONENT/OPERATION		CAT.		REFERENCE DOCUMENT		SECTION					
SL. NO.	CHARACTERISTICS CHECK	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	7	8	9	10	11			
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	MANUF'R'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 :				
				VENDOR		QUALITY PLAN		SPECIFICATION :				
				SYSTEM		NUMBER PED-506-00-Q-006, REV-01		TITLE :				
SL. NO.	COMPONENT/OPERATION	SHEET 2 OF 2	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION	AGENCY	VOLUME III
1	2	3	4	5	6	7	8	9	10	11		
NOTES: 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 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 2 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. 3												
<u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL		PARTICULARS		BIDDER/VENDOR								
		NAME										
		SIGNATURE										
		DATE										
BIDDER'S/VENDORS COMPANY SEAL												

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC			SHEET 1 OF 6

Sr. No.	Description	unit	Client specification
1.0	Manufacturer's name		*
2.0	Make of major components (ACB, Contactor, MCCB , CTs, PTs)		*
3.0	Type & model number of panel		*
4.0	Applicable standard.		*
5.0	Nominal system voltage, phase & frequency	V	415 V, 3 phase, 50 Hz, 3- wire/ 4- wire
6.0	System neutral earthing considered		Effectively earthed
7.0	Maximum system voltage	V	456.5
8.0	One minute power frequency withstand voltage	Power circuits	KV rms 2.5
		Control circuits	1.5
		Aux. circuits connected to secondary of CTs	2.0
9.0	Short circuit withstand capability	KA rms	Min. 50 KA
	a) Short time for 1 sec b) Dynamic rating	KA peak	Min. 127.5KA
10.0	Reference ambient temperature	Deg. C	50
11.0	Continuous current rating under site reference ambient condition	A	*
12.0	Maximum temperature of Bus Bars, dropper, connectors & contacts at continuous current rating under site reference ambient temperature	Deg C	90 deg. C for non silver plated joints 105 deg. C for silver plated

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, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC			SHEET 2 OF 6

			joints
13.0	Material of bus bars considered		Copper / Aluminum Alloy
14.0	Cable entry		Bottom only
15.0	Degree of protection		IP- 52 upto 1600A and IP-42 above 1600A.
16.0	Thickness of sheet steel enclosures / doors.		
	Cold Rolled		2mm
	Hot rolled		2.5mm
17.0	Shade of paints		Powder coated paint of shade RAL 7032 (Siemens Grey)
18.0	Earthing bus bar size & material considered		75 x12 mm (min) , GS
19.0	Clearance in air of live parts		
	a) phase to phase		25 mm
	b) phase to earth		19 mm
20.0	Circuit breaker		
	a) Type		*
	b) Rated operating duty		O-3min-CO-3min- CO
	c) Rated current at site reference ambient temp. A		
	d) Rated breaking current	KA rms	
	e) Rated making current	KA peak	*
	f) Short time current withstand capacity for 1	KA	*

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

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC			SHEET 3 OF 6

	sec duration g) Asymmetrical breaking current (1) AC component (2) DC component h) operating time (1) opening time (2) closing time i) Closing and opening coil particulars. j) Switching over voltage factor	rms KA rms Cycle s Cycle s	* * as per IEC – 62271 * * 220V DC 2.2
21.0	Trip free operating mechanism type		Motor charged spring (manual trip & close facility to be provided)
22.0	Auxiliary control voltage for trip, close, annunciation and spring charging.		220 V DC (+/- 15 %)
23.0	Auxiliary control voltage for space heater, DC failure annunciation, motor winding / space heaters, lighting etc		240V AC, 1-Ph, 2 wire, 50 Hz
24.0	Breakers application a) Incomer s		Yes
25.0	Details of contactors/ Switches/Fuses. • Type • Rated operating duty		*

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

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC			SHEET 4 OF 6

	- Rated current at site reference ambient temp. - Rated breaking current - Rated making current - Short time current withstand capacity for 1 sec duration - Asymmetrical breaking current - AC component - DC component - Operating time - opening time - closing time		
26.0	Details of CTs - Type - Ratio - Burden - Accuracy class - Knee point voltage - Magnetizing current at $V_k/2$ - Secondary resistance - Class of insulation - Short time & dynamic current rating - Applicable standard		(Cast resin, Class E or Better) **

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

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC			SHEET 5 OF 6

	No. of cores		
27.0	Details of VTs - Type - Ratio - Burden - Accuracy class - Magnetizing characteristic - Method of connection - Class of insulation - Rated voltage factor (continuous & 8 hours) - Applicable standard - No. of cores		(Cast resin Class E or Better , Overvoltage factor 1.5 continious,1.9 for 08 hours) **
28.0	Particular of meters		*
29.0	Particular of relays		*
30.0	Panels construction details		*
31.0	STARTERS		
31.1.	Type		DOL/Soft Starters
31.2.	Contactor rated duty as per IS:13947		Uninterrupted
31.3.	Utilisation category as per IS:13947		AC 3 for non reversible AC 4 for reversible

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

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 6 OF 6

31.4.	Control scheme & bill of material enclosed	YES/ NO	Yes
	CONTROL TRANSFORMER :		
	A) Separate for each module	YES/ NO	NO
	B) Common for each switchgear section with 100% standby	YES/ NO	YES
31.5.	Single phasing preventer required	YES/ NO	Yes

NOTE :

- 1.0 ‘**’ Information shall be filled furnished by BIDDER in contract document.
- 2.0 ‘***’ BIDDER shall furnish these details after award of contract.

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, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC			SHEET 1 OF 10
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
1.0	<u>SPECIFIC PARTICULARS</u>				
1.1	Switchgear designations				
1.2	Single front or double front		SF/DF		
1.3	Applicable Standard				
1.4	Fully drawout/semi drawout/Fixed		FD/SD/F		
1.5	Total dimensions of each complete switchgear L x W x D		mm $\frac{L}{W}{D}$		
1.6.1	Width of each vertical section with cable alley		mm		
1.6.2	Width of cable alley only		mm		
1.7	Minimum clear space required				
	a) In front		mm		
	b) Back		mm		
1.8	Max. cubicle weight with components		kg		
1.9	Have all the feeders and components specified in enclosed Drawings and Data Sheets A - 3 been provided ?			YES/NO	
2.0	<u>GENERAL PARTICULARS</u>				
2.1	Sheet steel				
NOTES TO BIDDER			SIGNATURE OF BIDDER & DATE		
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.			ISSUE R1		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC		SHEET 2 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
	a) Cold rolled/Hot rolled b) Thickness : i) Frames ii) Door iii) Rear cover iv) Side and top covers v) Panel partitions	mm mm mm mm mm	
2.2	Degree of protections provided by the enclosure (As per IS : 13947)		
2.3	Earth busbar size	Sq.mm	GI/AL/CU
2.4	BUSBAR a) Material of busbars b) Section c) Continuous current rating under site conditions d) Whether busbars have been insulated e) Type of insulation f) Temperature rise over the reference ambient	 Sq.mm A °C	AL/CU PH : N: YES/NO
<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 	
		ISSUE R1	

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9																																																																								
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC		SHEET 3 OF 10																																																																								
ENQUIRY/SPECIFICATION NO.:		BIDDER:																																																																									
<table border="1"> <tr> <td></td> <td>when carrying rated current</td> <td></td> <td></td> </tr> <tr> <td></td> <td>g) Material of busbar supports</td> <td></td> <td></td> </tr> <tr> <td></td> <td>h) Clearance in air :</td> <td></td> <td></td> </tr> <tr> <td></td> <td> i) Between phases</td> <td>mm</td> <td></td> </tr> <tr> <td></td> <td> ii) Between phases earth</td> <td>mm</td> <td></td> </tr> <tr> <td></td> <td>i) Short time rating (One Sec.)</td> <td>kA</td> <td></td> </tr> <tr> <td></td> <td>j) Momentary rating (peak)</td> <td>kA</td> <td></td> </tr> <tr> <td>3.0</td> <td>CIRCUIT BREAKERS</td> <td></td> <td></td> </tr> <tr> <td>3.1</td> <td>Maker's name</td> <td></td> <td></td> </tr> <tr> <td>3.2</td> <td>Maker's type designation</td> <td></td> <td></td> </tr> <tr> <td>3.3</td> <td>Applicable standards</td> <td></td> <td></td> </tr> <tr> <td>3.4</td> <td>Circuit breakers type (air break and or MCCB)</td> <td></td> <td></td> </tr> <tr> <td>3.5</td> <td>Rated voltage</td> <td>V</td> <td></td> </tr> <tr> <td>3.6</td> <td>Rated operating duty</td> <td></td> <td></td> </tr> <tr> <td>3.7</td> <td>Rated current</td> <td>A</td> <td></td> </tr> <tr> <td>3.8</td> <td>Derating factor for operation under site conditions</td> <td></td> <td></td> </tr> <tr> <td>3.9</td> <td>Rated symmetrical breaking current at rated voltage. (Indicate power factor)</td> <td>kA P.F.</td> <td></td> </tr> <tr> <td>3.10</td> <td>Rated peak making current</td> <td>kA</td> <td></td> </tr> </table>					when carrying rated current				g) Material of busbar supports				h) Clearance in air :				i) Between phases	mm			ii) Between phases earth	mm			i) Short time rating (One Sec.)	kA			j) Momentary rating (peak)	kA		3.0	CIRCUIT BREAKERS			3.1	Maker's name			3.2	Maker's type designation			3.3	Applicable standards			3.4	Circuit breakers type (air break and or MCCB)			3.5	Rated voltage	V		3.6	Rated operating duty			3.7	Rated current	A		3.8	Derating factor for operation under site conditions			3.9	Rated symmetrical breaking current at rated voltage. (Indicate power factor)	kA P.F.		3.10	Rated peak making current	kA	
	when carrying rated current																																																																										
	g) Material of busbar supports																																																																										
	h) Clearance in air :																																																																										
	i) Between phases	mm																																																																									
	ii) Between phases earth	mm																																																																									
	i) Short time rating (One Sec.)	kA																																																																									
	j) Momentary rating (peak)	kA																																																																									
3.0	CIRCUIT BREAKERS																																																																										
3.1	Maker's name																																																																										
3.2	Maker's type designation																																																																										
3.3	Applicable standards																																																																										
3.4	Circuit breakers type (air break and or MCCB)																																																																										
3.5	Rated voltage	V																																																																									
3.6	Rated operating duty																																																																										
3.7	Rated current	A																																																																									
3.8	Derating factor for operation under site conditions																																																																										
3.9	Rated symmetrical breaking current at rated voltage. (Indicate power factor)	kA P.F.																																																																									
3.10	Rated peak making current	kA																																																																									
<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 ISSUE R1																																																																									

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC		SHEET 4 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
3.11	Rated short time withstand rating (for 1 sec.) (For MCCB, BIDDER to indicate the time)		
3.12	Operating mechanism type		
3.13	Limits of voltage for satisfactory operation of the following devices as a % of normal voltage		
	i) Operating mechanism	%	
	ii) Closing at normal voltage	%	
	iv) Trip coil	%	
3.14	Power required for closing at normal voltage	W	
3.15	Power required for tripping at normal voltage	W	
3.16	Spring charging motor details :		
	i) Rating	kW	
	ii) Rated voltage	V, AC/DC	
	iii) Spring charging	Sec.	
3.17	Overload release provided	YES/NO	
3.18	Short circuit release settings and time delay features		
3.19	Undervoltage release setting		
3.20	Have electrical and mechanical anti-pumping features been provided	YES/NO	
3.21	Have type test certificates been enclosed ?	YES/NO	
4.0	AIR BREAK SWITCHES		
4.1	Make		
4.2	Type		
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 ISSUE R1	

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC		SHEET 5 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
4.3	Rated Voltage		
4.4	Applicable standards		
4.5	Maximum prospective fault current withstand of composite unit of switch and fuse	kA (peak)	
5.0	FUSES		
5.1	Make		
5.2	Type		
5.3	Applicable standards		
5.4	Rated voltage	V	
5.5	Rated current for individual circuits to be provided as per requirements of protection coordination	YES/NO	
6.0	CONTACTORS		
6.1	Make		
6.2	Rated duty		
6.3	Rated Utilisation Category		
6.4	Applicable standards		
6.5	Rated (thermal) current provided as per specification	YES/NO	
6.6	Rated voltage of auxiliary contacts	V	
6.7	Rated voltage of coil	V	
6.8	Rated breaking capacity	Factor of rated current	
6.9	Rated making capacity	Factor of rated current	
6.10	Limits of operation		
	i) Supply voltage variation	+ %	
	ii) Supply frequency variation for closing	+ %	
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 	
		ISSUE R1	

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC			SHEET 6 OF 10
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
	iii) Drop out voltage	%			
6.11	No of auxiliary contacts :				
	I) Normally open				
	ii) Normally closed				
7.0	SINGLE PHASING PREVENTERS				
7.1	Is it in built-in bimetal thermal overload relay	YES/NO			
8.0	CURRENT TRANSFORMERS				
8.1	Make				
8.2	Applicable standards				
8.3	All other parameters of CT as per enclosed SLD/list and Section-D	YES/NO			
9.0	VOLTAGE TRANSFORMERS				
9.1	Make				
9.2	Applicable standards				
9.3	Ratio	V/V			
9.4	Output per phase	VA			
9.5	Accuracy class				
9.6	Over voltage factor				
9.7	Class of insulation				
10.0	CONTROL TRANSFORMERS				
10.1	Make				
10.2	Type				
10.3	Applicable standards				
10.4	Ratio				
10.5	Class of insulation				
10.6	Rated output	VA			
11.0	INSTANTANEOUS OVERCURRENT RELAY				
11.1	Application (phase fault or earth fault)				
11.2	Make				
NOTES TO BIDDER			SIGNATURE OF BIDDER & DATE		
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.			ISSUE R1		

FILE NAME: F294R3.DOC

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC			SHEET 8 OF 10
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
18.2	Type				
18.3	Applicable standard				
18.4	Accuracy class				
19.0	INDICATING LAMPS				
19.1	Make				
19.2	Type				
19.3	Voltage	V			
19.4	Series resistor	Ohms			
19.5	Wattage of lamp	W			
20.0	PUSH BUTTONS				
20.1	Make				
20.2	Type designation				
20.3	No of contacts:				
	i) Normally open				
	ii) Normally closed				
20.4	Contact rating	A			
21.0	SPACE HEATER				
21.1	Make				
21.2	Type				
21.3	Rated voltage	V			
21.4	Heater output for each vertical panel	W			
21.5	Thermostat at setting °C				
22.0	WIRING AND TERMINAL BLOCKS				
22.1	Voltage grade				
22.2	Insulation				
22.3	Minimum size of conductor for :				
	i) Power wiring	Sq.mm			
	ii) Control wiring	Sq.mm			
22.4	Type of terminal blocks :				
NOTES TO BIDDER			SIGNATURE OF BIDDER & DATE		
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.			ISSUE R1		

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC			SHEET 9 OF 10
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
	i) For withdrawable Type ii) For Fixed type				
22.5	Minimum current rating of terminal blocks	A			
22.6	Whether terminals for CT's have been provided with short circuiting facilities	YES/NO			
23.0	PUSH BUTTON STATION				
23.1	Metal Enclosure :				
	i) Die-cast aluminium/sheet metal of 2mm thickness				
	ii) Degree of protection				
	iii) Painting, inscription earthing terminals as specified	YES/NO			
23.2	Gland plate and cable glands provided	YES/NO			
22.3	Facility for fixing on wall/structure provided	YES/NO			
23.4	No. of Contacts :				
	i) Normally open				
	ii) Normally closed				
23.5	Contact rating :				
	I) At 415 V AC	A			
	ii) At 110 V AC	A			
	iii) At 220 V DC	A			
23.6	Terminal blocks with identification nos.	YES/NO			
NOTES TO BIDDER			SIGNATURE OF BIDDER & DATE		
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.			ISSUE R1		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 10 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:
provided for external connections.		
NOTES TO BIDDER		SIGNATURE OF BIDDER & DATE
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.		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 1 OF 4

DATA TO BE FURNISHED BY THE CONTRACTOR AFTER AWARD OF CONTRACT

1.0 **OVERLOAD RELEASE**

(a) Characteristics

(b) Settings

2.0 **SINGLE PHASING PREVENTERS**

2.1 Make

2.2 Type designation

2.3 Rated voltage

3.0 **AUXILIARY RELAYS AND TIMERS**

3.1 Time delay range (for timers) Sec.

3.2 Resetting features

3.3 No. of contacts

3.3.1 Normally open/Normally closed

3.3.2 Contact rating A

4.0 **LIST OF DRAWINGS**

The VENDOR shall furnish the following drawings for each panel and switchgear.

4.1 Overall outline dimensions and general arrangement including plan, front elevation, rear & side elevations, clearances required in front and back, details of busduct connections, if any.

4.2 Switchgear layout plan including floor openings, fixing arrangements and loading details.

4.3 Schematic control diagrams to cover controls, protection, interlocks, instruments, space heaters, etc. for each type of module

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 2 OF 4
4.4 (a) Detailed internal wiring diagram of each type of module, including terminal block numbers, ferrule numbers and the PURCHASER's external cable connection designations (b) Itemised bill of material for each module, listing all devices mounted and also otherwise furnished like cable glands, indicating the MANUFACTURER's type, rating, quantity & special notes, if any. 4.5 Interpanel interconnection wiring diagram including terminal numbers and ferrule numbers 4.6 Switch development diagrams 4.7 Block Interlock Diagrams for I/C,B/C & Motor Modules of various types.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 3 OF 4
5.7 Each type of protection relay and circuit breaker release characteristics <u>6 months</u> 5.8 Fuse characteristic curves for each type and rating of fuse <u>6 months</u> 5.9 Space heater ratings and numbers provided per cubicle and the internal distribution scheme for the same, for each switchgear <u>6 months</u> NOTES: (a) The VENDOR shall be entirely responsible for the correctness of the internal wiring diagrams mentioned against Item 5.4. (b) The VENDOR shall ensure that the characteristics of the CTs, fuses, protection relays, VTs and all other devices offered by him are such as to be suitable for the purpose for which they are intended. (c) The VENDOR shall plan his manufacturing schedule so as to allow atleast 4 weeks time for approval of the drawings after their receipt by the PURCHASER. 6.0 <u>TEST CERTIFICATES</u> 6.1 Type test certificates of all standard component parts, e.g. contactors, breakers, switches, fuses, relays, CTs, VTs, and for the standard factory built assembly shall be submitted by the VENDOR within 3 months from receipt of order. 7.0 <u>INSTRUCTION MANUALS</u> The VENDOR shall furnish specified number of copies of the instruction manual which would contain detailed instructions for all operational & maintenance requirement. The manual shall be furnished at the time of despatch of the equipment and shall include the following aspects : a) Outline dimension drawings showing relevant cross-sectional views, earthing details and constructional features. b) Rated voltages, current, duty-cycle and all other technical information which may be necessary for correct operation of the switchgear. c) Catalogue numbers of all components liable to be replaced during the life of the switchgear.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 4 OF 4
d) Storage for prolonged duration. e) Unpacking. f) Handling at site. g) Erection. h) Precommissioning tests. i) Operating procedures. j) Maintenance procedures. k) Precautions to be taken during operation and maintenance work. ISSUE R1		

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
1.0 <u>AC & DC MOTORS</u> 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. 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. 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. 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. 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. 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. 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. These motors shall be designed to withstand at least 5% harmonics in the supply voltage. 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.		
		ISSUE R1

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 2 OF 7
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 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. 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. 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. 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. 1.14. The maximum double amplitude vibrations for motors shall be as per IS 12075. 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). 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. 1.17. The star connection side terminal box should have sufficient capacity to accommodate CT's for differential protection for motor above 1000kW. 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. 1.19. Motor bearing shall be insulated wherever required. 1.20. All HT motors shall be with VPI insulation or better		
		ISSUE R1

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 3 OF 7
1.21. All HT motors / LT motors 15 kW and above shall be provided with external greasing arrangement 1.22. CACW motor shall be provided with water leakage detector with remote alarms and tripping. 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. 1.24. All motors below 15 kW shall be provided with sealed ZZ bearings 1.25. Each motor shall have two earthing terminals. 1.26. All motors for outdoor duty shall have detachable metal canopy. 1.27. HT motors shall be designed for operation as follows: a) Upto 1000kW – Vacuum circuit breakers/SF6. b) Above 1000kW-Vacuum circuit breakers/SF6. c) All motors shall be suitable for DOL starting. 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. 1.29. Provision shall be made at DCS to monitor, integrate running hours, nos. of starts and stop recording for all motors. 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. 2.0 <u>ACTUATOR</u> 2.1. GENERAL TECHNICAL REQUIREMENT 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. 2.1.2. The actuator shall be suitable for installation in any position without lubrication leakage or other operational difficulty. 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. 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		
		ISSUE R1

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 4 OF 7
output drive. The hand wheel shall be clearly marked with an arrow and the word CLOSE. 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. 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. 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). 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. 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. 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. 2.2. LIMIT AND TORQUE SWITCHES 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. 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. 2.2.3. Two additional limit switches with 2NO + 2NC contacts, each adjustable at any intermediate position, shall be provided in the actuator. 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. 2.2.5. Torque and limit switches shall have only stainless steel flaps for better protection against environmental condition. 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.		
		ISSUE R1

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 5 OF 7

2.2.7. To guarantee proper function under high ambient temperatures, torque and limit switch sensing shall be of mechanical type.

2.3. ELECTRIC DRIVE FOR ACTUATOR (MOTOR)

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.

2.3.2. Motor shall be suitable for power supply of 415 V, 3 ph, 50 Hz, AC.

2.3.3. Motor shall be squirrel cage induction type and shall generally conform to IS-325.

2.3.4. Motor shall have minimum class 'F' insulation with temperature rise restricted to class 'B' under the design ambient temperature.

2.3.5. Motor shall be of totally enclosed surface cooled (TESC) type with IP-67 protection class after mounting on actuator.

2.3.6. Motor shall have three thermostats connected in series, one in each phase of stator winding, for protection against overheating.

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.

2.3.8. Motor shall be suitable for direct on-line (DOL) starting and starter shall be non integral to the motor.

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.

2.3.10. Finish shall be provided on the motor body to ensure better heat dissipation.

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.

2.4. CODES & STANDARDS

All the equipment specified herein shall comply with the requirements of the latest issue of the relevant National & International standards.

The design and materials used for the components shall also comply with the relevant National & International standards.

As a minimum requirement, the following standards shall be complied with :

Electric motor operated actuators:IS 9334

ISSUE
R1

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 6 OF 7
Degrees of protection provided by enclosures at low:IS 2147 voltage switch gear and control gear Flame Proof enclosure at electrical apparatus:IS 2148 Specification for three phase induction motors:IS 325 AC contactor for voltages not exceeding 1000 V:IS 2959 Degree of protection provided by enclosures for :IS 4691 Rotating electrical machinery Specification for rotating electrical machines:IS 4722 For other code refer Section D28. 2.5. OTHER REQUIREMENTS OF ACTUATOR. 2.5.1. Common potential free contact shall be available to annunciate the fault condition to the remote control station or DCS. 2.5.2. The following individual relay / potential free contacts shall be provided for the remote indication:- – Actuator OPEN. – Actuator CLOSE – Actuator fault feed-back – Thermal overload relay shall be provided to trip the actuator in case of overload 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. 3.0 TESTS 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.		
		ISSUE R1

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 7 OF 7
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. 3.3. Efficiency and loss measurements shall be done for all LT motors as per relevant standard (Being energy efficient motors.) as routine test. 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). 3.5. Noise level measurement test shall be conducted on one motor of each type. 3.6. Vibration measurement shall be taken for each motor of 45kW & above. 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. 4.0 For technical particulars refer datasheet-A.		
		ISSUE R1

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 1 OF 6

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 ISSUE R1					

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 3 OF 6					
ENQUIRY/SPECIFICATION NO.:			BIDDER:							
16.0	Method of starting a)AC motors b) DC motors									
17.0	Temperature rise above ambient of 50 deg. by Resistance method									
18.0	Type of duty									
19.0	Duty designation									
20.0	Synchronous speed a) Constant speed b) Variable speed (for VFD)									
21.0	Starting time at specified minimum starting voltage	Sec								
22.0	Starting torque (as % of FLT)									
23.0	Pull out torque (as % of FLT)									
24.0	Location considered – Hazardous area division									
25.0	Atmosphere considered- Chemical/Dusty/Salt laden									
26.0	Weather motor is suitable for VFD drive									
27.0	Details of bearing									
28.0	VOID									
<table border="1"> <tr> <td rowspan="2"> 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. </td> <td colspan="2">SIGNATURE OF BIDDER & DATE</td> </tr> <tr> <td colspan="2"> ISSUE R1 </td> </tr> </table>						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		ISSUE R1	
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									
	ISSUE R1									

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 4 OF 6		
ENQUIRY/SPECIFICATION NO.:			BIDDER:				
29.0	Whether CT for differential protection required						
30.0	Whether vibration detectors required						
31.0	Details of winding / space heaters						
32.0	Details of accessories a) Fans b) Temperature gauge c) Bearing d) Cooling motors e) Cooling water parameters f) Heaters g) Lube oil system details						
33.0	Maximum size & number of cables that can be accommodated in motor terminal box.						
34.0	Thermal capability curve to be attached						
35.0	Relay co-ordination guide to be attached						
36.0	Min. voltage required under starting conditions to accelerate driven equipment to rated speed.	Volts					
37.0	Locked rotor current withstand time (safe stall time) at 110 % rated voltage a) At rated temp. (hot) b) When cold	sec sec					
38.0	Stator thermal time constant	Sec					
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	
				ISSUE R1			

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%								
<table border="1"> <tr> <td rowspan="2"> 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. </td> <td colspan="2">SIGNATURE OF BIDDER & DATE</td> </tr> <tr> <td colspan="2"> ISSUE R1 </td> </tr> </table>						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		ISSUE R1	
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									
	ISSUE R1									

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 6 OF 6
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
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 ISSUE R1	

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

ISSUE
R1

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

ISSUE R1

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.

ISSUE R1

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 3 OF 4
4.2. Start/ Forward/ Open PBs shall have green coloured actuator and Stop/Reverse/Close PBs shall have Red coloured actuator. 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. 4.4. All PBs shall be push to actuate type. 4.5. Emergency local stop push button should be lockable in the STOP position. Emergency push buttons shall be stay put type 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. 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. 4.8. All LPBs shall be of Poly Carbonate/ FRP/Di-cast aluminium. 4.9. Name plate with Tag number and description of the service controlled by the LPB shall be provided on the front. 4.10. LPBs shall be suitable for wall/column mounting. Covers shall be provided with captive screws. 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. 5.0 <u>JUNCTION BOXES (JBs)</u> 5.1. Junction boxes as required for the power plant shall be supplied : 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. 5.3. All JBs, shall be of polycarbonate /FRP/ Di-cast aluminium. 5.4. Danger boards shall be provided in line with the statutory requirements. 5.5. Rubber mats shall be provided to meet the safety and other statutory requirements. 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. 5.7. Gland plate to be of removable type and made out of 3 mm thick sheet steel. 6.0 <u>TESTING</u> The following testing shall be conducted on all equipments at works and necessary test certificates shall be furnished. (a) IR (Insulation resistance) test before and after HV test.		
		ISSUE R1

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

(b) HV test at 2.5kV for 1 Minute.

(c) Electrical Functional test.

(d) Mechanical operation of the components.

(e) Visual check for compliance as per approved drawings.

Note: The international standards such as IEC, which are equivalent to IS, may also be applicable for the above mentioned testing.

7.0 DATA TO BE FURNISHED BY THE BIDDER

7.1 Experience list for the Control panels, JB's offered.

7.2 Descriptive literature/pamphlets on the equipment offered.

8.0 For technical particulars refer datasheet-A.

ISSUE

R1

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 ISSUE R1	

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

ISSUE
R1

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
1.0 CABLES 1.1 H T POWER CABLES 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. 1.2 L T POWER CABLES 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. 1.3 CONTROL CABLES 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. 1.4 INSTRUMENTATION CABLES 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. 1.5 TRAILING POWER AND CONTROL CABLES FOR MOBILE EQUIPMENT. 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. 1.6 FIRE SURVIVAL CABLES 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.		
		ISSUE R1

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
(a) DC emergency lube oil pumps (b) DC seal oil pumps (c) DC emergency lighting cables for main building (d) Batteries to chargers and DC distribution boards (e) Turbine lube oil pumps (f) Jacking oil pumps (g) Emergency turbine trip by pushbutton in control room (h) Boiler Turbine: Generator inter trip which includes the interconnecting cables between: – 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 1.6.2 FS cables shall have following properties: (a) Excellent fire resistance characteristics (b) Cables shall have features of nontoxic and low smoke generation (c) Flame non-propagation property (d) Ability to withstand burning & continue to function during and after fire (e) Low smoke emission & low halogen property to maintain circuit integrity to essential services under severe fire condition. 1.6.3 Construction of FS cables (a) Conductor- Copper stranded (b) Fire proof layer- heat barrier based (c) Insulation- elastomer rubber (d) Fire proof layer- same as 2 above but optional – natural or synthetic, fibre or elastomer (e) Filler- suitable filler optional (f) Binder tape – two layers of glass fibre tape (g) Inner sheath- HOFR FRLS elastomer (heat & oil flame retardant) (h) Armouring/screening – suitable wire (i) Over all sheath – HOFR FRLS		
		ISSUE R1

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 3 OF 9
1.7 Cables for the fire detection and alarm system and communication system shall be as described else where. 2.0 <u>CABLE PROPERTIES</u> 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. 2.2 The sheath shall be resistant to water, UV radiation, fungus, termite and rodent attack. 2.3 The outer sheath of FRLS PVC compound shall meet the following performance requirements: (a) The critical oxygen index value shall be minimum 29 when tested at $27 \pm 2^{\circ}\text{C}$ 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. (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%. (c) Flammability (i) Cables shall pass tests under fire condition as per IS-10810-Part-53. (ii) Cables shall also pass tests as per IS-10810 Part-61 & Part-62. Category group shall be considered as Category 'A'. (iii) Fire survival cables in addition to tests (i) and (ii) above shall pass tests as per IEC-331. (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%. (e) The cables shall pass the ultraviolet tests as per DIN 53387. (f) The cables shall pass the tests for Water absorption tests as per IS 10810. 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). 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. 2.6 All LT cable shall have embossing at interval of 1 meter for owner name, size/ core type and length.		
		ISSUE R1

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 4 OF 9
2.7 All cables shall be embossed with the name of RVUNL in addition to what is specified in the standards. 3.0 <u>DESIGN CRITERIA FOR CABLE SIZING</u> 3.1 POWER CABLES Power cable sizes shall be selected on the following basis: 3.1.1 Power cables shall carry the full load current of the circuit continuously under site conditions considering the condition listed below:- (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. 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. 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. 3.1.4 Voltage drop from transformer secondary to motor terminals during starting of motors will be limited to the following values: (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. 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. 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. 3.1.7 Design Calculation for arriving at cable size shall be submitted for purchaser's approval. 3.1.8 DC System Cables:-		
		ISSUE R1

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 5 OF 9
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. 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%. 3.1.8.3 Design Calculation for arriving at cable size shall be submitted for purchaser's approval. 3.2 <u>CONTROL CABLES</u> 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. 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. 3.3 <u>INSTRUMENTATION CABLE</u> 3.3.1 Element identification : As per IEC-60189-2 3.3.2 Core wrapping : By non-hygroscopic material by taping or by extrusion 3.3.3 Element screening : By copper tape of minimum 0.04mm thickness or by copper laminated plastic tape 3.3.4 Rip cord : Non-metallic rip cord under the core wrapping 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. Cabling elements shall be any one of the following: A 'Pair' of two insulated conductors twisted together designated by alphabet 'p' printed on a binding tape at 200 mm intervals. A 'Triple' of three insulated conductors twisted together designated by alphabet 't', printed on a binding tape at 200 mm intervals. Maximum length of lay in the finished cable shall be 120 mm. 3.3.6 <u>Units</u> 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		
		ISSUE R1

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 6 OF 9
units shall be designated by p1, p2, p3,. t1, t2, t3...,q1, q2, q3, .., or Q1, Q2, Q3 ..., etc. depending on the combination. 3.3.7 <u>Overall screening and armouring</u> 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. 3.3.8 <u>Inner and Outer Sheath</u> The inner and outer sheaths shall consist of black PVC compound. 3.3.9 <u>Insulation Resistance</u> Minimum insulation resistance per km shall be 500 mega Ohm. 3.3.10 <u>Mutual Capacitance</u> Mutual capacitance of any pair of conductors shall not exceed 120 nF/km. 3.3.11 <u>Capacitance Unbalance</u> 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 : IEC-60189 - Part-1 : Low frequency cables and wires with PVC insulation and sheath. General test and measuring methods IEC-60189 - Part-2: (-do- Cables in pairs and triples). 4.0 <u>CABLE TERMINATIONS</u> 4.1 Cables shall be laid in trays /trenches/ conduits by the Bidder. Also joint markers shall be provided at each joint. 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. 5.0 <u>CABLE JOINTS</u> 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. 6.0 <u>POWER RECEPTACLES</u>		
		ISSUE R1

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 7 OF 9
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. 7.0 <u>CABLE CARRIER SYSTEM</u> 7.1 The cable carrier system shall be designed considering the following : (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. 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. 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. 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. 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. 8.0 <u>CABLE INSTALLATION AND ACCESSORIES</u> 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. 8.2 Separate trays shall be provided for LV Power (AC&DC)/Control & Instrumentation cables. 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. 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		
		ISSUE R1

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 8 OF 9
suitable insulation material shall be provided between the cable trays and pipes. 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. 8.6 One spare conduit shall be provided for cable of center / outer drive in clarifier. 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 8.8 All cable entries to the buildings to be sealed by fire proof & water proof cement after cable installation. 8.9 One drum (500m) spare LT power/control of each size of cable shall be included. 9.0 <u>CABLE TRAYS AND COVERS</u> 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. 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. 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. 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. 10.0 <u>FIRE-PROOF SEALING OF CABLE PENETRATION</u> 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:		
		ISSUE R1

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 9 OF 9
(a) FPSS shall have a fire rating of two hours. (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'. (c) The FPSS will also conform to the in-combustibility test carried out in accordance with IS: 3144-1992. (d) Under fire condition, the FPSS material shall not emit excessive smoke or any corrosive or toxic fumes. (e) FPSS shall have minimum life of 25 years. 11.0 FIRE BREAK 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. 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. 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. 12.0 TESTS 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. Routine and acceptance test shall be carried out on FPSS. 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. 13.0 For technical particulars refer datasheet-A.		
		ISSUE R1

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 1 OF 2

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. TCE - 5750A	CLIENT : RRVUNL PROJECT : 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan
PPD. BY :	UM	SK		
CKD. BY :	MSVM	MSVM		
DATE	NOV'2009	JUN'2012		

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
	D-2863 b) Total acid gas generation by weight when tested as per IEC – 754-1 in % c) Percentage of light transmission under fire for assessment of smoke generation when tested as per ASTM – D – 2843-77 d) Will the cables offered against this specification pass the flammability tests as per 1) Class – F3 – Swedish standard S5-424- 1475 2) IEC 60332 – 1C 3) IEC 60331 – 1		
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
ENQUIRY/SPECIFICATION NO.:		BIDDER:	
Sl. No.	Description	Unit	Bidder's Offer
1.0	Cables		
1.1	Name of manufacturer		
1.2	Conductor a) No. core x Size b) Form- circular/segmented c) Effective cross sectional area sq. mm		
1.3	Whether cores identification numbers for cables with 5 cores and above to be provided		
1.4	Whether incremental running lengths are marked on cable		
1.5	Finished cable a) Diameter under armour in mm b) Diameter over armour in mm c) Overall diameter in mm		
1.6	Cable drums a) Whether cable drums confirm to		
<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 ISSUE R1	

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 2 OF 6																												
ENQUIRY/SPECIFICATION NO.:		BIDDER:																													
<table border="1"> <tr> <td></td> <td> 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 </td> <td></td> <td></td> </tr> <tr> <td>1.7</td> <td>FRLS cables</td> <td></td> <td></td> </tr> <tr> <td></td> <td>a) Critical oxygen index value at 250 deg C when tested for temperature index test</td> <td></td> <td></td> </tr> <tr> <td></td> <td>b) Total acid gas generation by weight</td> <td></td> <td></td> </tr> <tr> <td></td> <td>c) Percentage of light transmission under fire for assessment of smoke generation</td> <td></td> <td></td> </tr> <tr> <td></td> <td>d) Will the cables offered against this specification pass the flammability tests</td> <td></td> <td></td> </tr> <tr> <td>1.8</td> <td>maximum dielectric loss of cable per KM at normal voltage and frequency</td> <td>Watt/km</td> <td></td> </tr> </table>					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	
	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																													
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 ISSUE R1																													

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 3 OF 6																																																																
ENQUIRY/SPECIFICATION NO.:		BIDDER:																																																																	
<table border="1"> <tr> <td>1.9</td> <td>Short circuit capability for 1 Sec (HT & LT Power Cable)</td> <td>kA rms</td> <td></td> </tr> <tr> <td>1.10</td> <td>Maximum dielectric stress at core screen</td> <td>KV/cm</td> <td></td> </tr> <tr> <td>1.11</td> <td>Max. overall diameter of cables</td> <td>mm</td> <td></td> </tr> <tr> <td>2.0</td> <td>Cable Terminations & Joints</td> <td></td> <td></td> </tr> <tr> <td>2.1</td> <td>Name of manufacture</td> <td></td> <td></td> </tr> <tr> <td>2.2</td> <td>Applicable standards</td> <td></td> <td></td> </tr> <tr> <td>2.3</td> <td>Nominal (Ph -Ph) system voltages</td> <td>kV</td> <td></td> </tr> <tr> <td>2.4</td> <td>AC Withstand voltage (Ph-ground)</td> <td>kV</td> <td></td> </tr> <tr> <td></td> <td>• Time duration</td> <td>Min.</td> <td></td> </tr> <tr> <td>2.5</td> <td>Partial discharge at 2 Uo</td> <td>pC</td> <td></td> </tr> <tr> <td>2.6</td> <td>Impulse withstand, 1.2 / 50 µs</td> <td>kV</td> <td></td> </tr> <tr> <td>2.7</td> <td>Load cycle test</td> <td></td> <td></td> </tr> <tr> <td>a)</td> <td>Each cycle – heating duration</td> <td>Hrs</td> <td></td> </tr> <tr> <td>b)</td> <td>Temperature</td> <td>deg. C</td> <td></td> </tr> <tr> <td>c)</td> <td>Cooling duration</td> <td>Hrs</td> <td></td> </tr> <tr> <td>d)</td> <td>No. of cycles</td> <td></td> <td></td> </tr> </table>				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			• 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		
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																																																																	
	• 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																																																																		
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 ISSUE R1																																																																	

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:																																																													
<table border="1"> <tr> <td>e)</td> <td>Continuous phase to ground voltage withstand</td> <td>kV</td> <td></td> </tr> <tr> <td>2.8</td> <td>Thermal withstand short circuit current 1 sec</td> <td>kA</td> <td></td> </tr> <tr> <td>2.9</td> <td>Dynamic short circuit withstand</td> <td>kAp</td> <td></td> </tr> <tr> <td>2.10</td> <td>Type test report for all the tests enclosed as specified</td> <td>Yes / No</td> <td></td> </tr> <tr> <td>2.11</td> <td>Kit Particulars</td> <td></td> <td></td> </tr> <tr> <td>a)</td> <td>Material of the tubing / moulded party</td> <td></td> <td></td> </tr> <tr> <td>b)</td> <td>Method of stress control</td> <td></td> <td></td> </tr> <tr> <td>c)</td> <td>Method of environmental seal</td> <td></td> <td></td> </tr> <tr> <td>d)</td> <td>List of items included in the kit</td> <td></td> <td></td> </tr> <tr> <td></td> <td>• For terminations</td> <td></td> <td></td> </tr> <tr> <td></td> <td>• For joints</td> <td></td> <td></td> </tr> <tr> <td>e)</td> <td>Whether heating device included</td> <td>Yes/No</td> <td></td> </tr> <tr> <td></td> <td>• How many such device included</td> <td>Qty</td> <td></td> </tr> <tr> <td>f)</td> <td>Allowable kit storage temperature</td> <td>deg. C</td> <td></td> </tr> <tr> <td>g)</td> <td>Kit shelf life</td> <td>Years</td> <td></td> </tr> </table>				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				• For terminations				• For joints			e)	Whether heating device included	Yes/No			• How many such device included	Qty		f)	Allowable kit storage temperature	deg. C		g)	Kit shelf life	Years	
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																																																														
	• For terminations																																																														
	• For joints																																																														
e)	Whether heating device included	Yes/No																																																													
	• How many such device included	Qty																																																													
f)	Allowable kit storage temperature	deg. C																																																													
g)	Kit shelf life	Years																																																													
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 ISSUE R1																																																													

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 5 OF 6																																																				
ENQUIRY/SPECIFICATION NO.:		BIDDER:																																																					
<table border="1"> <tr> <td>2.12</td> <td>Cable terminations/joints instruction manual enclosed</td> <td>Yes/No</td> <td></td> </tr> <tr> <td>3.0</td> <td>Fire Proof Sealing System/Fire stops</td> <td></td> <td></td> </tr> <tr> <td>3.1</td> <td>Manufacturers name</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Type of FPSS provided</td> <td></td> <td></td> </tr> <tr> <td>3.2</td> <td>Duration for which the FPSS will retain its guaranteed properties (Life expectancy)</td> <td>Yrs.</td> <td></td> </tr> <tr> <td>3.3</td> <td>Minimum shelf life of the materials used in the fire stops</td> <td>Months</td> <td></td> </tr> <tr> <td>3.4</td> <td>Applicable standard</td> <td></td> <td></td> </tr> <tr> <td>3.5</td> <td>Performance tests</td> <td></td> <td></td> </tr> <tr> <td>3.5.1</td> <td>Whether type test certificates for the following tests enclosed</td> <td></td> <td></td> </tr> <tr> <td></td> <td>• Fire rating test</td> <td>Yes/No</td> <td></td> </tr> <tr> <td></td> <td>• Hose stream test</td> <td>Yes/No</td> <td></td> </tr> <tr> <td>4.0</td> <td>Fire Breaks</td> <td></td> <td></td> </tr> <tr> <td>4.1</td> <td>Manufacturers name</td> <td></td> <td></td> </tr> </table>				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		
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 ISSUE R1																																																					

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 6 OF 6																												
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	
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																													
<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 ISSUE R1																													

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D 16
PART B	RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan DATASHEET-C CABLES & CABLE CARRIER SYSTEMS	SHEET 1 OF 1

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



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 1 OF 6

**GENERAL TECHNICAL REQUIREMENTS
OF
CONDUITS AND PIPES
SPECIFICATION NO. PES-507-27
REV 0**



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 2 OF 6

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.



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 3 OF 6

- 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.



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 4 OF 6

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



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 5 OF 6

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.



DOCUMENT TITLE

CONDUITS AND PIPES

SPECIFICATION NO. PES-507-27

VOLUME II B

SECTION D

REVISION 0

DATE: 27/10/2010

SHEET 6 OF 6

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**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 1 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES**SINGLE GIRDER EOT CRANE****1.0.0 SCOPE**

This specification covers the design, material, manufacture, assembly, inspection and testing at manufacturer works for single girder EOT crane. The equipment shall include all the accessories required for the trouble free operation.

The crane shall be complete with trolley and truck, wheels and axles, Drive mechanisms, Hoisting Drums, Brakes, Creep Speed Arrangement, Lifting tackles, Buffers, Electric Motors, Controls, Switch Board and cabling, horns, warning lights, Limit switches etc. Any item not mentioned herein but required to make the system complete for the satisfactory performance of the crane shall also be included.

2.0.0 CODES AND STANDARDS

The equipment to be supplied under this specification shall conform to the following codes and standards (latest revisions) unless otherwise specified hereinafter.

- | | | |
|----|-----------------|---|
| a) | IS 807: 1976 | Codes of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of cranes and hoists |
| b) | IS: 3177 (1999) | Code of Practice for Design of Overhead Travelling Cranes and Gantry Cranes other than steel work cranes |
| c) | IS: 2266 | Specification for steel wire ropes for general Engineering purposes. |
| d) | IS: 4029 | Guide for testing induction motor (for temperature rise) |
| e) | IS: 15560 | Steel hooks for standard shank design |
| f) | IS: 1554 Part I | PVC insulated (Heavy-duty) electric cables for working voltages up to and including 1100 volts. |
| g) | IS: 325 | Three phase induction motors. |



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 2 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

- | | | |
|----|------------------|--|
| h) | IS: 900 | Code of practice for installation and maintenance of induction motors |
| i) | IS: 694 (Part-I) | Copper conductors PVC insulated cables for voltage up to 1000 V. |
| k) | IS: 434 (Pt I) | Copper conductors rubber insulated cables for voltage up to 1000V. |
| m) | IS: 691 | Flexible trailing cables rubber insulated. |
| n) | IS 3043 | Code of practice Earthing. |
| o) | IS: 3938 | Electric Wire Rope Hoists. |
| p) | IS: 2147 | Degree of protection provided by enclosures for Low voltage switchgear and control gear. |
| q) | IS: 1544 | Polyethylene insulated PVC sheathed cables. |

Indian electricity rules - 1956.

In the event of any conflict between the specification and standards mentioned above, the specification shall govern.

3.0.0 SINGLE GIRDER EOT CRANE**3.1.0 DESIGN REQUIREMENTS**

3.1.1 The crane shall be designed in accordance with the latest edition of IS-3177/IS-807 & hoist block shall be as per IS-3938 and any other standard as referred there in and subject to any modification and requirement as specified herein after.

Class of crane mechanism shall correspond to that of the crane requirement and as specified elsewhere.

3.1.2 Safety devices should be provided with all equipment/parts covered under this specification.

3.1.3 Parts requiring replacement or lubrication shall easily be accessible without dismantling the other equipment or structures. All electrical cables shall be laid to comply with recognized standards and purchaser's requirements.

3.1.4 For welded construction such as bridge girders, end carriages, rope drum, gearboxes etc; steel shall be conforming to IS-2062 quality.

3.1.5 No cast iron part shall be used on the crane.



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 3 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

3.1.6 Guard shall be provided on crane to prevent the hoist ropes coming in contact with down shop leads.

Guards of an approved design, which will push forward or off the track any object such as a person foot or arm, placed across it. Guards shall be attached to each end of the end carriages.

Suitable guards shall be provided to revolving shafts, coupling etc.

3.1.7 All cables shall be clamped individually. All trailing cables shall be clamped with PVC or non-metallic clamp.

3.1.8 All wheels, couplings, open gear etc. shall be provided with covers.

3.1.9 All bolts except those with locknut shall be provided with grip lock nuts or spring washers.

3.1.10 Fasteners for pedestal blocks, motors, gearboxes etc. shall be easily removable from the top. Studs shall not be used as fasteners for mechanical items except for fixing covers.

3.1.11 Defects in the material like fractures, cracks, blowholes, pitting etc. are not allowed. Rectification of any such flaw is permissible only with the approval of the purchaser.

3.1.12 All parts of the crane shall be thoroughly cleaned of mill scales, rust or foreign matter and then painted as per the specification requirements

3.1.13 The crane shall be manufactured as per the tolerances specified below

- | | | |
|----|---|------------------------------------|
| a) | Span over LT wheels | ± 3mm |
| b) | Diagonal on wheels | ± 3mm |
| c) | Long travel wheel alignment | ± 1mm |
| d) | Tilt of wheels or balancer axle | ±1/1000mm(horizontal and vertical) |
| e) | Permissible variation in Speeds at full notch with rated load, voltage and frequency shall be as follows. | |
| | i) Travelling and traversing | ±10% |
| | ii) Hoisting Lowering | ±10% |

3.1.14 Proper allowance shall be made for impact and wear in the design of the crane and in no case shall the factor of safety in any part be less than six (6), as per IS: 3177 based on the ultimate strength of the materials used at design duty.

3.2.0 STRUCTURAL DETAILS

3.2.1 Crane structure shall be designed in accordance with the latest edition of IS-807 after taking the following additions/deviations as applicable.

3.2.1.1 Black bolts shall not be used in the main structure of the crane. The calculated strength of other bolted joints in structural members shall not be less than net strength of member plus 25%.



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 4 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

- 3.2.1.2 The calculated strength of riveted joint or joints made by friction grip bolts in structure members shall be not less than the calculated net strength of the member.
- 3.2.1.3 Bolts used in shear shall be fitted in to reamed hole.
- 3.2.1.4 Transverse filled welding on load carrying member shall be avoided.
- 3.2.1.5 All butt welds on structural members subjected to tensile stress shall be X - rayed.
- 3.2.1.6 Fillet welding on load carrying members shall be avoided.
- 3.2.1.7 Plates, angles and other rolled section used in the load bearing members of the structure shall not be less than 6mm thick.
- 3.2.1.8 The cranes working out door or in corrosive environment, an allowance of 1.5 mm shall be added to the calculated thickness.
- 3.2.1.9 Minimum thickness of chequered plates for platform shall be over 5mm over plain. Chequered plates shall not be considered for strength calculations of load carrying member.
- 3.1.1.10 The material of construction of the major components shall be as specified in the specification/data sheet. Manufacturer are however free to use alternate material material which are superior for the intended service. But in all the cases, prior concurrence of the purchaser is must.
- 3.2.2 **Girder / Beam**
- 3.2.2.1 The girder / beam shall consist of a box construction with double web plate girders or lattice girders and shall be of adequate strength to withstand the rolling loads and other stresses it is subjected to. The design of the girder shall be in accordance with latest edition of IS- 807 with the following deletion / addition as applicable.
- 3.2.2.2 Minimum deflection of the bridge girder with safe working load shall not exceed 1/800 of span. The girder shall be cambered by an amount equal to the maximum deflection due to dead load plus one half the live load and trolley.
- 3.2.3 **End carriage**
- 3.2.3.1 End carriages shall be fabricated from rolled steel section or plates or as the case may be. End carriage shall be of ample strength to resist all stresses likely to be imposed on them under service conditions including collision with other cranes or stops.
- 3.3.0 **MECHANICAL**
- 3.3.1 **Rope drums**
- Rope drums shall be of mild steel plate fabricated or of cast steel. All fabricated rope drums shall be stress relieved. The drum shall be so designed to take full length of hoisting rope in single layers. The end of the rope shall be anchored to the drum in such a way that the



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 5 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

charger in readily accessible. Each rope shall have not less than two (2). Full turns on the drum when the hook is at lowest position not taking into consideration the turns covered by the rope in charge. There shall be one spare groove for each rope lead when the hook is at the highest position. Each rope end shall be clamped with minimum two clamping wedges with at least two bolts on each clamping arrangement.

The pitch diameter of the drum shall be as per IS -3177 or as specified elsewhere. The depth of the groove shall not be less than 0.35 times the rope diameter. Each rope shall be clamped to drum with two clamp wedges with at least two numbers of bolts on each clamping arrangement.

3.3.2 Hoist ropes

Ropes of steel core as specified in Data Sheet – A/B shall be of right hand lay, of 6x36 construction of best plough steel having minimum tensile strength as 160-175 kg/mm². Left hand lay wire ropes shall not be used (Reverse bend ropes shall be avoided as far as possible).

3.3.3 Rope sheaves

Sheaves shall be of cast steel. All sheaves shall be identical, however, exception may be made for equalizer sheave. Sheave groove shall be ground finished for getting increase rope life. Equalizer sheave shall be arranged to turn and swivel in order to maintain rope alignment under all circumstances.

3.3.4 Wheels

LT wheels shall be double flanged with tread to suit the rail. The wheels shall be capable of taking up misalignment in span as specified. Solid wheel shall either be of forged steel or as specified. The wheel shall be with hardness of BHN 300-350. Contact stresses between wheels and rails should be within permissible limits.

3.3.5 Buffer

Each End carriage shall be provided with buffer as per data sheet 'A'. Buffers should be so located that removal is not required while changing wheels or bogies. Buffers shall have sufficient tension on energy absorption capacity to bring the unloaded crane to rest from the speed of 50% of the rated speed to zero speed.

3.3.6 LT drive



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 6 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

One pair of wheels in each end carriage shall be driven by motor through reduction gear.

3.3.7 CT drive

The CT mechanism of the electric hoist shall consist of 2pairs of wheels which shall be driven by motor through reduction gear.

3.3.8. Gearing

3.3.8.1 Spur and helical gearing shall normally be used for all motions. Worms and bevel gears shall not be used. First high-speed reduction shall be through helical gears. All gears shall be hardened and tempered and of alloy steel with machine cut teeth. Surface hardening of teeth is not acceptable. Gear teeth shall preferably be cut in metric module system. Gears shall be designed to meet requirement of crane duty as per IS: 3177. The ratings of gears shall be established as per IS: 4660.

3.3.9 Gear Box

3.3.9.1 All gears shall be completely covered and enclosed in oil tight casing & sealed with gasket.

3.3.9.2 The gearboxes shall be of mild steel or cast steel. All fabricated gearboxes shall be stress relieved.

3.3.10 Bearing

3.3.10.1 Ball and roller antifriction bearing of FAG, SKF, NBC, NORMA make shall be used throughout, except where specified otherwise. Rated life of ball and roller bearing shall be not less than total working life as per relevant codes. Life of bearing shall be calculated in accordance with manufacturers recommendations.

3.3.10.2 Provision shall be made for service lubrication of all bearings. Bearing enclosures shall be designed as far as possible to exclude dirt and prevent oil leakage.

3.3.11. Couplings

3.3.11.1 Motor shafts shall be connected to gear box input extension shafts through flexible gear coupling. Solid coupling shall be used for connecting intermediate lengths of long travel shafts, if applicable.

3.3.12 Lifting hook

Standard hooks shall be used unless otherwise specified. These hooks shall conform to the latest edition of IS 15560 as specified in the data sheet "A".

3.3.13 Brakes

3.3.13.1 Selection and design of brakes shall be such as to meet the requirement. Electro mechanical brakes shall be provided for each motions. Brakes shall be designed to suit 150% FLT of



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 7 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

motor for the hoist motion and 100% FLT of motor for LT/CT motion. Brakes shall be provided as specified in Data Sheet 'A'

3.4.0 ELECTRICAL

3.4.1 The scope of supply shall cover all electrical equipments comprising from Main isolating switch, down shop leads, trolley conductors, current collectors etc.

3.4.1.1 Main isolating Switch fuse unit shall be provided at 1.5M above the operating floor level at one end of bay length or in the middle as specified in the data sheet A. Supply of cable from switch to down shop leads shall be included in the bidder's scope of work.. The switch shall be provided with Power ON Red indication lamp.

3.4.1.2 Run way conductors (Down shop leads) shrouded conductor as specified in the data sheet A shall have four conductors. One of the conductors shall be connected to earth grid for earthing connections of all electrical equipments on the crane and shall be connected to suitable collecting gear of earth conductor. Voltage drop across the down shop leads shall be less than 2%. Maintenance cradle for DSL shall be provided on crane if asked in Data Sheet 'A'. Sufficient allowance of min. 10% for wear & tear shall be considered while sizing the conductor. The runway conductors shall be supported on brackets and insulators.

3.4.1.3 The current collectors shall be of adequate current carrying capacity and shall maintain adequate contact pressure. Spacing between current collectors shall be such as to provide sufficient quenching area for sparks coming out of collectors surface. The collector system per conductor shall be top-running type having spring loaded CI/carbon metallic shoes to maintain adequate contact pressure.

3.4.1.4 The cable, supplying power to crane trolley / electric hoist shall be flexible trailing cable as per IS-9968 Part I (latest edition) and mounted on retracting supports (festoon type)

3.4.2 DRIVE MOTORS

3.4.2.1 Crane motors shall be totally enclosed, fan cooled and as per data sheet 'A'. The break down torque of the motors shall not be less than 225 percent of the full load torque with rated voltage and frequency applied and pull out torque shall not be less than 250% of the rated full load torque of motor.

3.4.2.2 Ambient correction factors as well as voltage /frequency correction factors depending upon the ambient temperature and voltage /frequency variation shall be applied to derate the motors. The minimum margin of 15% or as specified in the section C of specification shall be considered over the calculated rating of the motor. The protection class of the motors shall be as per data sheet A. Motors shall be tested at manufacturers works in accordance with IS-



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 8 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

325/as per agreed Quality plan & Reports shall be submitted for approval. Motors shall comply with the requirement of IS-325-1978 or as per the motor specification if enclosed here with.

- 3.4.2.3 All the motors shall be provided with lifting lugs Two earth terminals of adequate size to accept the earthing conductors shall be provided at diametrically opposite points unless specifically designed For higher speeds, motors shall be capable of with standing 2.5 times the rated speed.

3.4.3 **Limit Switch**

The hoist mechanism of the crane shall be provided with rotary type limit switch to open the control circuit and in order to prevent the crane hook from over hoisting and over lowering. One gravity type back-up limit switch of hand-reset type shall be provided. This switch shall operate in the event of failure of main limit switch if called for in data sheet "A".

Lever operated limit switches shall be provided at both ends of longitude travel and cross traverse. These limit switches shall be self reset type.

3.4.8 **Protective Panel / Controls**

- 3.4.8.1 The electrical protective panel shall be a cubicle fabricated from 2 mm thick sheet steel with lockable-hinged door. It shall be dust and vermin proof with degree of protection as IP-55 or as specified in data sheet A. All the equipment inside the panel shall have permanent identification. The panels shall be front connected type with front-hinged door for access to wiring and terminals. Engraved nameplate shall be furnished for all panels and also for the equipments and devices mounted there on.

The following minimum equipments shall be provided.

- a) One triple pole air break type main contactor with thermal overload relay.
- b) One triple pole main line connecting/disconnecting switch.
- c) Switch fuse unit with D.O.L. starter for each motion.
- d) Thermal overload relay for each drive. It shall be ambient temperature compensated and adjustable type.
- e) Contactors, timer and auxiliary contactors.
- f) Control transformer with fuses.
- g) Indicating lamps to indicate the live condition of all three phases.
- h) Other equipments as per supplier's standard practice. Air break contactors shall conform to category AC-4 duty. The contactor drop off voltage shall be between 45-50% of rated voltage.



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 9 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

- i) All internal wiring shall be identified with numbering ferrules at both ends as per the relevant wiring diagram.

3.4.9 Pendent Push button station

It shall be suspended by wire rope to prevent pull on the cables. The following minimum push buttons key operated type.

- a) Main" ON", "OFF" push button key operated and lockable in "OFF" position.
This push button will operate the main contactor.
- b) Hoist and lower directions. (2Nos.)
- c) Trolley travels both directions. (2 Nos.)
- d) Bridge travels both directions. (2 Nos.)
- e) Inching speed for hoisting & lowering
- f) Inching speed for bridge motion.
- g) Inching speed for trolley motion.
- h) Creep speeds
- i) Emergency stop push button (mushroom type).
- j) Alarm bell push button.

3.4.10 Grounding

3.4.10.1 The crane structure, motor frame and all other electrical equipments shall be grounded in accordance with the Indian Electricity Rules. The connections from Crane Bridge to 4th conductor of down shop leads shall be by means of current collector.

3.4.10.2 The equipment fed by flexible cables shall be grounded by means of fourth core provided in the flexible trailing cable. Pendent push button station shall be earthed separately.

3.4.10.3 Red warning light 3 Nos. shall be provided at both ends of the gantry girder to indicate the aliveness of DSL.

3.4.15 WIRING SYSTEM

- a) The supplier shall furnish all power, control and auxiliary circuit wiring of the equipment and the panel located on the trolley or bridge.
- b) The wiring shall be complete in all respect to ensure the proper functioning of the equipment.
- c) Power wiring to any motor shall be done with 1100V grade Cu conductor, PVC insulated / armoured /FRLS cable of suitable sizes as specified in Data Sheet A.
- d) For selecting the cable rating, cable for power wiring, consideration shall be given to the motor duty, ambient temperature grouping and disposition of the cables voltage drop etc.



TITLE

TECHNICAL SPECIFICATION**SINGLE GIRDER CRANES**

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

SPECIFICATION NO. PE-TS- 392-524-A001

VOLUME II - B

SECTION -D

REV. 00

DATE:

Page 10 of 10

STANDARD TECHNICAL REQUIREMENTS FOR SINGLE GIRDER CRANES

- e) All control and auxiliary external circuit wiring shall be done with PVC insulated FRLS type 2.5mm stranded copper conductor.
- f) Armoured cables or un-armoured running through the flexible conduits may be used for power wiring / control and auxiliary circuit wiring shall run through flexible conduits.
- g) Each motor shall be wired independently. Power and control wiring shall be effectively separated.
- h) Each wire shall be identified at both ends with wire designation in accordance with circuit wiring diagram.
- i) All wire termination to the panels shall be provided with clamp type connections screw. Type terminals with screw directly impinging on conductors are not acceptable.
- j) Multi-way terminal blocks complete with screw nut, washer and marking strips shall be furnished for terminating the panel wiring and outgoing.
- k) Not more than two wires shall be connected to any terminal on either side of terminal block. If necessary number of terminals shall be jumped together to provide the wiring points
- l) Each terminal block shall be marked with designation in accordance with conductors wiring diagram.

4.0.0 LOAD INDICATION:

The crane shall have a permanent inscription of English on each side, readily visible from the ground level, stating the safe working loads in tonnes, year of manufacture, crane serial number and manufacturer's name.



TITLE

TECHNICAL SPECIFICATION
FOR VVVF CONTROL DRIVES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION-D

Rev 00

DATE

Page 1 of 5

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



TITLE

TECHNICAL SPECIFICATION
FOR VVVF CONTROL DRIVES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION-D

Rev 00

DATE

Page 2 of 5

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION-D

Rev 00

DATE

Page 3 of 5

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.

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.



TITLE

TECHNICAL SPECIFICATION
FOR VVVF CONTROL DRIVES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION-D

Rev 00

DATE

Page 4 of 5

- 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



TITLE

TECHNICAL SPECIFICATION
FOR VVVF CONTROL DRIVES

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

SPECIFICATION NO. PE-TS-392-524-A001

VOLUME II - B

SECTION-D

Rev 00

DATE

Page 5 of 5

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)

VOLUME III
DEVIATION SHEET (COST OF WITHDRAWAL)



PROJECT:- 2x660MW Suratgarh STPS

PACKAGE:- Single Girder Cranes, SPECIFICATION NO.: PE-TS-392-524-A001

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
-------	-----------------	----------	------------	--	-----------------------------------	--------------------------------	---	---	------------------------------

TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

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 SINGLE GIRDER EOT CRANE 2X660 MW SURATGARH, STAGE - V UNIT 7&8	SPECIFICATION NO. PE-TS- 393-524-A001 VOLUME III REV 00 DATE Page 1 of 1
--	--	--

ANNEXURE VI

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) Signed and stamped copy of :
 - a) “Electrical Equipment Specification for Electrical Hoists’ sheet
 - b) “Electrical Scope between BHEL and Vendor” sheet
 - c) “Electrical Load Data” sheet

Note1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / 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. 1.0 to 5.0 along with their offer then their offer is liable to be rejected.



TITLE:
TECHNICAL SPECIFICATION
COMPLIANCE CUM CONFIRMATION
CERTIFICATE

SPEC. NO.: PE-TS-392-524-A001
VOLUME: III
SECTION:
REV. NO. 0 DATE 07.05.14

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.



TITLE:

TECHNICAL SPECIFICATION

**COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-392-524-A001

VOLUME: III

SECTION:

REV. NO. 0 DATE 07.05.14

- 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.