



RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.

**2 x 660 MW, SUPER-CRITICAL THERMAL POWER STATION
STAGE –V, UNIT 7 # 8 AT SURATGARH, RAJASTHAN**

**SPECIFIC TECHNICAL REQUIREMENTS – MECHANICAL
WORKS**

SPECIFICATION NO. TCE.5750A-H-500-01

**VOLUME – III
PART B**



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

	Volume I	GENERAL CONDITIONS OF CONTRACT AND SPECIAL CONDITIONS OF CONTRACT
	Volume II	GENERAL TECHNICAL REQUIREMENTS & SCHEDULES
	Volume III	SPECIFIC TECHNICAL REQUIREMENTS – MECHANICAL WORKS
	Volume IV	SPECIFIC TECHNICAL REQUIREMENTS – ELECTRICAL WORKS
	Volume V	SPECIFIC TECHNICAL REQUIREMENTS – INSTRUMENTATION & CONTROL WORKS
	Volume VI	SPECIFIC TECHNICAL REQUIREMENTS – CIVIL WORKS
	Volume VII	DRAWINGS AND SKETCHES

ISSUE R1

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

SECTION	TITLE	NO. OF PAGES
D1	VOID	-
D2	VOID	-
D3	VOID	-
D4	WATER SYSTEMS	74
D5	EFFLUENT RECYCLE AND REUSE SYSTEM	6
D6	FIRE PROTECTION SYSTEM	16
D7	POWER PLANT PIPING AND VALVES	22
D8	COAL HANDLING SYSTEM	73
D9	ASH HANDLING SYSTEM	111
D10	CRANES & HOISTS	41
D11	COMPRESSED AIR SYSTEM	27
D12	AIR CONDITIONING & VENTILATION SYSTEM	28
D13	EMERGENCY DIESEL GENERATOR SETS	13
D14	FUEL OIL SYSTEM	11
D15	NATURAL DRAFT COOLING TOWERS	13
D16	MILL REJECT HANDLING SYSTEM	20
D17	VOID	-
D18	HYDROGEN GENERATION PLANT	7
D19	MISCELLANEOUS EQUIPMENT	46
D20	RIVER WATER SYSTEM	8

ISSUE
R1

D4

WATER SYSTEM

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 1 OF 23
1.0 Water system facilities required for the complete power plant are covered under the following categories. (i) River/Canal water supply system (ii) Raw water storage pond and pump house (ii) Raw water pre-treatment system (Clarification & Filtration plant) (iii) Water treatment system (DM plant) (iv) Condenser cooling water (CCW) system (v) Auxiliary cooling water (ACW) system (vi) Plant Service & Potable water system (vii) Fire protection system (viii) Effluent Collection and Disposal System. (ix) Bulk ammonia, hydrazine and phosphate storage and transfer system (x) DM make up system 1.1 The overall scheme for the power plant water systems shall be as per the enclosed drawing 'Water system - Scheme'. CONTRACTOR shall establish hourly rates and daily consumption for various services depending on system design. Contractor shall furnish material balance diagram duly considering specification aspects and shall note that raw water requirement for 2 x 660 MW capacity units is envisaged to be limited to 1440 mcft/year. Contractor shall highlight in the offer, the raw water requirement and various water conservation methods proposed to minimise the raw water consumption. The raw water analysis is indicated in Annexure-1. 1.2 The system and equipment design requirements, codes and standards applicable, materials for the various systems and sub-systems are specified in the enclosed data sheets for individual equipments / systems. 1.3 CONTRACTOR is allowed to use codes equivalent to that specified in the data sheets, but categorically indicate the design and material code wherever called for. 1.4 All codes and standards referred to in the specification shall be understood to be the latest versions on the date of offer made by the CONTRACTOR unless otherwise indicated. 2.0 RIVER WATER SUPPLY SYSTEM 2.1 The source of raw water for the proposed station would be from Indira Gandhi Nahar Prayojana (IGNP) canal which is situated 6 km away from the site.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 2 OF 23

2.2

RAW WATER STORAGE POND & PUMP HOUSE

2.2.1

Raw water shall be stored in a raw water reservoir within the plant boundary which shall be sized for a useful storage 30 days of raw water requirement of 2x660 MW units. The actual storage shall be such as to account for evaporation & seepage losses. Contractor shall construct the raw water pond in earthen material with LDPE lining. The net storage capacity shall not be less than that 35 lakh m3. The raw water reservoir shall be partitioned into two equally sized compartments. Two motor boat (one per each compartment) shall be provided for raw water reservoir algae/weed control.

2.2.2

Raw water pump house shall be provided at the periphery of the raw water pond. The pump house shall be of RCC construction. The pump house shall be sized to accommodate 3x50% Raw water pumps and 3x50% Ash water makeup pumps. Separate bays within the pump house shall be provided for equipment unloading, pump/motor maintenance, chlorination equipment, MCC and Control room. Stop logs & coarse screens shall be provided at the inlet of each pumping chamber.

2.2.3

CONTRACTOR shall provide an effective, proven system for algae/weed control in the reservoir.

3.0

RAW WATER PRE-TREATMENT SYSTEM:

3.1

A complete pre-treatment plant to treat the raw water received to produce clarified & filtered water to meet various services of the plant shall be provided.

The pre-treatment plant shall consist of the following systems:

3.2

Raw water pumping system

3.2.1

3 x 50% (2w+1s) capacity raw water pumps shall be provided to pump raw water from the storage reservoir to the pre treatment plant.

3.2.2

The raw water pump discharge piping shall be buried with suitable underground protection. Each pump discharge shall consist of expansion joints, check valves ,motorised butterfly valves, pressure gauges, vent valves, manholes and other accessories.

3.2.3

Minimum recirculation for raw water pumps shall be provided complete with restriction orifices, motor operated valves, pressure switches, etc.,.

3.2.4

The raw water piping shall branch into two streams after undergoing complete aeration in a cascading aerator (at the pre-treatment plant area). One branch is for Main clarifier system and the other for DM clarifier system.

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 3 OF 23
3.2.5 The raw water system shall be complete with piping, fittings, underground protection, motor operated valves, vent valves, thrust blocks, expansion joints and necessary instrumentation. 3.3 <u>Electro chlorination</u> 3.3.1 The Electro chlorination is common for raw water and circulating water system. The disinfection system shall consist of an on-site sodium hypochlorite generating system, dosing equipment to deliver sodium hypochlorite to the point of application, and a chlorine residual analysis and control system to maintain the desired disinfection level. 3.3.2 Production of the sodium hypochlorite solution shall be automatic and on-demand, utilizing common grade salt, water, and electrical power to produce a 0.7 to 0.9% hypochlorite solution. 3.4 <u>Aeration Plant</u> 3.4.1 A cascading aerator fountain of RCC construction is proposed for effective reduction of carbon di oxide, ammonia & other gases and oxidation of iron and manganese content in raw water, succeeded by a stilling chamber to reduce turbulence and provide a laminar flow at the outlet. 3.4.2 Inlet to cascade aerator will have a motorized valve. 3.4.3 Minimum 6 stages of aeration shall be provided 3.5 <u>Main clarification plant</u> 3.5.1 2x60% capacity main clarifiers shall be provided to meet the requirements of plant .The services utilising clarified water from the Main Clarification plant are :- a) Filtration plant for CW make up b) HVAC Make up c) Potable water for plant d) Potable water for colony e) Misc. Services (plant washing) 3.5.2 The main clarification plant shall consist of the following systems a) Parshall flume with ultrasonic flow measurement b) Flash mixer with motor driven agitator		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 4 OF 23
c) Clariflocculator d) Alum and PolyElectrolyte (PE) dosing systems e) Sludge collection, handling and disposal system consisting of thickeners, centrifuges OR belt filter press for a complete “Solid Waste Management”. f) Telescopic sludge bleed arrangement. g) Post chlorination using sodium hypochlorite solution h) Online Residual chlorine analysers at inlet and outlet of Main Clarifier i) Inlet, outlet, bypass, drains and clear water piping complete with motorised butterfly valves and instruments. 3.5.3 <u>Rapid Gravity Filters</u> Clarified water from the Main Clarifier shall be led to Rapid Gravity Filters (RGF) by gravity. Filtered water from the gravity filters shall be stored in a Filter Water Sump. The hydraulic circuit of the pre treatment plant shall be designed accordingly. 3.5.4 <u>Filter Water Sump</u> The Filter Water Sump shall be of RCC construction with top RCC cover. The sump shall have an associated pump house which shall include the following pumps (inclusive of all piping, fittings, valves, specialities & instrumentation) :- a) 3x50% CW make up pumps (with flow nozzle and transmitter on make up line) b) 2x100% each for Filter water and service water pumps to plant c) 3x60% Potable Water pumps for colony d) 3x50% Filter backwash pumps 3.5.5 The sump shall have a net capacity of minimum 4 hours of consumptive water requirement. 3.5.6 The tank shall have 2 compartments with inlet isolation gates. 3.5.7 Acid – Alkali resistant tiles OR equivalent proven materials shall be provided for all equipments coming under contact with coagulants / chemicals.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 5 OF 23
3.5.8 A PLC based control system shall be provided for Main clarification plant. 3.6 <u>DM clarification plant</u> 3.6.1 1x100% capacity DM clarification plant is envisaged to meet the requirements of plant DM water. 3.6.2 The DM clarification plant shall consist of the following :- a) Feed water for DM clarifier from aerator outlet, by gravity b) Solids contact type clarifier c) PE dosing system d) Sludge handling and disposal system e) Post chlorination using sodium hypochlorite solution f) Online Residual chlorine analysers at inlet and outlet of clarifier h) Inlet , outlet, drains and clear water piping complete with motorised butterfly valves and instruments. 3.6.3 The hydraulic circuit shall be designed so as to ensure gravity flow from the DM clarifier to the DM clarified water storage tank. 3.6.4 A PLC based control system shall be provided for DM clarification plant. 3.7 <u>Chemical House</u> 3.7.1 Chemicals that need to be dosed at the pre treatment plant (for main clarifiers and DM clarifier) will be stored in a chemical house for a storage period of 15 days. The chemical house will be located in the pre treatment plant and shall be designed with proper ventilation, lighting and corrosion protection. The house will have sufficient unloading space, wide corridors, office space, laboratory, toilets, etc. The house will be of two (2) floors. All Chemical preparation tanks will be located in the first floor. Dosing pumps will be located in the first floor. Control panels shall be housed in the ground floor of the chemical house with suitable glass wall partitioning. Suitable walkways, handrails, platforms will be provided to have clear access from chemical house to the different units like, aerator, Parshall flume, stilling chamber, flash mixer, sludge pits and all clarifiers.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 6 OF 23

3.7.2 Handling of chemicals

The chemical house shall have suitable handling arrangement for the housed equipments. Electrically operated hoist with trolley is envisaged for the same. The coagulant stocking area (floor and wall upto the height of stocking) will be lined with acid resistant tiles.

For coagulant solution preparation, a Two (2) cu.m, potable water overhead tank of RCC construction is envisaged.

After preparing the solution the floor area shall be thoroughly flushed with water from the service water header located at the roof of the chemical house.

The list of chemicals and associated systems to be stored in the chemical house are as follows:

(i)	Alum Dosing Tanks	2 nos
(ii)	Alum metering pumps	2 x 100 %
(iii)	Alum Lump	15 days storage
(iv)	Polyelectrolyte Dosing Tanks	2 nos each
(v)	Polyelectrolyte Metering pumps	2 x 100 % each
(vi)	Polyelectrolyte	15 days storage
(vii)	Potable Water Over Head Tank	2 cu.m capacity
(viii)	Eye Wash Fountain/ Safety Shower	1 no.
(ix)	Safety goggles, rubber hand gloves, coveralls/boots:	2 sets
(x)	Bulk storage tanks and dosing pumps	
(xi)	Any other chemicals / coagulants as required for the process.	

3.8 Coagulant dosing system

3.8.1 Dosing pumps shall be provided for alum and Polyelectrolyte. The pumps shall be complete with suction strainers, stroke adjustment, discharge pressure gauges, interconnecting, piping, fittings, valves, etc.

3.9 DM clarified water storage tank

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 7 OF 23

3.9.1 DM clarified water tank shall be above ground of RCC construction.

3.9.2 The tank shall have a net capacity of minimum **5 hours** of consumptive water requirements. Isolation gates shall be provided at tank inlet.

3.9.3 The DM clarified water pump house adjoining the tank shall house the DM plant supply pumps.

3.10 Sludge handling and disposal system

3.10.1 Sludge from main clarifier, DM clarifier, ETP clarifier if any, and all filter backwash wastes shall be collected in a common sludge pit, suitably sized for all influents.

3.10.2 Sludge and drains from main clarifier and DM clarifier shall flow by gravity to this common sludge pit. It is preferred to provide GRP / FRP pipes for filter backwash wastes leading to this sludge pit by gravity.

3.10.3 The sludge pit shall have 2x100% air blowers (with air filters, pressure gauges, distribution headers, nozzles, etc) for effective agitation of the sludge pit.

3.10.4 CONTRACTOR shall adopt a complete “solid waste management” concept to ensure maximum recovery of water from the sludge. Thickener, Centrifuges / Belt Filter press shall be provided for maximum water recovery.

3.11 **Specific requirements**

3.11.1 Turbidity and suspended solids at the outlet of both clarifiers shall be less than 15 units with a residual chlorine of 0.5 mg/l .

4.2.0 **WATER TREATMENT PLANT**

4.1 The water treatment (WT) plant shall provide make up water of the specified quality and quantity to meet the feed cycle make up of the unit and auxiliary cooling water system make up.

4.2 The water treatment plant shall consist of a Filtration plant followed by DM plant (by resin based ion exchange technology).
Refer **Annexure 1** for the raw water analysis.

4.2.1 Filtration plant

4.2.2 3x70% capacity pumps shall pump clarified water to the filtration plant. These pumps shall take suction from the DM Clarified Water Tank.

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 8 OF 23
4.2.3 3x70% capacity Dual media filters (DMF) shall be provided to reduce suspended solids from the feed water. 4.2.4 3x70% capacity Activated carbon filters (ACF) shall be provided downstream of DMF to remove organics, colour and residual chlorine. 4.2.5 A filtered water overhead tank (suitably sized for daily backwash water requirements) shall be provided for backwashing of DMF by gravity. Online backwash for ACF shall be provided. 4.3 <u>De-Mineralising (DM) Plant.</u> The DM plant shall essentially include but not be limited to the following:- 4.3.1 3x70% capacity Strongly Acidic Cation (SAC) Exchanger units 4.3.2 3x70% capacity Degasser towers 4.3.3 2x100% air blowers for each degasser 4.3.4 1x100% degassed water sump 4.3.5 3x70% degassed water pumps. 4.3.6 3x70% capacity WBA units 4.3.7 3x70% capacity SBA units 4.3.8 3x70% capacity MB units 4.3.9 2x100% capacity MB air blowers 4.3.10 3x60% Ultra Filtration Units, complete with all accessories for chemical treatment (inclusive of 3x60% UF feed pumps, 2x100% backwash pumps, 2x100% fast flush pumps). 4.3.11 Acid regeneration system (common for DM plant & CPU regeneration) consisting of the following : (a) Two (2) bulk acid tanks , each tank sized for one tanker capacity of 50 T. The tank shall be fitted with vent, drain, fume absorber, overflow seal pots etc. (b) Two (2) No. Acid measuring cum dilution tank, each for Cation units and MB units.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 9 OF 23
(c) 2x100% Metering pumps OR Ejectors with associated accessories (d) Two (2) Nos. (2 x 100% capacity) acid unloading pumps with 80 mm dia Heliflex hoses of 10m length. 4.3.12 Alkali regeneration system consisting of the following : (a) Two (2) bulk alkali tanks, each tank sized for one tanker capacity of 25 T. The tank shall be fitted with vent, drain, CO₂ absorber, overflow seal pots etc. (b) Two (2) No. alkali measuring cum dilution tank with a motorised agitator, each for each Anion units and MB units. (c) One(1) No. alkali preparation and dilution tanks (from alkali flakes), with dissolving baskets & motorised agitators. (d) 2x100% Metering pumps OR Ejectors with associated accessories (e) Two (2) Nos,. (2 X 100 % capacity) alkali unloading pumps with 50 mm dia Heliflex hoses of 10 m length. 4.3.13 One(1) No. Chemical preparation tank for neutralising pit, complete with dissolving basket and motorised agitators. 4.3.14 2 x 100 % capacity DM regeneration pumps 4.3.15 Three (3) Nos DM storage tank each of effective capacity 1000 m³ with vent, drain, CO₂ absorber, PVC balls, overflow and seal pots. 4.3.16 One (1) No, Neutralising pit in two compartments, each compartment of effective capacity based on 120% of maximum daily regeneration wastes. The neutralising pit shall be common for DM plant & CPU regeneration. 4.3.17 2 x 100% neutralising horizontal centrifugal pumps shall be provided in each compartment of neutralisation pit and total of 4x100% for neutralising pit to pump the effluents to CMB. <i>(CONTRACTOR to decide on an optimum scheme for effective recovery and reuse of neutralised effluent).</i> 4.3.18 Two(2) Nos. Safety /eye wash shower (One at DM-CPU area and one at PT plant area). 4.4 Control and Instrumentation for the Water Treatment Plant (Pre-Treatment and DM plant)		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 10 OF 23
a) Type of plant control Semi-Automatic, micro processor based PLC system: operation will be carried out from the control panel; Taking the equipment into service and initiation of backwash of filters and regeneration of ion-exchange units shall be initiated manually from the control panel and balance operation shall be carried out sequentially by the PLC. Manual override facility for all operations shall also be available. Local Push button station for emergency operation located near the equipment. This shall include the monitoring, operation and control of DM water storage tank and DM water transfer pumps. b) Plant Instrumentation i) Inlet and outlet pressure indicators for vessels and discharge pressure indicators for various pumps. ii) Inlet (rate of) flow indicators and outlet flow totalizers. iii) Conductivity transmitter at outlet of each ion exchange unit. Conductivity comparators & online sodium analysers shall be provided for SAC units. iV) Flow transmitters at outlet of each ion exchange unit V) Differential pressure switches Vi) Residual chlorine analysers (Online) at outlet of ACFs Vii) pH recorders and transmitters Viii) Pressure switches iX) Flow switches at filter outlet. Xi) Outlet silica analyser cum recorder at outlet of Anion & MB units with multipoint recorder. Xii) Density indicators for regenerant chemical solutions.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 11 OF 23

Xiii) Tanks including clarified water tanks, filter water storage sumps and tanks, degassed water storage tanks and DM regeneration tank - level indicators and level switches with protection interlocks for associated pumps.

Xiv) Instrumentation & control cables and erection hardware.

c) **Annunciations**

Annunciations for abnormal conditions like conductivity, pH and silica levels, high flow through filters and ion exchange units, levels (high & low) in chemical tanks/clarified water tank/raw water tank, filtered water tank, degassed water tanks and neutralisation pit shall be annunciated in the control panel.

4.5 The water treatment plant building shall house all equipment of DM plant and CPU regeneration. Chemical lab shall be located in the 1st floor of this building. Chemical dyke area shall consist of Acid tanks, alkali tanks, ammonia storage tanks (for feed water conditioning). All necessary facilities, including furniture, air-conditioning, wash rooms / toilets, etc shall be provided in the building

4.6 The guaranteed effluent quality shall be as follows:

4.6.1 Activated Carbon Filter (ACF)

The quality of treated water from each ACF at design flow rate shall be guaranteed under correction as below:

Residual Chlorine, colour and Organics : Nil.

4.6.2 DUAL MEDIA FILTER

The quality of treated water from each DMF at design flow rate shall be guaranteed under correction as below:

Suspended solids and turbidity : 2ppm (Max) on silica Scale

4.6.3 DM PLANT

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 12 OF 23

The contractor shall guarantee the following parameters :

Outlet of SAC units : 1 ppm Na as CaCO₃

Outlet of degasser units : 5 ppm CO₂

Outlet of SBA units : 0.1 ppm Silica as SiO₂

and Conductivity < 6 micromho/cm

The quality of DM water at the outlet of mixed bed units at design flow rate shall be guaranteed under correction as follows:

- a) Conductivity at the outlet : Not greater than 0.1 µmho/cm @ 25°
- b) pH : 6.8 – 7.2
- c) Total Silica (Reactive + Colloidal) : Not to exceed 0.02 ppm as SiO₂

5.0 COOLING WATER SYSTEM

- 5.1 A cooling water system shall be provided to meet the cooling duty necessary to cater to rated plant performance requirements. The system should be capable of ensuring supply of cooling water to the condenser at all conditions of operation.

5.2 Circulating Water Pumps

- 5.2.1 3x33.33%capacity main circulating pumps for each unit and 1 no. common standby shall be provided to cater to the condenser cooling water requirements of the power plant. Separate header shall be provided for each unit. The technical requirements shall be as per the relevant data sheets enclosed.
- 5.2.2 The circulating water pump discharge piping shall be complete with expansion joints, motorised & manually operated butterfly valves and other fittings. In view of provision of expansion joint on pump discharge line, the pump discharge elbow is likely to experience a back thrust particularly under shut off condition; the pump support and foundation bolts shall be designed to take care of this thrust. Suitable thrust rod arrangement shall be provided at the back of discharge elbow. The pump shall be of self lubricating type. The pump and motor shall be capable of reverse rotation due to back flow of water during pump tripping for a short time. Simple RTD's for measurement of motor winding temperature. Duplex-1C type thermocouple for thrust bearings, pressure gauge on pump discharge, vibration

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 13 OF 23
sensing and measuring instruments to make the system complete shall be provided. 5.2.3 Provision shall be made for isolation of individual pumps for maintenance. The pump forebay design shall allow operation of any permitted pump combination while ensuring reasonably uniform flow conditions to each pump outlet. 5.2.4 Validation of the design of sump shall be substantiated during post award of Contract by physical modelling scale of 1:10. 5.2.5 Each pump chamber shall be provided with a stop log (2 stop logs for CW and 1 no. for ACW) and screens along with necessary handling facilities. Availability of service water for screen washing shall be provided. 5.2.6 Circulating water pumps shall be located in an RCC building which shall also accommodate ACW pumps, CW chemical dosing & chlorination systems. 5.2.7 Provision for handling stop logs, screen etc. shall be made available. EOT crane shall be made available for handling of main circulating water pumps as well as ACW pumps. 6.0 CHEMICAL DOSING SYSTEMS 6.1 CONTRACTOR shall design the cooling water circuit to operate at optimum cycles of concentration (COC 5) in order to limit fresh water consumption and minimise blowdown- which should be utilised for other plant fresh water requirement such as coal & ash handling system, fire protection system, ESP/APH washing and gardening (as per TAC requirements) with a view to achieve zero plant effluent discharge concept. CONTRACTOR shall select an optimum concentration ratio based on the raw water analysis and with a necessary chemical dosing systems with anti scalant / dispersant / corrosion inhibitor chemicals to prevent scale formation / fouling/ corrosion shall be incorporated. All required chemical dosing equipment shall be included. Further CONTRACTOR to substantiate the value of concentration ratio selected with calculations and past experience. 6.2 CW make up shall be provided by 3x50% pumps taking suction from filtered water tank. The quality of circulating water shall be determined by laboratory analysis of grab samples and by conductivity measurements. Conductivity, pH and temperature measurement, shall be provided at cooling tower side as well as the condenser side. Accordingly the chemical dosing system shall be operated. Make up to CW system shall be automatically controlled through control valves and level controller in CW forebay. 6.3 The CONTRACTOR shall provide the required chemicals & systems for 6 months after handing over of the plant to the OWNER. The requirement of bulk		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 14 OF 23
chemicals, other chemicals reagents, glass & polythene ware should be approved from the owner. 6.4 2x100% chemical dosing pumps and 2x100% chemical preparation cum dilution tanks along with all necessary piping, valves and instruments shall be provided for each type of chemical. 6.5 Acid dosing system consisting of 2x100% chemical dosing pumps, 2x100% day tanks, 2 nos bulk acid storage tank each of 15T capacity, safety shower, 2 x100% acid unloading pumps along with necessary piping, valves and instruments shall be provided. Stroke adjustment of dosing pumps shall be automatic from pH controller located on CW pump discharge header. 7.0 COOLING TOWERS (Refer Section D15 for more details) 7.1 Two(2) nos., Natural draft cooling towers (one for each unit), shall be provided, to cool the hot water from the condensers and other auxiliaries . The cooling towers shall be complete with basin, associated supporting structures, fills, drift eliminators, hot water conduits, drain sumps, drain pumps, wind walls, pressure & temperature gauges, etc. Each cooling tower basin shall have a hold up volume equivalent to 6 hours of makeup water flow. The basin shall be partitioned into two compartments complete with drain sumps and pumps. Cold water outlet channel with screen and stop logs shall be provided. 7.2 The Natural Draft Cooling Towers shall be as per Data sheet elsewhere in the Specification. 7.3 Suitable handling facilities to handle stop logs and screens shall be provided. 7.4 The wet bulb temperature and cooling range (for design) shall be as specified in the data sheets. Suitable recirculation allowance shall be added to the ambient wet bulb temperature for arriving at the design inlet wet bulb temperature (Applicable for IDCT only if specified). 8.0 AUXILIARY COOLING WATER SYSTEM 8.1 The principal criteria for the design of the system shall be to ensure a continuous and reliable supply of auxiliary cooling water to the plant in all conditions and at all times. 8.2 Passivated DM water (primary side) shall be used to cool all the SG and TG auxiliaries, by means of the following :- a) 2x100% SG DM cooling water pumps (for each unit)		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 15 OF 23
b) 2x100% capacity Plate Heat Exchangers for SG Auxiliaries (for each unit) c) 2x100% TG DM cooling water pumps (for each unit) d) 3x50% capacity Plate Heat Exchangers for TG Auxiliaries (for each unit) e) 2x100% Plant compressors DM cooling water pumps f) 2x100% Plate heat exchangers for plant compressor. 8.3 A common overhead tank (for each unit) of 10 m³ capacity, consisting of passivated DM water shall be provided on the suction side of the SG & TG DM cooling water pumps. 8.4 Secondary cooling water shall be supplied by auxiliary cooling water pumps(2x50% pumps for each unit with 1x50% common standby) located in the CW pump house, to cool the passivated DM water through plate type heat exchangers . ACW pumps shall be of vertical turbine type. Separate pipeline header shall be provided for each unit. 8.5 Auxiliary Cooling water shall be provided for the following : (i) Vacuum pump coolers (ii) Turbine Oil Coolers 8.6 DM Cooling Water shall be provided on the primary side of Plate Heat Exchangers for the following : i SG auxiliaries consisting of, (i) ID Fan coolers (ii) PA Fan coolers (iii) FD Fan coolers (iv) Mill coolers (v) Air Pre-heater coolers (vi) Boiler access doors (vii) Sample coolers ii TG auxiliaries consisting of, (i) SWAS coolers (ii) BFP coolers (iii) CEP coolers (iv) Hydrogen coolers (v) Exciter air coolers (vi) Seal oil coolers iii Air compressor for plant 8.7 Bidder to note that all coolers shall be designed to guarantee best performance, without any external spray water or additional retrofits during plant operation (even in peak summer seasons).		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 16 OF 23

9.0 SERVICE WATER SYSTEM

- 9.1 The requirements of plant miscellaneous services such as washing, make up to air-conditioning systems and others shall be met from a service water overhead tank of capacity not less than **2 x 100 cu.m.** The tank shall be made of steel and located on highest point of the plant, bunker floor, so that flow to all consumptive points of each building is by gravity. 2x100% Booster pumps shall be provided for service water requirements at higher levels with suitable size tanks. Distribution of service water will be done from outlet of these tanks so that available of service water may be ensured at higher elevation floors including tripper floor. Dedicated booster pumps shall be provided for ESP/APH washing. The pumps shall be 2x100% (1w+1s) for each unit. These pumps shall be of horizontal centrifugal type. The pumps shall be suitably located close to the ESP's taking suction from blowdown tank.
- 9.2 Filtered water overhead tank shall be filled by means 2 x 100% filtered water pumps.
- 9.3 Suitable interconnections from service water pump discharge to DM clarified water tank shall be provided.
- 9.4 A PLC based control system shall be provided for pumps and tank level controls. The tank level shall also be monitored in DCS.

10.0 POTABLE WATER SYSTEM

- 10.1 Potable water shall be supplied to the plant by gravity from the filtered water storage tank located on highest point of the plant, deaerator floor. 2 x 100% booster pumps with suitable size tanks shall be provided for higher elevation so that availability of potable water may be ensured at higher elevations including tripper floor. The plant potable water distribution system shall be complete with piping, fittings, valves, instrumentation, etc for each consumptive points in all the buildings.
- 10.2 For colony, 3x60% potable water pumps shall be provided, taking suction from main filter water sump. These pumps shall pump filtered water to the overhead tanks located in the colony.
- 3 nos. Potable water pumps capacity of 20 cu.m/hr and head of 50mwc shall be provided.
- 10.3 Float and chord type level gauges shall be provided for all tanks. Float operated valve shall control the levels in the tanks.
- 10.4 Suitable post treatment of plant and colony potable water shall be provided before distribution. This shall include, post chlorination / dechlorination with ACF.

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 17 OF 23

10.5 Potable water Coolers shall be provided in each building and at each floor. Contractor shall provide these coolers of reputed make.

11.0 MISCELLANEOUS PUMPS AND SUMP PUMPS

11.1 Miscellaneous pumps as required for the plant shall be provided as per the enclosed data sheets.

11.2 CONTRACTOR shall decide the quantity and parameters of the sump pumps depending on the plant layout and plant drainage design.

11.3 In the outdoor area portable submersible pumps shall be provided for dewatering purposes for pump house sumps, tanks and cooling tower basin.

11.4 Following additional pumps shall be provided :-

- a) **8 nos.**, portable submersible pumps of minimum **100 m³/hr, 25mwc** capacity each.
- b) **4 nos.**, motor driven pumps of minimum **150 m³/hr, 25mwc** capacity each.
- c) **2 nos.**, diesel engine driven pumps of minimum **150 m³/hr, 25mwc** capacity each.

12.0 PERFORMANCE, LAYOUT AND MAINTENANCE REQUIREMENTS

12.1 PERFORMANCE REQUIREMENT

12.1.1 Equipment and accessories as called for, be designed to operate continuously at the specified condition in respective data sheet-A.

12.1.2 All electrical equipment performance should be as per electrical volume

12.2 LAYOUT AND MAINTETANCE REQUIREMENTS

12.2.1 DM plant equipment will be located under a top covered shed. However the DMF's shall be located outdoors. Necessary drain trench (with suitable lining) for carrying regeneration/backwash effluents and pipe/cable racks shall also be provided.

12.2.2 Chemical house shall be a complete building to house all required facilities minimum as per sr.no. 3.7 above.

12.2.3 All access platforms and stairways necessary for the operation and maintenance of equipment supplied under this contract shall be provided by the vendor.

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 18 OF 23

12.2.4 Bidder shall furnish the general arrangement drawing as proposed by him clearly indicating the dimensions of the various equipment, pipe routing, maintenance space etc. The pipelines and valves shall be laid out in such a way that they are easily accessible for any maintenance or repair. Bidder to propose an optimum layout ensuring adequate space for operation and maintenance of equipment.

12.2.5 All components/item/equipment shall be so laid that it provides easy access for periodical/routine inspection, removal, maintenance and reinstallation. The BIDDER shall supply the required maintenance tools for attending to different equipment offered by him. Bidder shall furnish the list of tools offered.

12.2.6 Suitable handling facilities shall be provided for handling and maintenance of mechanical equipment. The handling equipment shall be part of the equipment and shall be self contained, including all necessary hoists, chains etc. to erect/dismantle mechanical/electrical equipment. BIDDER shall demonstrate use of the handling equipment immediately after completion of the erection.

13.0 CHEMICAL LABORATORY EQUIPMENT

13.1 Following laboratories are proposed.

1. General Laboratory
2. Shift Laboratory
3. Coal & Oil Laboratory
4. Environmental Laboratory

All the above laboratory should be furnished by following materials.

- a) Lab furniture modules with service tables
- b) Hanging almirahs for lab reagents and glass ware
- c) Fume chamber for oil & coal lab.
- d) One Godrej Almirah for each lab.
- e) Water sinks with taps & safety showers.

A suitable chemical laboratory shall be provided in the power plant to enable testing of fuel, water, flue gas, etc. as required for normal operation of the power plant. The equipment proposed to be provided are listed below. In addition to these equipment, the laboratory shall also be equipped by the Contractor with necessary laboratory glassware, reagent chemicals, laboratory furniture and water sinks with taps, safety showers, etc. A portion of the chemical laboratory housing equipment such as the spectrophotometer shall be air-conditioned. Any other equipment to make the system complete shall be provided by the CONTRACTOR.

13.2 The following equipment shall be provided in the chemical laboratory.

13.2.1 Equipment for Water Analysis

- (a) Conductivity meter- (Make-Hach, Model no. 5450011)
- (b) Alfoc test kit for oxygen (Make-Hach)

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 19 OF 23
(c) pH meter (Digital type : 1 no. & on line operated : 1 No.) (Make- Hach/Sension, Model no. 51700-10) (d) Turbidity meter (Make-Hach) (e) Spectrophotometer (Make-Hach, Model no. DR-5000) (f) Jar test apparatus (laboratory flocculator) (Make-Hach, Model no. 27038-02) 13.2.2 Equipment for Coal Analysis (a) Muffle furnace (0 to 1700 deg.C) (Make- MEW/BTI/Eqvt.) (b) Vacuum oven (Make- MEW/BTI/Eqvt.) (c) Ordinary oven (Make- MEW/BTI/Eqvt.) (d) Bomb calorimeter (Make- LECOAC-500WC/PARR-620) (e) Sieve shaker (Make- MEW/Jayanth/Eqvt.) (f) Sieves, cover & receiver (Make- MEW/Jayanth/Eqvt.) (g) Mechanical jaw crushers (Make- MEW/Jayanth/Eqvt.) (h) Grinder (Make- MEW/Jayanth/Eqvt.) (i) Jar ball mill (Make- MEW/Jayanth/Eqvt.) (j) Electric oven for coal analysis (Make- MEW) (k) Hardgrove grindability tester (Make- MEW) (l) Apparatus for ultimate analysis complete with accessories (Make- LECO/TGA 70154 CR) (m) Apparatus for oxidation stability test. 13.2.3 Equipment for Oil Analysis (a) Apparatus for oxidation (Make- PIL) (b) Redwood viscometer (Make- Cole parmer, USA) (c) Apparatus for water in oil by Dean and Stack method automatic KF titration (Make- Mettler/DL 32 X KF) (d) Interfacial tension apparatus (Make- PIL) (e) Pensky-Martens flash point apparatus. (Make- PIL) 13.2.4 Equipment for Gas Analysis (a) Three-bulb Orsat (Make- J/Sil) (b) Explosimeter (Combustible gas analyser) (Make- Endee) (c) Hydrogen purity test apparatus (Make- Endee) (d) Ultimate analysis apparatus hydrometer. (Make- Lemco) 13.2.5 General Equipment (a) Magnetic stirrer (Make- Hach, Model no. 23442-02) (b) Balance (chainomatic) with weight box (Make- Mettler/Sartorius) (c) Atomic absorption spectrophotometer (Make- CHEMITO/Elenco) (d) Triple beam balance (Make- Mettler)		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 20 OF 23
(e) Single pan balance (Make- Mettler) (f) Water bath (Make- Biomatrix) (g) Gas heating assembly (Any indigenous make) (h) Hot plate (Any indigenous make) (i) Distilling still (Any indigenous make) (j) Vacuum pump (Any indigenous make) (k) Heating mantle (Any indigenous make) (l) Kipp's apparatus (Make- J/Sil) (m) Flame photometer (Make- Buck Scientific, USA) (n) Lovibond comparator (Any indigenous make) (o) Hot plate-cum-magnetic stirrer (Any indigenous make) (p) Refrigerators : 2 Nos. (One for storage of chemicals and the other for storage of samples) ((Make- LG/ Samsung) (q) Laboratory centrifuge (Any indigenous make) (r) Potentiometric titration apparatus (Any indigenous make) (s) Atomic absorption spectrophotometer (AAS) (Make- CHEMITO/Ellico) (t) Gas chromatograph with data processor (GS) (Make- Shimadzu Corp.) (u) Noise level meter (Make- Leutron) (v) Wind anemometer and wind vane (Make- Leutron) (w) Dial type barometer (Make- Hach) (x) Stack monitoring kit (Make- Envirotech) (y) Hygrometer (Any indigenous make) (z) Dry & wet bulb thermometer (Any indigenous make) (aa) Dew point tester (Make- Endee) (bb) BOD incubator (Any indigenous make) (cc) COD incubator. (Make- Hach) The technical parameters, measurement range and accuracy shall be suitable for the minimum anticipated level / concentration of the constituents measured. 13.2.6 Environmental Laboratory Equipment (a) Stack monitoring kit for Iso-kinetic sampling consisting of control module, flow totalizer module (dry gas meter), impinger & condenser module, pitot tube. (2 sets) (Make- Envirotech) (b) Continuous ambient air Quality monitor for Sox (UV Fluorescent principle) Nox equivalent tp Rupprecht & Patashnick 1400 TSP monitor USA series (1 No.) (c) High Volume Samplers (Respirable dust sampler) for Ambient Air Monitoring. (Make- Envirotech) (d) Weather Monitoring Station consisting of 8 channel data logger LCD display RTC Calendar serial output port, wind speed & direction sensor, rain fall sensor, relative humidity sensor, solar panel with charger unit. (Make- Envirotech)		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 21 OF 23

13.2.7 Pollution control Monitoring Equipment

- (a) Micro metrology monitor with sealed micrologor (1 No.) (Make- Envirotech)
- (b) Portable water analysis kit (with salinity and turbidity analysis) (1 Set).
(Make- Hach)
- (c) Auto clave (1 No.) (Any indigenous make)
- (d) Inaculation chamber (1 No.)
- (e) Dessicator (1 No.) (Any indigenous make)

14.0 All necessary instruments stand pipes, fittings, valves, etc. to be provided to make the above all the water systems complete in working condition.

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 22 OF 23

ANNEXURE –1

RAW WATER ANALYSIS

Water samples are yet to be analysed in order to arrive at design quality.
However, the following shall be considered for this enquiry

SL. NO.	Constituent	Unit	Value
1.	P ^H	-	8.5
2.	Color and odor		
3.	Oil and grease	mg/l	DN
4.	BOD		3
5.	COD		20
6.	Suspended solids	mg/l	200
7.	Turbidity	NTU	200
8.	Calcium hardness as CaCO ₃	mg/l	74
9.	Magnesium hardness as CaCO ₃	mg/l	52
10.	Sodium as Na	mg/l	61
11.	Potassium as CaCO ₃	mg/l	-
12.	Chloride as cl	mg/l	39
13.	Sulphate as So ₄	mg/l	48
14.	Sulphide as S	Mg/l	-
15.	M- Alkalinity as CaCO ₃	mg/l	140
16.	P-Alkalinity as CaCO ₃	mg/l	Nil
17.	Nitrates as No ₃	mg/l	17
18.	Nitrites as NO ₂	mg/l	Nil
19.	Silica as SiO ₂ – Dissolved	mg/l	15
20.	Silica as SiO ₂ – Colloidal	mg/l	0.6
21.	Iron as CaCo3-dissolved	mg/l	0.5
22.	Iron as Fe-suspended	mg/l	0.1
23.	Total dissolved solids	mg/l	393

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WATER SYSTEMS	SHEET 23 OF 23

24.	Conductivity at 25 ⁰ C	μ-mho/cm	500
25.	Dissolved Oxygen as O ₂	mg/l	5.0
26.	Carbon dioxide free	mg/l	5

1. The analysis given above shall be utilised for Bidding Purpose Only.
2. For design raw water analysis, the successful Contractor shall conduct physical & chemical tests to estimate the quality of raw water.
3. Should there be any change in the design raw water quality (based on physical & chemical tests, carried out by the successful contractor) from the analysis given above, the CONTRACTOR shall provide necessary alterations in the pre treatment & DM plant designs without any commercial implications.

TERMINAL POINTS

- 1.0 Potable water and service water piping at one point at colony.

EXCLUSIONS

- 1.0 Potable and service water distribution within colony.

ISSUE
R1

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 4.1
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 1 OF 2
DATASHEET A		RAW WATER PUMPS	
SL. NO.	ITEM	UNIT	

1	Total No. of pumps	NOS.	3x50% for Raw water pumps 3x50% Ash water make-up pumps
2	No. of pumps operating	NOS.	2W + 1S (each)
3	Pump capacity	Cu.m/hr	By Bidder (10 % margin to be considered on actual flow)
4	Pump Total Head excluding losses in the pump	m	By Bidder
5	Pump speed (max.)	RPM	By Bidder (to limit specific speed to 6000 & ensure adequate NPSH at all conditions)
6	Type of pump		Vertical Turbine
7	Type of internal element		Non pull out
8	Liquid handled		River water
9	Type of line bearing lubrication		Self
10	Liquid for lubrication		Pumped liquid
11	Type of pump motor coupling		By Bidder
12	Thrust bearing location		By Bidder
13	Pump operating range		Refer Note-1
14	Motor rating		Minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.
15	Materials of construction		
	(a) Pump column pipe, Discharge elbow		Fab steel to IS 2062 Gr. B with epoxy painting
	(b) Pump bowl and bell mouth		CI to IS 210 FG 260
	(c) Impeller		ASTM A351 A Gr. CF8
	(d) Shaft		ASTM A 276 Type 410

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 4.1
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 2 OF 2
DATASHEET A		RAW WATER PUMPS	
SL. NO.	ITEM	UNIT	

	(e) Line shaft coupling		ASTM A 276 Type 410
	(f) Line shaft bearing		Cutlass Nitrile rubber in SS shell
	(g) All hardware		ASTM A193 / 194 -B8M /8M
	(h) Sole plate		MS - IS 2062 Gr. B
	(i) Base plate		MS - IS 2062 Gr. B
	(j) Shaft sleeve		ASTM A 276 Type 410
	(k) Wear ring		ASTM A351 A Gr. CF8
	(l) Gland		SS 304
	(j) Gland packing		PTFE
1.6	Inspection Requirement		As per relevant section
1)	Note : Pumps shall be capable of operating from shut-off point to a maximum flow of 130%		
2)	Bidder shall establish the water levels in the reservoir and accordingly design the head of raw water pumps		
3)	This data sheet is typical for vertical pumps (except CW pumps) and is applicable for any other vertical pump to be covered under this contract.		

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.1
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B RAW WATER PUMPS	SHEET 1 OF 1

ENQUIRY/SPECIFICATION NO.:		BIDDER:	
SL. NO.	ITEM	UNIT	

1	Pump make and type /Model		Raw water Pumps	Ash water makeup pumps
2	Motor make & model			
3	Guaranteed performance			
	(a) Design capacity	(cu.m. /hr)		
	(b) Total head excluding losses in pumps	m		
	(c) Losses in pumps	m		
	(d) Shut off head	m		
	(e) Pump speed	RPM		
	(f) Bowl efficiency	%		
	(g) Pump overall efficiency	%		
	(h) Power input to pump at duty point	kW		
	(i) Noise level	dBA		
	(j) Vibration level	microns		
4	Pump materials of construction			
5	Pump set weight			
	(a) Static weight including weight of rotating parts	kg.		
	(b) Weight of rotating parts	kg.		
6	Pump setting length	M		
7	Motor rating	kW		

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 – III SECTION: D 4.1
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RAW WATER PUMPS : DATASHEET C	SHEET 1 OF 1
1.1 Final dimensional drawings for the pumpset with details of opening required in the floors for clearance of casing, details of pump plate and anchor bolts (size, location, embedment, projection etc.,) grouting details, details of sealing the floor openings, grouting details for thrust pad arrangement weight of pump and motor including water column, forces acting at pump, base plate and other bends in the pump suction and delivery lines, necessary clearances for erection / maintenance and any other relevant data required for design of civil structures. 1.2 Cross Sectional drawing of the pump with complete bill of material for various components indicating recommended spare parts. 1.3 Loading data required for foundation design. 1.4 Layout drawings for pumps gland sealing and line bearing lubrication system. 1.5 Final list of motors including voltage phase, kilowatt, service and location etc. 1.6 Schedule of valves and fittings. 1.7 Write-up & recommended logic schemes for interlock, protection and sequential controls for pumps and its auxiliaries. 1.8 Characteristic of temperature elements. 1.9 List of alarm and trip settings. 1.10 Weights and sizes of major components / sub-assemblies to be handled at site as single lift during erection. 1.11 Inspection and Test procedure. 1.12 Recommended mode of erection, erection sequence and other relevant particulars in respect of erection of circulating water pumps and accessories. 1.13 Instructions Manual 1.14 Quality Plans 1.15 Pump performance curves 1.16 Details of handling equipment to carry out maintenance work on pumps 1.17 Calculations for establishing pump head. 1.18 System resistance curve		
		ISSUE R1

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A RAW WATER PRE TREATMENT PLANT	SHEET 1 OF 5

<u>A) RAW WATER INLET / BYPASS PIPING</u>	
1) Size of raw water inlet piping to Aerator	By bidder
2) Material of Construction of Pipe	Carbon steel IS 3589 Heavy Grade
<u>B) CASCADE AERATOR (common for main & DM clarifier)</u>	
1) No. Of Aerator	1x100%
2) Surface Loading	20 m ³ /hr/m ²
3) Material of Construction	RCC
4) Size	BY BIDDER
<u>C) STILLING CHAMBER (for main clarifier)</u>	
1) No. Required	1x100%
2) Construction	RCC
3) Detention Time	One (1) minute
<u>D) PARSHALL FLUME (for main clarifier)</u>	
1) No. Required	1x100%
2) Construction	RCC
3) Capacity	Maximum rated capacity of main clarifier.
<u>E) FLASH MIXER (for main clarifier)</u>	
1) No. Required	2X60%
2) Construction	RCC

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12					

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A RAW WATER PRE TREATMENT PLANT	SHEET 2 OF 5

3) Detention Time	One (1) minute
4) Free Board	300 mm (minimum)
5) Agitator	Turbine Type A.C. Electric motor, operated through reduction gear ss-316)
6) Protection Cover of GI construction for motors and gears	Required (as per IPW-55)

F1) CLARIFLOCCULATOR (main clarifier)

1) No. Required	2x60%
2) Construction & Type	RCC / Radial
3) Capacity	By bidder
4) Guaranteed Effluent Quality	Turbidity < 15 NTU TSS < 15 mg/l Residual Chlorine 0.5 PPM
5) Detention Period	Flocculation Zone : 30 min Clarification Zone :150 min
6) Rise Rate	1.5 m ³ /hr/m ²
7) Surface Flow Rate	1.5 m ³ /hr/m ² (maximum)
8) Velocity in launder	0.4 m/s (maximum)
9) Platform with railing	1.5 m wide all along the clariflocculator
10) Rake Bridge	MS IS:2062 epoxy coated
11) Sludge Blow Off constant bleed arrangement with telescopic devise and flushing connection	Required
12) Inlet piping / By pass piping	MS
13) Clariflocculator Size	BY BIDDER

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12					

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A RAW WATER PRE TREATMENT PLANT	SHEET 3 OF 5

<u>F2</u> <u>SOLIDS CONTACT CLARIFIER (DM clarifier)</u>	
1) No. Required	One (1) x 100 %
2) Construction & Type	RCC / high rate solids contact type
3) Capacity	By bidder
4) Guaranteed Effluent Quality	Turbidity < 15 NTU TSS < 15 mg/l Residual Chlorine 0.5 ppm
5) Detention Period	Minimum 100 minutes
6) Rise Rate	2.5 m ³ /hr/m ²
<u>G) CHEMICAL DOSING SYSTEM</u>	
COMPLETE PIPING / FITTING / VALVES	HDPE / UPVC (minimum 10 kg/sq.cm rating)
1) <u>ALUM DOSING SYSTEM</u>	
Solution preparation-cum-measuring tanks	Two (2) nos., RCC
b) Effective Capacity	To store one day's reqmt
c) Dosage Level	20 mg/l
d) Solution Concentration	10 %
e) Agitator	High Speed Motor Driven, SS316
f) Dissolving Basket	SS , with 10 mm dia holes on 50 mm triangular pitch
g) Dosing Pumps	2 x 100 % metering type / PP material / complete with suction strainers
h) Capacity / Head	BY BIDDER

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12					

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A RAW WATER PRE TREATMENT PLANT	SHEET 4 OF 5

2) <u>P.E. DOSING SYSTEM</u>	
Solution preparation-cum-measuring tanks	Two (2) nos., MSRL/FRP
b) Effective Capacity	To store one day's reqmt
c) Dosage Level	1 mg/l
d) Solution Concentration	1 %
e) Agitator	High Speed Motor Driven, SS316
f) Dissolving Basket	SS , with 10 mm dia holes on 50 mm triangular pitch
g) Dosing Pumps	2 x 100 % metering type / PP material / complete with suction strainers
h) Capacity / Head	BY BIDDER
<u>H) SLUDGE SYSTEM</u>	
1) <u>SLUDGE PIT</u>	One (1) , RCC with two compartments
1.1) Capacity	By bidder (refer water system scheme for inflows)
1.2) Size	By bidder
2) <u>THICKENER</u>	One(1) RCC
2.1 Cap & size	By bidder
3) <u>CENTRIFUGE / FILTER PRESS</u>	Required. (Refer Note1)
4) Sludge piping / fitting / valves	HDPE IS:4984
<u>I) NaOCl DOSING SYSTEM</u>	
1) NaOCl unloading pumps	2x100%, PP
2) NaOCl Bulk Tanks	2 nos, each, 10 Tons

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12					

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A RAW WATER PRE TREATMENT PLANT	SHEET 5 OF 5

3) NaOCl dosing pumps clarifier	2 x 100% for each PP
J) RAPID GRAVITY FILTERS	
1) Surface flow	15 m3/hr/m2
2) Treated Water Guaranteed	Turbidity & Suspended solids < 2 units
3) Backwash filter	3x50% pumps from water sump
4) Feed capacity / filter media / size	By Bidder

Note :

- Bidder shall provide centrifuge or filter press of proven design for complete solid waste management and maximum clear water recovery. If centrifuges are considered, only Solid bowl decanter shall be used.
- Sludge consistencies to be adopted :
 - Clarifier sludge : 3%
 - Thickener : 6%
 - Centrifuge / Filter press : 20%

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12					

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RAW WATER PRETREATMENT PLANT- DATA SHEET-B	SHEET 1 OF 2

1.0 **CLARIFIER**

UNIT

Main Plant / DM Plant

a) Type

b) Size of clarifier

i. Clarification zone

m x m

Dia & Depth

ii. Flocculation zone

m x m

Dia & Depth

c) Surface flow rate

cu.m/hr/
sq.m

d) Pressure drop (from inlet to stilling
chamber upto outlet of clarifier
including flow measuring devices)

m

e) Sludge volume

cu.m

f) Sludge chamber size

m x m

g) Sludge transfer pumps data

i. Make

ii. Capacity & Head

cu.m/hr
& mwc

iii. Setting length

m

iv. Motor make & rating

m

h) Frequency of sludge blowdown

i) Centrifuge / Filter press data

i. Make

ii. Type

iii. Feed flow rate

m³/hr
kW

iv. Rating

j) Thickener

i. Size

ii. Feed flow rate

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RAW WATER PRETREATMENT PLANT - DATA SHEET -C	SHEET 1 OF 1

DATA / DRAWINGS TO BE SUBMITTED AFTER THE AWARD OF CONTRACT

- 1.0 Detailed Raw Water Pre-treatment Plant – P&ID
- 2.0 Detailed General Arrangement Drawings.
- 3.0 Data Sheets for all equipment covered.
- 4.0 Civil construction drawings.
- 5.0 Detailed piping layout drawings of equipment connections included in the system.
- 6.0 Operating test procedures.
- 7.0 Instrumentation & Controls
- 7.1 Duly filled manufacturer's data sheets along with Catalogues.
- 7.2 Control panel, junction box and terminal block details.
- 7.3 Termination details of all input / output signals and power supplies on control panel, junction boxes, etc..
- 7.4 Cable list for all the cables & interconnection schedule.
- 7.5 Local panel layout drawings.
- 7.6 Panel internal wiring diagram.
- 7.7 Control scheme (write-ups).
- 8.0 Operation & maintenance manual.
- 9.0 Quality Plans, inspection and performance test procedures.
- 10.0 As built drawings of all equipment/system
- 11.0 Hydraulic diagrams along with calculations
- 12.0 PT Plant sizing calculations

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 1 OF 9

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope

1. The disinfection system shall consist of an on-site sodium hypochlorite generating system, dosing equipment to deliver sodium hypochlorite to the point of application, and a chlorine residual analysis and control system to maintain the desired disinfection level.
2. Production of the sodium hypochlorite solution shall be automatic and on-demand, utilizing common grade salt, water, and electrical power to produce a 0.7 to 0.9% hypochlorite solution.
3. Total capacity of the plant shall be as per the dosing scheme specified elsewhere. The plant shall be configured in a number of streams of same capacity to give N + 1 redundancy.
4. In order to simplify spares and service requirements and to assure system integrity, the complete disinfection system, including the hypochlorite dosing equipment, residual analyzer, and control system, shall be manufactured and provided by the same manufacturer as the Hypochlorite generator.
5. The Electro Chlorination system common for C.W and R.W system

The on-site generator manufacturer must have a minimum of 20 years experience supplying the specified technology.

1.02 DOSING REQUIREMENT

I. CW system:

- A. 1 ppm Continuous Dosing for 22.5 hr per day.
- B. 2 ppm Shock Dosing for 1.5 hr per day (0.5 hr per shift).

Dosing point shall be provided in each pump chamber and provision for dosing in common forebay also shall be provided.

II. Raw water system:

Dosing rate: 1ppm continuous (24 hours)

III. Pre-treatment plant

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 2 OF 9
Dosing rate : 1ppm continuous (24 hours) III. Potable water Plant & Colony: Dosing rate: 0.5 ppm continuous (24 hours) (each) <u>PART 2 PRODUCTS</u> <u>2.01 ELECTROLYZER ASSEMBLY</u> A. An electrolyzer assembly with a suitable capacity in kg of equivalent chlorine per day as 0.7 to 0.9% sodium hypochlorite solution to meet overall dosage required. B. The electrolyzer shall be a membrane-less type to minimize the possibility of fouling. C. Anodes shall be DSA type, with precious metal oxide coating on a titanium substrate. D. Anodes and cathodes shall be assembled on titanium and PVC chassis which can easily be removed as one unit from its tubular casing for inspection. F. Anodes and cathodes shall be oriented vertically to facilitate the escape of Hydrogen gas-horizontal placement of electrodes shall not be permitted. G. Brine and dilution water flowmeters shall be used to indicate the respective flows. H. Casing shall be suitable diameter PVC tube with end flanges. I. The following alarm sensors shall be provided for the electrolyzer assembly. 1. High & low temperature 2. Low electrolyte 3. Low dilution water flow 4. Low brine flow		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 3 OF 9
J. Sample valves to test the brine and Hypochlorite product strength shall be provided on the electrolyzer. K. Integral connections to allow for acid flushing the electrolyzer shall be provided. L. Acid cleaning shall typically be required no more than once per year with specified salt and water quality. M. The electrolyzer assembly shall consist of the following major components. 1. Electrolytic cell assembly 2. Water flow meters with low-flow set point 3. Brine flow meter with low-flow set 4. Water pressure regulating valve 5. Cell electrolyte level switch 6. Cell temperature switch 7. Valves for brine and water sampling 8. Valve connections for acid cleaning and draining of cell 9. Back pressure valve for brine inlet 10. Epoxy-coated steel structural frame with points for securing to floor <u>2.02 TRANSFORMER/RECTIFIER</u> A. Power for the electrolysis of brine shall be provided by a solid-state controlled, force-air-cooled transformer/rectifier, which shall be full wave, less than 5% RMS ripple. B. Input power shall be 415 VAC +/-5%, 3 Phase, 50Hz, 3 wire, with a constant current ±1% regulated with maximum output limits built in to 110% nominal. C. A built-in voltmeter and ammeter shall be provided. D. Design of the rectifier must include cell voltage monitoring with alarm contact output.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 4 OF 9
E. Rectifier must be self-monitoring for cell voltage, thermal overload, and internal faults <u>2.03 BUSBAR</u> A. Electrical connections between the transformer/rectifier and electrolyzer shall be through sheathed, rigid, copper busbars for maximum current flow and maximum heat dissipation. B. Busbars and connections shall be insulated. C. Termination connections shall be protected with PVC end caps. <u>2.04 SATURATOR</u> A. The saturated brine solution shall be produced by a salt saturator. B. A constant brine level shall be maintained. C. Usable storage capacity shall be equal to 15 day(s) storage. D. The saturator shall be designed for storage of brine solution at ambient temperature and atmospheric pressure, and shall be suitable for outdoor covered installation. <u>2.05 WATER SOFTENER</u> A. Available water hardness as per the water analysis to be considered. B. If the incoming water exceeds 17 mg/l in calcium hardness, a water softener shall be provided to eliminate potential fouling of the electrodes, which impairs the efficiency of the electrolysis process. C. The softener shall be a twin-tank design with automatic changeover for regeneration, and be suitably sized for the system water requirements.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 5 OF 9

2.06 HYPOCHLORITE STORAGE TANK

- A. The freshly produced Hypochlorite solution shall be stored in a totally enclosed tank with flanged inlet and outlet, drain, and overflow connections.
- B. In addition, there shall be flanged connections for the inlet and outlet from an air dilution blower, which shall be suitably sized to dilute hydrogen to at least 25% of the LEL.
- C. The following controls shall be included in the storage tank:
 1. Intrinsically safe level control for start-stop operation of the system
 2. Overflow alarm
 3. Low storage level alarm and disable metering pump signal
- D. Storage capacity: equal to 24 hours.

2.07 AIR DILUTION BLOWER

- A. An air dilution blower shall be provided to force ventilate the product tank, reducing the concentration of Hydrogen gas in the tank and discharged from the system vent to below 25% of LEL, which is 1% in air.
- B. Under no circumstances will natural convection only or unaided ventilation of the product tank be allowed.
- C. A standby blower shall be provided to automatically start if the primary blower fails.
- D. Both blowers shall be connected with a "Y" piece to common entry into the storage tank.
- E. The tank ventilation pipe work shall house the airflow sensor, which will provide activation for the standby blower unit via the control panel.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 6 OF 9
F. In the event both blowers fail, controls shall be provided to automatically shut down the electro-chlorination system. G. To ensure that the electrolytic process can be activated, it must be established that an airflow condition exists. H. On system shut down, the blower must remain active for duration of 15 minutes. <u>2.08 CONTROL PANEL</u> A. The entire generation process shall be controlled by a PLC-based control panel. B. The front door shall include an HMI with LCD screen. C. The unit shall include a keypad and hierarchical menu-driven program. D. Operation and alarm readouts shall indicate system status as outlined below: 1. Status indicators to include a) Audible alarm b) Power on 2. Status Indicated by text message: a) Rectifier on b) Water supply on c) Blower running d) Brine pump on e) Electrolyte inlet and Hypochlorite outlet temperature - Storage tank level 3. Necessary alarms shall be provided, some of which include: a) Rectifier failed b) Improper voltage c) High electrolyte temperature d) Low electrolyte level e) Low water level f) Overflow of storage tank g) Low storage tank level		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 7 OF 9
h) Air flow failed, blower failed i) Low brine flow j) External interlock open k) Loss of analog signal (i.e., tank level indication) 4. An anti-condensation heater shall be provided inside the control panel. 5. The following volt-free outputs shall be provided: a) Hydrogen leak alarm (if used) b) Minor alarm c) Priority alarm d) Dosing pump enable e) Room ventilation f) Electrolyzer running E. The enclosure shall be painted-steel construction with a lockable door. F. Input power shall be 230 VAC, 3 phase, 50 Hz. G. Control voltage shall be 24 VDC, 5 amp. H. Integral motor starters for brine pump, Hypochlorite pump, and hydrogen blower shall be part of the control panel. J. The control panel shall provide the option for operation during off-peak power periods to reduce operating costs. <u>2.09 METERING PUMP FOR HYPOCHLORITE & BRINE FEED</u> A. The hypochlorite metering pump shall be provided. B. The pump shall be of the positive displacement-type with a non-loss-motion mechanically actuated diaphragm. C. The pump shall have a maximum capacity suitable for the maximum dosing requirements.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 8 OF 9
D. The pump shall have a painted, cast iron gearbox with a 4-step pulley to provide an additional 4:1 operating range. E. Aluminum or plastic gearbox shall not be acceptable. F. The pump head shall be PVC with clear PVC molded cartridge-type check valves to facilitate service and provide integral sight flow indication. G. Conventional threaded valves and external sight flow indicators are not allowed. H. The pumping diaphragm shall be a TFE-faced, fabric-reinforced elastomer with an imbedded steel backing plate to ensure accurate repeatability for each stroke. I. A 10-turn, micrometer-type stroke length adjuster shall be provided to change to feedrate of the pump. <u>2.10 ANALYTICAL TITRATION KIT</u> A. A titration kit to measure the product concentration and brine concentration shall be furnished with the electrochlorination system. <u>2.11 HYDROGEN-IN-AIR DETECTOR & ALARM</u> A. A Hydrogen detecting system shall continuously monitor the on-site Hypochlorite equipment are for the presence of hydrogen gas in the ambient atmosphere. B. The system shall be remote electrochemical sensor-type consisting of sensor/transmitter and receiver. C. The gas detector shall be ranged for 0-4% gas concentration and shall have two independent alarm set points adjustable for 5% to 100% of range, with separate alarm LEDs and an integral audible alarm horn.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D 4.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan ELECTRO CHLORINATION SYSTEM	SHEET 9 OF 9

D. There shall also be LED readout of gas concentration in percent and a 4-20 mA proportional output signal available.

PART 3 EXECUTIONS

3.01 TRAINING

A. One half day of training shall be provided on-site to the operation staff after the equipment start-up.

3.02 SERVICE

A. Factory trained direct or authorized service contractor shall be available within 24 hours of notification.

3.03 WARRANTY

A. Anodes shall be warranted for five years prorated.

B. Electrolyzer shall be warranted for two years full and five years prorated.

C. System shall be warranted for 12 months from date of start-up.

3.04 APPROVED VENDOR LIST

A. Siemens.

B. Daiki Ataka, Japan.

C. Severntrent Denora, USA.

ISSUE
R1

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA Consulting Engineers Limited		VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B ELECROCHLORINATION PLANT		SHEET 1 OF 7
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

SL.NO	SYSTEM	UNIT	DESCRIPTION
1.0	BOOSTER PUMPS		[[
1.1	Quantity (Working + Standby)	-	[[
1.2	Location	-	[[
1.3	Fluid to be handled	-	[[
1.4	Type	-	[[
1.5	Design Temperature Range	Deg C	[[
1.6	Rated Capacity	M ³ /hr	[[
1.7	Range of Operation	-	[[
1.8	Suction Condition	-	[[
1.9	Available Suction Pressure at Terminal Point	mwc	[[
1.10	Total Delivery Head	mwc	[[
1.11	Type of lubrication	-	[[
1.12	Pump Speed	rpm	[[
1.13	Material of Construction		[[
1.13.1	Casing	-	[[
1.13.2	Impeller	-	[[
1.13.3	Shaft Sealing	-	[[
2.0	STRAINER		[[
2.1	Quantity (Working + Standby)	-	[[
2.2	Location	-	[[
2.3	Fluid to be handled	-	[[
2.4	Type	-	[[
2.5	Rated Capacity	-	[[

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

SPECIFICATION NO. TCE.5750A-500-H-001	TATA Consulting Engineers Limited		VOL III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D 4.2
PART B	DATA SHEET B ELECROCHLORINATION PLANT		SHEET 2 OF 7
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

SL.NO	SYSTEM	UNIT	DESCRIPTION
2.6	Mesh size of screen	mm	[[]]
2.7	Material of Construction	-	[[]]
2.8	Accessories	-	[[]]
3.0	ELECTROLYSER		[[]]
3.1	Quantity	-	[[]]
3.2	Capacity per stream	-	[[]]
3.3	Type	-	[[]]
3.4	Available chlorine content at outlet	ppm	[[]]
3.5	Guaranteed life of electrodes	Years	[[]]
3.6	Range of sodium hypochlorite generation	-	[[]]
3.7	Design temperature range	Deg C	[[]]
3.8	Design pressure	Bar (g)	[[]]
3.9	Testing pressure	Bar (g)	[[]]
3.10	Pressure drop across electrolyser	Bar	[[]]
3.11	Feed Amperage	Amps DC	[[]]
3.12	Operating Voltage	Volts DC	[[]]
3.13	No. of electrolytic cells / Unit	-	[[]]
3.14	Materials of Construction		[[]]
3.14.1	Anode	-	[[]]
3.14.2	Cathode	-	[[]]
3.14.3	Cell Body	-	[[]]
3.14.4	Spacers	-	[[]]
3.14.5	Gaskets	-	[[]]
3.14.6	Fasteners	-	[[]]

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

SPECIFICATION NO. TCE.5750A-500-H-001	TATA Consulting Engineers Limited		VOL III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D 4.2
PART B	DATA SHEET B ELECTROCHLORINATION PLANT		SHEET 3 OF 7
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

SL.NO	SYSTEM	UNIT	DESCRIPTION
4.0	Hypochlorite Storage cum Hydrogen Degassing Tank		
4.1	Quantity	-	
4.2	Type of tank	-	
4.3	Fluid to be stored	-	
4.4	Net capacity per tank (excluding 500 mm freeboard)	Cu.m	
4.5	Operating Pressure	Bar (g)	
4.6	Design Pressure	Bar (g)	
4.7	Testing Pressure	Bar (g)	
4.8	Design Temperature	Deg C	
4.9	Material of Construction		
5.0	Hydrogen Degassing Blowers		
5.1	Qty (w+s)	-	
5.2	Location	-	
5.3	Fluid to be handled	-	
5.4	Service	-	
5.5	Speed	Rpm	
5.6	Capacity	M3/hr	
5.7	Total delivery head	mlc	
5.8	Material of Construction		
5.8.1	Casing		
5.8.2	Impeller		
5.8.3	Shaft		
6.0	Continuous & Shock Dosing Pumps		
6.1	Quantity (working + standby)	-	

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
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SPECIFICATION NO. TCE.5750A-500-H-001	TATA Consulting Engineers Limited		VOL III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D 4.2
PART B	DATA SHEET B ELECROCHLORINATION PLANT		SHEET 4 OF 7
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

SL.NO	SYSTEM	UNIT	DESCRIPTION
6.2	Location	-	[[]]
6.3	Fluid to be handled	-	[[]]
6.4	Capacity per pump	M3/hr	[[]]
6.5	TDH per pump	mwc	[[]]
6.6	Speed	rpm	[[]]
6.7	Range of operation	-	[[]]
6.8	Material of Construction	-	[[]]
6.8.1	Casing	-	[[]]
6.8.2	Impeller	-	[[]]
6.8.3	Shaft Sleeve	-	[[]]
6.8.4	Shaft Sealing	-	[[]]
7.0	Acid Tank	-	[[]]
7.1	Quantity	-	[[]]
7.2	Type of tank	-	[[]]
7.3	Fluid to be stored	-	[[]]
7.4	Net capacity per tank (excluding 500 mm freeboard)	Cu.m	[[]]
7.5	Operating Pressure	-	[[]]
7.6	Design Pressure	-	[[]]
7.7	Testing Pressure	-	[[]]
7.8	Design Temperature	-	[[]]
7.9	Material of Construction	-	[[]]
8.0	Acid Cleaning Pump	-	[[]]
8.1	Quantity (working + standby)	-	[[]]
8.2	Location	-	[[]]

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

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA Consulting Engineers Limited		VOL III SECTION: D 4.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B ELECROCHLORINATION PLANT		SHEET 5 OF 7
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

SL.NO	SYSTEM	UNIT	DESCRIPTION
8.3	Fluid to be handled	-	[]
8.4	Capacity per pump	-	[]
8.5	TDH per pump	-	[]
8.6	Speed	Rpm	[]
8.7	Range of operation	-	[]
8.8	Material of Construction		[]
8.8.1	Casing	-	[]
8.8.2	Impeller	-	[]
8.8.3	Shaft Sleeve	-	[]
8.8.4	Shaft Sealing	-	[]
9.0	Transformer Rectifiers		[]
9.1	Quantity	-	[]
9.2	Location	-	[]
9.3	Enclosure type	-	[]
9.4	Type	-	[]
9.5	Input Voltage	-	[]
9.6	Rating	kVA	[]
9.7	Cooling Type	-	[]
9.8	Output DC Voltage	-	[]
9.9	Output DC Current	-	[]
9.10	Build & Ripple	-	[]
10.0	Piping Fittings & Valves		[]
10.1	Pipes & Fittings for entire system	-	[]
10.2	Valves	-	[]

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

SPECIFICATION NO. TCE.5750A-500-H-001		TATA Consulting Engineers Limited		VOL III	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D 4.2	
		DATA SHEET B		SHEET 6 OF 7	
		ELECTROCHLORINATION PLANT			
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			

Note:

- 1) Bidder to furnish characteristic curves for all pumps and motors offered
- 2) Bidder to furnish catalogues of electrolyzers, transformers & rectifiers offered
- 3) Bidder to fill in all details of Utility Chart enclosed here under, failing which the bids are liable for rejection.

UTILITY CHART
(To be filled in by Bidder)

SI No	Electrolyser	AC kw/kg	kg/d	days/yr	kwhr/yr	Opex Crore Rs./yr
1	Power for Electrolyser	*	*	330	*	
SI No	Pumps & Blowers	Qty	Working	KW / wk pump	Total kw	Opex Crore Rs./yr
3	Auto strainer	*	*	*	*	
4	SW Booster Pump	*	*	*	*	
5	Hypo Dosing Pump Cont	*	*	*	*	
6	Hypo Dosing Pump Shock	*	*	*	*	
7	Pumps Mech Seal Pump (if offered)	*	*	*	*	
8	Acid Wash Pump	*	*	*	*	
9	Hypo Blowers	*	*	*	*	

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	

SPECIFICATION NO. TCE.5750A-500-H-001		TATA Consulting Engineers Limited		VOL III	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D 4.2	
		DATA SHEET B		SHEET 7 OF 7	
		ELECTROCHLORINATION PLANT			
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			

Sl No	Refurbishments	Cost/Repl (Rs.Crore)	Freq. of Repl, once in years	Rs. Crore/yr	No.of Cells being replaced	Opex Crore Rs./yr
11	Electrode Repla(c)ting	*	5	*	*	
12	Chemical cost for cleaning (Bidder to indicate yearly acid consumption)	*				
TOTAL						

* = Bidder to indicate

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	

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A DUAL MEDIA FILTERS	SHEET 1 OF 2

Sl.No.	PARAMETERS	DESCRIPTION
1.	No. of streams	3x70%
2.	Capacity per stream	Refer Water System Scheme
3.	Location	Indoor (DM plant + CPU regeneration building)
4.	Fluid Handled	Clarified water (TSS & Turbidity : max 20 units)
5.	Outlet Turbidity & Suspended Solids	< 2 units
6.	Type of Filter	Dual Media, Vertical, Pressurised
7.	Design surface flow rate	Max 15 m ³ /hr/m ²
8.	Filter Media	Graded Quartz Sand (free from carbonates & other foreign matter) and anthracite as per BSEN12909
9.	Supporting bed	Rounded and graded gravel free from clay & limestone
10.	Minimum bed depth	1000 mm (excluding supporting bed)
11.	Free Board	75% of total bed depth
12.	Materials for shell and dished ends	CS :- SA516 Gr.70
13.	Minimum thickness for shells	6 mm
14.	Minimum thickness for dished ends	8 mm
15.	Design pressure	10 kg/cm ²

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A DUAL MEDIA FILTERS	SHEET 2 OF 2

16.	Backwash source	By gravity, from Filtered water overhead tank, sized for one day's backwashing requirements with 20% margin. Tank shall be of RCC construction.
17.	Instruments Required per vessel	Sight Glass : 2 Pressure gauge : 1 at inlet & outlet Inlet flow indicator : 1 Backwash flow indicator : 1 Sampling valve : 1x15NB at inlet & outlet DP indicator cum switch : 1
18.	Painting	External : 1 coat of primer and 2 coats of epoxy/anti corrosive paint Internal : 2 coats of epoxy primer and 3 coats of solvent free epoxy based finishing paint with DFT :240 microns.

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B		TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A FILTER	SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

Sl.No.	PARAMETERS	DESCRIPTION
1.	No. of streams	3x70%
2.	Capacity per stream	Refer Water System Scheme
3.	Location	Indoor (DM plant + CPU regeneration building)
4.	Fluid Handled	Filtered water from DMF
5.	Outlet guarantees	Residual chlorine, colour and organics : NIL
6.	Type of Filter	Vertical Pressurised
7.	Design surface flow rate	Max 20 m ³ /hr/m ²
8.	Filter Media	Granular activated carbon as per AWWA 8604 – Dechlorination grade. The media shall work continuously without any reactivation or replacement for minimum 1 year.
9.	Supporting bed	Rounded and graded gravel free from clay & limestone
10.	Minimum bed depth	1000 mm (excluding supporting bed)
11.	Free Board	75% of total bed depth
12.	Materials for shell and dished ends	CS :- SA516 Gr.70
13.	Minimum thickness for shells	6 mm
14.	Minimum thickness for dished ends	8 mm

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12					ISSUE R1

SPECIFICATION NO. TCE.5750A-500-H-001 PART B		TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SHEET 2 OF 2
		DATASHEET A FILTER	
SL. NO.	ITEM	UNIT	

15.	Design pressure	10 kg/cm ²
16.	Backwash source	Online, by flow reversal.
17.	Instruments Required per vessel	Sight Glass : 2 Pressure gauge : 1 at inlet & outlet Inlet flow indicator : 1 Backwash flow indicator : 1 Sampling valve : 1x15NB at inlet & outlet DP indicator cum switch : 1 Carbon trap at outlet : 1 Online residual chlorine analyser : 1
18.	Painting	External : 1 coat of primer and 2 coats of epoxy/anti corrosive paint Internal : 2 coats of epoxy primer and 3 coats of solvent free epoxy based finishing paint with DFT :240 microns.

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12					

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A DE-MINERALISED PLANT	SHEET 1 OF 2

Sl.No.	PARAMETERS	DESCRIPTION
1.	No. of streams	3x70% (2W+1S)
2.	Capacity per stream	70 m ³ /hr, net output
3.	Net OBR per stream of SAC, DG, WBA, SBA units	70 x 18 = 1260 m ³
4.	Net OBR per stream of MB units	70 x 18 x 5 = 6300 m ³
5.	Gross OBR	By Bidder
6.	Type of exchange units	Vertical, Pressurised
7.	Design surface flow rate	Max 40 m ³ /hr/m ² for SAC, WBA, SBA units Max 60 m ³ /hr/m ² for MB units
8.	Type of ion exchange resins	SAC Resins : Organic monosphere/gel [H] form WBA Resins : Organic monosphere / gel –tertiary amine SBA Resins : Organic monosphere / gel [OH] form, Type 1 MB Resins : Organic monosphere Inert Resins : Adsorbent inert resin / Active Resin Approved makes : Rohm & Haas, Dowe, Bayer, Thermax, Ion Exchange
9.	Minimum bed depth	1000 mm (excluding inert resin)
10.	Minimum Free Boards	50% of total bed depth for SAC 75% of total bed depth for WBA 50% of total bed depth for SBA 100% of total bed depth for MB
11.	Materials for shell and dished ends	CS :- SA516 Gr.70 with Rubber Lining (3x1.5mm thk RL of shore hardness 65 ± 5 Scale A)

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A DE-MINERALISED PLANT	SHEET 2 OF 2

12.	Design pressure	10 kg/cm ²
13.	Minimum thickness for shells	6 mm
14.	Minimum thickness for dished ends	8 mm
15.	Derating factor to be considered on selected Exchange Capacity	10%
16.	MB air blowers	2x100% Centrifugal CI IS 210 FG 260
17.	Pipes & Valves	SS / MSRL for corrosive services ASTM A53 Gr.B for normal services Ebonite lined diaphragm valves for corrosive services Elastomer lined butterfly valves for normal services All automatic operated valves shall be solenoid assisted pneumatic actuated.
18.	Degasser System	<u>Degasser Towers</u> : 2x70%, counter flow, forced draft CSRL (SA516Gr.70 +3x1.5mm thk RL) <u>Blowers</u> : 2x100% per tower, centrifugal oil free FRP casing, FRP impeller, SS316 shaft , FRP ducting <u>Degassed water sump</u> : 1x100%, sized for one regeneration requirement of SAC units with 20% margin. CSRL (SA516Gr.70 +3x1.5mm thk RL) <u>Degassed water pumps</u> : 3x70%, horizontal centrifugal, SS316 internals.

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12				ISSUE R1

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A DM WATER STORAGE TANKS	SHEET 1 OF 1

Sl.No.	PARAMETERS	DESCRIPTION
1.	No. of tanks	3 nos
2.	Capacity of each tank	1000 m ³ , net
3.	Tank Type	Vertical , Cylindrical with conical self supported roof and bottom plate of minimum 12mm thk.
4.	Design Code	IS803 and API650
5.	Materials of Construction	IS2062 GrA + epoxy paint Internal painting : 2 coats of epoxy based primer + 3 coats of solvent free epoxy based finishing paint External painting : 2 coats of red oxide primer + 3 coats of aluminium paint
6.	Accessories	CO ₂ absorber 3 layers of floating PP balls Side mounted level switch Local level indicators High & level alarms Overflow & seal arrangements 2x 500 NB manholes Platform for maintenance and interconnection between platforms of two tanks, staircase with handrails

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A NEURALISING PIT		SHEET 1 OF 1
SL. NO.	ITEM	UNIT	

Sl.No.	PARAMETERS	DESCRIPTION
1.	Neutralising Pit	One (1) no. RCC with acid-alkali resistant tiling / equiv Capacity : 120% of maximum daily influents (DM + CPU) No.of compartments: 2 Free board : 350 mm Accessories : Panel mounted pH indicator cum recorder on pump discharge recirculation header
2.	Neutralising Tank (Chemical preparation tank)	One (1) no. SA516Gr.70 + 3x1.5mm thk RL Capacity : 120% of one neutralising chemical requirement Tank type : Vertical Cylindrical with hinged cover & flat bottom. Necessary fume absorbers, overflow seals, etc shall be provided. Motorised agitator and dissolving baskets shall be provided
3.	Air blowers for neutralising pit	2x100% Centrifugal, CI IS 210 FG260 Cap & head : By Bidder
4.	Neutralised Effluent Transfer pump	4x100% horizontal centrifugal pumps, SS316 Cap : to empty the entire pit in 4 hours + 10% margin TDH : By Bidder

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-12	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A ACID ALKALI SYSTEM	SHEET 1 OF 2
SL. NO.	ITEM	UNIT

Sl.No.	PARAMETERS	DESCRIPTION
1.	Acid used	33.33 % Hydrochloric acid
2.	Alkali used	48% Sodium Hydroxide / alkali flakes
3.	Acid unloading pumps	2x100%, Casing & impeller : PP, Shaft : EN8+PP Capacity & TDH : By bidder
4.	Bulk Acid tank	2 nos, each tank sized for one tanker capacity of 50 T OR capacity of both tanks together shall be sized for one month's storage * ¹ , whichever is higher. The tank shall be fitted with vent, drain, fume absorber, overflow seal pots etc. Tank type : Horizontal Cylindrical with dished ends Material of construction : FRP made of bisphenol resin
5.	Acid Measuring Tank	One (1) no, for each SAC & MB units Capacity : 120% of one regeneration requirement Tank type: Vertical Cylindrical with top cover hinged & flat bottom. The tank shall be fitted with vent, drain, fume absorber, overflow seal pots etc. Material of construction : FRP made of bisphenol resin
6.	Alkali unloading pumps	2x100%, Casing :CI Impeller : SS316 Shaft sleeve : SS316 with flexible coupling Capacity & TDH : By Bidder

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 4.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 2 OF 2
DATASHEET A		ACID ALKALI SYSTEM	
SL. NO.	ITEM	UNIT	

7.	Bulk Alkali Tanks	Two (2) bulk alkali tanks, each tank sized for one tanker capacity of 25 T OR capacity of both tanks together shall be sized for one month's storage * ¹ , whichever is higher. The tank shall be fitted with vent, drain, CO ₂ absorber, overflow seal pots etc Tank type : Horizontal Cylindrical with dished ends Material of construction : SA516 Gr.70 + 3x1.5mm thk RL
8.	Alkali Measuring tanks	One (1) no, for each Anion & MB units Capacity : 120% of one regeneration requirement Tank type: Vertical Cylindrical with top cover hinged & flat bottom. The tank shall be fitted with vent, drain, CO ₂ absorber, overflow seal pots etc Material of construction : SA516 Gr.70 + 3x1.5mm thk RL
9.	External Painting for all CSRL tanks (applicable for all systems)	1 coat of primer and 2 coats of epoxy / anticorrosive paint
10.	Alkali preparation & dilution tank with activated carbon filter	One(1) No. alkali preparation and dilution tanks (from alkali flakes), with dissolving baskets & motorised agitators. ACF along with necessary accessories shall also be provided

Note :

- Bulk acid and alkali tanks shall be sized based on the requirements of DM plant as well as CPU external regeneration.*

REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK				
CHD. BY	AKC	AKC			PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12				

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RUBBER EXPANSION JOINTS - DATA SHEET A	SHEET 1 OF 2

Sl.No.	Parameters	Units	Description
1.0	Designation		CW System / Raw water Systems
2.0	Expansion joint ID/Pipe ID	mm	By Bidder
3.0	Numbers required	Nos.	Each CW pump discharge :1 no Each Condenser inlet & outlet nozzle: 1no – BTG Vendor scope Each Raw water pump discharge:1 no
4.0	Fluid handled		River water / Raw water
5.0	Flow Normal	m ³ /hr	By Bidder (Refer Note – 2).
6.0	Maximum	m ³ /hr	By Bidder
7.0	Pressure – operating / design / test	mwc	By Bidder
8.0	Pressure drop across the expansion joint	mwc	By Bidder
9.0	Vacuum (test) in mm of Hg		700 (Refer Note – 3)
10.0	Operating temperature in	°C	By Bidder
11.0	Movements (min) Axial Compression Axial elongation Lateral movement	mm } mm } mm }	12 (Refer Note – 1) 12 12
12.0	No of arches		By Bidder
13.0	Controls unit to be provided		Yes
14.0	Companion flanges can be made in one piece or in segments. If segmentally welded 100% radiography shall be carried out		
15.0	Companion flanges shall be supplied with bolts, nuts and		

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.4
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RUBBER EXPANSION JOINTS - DATA SHEET A	SHEET 2 OF 2

	washers		
16.0	Material of construction		
16.1	Main body		High grade abrasion resistant natural or synthetic rubber compound
16.2	Reinforcement		ASTM A 517 Gr.F
16.3	Retaining ring		ASTM A 283 Gr.D (Galvanised)
16.4	Outer cover		Exposed surface shall be given 3 mm thick coating of neoprene
16.5	Bolts & nuts		IS 1367 Gr. 4.6 / ASTM A193 / ASTM A 307
16.6	Stretcher bolt plates		ASTM A 283 Gr.D
	Note :- 1. Bidder to check the value with the movement of condenser and design the expansion joint. 2. Flow values to be based on single pump operation. 3. The test pressure may vary for raw water pump discharge, which will be furnished by bidder.		

ISSUE
R1

ISSUE NO. R5	SPEC. NO.		TATA CONSULTING ENGINEERS LIMITED		SECTION: D	
	TCE-M4-103-53		DATA SHEET - B		SHEET 1 OF 2	
	RUBBER EXPANSION JOINTS					
ENQUIRY /SPECIFICATION NO.						
SL. NO.	ITEM →	BIDDER →				
1.0	EXPANSION JOINT SIZE	mm				
2.0	<u>DESIGN AND OPERATING CONDITION</u>					
2.1	AS PER DATA SHEET - A	YES/NO				
2.2	IF NO LIST OF DEVIATIONS					
2.3	PRESSURE DROP THROUGH THE EXPANSION JOINT AT DESIGN FLOW	bar				
3.0	<u>MAXIMUM ALLOWABLE MOVEMENTS</u>					
3.1	Axial Compression	mm				
3.2	Axial Elongation	mm				
3.3	Lateral Movement	mm				
4.0	<u>MATERIALS OF CONSTRUCTION</u>					
4.1	AS PER SPECIFICATION AND DATA SHEET- A					
4.2	IF NO LIST OF DEVIATIONS					
5.0	<u>FEATURES OF CONSTRUCTION</u>					
5.1	FACE TO FACE DIMENSION	mm				
5.2	WALL THICKNESS	mm				
5.2.1	FLANGE	mm				
5.2.2	BODY	mm				
5.2.3	ARCH	mm				
5.3	STEEL RETAINING RING					
5.3.1	THICKNESS	mm				
5.3.2	NUMBER OF SEGMENTS					
5.4	ARCH INNER DIAMETER	mm				
NOTE TO BIDDER					SIGNATURE OF BIDDER	
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)					DATE	
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF BID.						

ISSUE NO. R5	SPEC. NO.		TATA CONSULTING ENGINEERS LIMITED		SECTION: D	
	TCE-M4-103-53		DATA SHEET - B RUBBER EXPANSION JOINTS		SHEET 2 OF 2	
	ENQUIRY /SPECIFICATION NO.					
SL. NO.	ITEM →	BIDDER →				
5.5	NUMBER OF CONTROL UNITS PER EXPANSION JOINT					
5.6	TOTAL WEIGHT OF EXPANSION JOINT INCLUDING CONTROL UNIT.					
6.0	DRAWINGS TO BE SUBMITTED WITH BID					
6.1	DIMENSIONAL OUTLINE DRAWING					
6.2	CROSS SECTIONAL DRAWING					
6.3	DRAWING SHOWING DETAILS OF THE CONTROL UNIT ENCLOSED.					
NOTE TO BIDDER				SIGNATURE OF BIDDER		
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)				DATE		
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF BID.						

SPEC No: TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED						VOLUME – III SECTION: D 4.6	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS PUMPS-- DATA SHEET A						SHEET 1 OF 3	

SL. NO.	PUMP DESIGNATION ITEMS	UNITS	POTABLE WATER FOR COLONY/ FILTERED WATER PUMP.	SERVICE WATER	DM PLANT SUPPLY	CW MAKEUP PUMPS	DM TRANSFER PUMP / DEGASSED WATER PUMPS	DM, CPU REGEN & UF PUMPS	APH WASH PUMPS
1	2	3	4	5	6	7	8	9	10
1.0	GENERAL DATA								
1.1	NO. OF PUMPS		REFER RESPECTIVE SYSTEM DATA SHEETS / WRITEUP / WATER SYSTEM SCHEME						
1.2	NO. OF PUMPS NORMALLY WORKING								
1.3	LOCATION	Indoor / Outdoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Outdoor
1.4	DUTY OF PUMP	Continuous © / Intermittent (I)	I	C	C	C	C	I	I
1.5	LIQUID HANDLED		Filtered water	Clarified Filtered water	Clarified filtered water	Clarified filtered water	DM water	DM water	Clarified water
2.0	DESIGN DATA								
2.1	DESIGN CAPACITY	m ³ /hr	BIDDER TO DECIDE INCLUDING 10% OF MARGIN						
2.2	TOTAL HEAD	mlc	BIDDER TO DECIDE BASED ON SYSTEM REQUIREMENTS						
2.3	MAX. DISCHARGE HEAD	mlc	By Bidder	By Bidder	By Bidder	By Bidder	By Bidder	By Bidder	By Bidder
2.4	MAX. RATED SPEED	RPM	3000	1500	1500	1500	1500	3000	3000
2.5	NORMAL SUPPLY CONDITIONS		-----415 V / 3 Ph / 50 Hz-----						
2.6	ACCEPTABLE NOISE LEVEL		NOT GREATER THAN 85 d BA AT A DISTANCE OF 1.8 M FROM OUTLINE OF EQUIPMENT						
2.7	VIBRATION LEVEL		AS PER HYDRAULIC INSTITUTE STANDARDS						
3.0	CONSTRUCTION FEATURES								
3.1	TYPE OF PUMP		-----> BY CONTRACTOR <-----						
3.2	TYPE IMPELLER		Open / Enclosed	Open / Enclosed	Open / Enclosed	Open / Enclosed	Open / Enclosed	Open / Enclosed	Open / Closed
3.3	DRIVE TRANSMISSION		Direct	Direct	Direct	Direct	Direct	Direct	Direct

ISSUE R1	

SPEC No: TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED						VOLUME – III SECTION: D 4.6	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS PUMPS-- DATA SHEET A						SHEET 2 OF 3	

SL. NO.	PUMP DESIGNATION ITEMS	UNITS	POTABLE WATER FOR COLONY / FILTERED WATER PUMP.	SERVICE WATER	DM PLANT SUPPLY	CW MAKEUP PUMPS	DM TRANSFER PUMP / DEGASSED WATER PUMPS	DM, CPU REGEN & UF PUMPS	APH WASH PUMPS
1	2	3	4	5	6	7	8	9	10
3.4	SEAL		Gland	Gland	Gland	Gland	Gland	Mechanical seal	Gland
3.5	TYPE OF COUPLING		-----> BY CONTRACTOR <-----						
3.6	NOZZLE ORIENTATION		-----> BY CONTRACTOR <-----						
3.7	FLANGE DRILLING		ANSI B 16.5	ANSI B16.5	ANSI B16.5	ANSI B16.5	ANSI B16.5	ANSI B16.5	ANSI B16.5
3.8	PRIME MOVER		AC electric motor	AC electric motor	AC electric motor	AC electric motor	AC electric motor	AC electric motor	AC electric motor
4.0	<u>MATERIALS OF CONSTRUCTION</u>								
4.1	CASING		Cl. to IS 210 Gr. 260	Cl. to IS.210 Gr.260	Cl. to IS 210 Gr.260	Cl. to IS 210 Gr. 260	SS 304	SS 304	Cl. IS 210 Gr. 260
4.2	IMPELLER		SS / Bronze	SS / Bronze	SS / Bronze	SS 304	SS 304	SS 304	SS / Bronze
4.3	SHAFT		SS 410	SS 410	SS 410	SS 304	SS 304	SS 304	SS 410
4.4	SHAFT SLEEVES		SS	SS	SS	SS	SS	SS	SS
4.5	STUFFING BOX PACKING		Asbestos free	Asbestos free	Asbestos free	Asbestos free	Asbestos free	Asbestos free	Asbestos free
4.6	BASE PLATE		MS to IS 2062	MS to IS 2062	MS to IS 2062	MS to IS 2062	MS to IS 2062	MS to IS 2062	MS to IS 2062
4.7	FLEXIBLE COUPLING		SS	SS	SS	SS	SS	SS	SS
4.8	BOLTS AND NUTS		High tensile steel	High tensile steel	High tensile steel	High tensile steel	High tensile steel	High tensile steel	High tensile steel
5.0	<u>ACCESSORIES</u>								
5.1	COMPANION FLANGES		YES	YES	YES	YES	YES	YES	YES
5.2	FOUNDATION BOLTS		YES	YES	YES	YES	YES	YES	YES
5.3	RECOM. SP. MAINT. TOOLS		YES	YES	YES	YES	YES	YES	YES

									ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS PUMPS-- DATA SHEET A	SHEET 3 OF 3

SL. NO.	PUMP DESIGNATION ITEMS	UNITS	POTABLE WATER FOR COLONY / FILTERED WATER PUMP.	SERVICE WATER	DM PLANT SUPPLY	CW MAKEUP PUMPS	DM TRANSFER PUMP / DEGASSED WATER PUMPS	DM, CPU REGEN & UF PUMPS	APH WASH PUMPS
1	2	3	4	5	6	7	8	9	10
5.4	RECOM. SPARE PARTS		YES	YES	YES	YES	YES	YES	YES
5.5	ERECTION SUPERVISION		YES	YES	YES	YES	YES	YES	YES
6.0	<u>TESTS AND INSPECTION</u>								
6.1	ALL CASTINGS / CASINGS		REFER RELEVANT INSPECTION SECTION OF SPECIFICATION.						
6.2	SHAFT		REFER RELEVANT INSPECTION SECTION OF SPECIFICATION.						
6.3	IMPELLERS		REFER RELEVANT INSPECTION SECTION OF SPECIFICATION.						
6.4	PUMP ASSEMBLY		REFER RELEVANT INSPECTION SECTION OF SPECIFICATION.						

NOTE:

- 1) Motor rating shall be minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.
- 2) Essential spares to be provided for each type of pump
 - Bearings : Two sets
 - Gland seals/Mechanical : 1 set
 - Couplings : 1 set
 - Coupling pads/bushings : 1 set
- 3) This data sheet is typical for horizontal pumps and applicable for any other pumps to be covered under this Contract.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D 4.7
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CW AND ACW PUMPS - DATA SHEET A		SHEET 1 OF 3

1	Total No. of pumps	NOS.	Refer Write up / Water System Scheme
2	No. of pumps operating	NOS.	Refer Write up / Water System Scheme
3	Pump capacity	Cu.m/hr	Refer Water System Scheme (Total capacity of pumps shall be equal to 105% of cooling water requirement of the unit.
4	Pump Total Head excluding losses in the pump	m	By Bidder [Refer Note 4]
5	Pump speed (max.)	RPM	To limit specific speed to 6000 & ensure adequate NPSH under all conditions
6	Type of pump		Vertical mixed flow
7	Location		Indoor
8	Type of internal element		Non pull out
9	Liquid handled		River water
10	Type of line bearing lubrication		Self
11	Liquid for lubrication		Pumped liquid
12	Type of pump motor coupling		Flexible
13	Thrust bearing location		In pump and motor
14	Pump operating range		Refer Note – 2

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.7
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CW AND ACW PUMPS - DATA SHEET A	SHEET 2 OF 3

15	Motor rating		Minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.
16	Materials of Construction (a) Pump column pipe, discharge elbow (b) Pump bowl and bell mouth (c) Impeller (d) Shaft (e) Line shaft coupling (f) Line shaft bearing (g) All hardware (h) Sole plate / base plate (i) Shaft sleeve (j) Wear ring (k) Gland (l) Gland packing (m) Thrust bearing cooling system, piping & valves		Fab steel to IS 2062 Gr. B with epoxy painting CI to IS 210 FG 260 ASTM A351 A Gr. CF8 ASTM A 276 Type 410 ASTM A 276 Type 410 Cutlass rubber in SS Shell ASTM A193 / 194 -B8M /8M MS IS 2062, Gr. B ASTM A 276 Type 410 ASTM A351 A Gr. CF8 SS304 PTFE SS 304

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.7
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CW AND ACW PUMPS - DATA SHEET A	SHEET 3 OF 3

Note – 1 :

1. Pumps shall be capable of operating from shut-off point to a maximum flow of 10% over the point of intersection between system resistance curve and pump H-Q curve for single pump operation.
2. Channel design shall be as per HIS OR BHRA standard.
3. Pressure drop across Condenser – BTG Vendor.
4. Shop performance tests are to be conducted on all pumps
5. Inspection requirements shall be as per approved QAP
6. System resistance curve shall be furnished super imposed with performance curve during detail engineering for one, two and three pumps in operation.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.8
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan BUTTERFLY VALVES - DATA SHEET A	SHEET 1 OF 2

Sl.N o.	PARAMETERS	DESCRIPTION	
1.	SERVICE	CW PUMP DISCHARGE, CW MAKEUP PUMP DISCHARGE & RAW WATER (RW) PUMP DISCH.	
2.	VALVE SIZE	BY BIDDER	
3.	NO. OF VALVES	1 M + 1 E ON EACH (CW, CW MAKEUP & RW PUMP DISCHARGE)	
4.	COMPANION FLANGE TO BE SUPPLIES	YES	
5.	HANDWHEEL REQD.	YES	
6.	VALVE OPENING / CLOSING TIME	BY BIDDER	
7.	FLOW RATE	BY BIDDER	
8.	FREQUENCY OF OPERATION	INTERMITTENT	
9.	MATERIALS OF CONSTRUCTION	Body	CI IS 260
		Disc	Fabricated IS 2062 Gr 2B *
		Shaft	SS
		Bearings	MFG Std.
		Body seat rings	SS
		Disc seal rings	Natural Rubber
		Seal retaining rings	SS
		Gear casing	MFG STD
		Gears	MFG STD
		Companion Flange Gr.B	Carbon Steel to IS 2062
		Internal hardware	SS316
		External hardware	SS 316

* Fabricated valve is acceptable only for sizes 1000mm and above.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D 4.8
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan BUTTERFLY VALVES - DATA SHEET A	SHEET 2 OF 2

Notes : -

- Bidder shall include end limit switches, torque limit switches and adjustable limit switches suitably as per the logics and interlock controls for motorised valves
- Legend

E - ELECTRIC
M - MANUAL
INT - INTERMITTENT
- Essential spares for each size of butterfly valve

Bearings 1 set each
Body Seat/Disc Seal ring 1 set
Seal retaining ring 1 set
- This data sheet is typical for butterfly valves and is applicable for any other butterfly valve to be covered under this contract

ISSUE
R1

D5

EFFLUENT RECYCLE AND REUSE SYSTEM

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D5
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EFFLUENT RECYCLE AND REUSE SYSTEM	SHEET 1 OF 2
1.0 The waste water treatment system shall be designed to collect waste water from all sources in the power plant and provide treatment to enable it to be reused in the power plant to achieve ZERO DISCHARGE. The quality of effluent shall conform to the requirements of reuse. 2.0 The sources of plant effluent are mainly: a) C.W. system blowdown b) Effluent from WT plant (Pre treatment, DM, UF plants) c) Coal pile area run off water d) Ash Water from ash pond e) Plant drains and boiler blowdown f) Sludge from various clarifiers / tube settlers g) Oily wastes from all transformer yard drains h) Oily wastes from fuel oil unloading and tank farm areas 3.0 C.W system blowdown water shall be supplied to CW blowdown tank cum CMB which would be utilised for meeting the requirement of ash handling system (such as fly ash conditioning, bottom ash disposal, refractory cooling, etc), Coal handling system (dust suppression), gardening and fire protection system. Additional water required for ash handling system shall be pumped from the ash water makeup pumps which is located at raw water pond. CONTRACTOR shall ensure the quality of water at the CMB for horticulture / service purpose as per MoEF/PCB norms. 4.0 Water treatment plant effluent comprises mainly of DM & CPU regeneration waste. These effluents shall be pumped to the CMB after neutralisation. CONTRACTOR shall ensure the quality of water (with suitable treatment) at the CMB for horticulture / service purpose as per MoEF / PCB norms 5.0 The drains from the coal handling area run-off shall be led to a settling tank. Coal particles shall settle down in the settling tank and the clear water from the shall be pumped to the CMB after suitable treatment. 6.0 Plant drains from SG/TG areas shall be led to a sump which shall also collect oily wastes from transformer area and fuel oil farm area. These oily effluents shall be further treated in an oil water separator for removal of oil traces. Oil separators shall be provided at individual locations and should include Transformer yard area. The clear water shall be led to the CMB after treatment process and the dirty oil shall be disposed off in drums separately. Boiler blow down shall be collected directly in CMB.		
		ISSUE R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D5
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EFFLUENT RECYCLE AND REUSE SYSTEM	SHEET 2 OF 2

7.0 Clarifier sludge system shall undergo a complete solid waste management concept. Separated solids after thickener / centrifuge / filter press mechanisms shall be disposed off manually.

8.0 The Blowdown tank / CMB shall have two (2) compartments with each compartment having adequate storage to collect a day's effluents (minimum capacity of CMB shall be as per enclosed water system scheme). Facilities in the form of chemical dosing system, effluent recirculation system, pH correction, etc shall be provided to treat the effluent and bring the quality suitable for reuse. The treated effluent should be utilised as far as possible for horticulture, service water, etc.

9.0 Necessary instruments shall be provided for monitoring the quality of effluents. This system shall be complete with all pipes, valves, flow measuring devices and fittings etc.

10.0 A complete sewage treatment plant shall be provided to treat the sewage from the power plant and the colony. The sewage treatment plant shall be located inside the power plant. Dedicated sewage lines from each building shall be led to the sewage treatment plant. The plant shall consist of primary, secondary and tertiary treatment facilities. Final treated water shall be utilised strictly for horticulture only. Contractor shall adopt state of the art technologies for sewage treatment plant.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D5
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EFFLUENT RECYCLE AND REUSE SYSTEM	SHEET 1 OF 2
<u>GENERAL REQUIREMENTS</u> 1.0 The CONTRACTOR shall be liable for achieving the standards laid down under the Environment (Protection) Act, 1986 and the rules made there under in respect of ambient air quality and industrial / domestic effluent. 2.0 A well designed water spray system will be installed to arrest fugitive emissions generated from coal handling areas. 3.0 The CONTRACTOR shall comply with provisions of latest notifications issued by Ministry of Environment and Forests, Govt. of India, regarding fly ash utilisation. 4.0 The CONTRACTOR shall implement all the control measures as proposed in Rapid Environment Impact Assessment report for environmental management and for utilisation/recycling/reuse of dry fly ash. 5.0 The CONTRACTOR shall comply with standard / directions received from CPCB regarding Corporate Responsibility for Environmental Protection (CREP) recommendations in respect of 17 categories of highly polluting industries (New Thermal Power Plant). 6.0 No treated or untreated effluent will be discharged outside the plant boundary. 7.0 The domestic waste water generated from the residential colony and the plant area shall be treated in an adequately designed sewage treatment plant and the treated effluent shall be utilised for developing the green belt within the plant premises. 8.0 The remaining fly ash / bottom ash shall be disposed off in a well designed ash pond having proper surface sealing. The ash pond effluents shall be properly collected / treated and reused in the plant or for development of green belt. 9.0 The CONTRACTOR shall establish a continuous ambient air quality monitoring system for critical parameters such as RSPM, NOX, SOX, NOX and Lead. 10.0 The CONTRACTOR shall install piezometric wells around the ash pond and carry out monitoring of ground water by drawing samples from these piezometric wells at regular intervals. The number and location of piezometric wells and parameters to be analysed shall be decided in consultation with concern R.O. 11.0 The CONTRACTOR shall establish ground water, surface water and ambient air quality monitoring stations in a radius of 10 km from the plant premises to keep watch on the ambient air and water quality. The number and location of the monitoring stations shall be decided with concern R.O..		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D5
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EFFLUENT RECYCLE AND REUSE SYSTEM	SHEET 2 OF 2
12.0 The CONTRACTOR shall provide infrastructure facility for monitoring stack emissions on each stack and flow measuring devices at each unit of Effluent Treatment Plant. 13.0 The CONTRACTOR shall ensure that ambient air monitoring shall be conducted as per Emission Regulations Part III and monitoring results shall be submitted to the Board. For this purpose an adequate number of stations shall be established for monitoring of ambient air and micro meteorological conditions. 14.0 The CONTRACTOR shall comply with the provisions of manufacture, storage and Implementation of Hazardous Chemicals Rules 1989 and Hazardous waste Rules 1989 and shall submit the details in the prescribed forms of these rules to the board and take necessary safety measures as envisaged in the rules. Also necessary authorisation for disposal of hazardous waste shall be taken from the board separately. 15.0 The CONTRACTOR shall acquire statutory clearances from various departments before starting the work. 16.0 Installation of water meters/systems along with integration of the total quantity of ground water extracted or water drawn from any source. 17.0 Installation of water meters/ flow meters for assessment of water consumption under various categories.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D5
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EFFLUENT RECYCLE AND REUSE SYSTEM - DATA SHEET -A	SHEET 1 OF 2

Sl.No.	Parameters	Units	Description
1	EFFLUENT TREATMENT PLANT		
1.1	QTY		REFER WATER BALANCE
1.2	TOTAL DESIGN FLOW RATE		REFER WATER BALANCE
1.3	TYPE OF TREATMENT PROGRAM		1) MICRO FILTRATION OR CLARIFIER PLANT 2) OIL WATER SEPARATION PLANT 3) REVERSE OSMOSIS PLANT 4) PH CORRECTION SYSTEM 5) ASSOCIATED CHEMICAL DOSING SYSTEMS 6) REJECT HANDLING AND DEWATERING SYSTEM
2	INFLUENTS TO ETP		
2.1	FLOOR WASH DRAINS FROM BOILERS & TURBINE HALLS	M ³ /DAY	MINIMUM 150
2.2	OILY WATER WASTES FROM FUEL OIL UNLOADING & TANK FARM AREAS	M ³ /DAY	MINIMUM 100
2.3	MAIN TRANSFORMER YARD DRAINS	M ³ /DAY	BY BIDDER
2.4	ALL OTHER TRANSFORMER YARD DRAINS	M ³ /DAY	BY BIDDER
2.5	RECOVERED WATER FROM THICKENER & FILTER PRESS	M ³ /DAY	BY BIDDER
2.6	SG1 BLOW DOWN	M ³ /DAY	BY BIDDER

ISSUE
R1

SPEC No: TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D5
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 2 OF 2
EFFLUENT RECYCLE AND REUSE SYSTEM - DATA SHEET -A				
2.7	SG1 BLOW DOWN	M ³ /DAY	BY BIDDER	
2.8	EXCESS FROM CW BLOWDOWN TANK	M ³ /DAY	BY BIDDER	
2.9	DRAINS FROM HVAC PLANTS	M ³ /DAY	BY BIDDER	
2.10	COAL PILE RUN OFF	M ³ /DAY	BY BIDDER	
2.11	ASH WATER RECOVERY	M ³ /DAY	BY BIDDER	
3	TREATED WATER GUARANTEES			
3.1	TOTAL SUSPENDED SOLIDS & TURBIDITY		< 2 UNITS	
3.2	ORGANICS, OIL & GREASE	MG / L	NIL	
3.3	PH	-	NEUTRAL	
3.4	TOTAL DISSOLVED SOLIDS	MG / L	75- 120	
4	BLOWDON TANK/ CENTRAL MONITORING BASIN (CMB)			
4.1	QTY	#	1 NO. WITH 2 EQUAL PARTITIONS	
4.2	NET CAPACITY	M ³	MINIMUM 8000	
4.3	MATERIAL OF CONSTRUCTION		RCC WITH ANTI CORROSSIVE PROTECTION	
	Note :- - Contractor shall provide all necessary sumps ,pumps & instrumentation to make the system complete. - The Effluent treatment plant and sewage treatment plant shall be located at a common place with common chemical storage and dosing facilities.			
				ISSUE R1

D6

FIRE PROTECTION SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 1 OF 8
1.0 FIRE PROTECTION SYSTEM This section covers the fire protection systems suitable for the type of risk/fire for different buildings, equipment, tanks transformers, etc., covering the power plant and associated auxiliaries/facilities completely. Various types of protection systems and associated equipment / system components shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India. CONTRACTOR shall obtain all necessary clearances from Purchaser's Insurance company. 2.0 CODES AND STANDARDS The fire protection system shall comply with the following regulations: Tariff Advisory Committee (TAC) of IRDA India NFPA - National Fire Protection Association (for systems not covered by TAC regulations) 3.0 DESIGN REQUIREMENTS (a) The makes/models and technical features offered for various components/ equipment shall comply with the standards of TAC/ BIS and FM/NFPA/ FOC as applicable. (b) Type of Systems The following type of systems shall be provided for the proposed power plant: - i Hydrant System for entire area of power plant. - ii High Velocity Water Spray System (HVWS) for Interconnecting transformer, reactor, generator transformer, Unit transformer, , main lube oil tank, clean and dirty lube oil tanks, BFP lube oil system, boiler burner front,TG oil canal and LDO/HFO storage tanks, rectifier transformer above ESP roof. - iii Medium Velocity Water Spray System (MVWS) for cable galleries and complete conveyer system, bunker floor, wagon tippler area and conveyor tunnel. - iv Portable Fire Extinguishers - v –VOID– - vi Foam system for fuel oil storage tanks:		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 2 OF 8
(c) It is entirely the responsibility of the CONTRACTOR to obtain the approvals of agencies nominated by Purchaser's insurance company and ensure that the maximum allowable insurance rebates are obtained. CONTRACTOR shall ensure that the procedures are properly met and inspection are carried out as and when required and carry out all the necessary modification / augmentation in this fire protection system. (d) Water supply to the proposed fire protection system shall be provided from the CW blow down tank. Fire water pumps shall be located in the pump house adjoining the tank along with other pumps viz. coal handling / ash handling pumps . Adequate reserve storage shall be provided for fire protection system in line with TAC requirements (a minimum dead storage of 3000 cu.m shall be provided). Separate header shall be provided for Hydrant system and spray system from the outlet of the pump house. Hydrant pump may feed spray system and not vice versa. Space for one more electric pump be kept for future for each system. Separate hydrant and spray pumps shall be provided with provision for interconnection between hydrant and spray system. Near the boiler area two (2) numbers (1 working – motor driven and one standby -diesel engine driven) booster pumps of capacity 137 m3/hr and head of 50 mwc shall be provided. (e) Fire hose cabinets shall be provided on main locations of plant such as turbine floors, ESP area, Fire station, etc. 4.0 HYDRANT SYSTEM The hydrant system shall be provided for all the areas of the power plant. Foam hydrants shall be provided along the fuel oil dyke in addition to hydrants. Horizontal centrifugal pumps with motor and diesel drive of adequate capacity and head shall be provided. In order to provide make-up for minor leakages in the system and to maintain the system pressure, two (2) numbers electric motor driven (1 working and one standby) jockey pumps, Two (2) numbers air compressors (1 working and one standby) and one (1) number hydro-pneumatic tank shall be provided. Jockey pumps shall not be running when main pumps are in operation. Hydrant system shall consist of the underground ring headers, mains (piping)		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 3 OF 8
upto the individual hydrant outlets, risers and above ground branch headers (terminal mains) with isolating valves in case of landing valves / internal hydrants, stand posts, single headed or double headed hydrant valves depending on the hazard covered, hoses, hose couplings, branch pipes and nozzle assemblies and all associated accessories, fittings, valves and specialities, etc. to be included in supply. All accessories required for external, internal and Foam hydrants shall be stored in Hose boxes located alongside of each hydrants. CONTRACTOR shall study the layout given in the plot plan drawing and provide fire protection system accordingly to the complete power plant. Sectionalizing valves shall be provided in the network header as per TAC to isolate a section of the header during maintenance without shutting down the hydrant system. These valves shall be provided after every 4-5 hydrants / Monitor connection from the header pipe. The mode of operation of the hydrant system shall be automatic. Stopping of the pumps shall be manual. Emergency Hydrants System: In this package independent emergency hydrant system with minimum 25 number hydrants and other required accessories to be provided for protecting the power house building over and above the main normal hydrant system which will be connected with service water storage tank located at the top of bunker floor by minimum 200 NB pipe line. This system shall be interconnected with main normal hydrant header with valve and NRV 5.0 HIGH VELOCITY WATER SPRAY (HVWS) SYSTEM This system shall be designed for automatic and remote manual operation for the Interconnecting transformer, Reactor, Generator Transformers, Unit Aux. Transformer and Station Transformer and remote manual operation for Main lube oil tanks, clean, dirty oil tank and LDO/HFO tanks. The location of wet pilot type deluge valve shall be kept away from the equipment to be protected. The detection system for the transformer shall consist of heat sensing detectors of fusible type (quartzoid bulb) mounted on water filled detector pipe network around the equipment to be protected. Another network of water projectors shall be mounted around the equipment to be protected and this network shall be connected to the water supply mains through a deluge valve. The deluge valve shall be normally kept closed by the water pressure in the network against the water pressure in the mains. Remote / manual actuation push button units shall also be provided. Suitable detectors shall be provided for the oil tanks for initiation of HVWS system manually. Fast acting butterfly valves shall be provided as a bypass valve to the deluge valve, so that the butterfly valve can be kept closed and		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 4 OF 8
operated manually in the event of fire, if there is any malfunction of deluge valve. Isolation valves on upstream and downstream side of deluge valve shall be provided. One no. Testing valve of same size to test the deluge valve without spraying water on equipment. Water supply for spray system shall be provided from the spray system header. Sectionalizing valves shall be provided in the spray system header to isolate portion of the header during maintenance without shutting down the spray system. The design shall ensure alternate path of water supply to all other spray system. A section of the header shall be isolated by operating two consecutive sectionalizing valves. All deluge valves with automatic re-set arrangement and Shed shall be provided. Fire wall barrier of minimum 120 minutes rating at transformer yard area shall be provided. 6.0 MEDIUM VELOCITY WATER SPRAY (MVWS) SYSTEM Medium velocity water spray system shall be provided for the cable vault/gallery of station building and coal conveyors. In order to avoid total flooding of the area in the event of fire in a particular zone, the area shall be divided into number of zones. Each zone will have separate water supply network controlled by a deluge valve. The fire in the cable vault/gallery and coal conveyors will be detected by a detection system which will give an electrical signal for the operation of the deluge valve. In the event of fire in a particular zone, the deluge valve of corresponding zone and those of adjacent zone on either side shall be opened. The Bidder shall decide the number of zones. Water required for this system shall be tapped off from spray fire water header. Opening of deluge valve will result in starting of pump. Fast acting butterfly valves shall be provided as a bypass to deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves. Isolation valves on upstream and downstream side of deluge valve shall also be provided. The cable galleries will have number of rows of cable trays and each row will have number of tiers of cable trays. Each of the cable rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall consist of distribution header for each row of cable tray and on these header drop pipes located at an interval not exceeding 3 metres shall be provided so as to cover all the tiers. The MVWS system for coal conveyors shall be provided for both top and return conveyors. Hoppers and feeders shall also be covered. These conveyors shall be divided into number of zones. Operation of this system shall be in similar lines as explained for cable gallery. One no. Testing valve of same size to test the deluge valve without spraying water on equipment		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 5 OF 8
Water supply for spray system shall be provided from the spray system header. All deluge valves with automatic re-set arrangement and shed shall be provided. Fire wall barrier of minimum 120 minutes rating shall be provided in cable vaults and cable galleries 7.0 Foam Protection System 7.1 Automatic foam protection system (Pressure proportionating system) shall be provided for HFO and LDO oil storage tanks located in fuel oil dyke area. The system shall be designed as per NFPA – 11 / TAC. The system shall consist of 2 x 100 % capacity foam concentrate tanks (MS with Epoxy or FRP lining inside the tank) with foam concentrate, , ratio proportioners, foam inductors / ejectors, balance proportioners, foam makers with discharge outlets, associated interconnection piping, valves, fittings, instrumentation etc., The foam shall be Aqueous Film forming Foam (AFFF) type. A tap-off from the hydrant line shall be connected to the foam ejector with a deluge valve, which shall open automatically on detection of fire. 7.2 The operation of foam protection system shall be automatic with the help of fire detection system. The type of fire detection for the fuel oil tank shall be tank mounted addressable flameproof rate of rise of temperature detector with fixed temperature element. 7.3 On detection of fire, the signal generated from detection system shall open the deluge valve provided in the tap-off from the hydrant line and therefore the foam is injected through the ejector in the fuel oil tank, which is under fire 8.0 Fire water storage system and Pressurisation System 8.1 Separate pumps for hydrant and spray system should be provided such that water flow from hydrant pump to spray system but not vice versa. Spary system will be independent from hydrant system. In order to provide make-up for minor leakages in the system and to maintain the system pressure, two (2) numbers electric motor driven (1 working and one standby) jockey pumps, Two (2) numbers air compressors (1 working and one standby) and one (1) number hydro-pneumatic tank shall be provided. The mode of operation of the pressurisation system shall be as follows: (a) This system shall keep the hydrant and spray system under pressurised state under all conditions. (b) The pressurisation in the hydro-pneumatic tank is achieved by means of two air compressors. Two (2) nos. jockey pumps shall assure that the		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 6 OF 8
volume of water inside the hydro-pneumatic tank shall be refilled after reaching the minimum level. (c) Small system leakages are met by make up water supply from hydro-pneumatic tank and electric driven jockey pump. When the water level in the hydro-pneumatic tank falls to a predetermined low level the jockey pump shall start automatically through an impulse from the level switch and pumps water to the hydro-pneumatic tank. The jockey pump shall stop when predetermined high level is reached in the tank through an impulse from the level switch. However compressor shall start only when the water level has reached a high set point and the pressure in the tank falls below the determined set point and stops when the pressure in the tank reaches the determined set point sensed through the pressure switch. While deciding the settings it shall be ensured that the jockey pump and compressor do not start simultaneously. The jockey pump and compressors shall be capable of both start and stop in either auto or manual modes. (d) The local control panel shall have all necessary control for operation and control of the pumps and compressors. (e) All the pumps shall be protected against low suction levels. 9.0 PORTABLE EXTINGUISHERS: Portable Extinguishers with suitable capacity, rating and medium (water CO₂ foam etc.) in adequate numbers covering all the buildings in the power plant premises shall be provided. Trolley mounted 22.5 kg CO₂ extinguisher shall be provided for control room. Adequate number of Dry Chemical Powder (DCP) type extinguishers shall be provided for the control room. For switchgear rooms a combination of adequate number of DCP and CO₂ extinguishers shall be provided. Foam type portable extinguishers shall be provided for controlling oil fires. Sand / water buckets shall be avoided. 10.0 ELECTRICAL SYSTEM REQUIREMENTS Equipments such as motors, control panels and cables shall conform to the requirements specified in electrical section. Following panels for hydrant, HVWS and MVWS systems shall be provided: (i) Local Control Panel complete with battery and charger for diesel engine driven pumps to be located in this water pump house. (ii) Local Control Panels for deluge valves and other accessories for cable galleries where all necessary interlocks, relays, pressure switches, indicating lamps are wired. These panels shall be located near the cable gallery. The power for these panels shall be arranged from the nearest MCC. Necessary interlocks with fire detection panel shall also be provided.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 7 OF 8
(iii) Local Control Panels for deluge valves of Generator transformer, Unit auxiliary transformer, station transformer and ICT and LDO/HFO tanks. Other details shall be same as (ii) above. Additionally for all the transformers, fire protection system 'under test' contact shall be wired to generator control panel. (iv) Local Control Panels for deluge valves of oil tanks in station building. Other details shall be same as (ii) above. (v) Local Control Panel for MVW system for coal conveyors shall be provided in coal handling control room. The panel details shall be same as (ii) above. (vi) Common annunciation cum control panel for hydrant system and spray system shall be provided in the fire water pump house. This panel shall have suitable relays and contacts for remote indication in the main control room. (vii) Annunciation panel in fire station: This panel shall provide annunciation about the status of fire protection system in each area. The annunciation panel specified at (vi) above shall have separate sectors, one each for hydrant, MVWS system and each sector shall provide annunciation for the normal and abnormalities in respective systems. 11.0 LAYOUT REQUIREMENTS The layout shall be strictly in compliance with TAC especially with regard to clearances of mains from buildings/structures, spacing of hydrants, laying out of cables, etc. Building regulations of TAC with respect to staircases, fire proof doors, fire resistant walls etc., and Electrical Regulations of TAC with regard to location of switchgears, segregation of electrical equipment/panel rooms, layout of cables, etc. shall be strictly adhered to. 12.0 DETAILS TO BE FURNISHED BY THE CONTRACTOR ALONG WITH THE BID 12.1 Preliminary Layout of Fire Protection System as detailed above. 12.2 Description of the fire protection system for the proposed plant. 12.3 Details of HVWS system for transformers lube oil tank, LDO/HFO tanks and MVWS system of cable gallery and coal conveyors and water requirement for		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM	SHEET 8 OF 8
each equipment. 12.4 Scheme drawing of complete fire protection system indicating capacity and head of pumps, dead storage, number of hydrants, water flow requirements, for complete system, quantity of pumps etc. 12.5 Data Sheet B as called for in the following sections		
		ISSUE R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A FIRE PROTECTION SYSTEM		VOLUME:III SECTION: D6
TCE.5750A-500-H-001 PART A			SHEET 1 OF 5
SL. NO.	ITEM	UNIT	

1.0	HYDRANT SYSTEM		
1.1	Areas covered by Hydrant system		Refer Plot plan – Complete power plant
1.2	Hydrants		As per IS 5290 (MOC-SS)
1.3	Hose pipes		Unlined flex canvas, UL listed and ISI stamped.(End couplings MOC- SS)
1.4	Hose cabinets (For indoor Foam/Water Hydrants)		As per TAC
1.5	Branch pipes & nozzle		As per IS 903. For branch pipes as per IS 903/IS 2871 (MOC-SS)
1.6	Monitors		As per IS 8422, (Nozzle and swivel bearing MOC-SS)
1.7	Valves		CI-IS 780/IS 5312 rising spindle
1.8	Foam Hydrants component		One nozzle with coupling, one foam branch pipe with nozzle, one cannister with 60 kg foam concentrate, two 7.5 m length hose and one foam concentrate pipe
2.0	HVWS SYSTEM		
2.1	Equipment to be protected		1. Generator transformer
			2. Unit transformer
			3. Main oil tank
			4. Clean oil tank
			5. Dirty oil tank
			6. Main Lub. Oil tank
			7. ICT
			8. LDO/HFO tanks

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK			TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
CHD. BY	AKC	AKC					
DATE	NOV-09	MAY-12					

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A FIRE PROTECTION SYSTEM		VOLUME:III SECTION: D6
TCE.5750A-500-H-001 PART A			SHEET 2 OF 5
SL. NO.	ITEM	UNIT	

			All nozzle MOC shall be SS
3.0	MVWS SYSTEM		
3.1	Design code		NFPA - 15/TAC
3.2	Deluge valve		Wet Pilot valve. Limit switches shall be provided for upstreams & downstream isolation valves
3.3	Total No. of zones (Coal conveyors)		Minimum three zones to be considered for operation
3.4	Total No. of zones for cable gallery		Minimum three zones to be considered for operation
3.5	System actuation		From the alarm & detection system with cross zoning All nozzle MOC shall be SS
4.0	PORTABLE EXTINGUISHERS		
4.1	Design Code		TAC/NFPA-10
4.2	Equipment Standard		As per relevant IS standard Caps MOC -SS
5.0	PUMPS		
5.1	Location		Blow Down Water tank /CMB Pump house
5.2	Capacity & designation		
	I) Hydrant pump a. Qty, Capacity & Head b. Drive type c. Speed II) Spray pumps a. Qty, capacity & Head b. Drive type		by bidder as per TAC. Working and standby pumps to be provided As per TAC 1500 RPM by bidder as per TAC. Working and standby pumps to be provided as per TAC

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK			TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
CHD. BY	AKC	AKC					
DATE	NOV-09	MAY-12					

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III	
TCE.5750A-500-H-001				SECTION: D6	
PART A		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A FIRE PROTECTION SYSTEM		SHEET 3 OF 5	
SL. NO.	ITEM		UNIT		

	c. Speed III) Jockey pump a. Qty b. Capacity and Head c. Drive type d. Speed		1500 rpm 1w + 1s (Common for Hydrant and spray system) Contractor to decide motor driven 2900 rpm
5.3	Material of construction		
	a. Impeller		Bronze to IS 318 Gr.2 / SS
	b. Casing		Cl :IS 210 Gr. FG.260
	c. Shaft		SS 410
	d. Make & model		By bidder
5.4	Diesel engine & accessories		
	a. Make & model		By bidder
	b. Type		Turbo charged
	c. Accessories		As required
5.5	Spares shall be provided strictly in compliance with TAC regulations		
6.0	PIPES		
6.1	Underground piping		All underground pipes shall be provided in trenches in power block area.
	a. Material		MS
	b. Standard (Pipes)		IS 3589/IS 1239 Part – I
	c. Standard (Fittings)		IS 1239 part II for fittings NB 150 & below & Fabricated from parent pipes for NB 200 & above
	d. Type of joints		Welded
	e. Type of protection		IS 10221
	f. Class		Medium (pipes NB200 & above shall have thickness of 6.35 mm)

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC			TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12			5750A		

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
TCE.5750A-500-H-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D6
PART A	DATA SHEET A		SHEET 4 OF 5
	FIRE PROTECTION SYSTEM		
SL. NO.	ITEM	UNIT	

6.2	Above ground piping		
	a. Material		GI for spray system after deluge valve/MS for other system
	b. Standard (Pipes)		IS 1239/IS 3589
	c. Standard (Fittings)		IS 1239 part II/TAC
	d. Type of joints		Medium Note : pipes NB 200 & above shall have thickness of 6.35 mm
	e. Type of protection		Welded / Flanged
	f. Class		Painted Two coats of grey zinc primer. Two coats of enamel paint each 75 microns thickness
6.3	Mobile fire & foam tenders		As per TAC / BIS – IS : 10460
			one vehicle (Make-Mahindra -Bolero) with rescue articles such as Breathing apparatus (BA) set, fire entry suit , first Aid articles & other all fire safety articles / apparatus shall be provided to fire station for handling the catastrophe with seating arrangement for carrying 4/5 fire force.

Note:

1. Pipes shall be hydrotested at 1.5 times the pump shut-off head or twice the design head, whichever is higher.

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC			TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
DATE	NOV-09	MAY-12			5750A		

SPECIFICATION NO. TCE.5750A-500-H-001 PART A	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A FIRE PROTECTION SYSTEM			VOLUME:III SECTION: D6 SHEET 5 OF 5
SL. NO.	ITEM	UNIT		

2. Motor rating shall be minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.
3. Fire alarm, detection and annunciation system shall be offered as specified elsewhere in the specification.

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12					ISSUE R1

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D6
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B FIRE PROTECTION SYSTEM		SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

1.0	<u>HYDRANT SYSTEM</u>		
1.1	External Hydrant	Nos.	
1.2	Internal Hydrant	Nos.	
1.3	Water monitors	(Nos./ size)	
1.4	Hose		
1.5	Hose Boxes	Nos.	
2.0	<u>SPRAY SYSTEM</u>		
2.1	Design code		
2.2	All Coal Conveyors		
2.2.1	Spray water required (for 3 zone operation)	m ³ /hr	
2.2.2	Total no. of Zones		
2.3	Cable Gallery		
2.3.1	Spray water req.(for 3 zone operation)	m ³ /hr	
2.3.2	Total no. of zones	Nos.	
2.4	Transformer		
2.4.1	Max. spray water demand	m ³ /hr	

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

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D6
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B FIRE PROTECTION SYSTEM		SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

	(Transformers)		
2.5	Main Lub oil tank	m ³ /hr	
2.6	Spray water for clean & dirty oil tank.	m ³ /hr	
2.7	Spray water for fuel oil tank	m ³ /hr	

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 – III SECTION: D6
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FIRE PROTECTION SYSTEM - DATA SHEET -C	SHEET 1 OF 1

DATA TO BE FURNISHED AFTER THE AWARD OF CONTRACT

The vendor shall submit the following key drawings / data having engineering information to the Purchaser / engineer as listed below :

- 1.0 Design Philosophy including flow diagram and piping layout.
- 2.0 Hydraulic calculations
- 3.0 Detailed layout of complete FPS like Hydrant, HVWS & MVWS system
- 4.0 Potable Extinguisher layout
- 5.0 Data sheets for all equipment such as pumps , motors, pipes, valves, hydrants, Fire Tender etc.
- 6.0 Schematic wiring diagram & GA of all local control panel.
- 7.0 Pump house piping layout, performance characteristics curve of pump, foundation details of pump, bill of material.
- 8.0 As built drawing.
- 9.0 Operation, erection and maintenance manuals.
10. Isometric view of flow diagram and piping layout for complete fire protection system.

ISSUE
R1

ISSUE NO. R2	TCE.M4-111-12		TATA CONSULTING ENGINEERS LIMITED		SECTION : D 6.2	
	ENQ.SPEC.NO. 5750A-500-H-001		DATA SHEET A		SHEET : 1 OF 1	
			FIRE PROTECTION EQUIPMENT MOBILE TENDER			
GENERAL	1. STANDARD : IS 10460		DESIGN AND CONSTRUCTION (CONTD.)	15. INSTRUCTION BOOK, ACCESSORIES AND EQUIPMENT AS PER CLAUSES 6.1 AND 6.2 OF IS 10460 REQUIRED : YES		
	2. FIRE PUMP : 108 m ³ / hr 8.5 Kg / cm ² (g)			16. SCHEDULE OF EQUIPMENT TO BE SUPPLIED WITH THE APPLIANCE : AS PER APPENDIX-B OF IS 10460 REQUIRED : YES		
	3. WATER TANK : 4.5 m ³			17.		
	4. FOAM TANK : 0.5 m ³			18.		
	5. HOSE REEL REQUIRED : YES			19.		
	6. SUPPLEMENTARY EXTINGUISHING AGENT AS PER APPENDIX-A OF IS 10460 REQUIRED : YES			20.		
	7. FOAM COMPOUND : AS PER IS 4989 PART 1 / 2 / 3			21.		
	8. FOAM CONCENTRATION : By Bidder					
	9. FOAM INDUCTION : AUTOMATIC/ MANUAL		TESTS AND INSPECTION	22. AS PER TAC REGULATIONS AND IS 10460		
	10. MATERIAL SELECTION AND TREAT- MENT : AS PER IS 10460			23.		
	11. PAINTING : FIRE RED SHADE NO. 536 OF IS 5. PAINT SHALL CONFORM TO IS 2932			24.		
	12. CHASIS MAKE: TATA / ASHOK LEYLAND			25.		
	13. QUANTITY:2 NOS. FIRE TENDER			26.		
DESIGN AND CONSTRUCTION	14. ENGINE ELECTRICAL SYSTEM, WATER TANK, HOSE REEL, PUMP, PRIMER, FOAM EQUIPMENT, CONTROL PANEL, BODY WORK AND STOWAGE AND STABILITY : AS PER IS 10460		APPROVED SUB-VENDORS	27.		
				28.		
				29.		
				30.		
				31.		
32.						
.						
REV.NO.				JOB NO.	CLIENT : RRVUNL	
DATE				TCE.	Project: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
REV BY.				5750A		

ISSUE NO. R2	SPECIFICATION NO. TCE.M4-111-12		TATA CONSULTING ENGINEERS LIMITED		SECTION : D6.2	
			DATA SHEET B FIRE PROTECTION EQUIPMENT MOBILE TENDER		SHEET : 1 OF 1	
	ENQUIRY/ SPECIFICATION NO.					
		SL. NO.	BIDDER			
GENERAL	1.	SUB-VENDOR'S NAME				
	2.	ARE ALL ITEMS, EQUIPMENT AND ACCESSORIES AS PER IS 10460 INCLUDED			YES / NO	
	3.	DESCRIPTIVE CATALOGUES LISTING ALL ITEMS, EQUIPMENT AND ACCESSORIES AS PER IS 10460 WITH BRIEF SPECIFICATIONS TO BE ENCLOSED			WHETHER ENCLOSED YES / NO	
	4.	OVERALL DIMENSIONAL DRAWING OF MOBILE FOAM TENDER TO BE ENCLOSED			WHETHER ENCLOSED YES / NO	
	5.	WHETHER MOBILE FOAM TENDER IS TAC APPROVED			YES / NO	
	6.	WHETHER RELEVANT ITEMS ARE ISI MARKED			YES / NO	
	7.					
	8.					
<u>NOTES TO BIDDER</u> 1 DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				SIGNATURE OF BIDDER		
				DATE		

SPEC.NO. TCE.M4-111-12	TATA CONSULTING ENGINEERS LIMITED	SECTION: D6.2
	FIRE PROTECTION EQUIPMENT MOBILE TENDER	SHEET 1 OF 1

DATA SHEET C

**DATA TO BE FURNISHED BY THE VENDOR AFTER THE
ISSUE OF PURCHASE ORDER**

1. List of drawings and documents to be submitted for review, approval and information with scheduled submission dates
2. Quality Assurance Plan (QAP)
3. Detailed dimensional drawings of mobile tender, all items, equipment and accessories with specifications, part list and materials of construction. Wherever necessary, cross-section drawings shall also be furnished.
4. Descriptive catalogues listing all items, equipment and accessories
5. Operation and maintenance manual along with lubrication schedule

ISSUE
R2

D7

POWER PLANT PIPING & VALVES

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 1 OF 22

This Section covers the basic requirements for the all the piping systems, valves and specialties and thermal insulation to be provided for the power plant.

1.0 LINE SIZING

1.1 Sizes of pipelines shall be selected such that the velocity of fluid in pipes does not exceed the following limits under conditions of maximum possible volumetric flow:

Steam

Saturated steam	40 m/s
Wet steam/Exhaust steam	30 m/s

Water

Pump suction	1.5 m/s
Pump delivery	3.0 m/s
Service/Potable water	1.5 m/s

Oil

LDO	2.0 m/s
HFO	1.5 m/s

Gas

Compressed air	15 m/s

1.2 Lower values of velocities than those stated above shall be used to determine line size if dictated by considerations of pressure drop, NPSH, surges, water hammer, etc.

1.3 The design flows considered in line sizing shall not be less than the rated capacities of equipment to which the piping is connected such as pumps, blowers, compressors, valves, flow limiting orifices, etc., or, the system heat and/or mass balance diagrams.

1.4 Sizes of Boiler feed pump suction piping shall be selected to meet the NPSH requirements of the pumps under transient conditions prevailing on loss of steam supply to feed water tank. Similarly for all pumps, NPSH requirements shall be satisfied in line sizing.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 2 OF 22

2.0 MATERIALS

The material specifications of pipelines of various systems shall be as specified in Data Sheet - A attached to this specification.

3.0 WALL THICKNESS

3.1 The calculation of wall thickness required for pipelines subject to internal and/or external pressure shall be based on the formulae and recommendations as given in the applicable codes. Adequate allowances shall be made towards thinning due to bending, weakening at branch connections, threading, commercial tolerances on pipe wall thickness, corrosion and erosion, etc. and the same shall be subject to approval by ENGINEER. In any case a minimum corrosion allowance of 1.0 mm shall be considered while selecting the thickness.

3.2 In case of carbon steel materials, the nominal wall thickness of pipeline shall be not less than the minimum acceptable values given below:

NB mm (inch)	15 (1/2)	20 (3/4)	25 (1)	32 (1 ¹ / ₄)	40 (1 ¹ / ₂)	50 (2)	65 (2 ¹ / ₂)	80 (3)	100 (4)	125 (5)
Min. thickness, mm	3.2	3.2	4.0	4.0	4.0	4.5	4.5	4.8	5.4	5.4
NB mm (inch)	150 (6)	200 (8)	250 (10)	300 (12)	350 (14)	400 (16)	450 (18)	500 (20)	600 (24)	
Min. thickness, mm	5.4	6.3	6.3	6.3	7.1	7.1	7.1	8.0	8.0	

- NB 600 mm to NB 950 mm - 10.00 mm
- NB 950 mm to NB 1200 mm - 12.00 mm

Sizes of NB 32(1¹/₄"), NB 65(2¹/₂"), and NB 125(5") shall not be used in the piping system.

4.0 FLEXIBILITY ANALYSIS

4.1 Formal flexibility analysis calculations shall be carried out in case of pipelines subjected to restrained thermal expansions or contractions. The following piping systems shall be analyzed:

- (a) Pipelines with a maximum operating temperature equal to or greater than 150°C
- (b) Regardless of their operating temperatures, all pipelines

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 3 OF 22
connected to sensitive rotating equipment such as turbines, feed pumps etc. for which limiting values of pipe reaction have been specified by the equipment manufacturer (c) Any other pipeline which in the opinion of the OWNER/ENGINEER requires a formal analysis. 4.2 If it is deemed necessary by the boiler or turbine vendor, a surge analysis shall be carried out by the Contractor to evaluate the effect of closure of valves that are hydrostatically or pneumatically actuated. The pressure rise in the pipeline, additional forces and moments at terminal points and additional stresses shall be calculated. If the stresses or the forces and moments exceed the allowable value, suitable shock absorbers shall be provided by the Contractor. 5.0 LAYOUT AND DETAILING 5.1 All pipelines with size greater than NB 50 mm are considered as shop fabricated piping and detailed piping layout drawings shall be prepared for all such pipelines. The drawings shall be to scale and shall be prepared as plan & sections and shall carry the following minimum details: 5.1.1 Fully dimensioned layout with locating dimensions referred to plant axes and coordinates 5.1.2 Details of all stub connections and other welded attachments as required for anchors, restraints, hangers supports, etc. 5.1.3 Slope, drains and vents 5.1.4 Edge preparation details of weld ends 5.1.5 Mounting and orientation of valves and specialties and maintenance space requirements 5.1.6 Location and tag numbers of hangers, supports, restraints, anchors, etc. 5.1.7 Location and magnitude of cold cuts, if any 5.1.8 Pipe sizes, materials, design parameters, shop and field test requirements 5.1.9 Insulation details 5.1.10 Tolerances, if any 5.1.11 Any specific requirements on shop fabrication and/or field erection 5.1.12 Any other detail considered necessary by the ENGINEER.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 4 OF 22
5.2 Pipelines with a size of NPS 50 mm or smaller are regarded as field routed. CONTRACTOR shall however indicate any specific requirements he may have in regard to the routing of these pipelines. 5.3 Detailed bill of material shall be prepared for all piping systems. In case of shop fabricated piping, the bill of material shall correspond to the layout drawing prepared. 5.4 While routing piping, the following requirements shall be taken into account: 5.4.1 All piping shall be routed so as to avoid interference with other pipes and their hangers and supports, electrical cable trays, ventilation ducting, structural members, equipment, etc. Adequate clearances shall be ensured with respect to the above to accommodate insulation and pipe movements. 5.4.2 All piping shall be grouped where practicable and shall be routed to present a neat and aesthetic appearance. 5.4.3 The piping shall be arranged to provide clearance for the removal of equipment requiring maintenance and for easy access to valves and other piping accessories required for operation and maintenance. Layout drawings shall indicate valve orientations and availability of access to valves and specialties. Layout of all piping shall ensure that all valves including motor operated valves are located as to be accessible conveniently for operation. Valves for operation and maintenance shall have 1.0 m clear approach space. If any of the valves are not accessible, suitable access platform shall be provided by the CONTRACTOR. 5.4.4 Piping shall generally be routed above ground but where specifically indicated/approved by the ENGINEER the pipes may be arranged in trenches or buried. Pipes at working temperatures above the ambient shall however not be buried. 5.4.5 Where steel piping is required to be buried, the pipe work shall be protected from soil corrosion by suitable anti-corrosive treatment as specified. 5.4.6 Overhead piping shall have a minimum vertical clearance of 2.3 meters above walkways and working areas and 7.5 meters above roadways unless otherwise approved by the ENGINEER. 5.4.7 Drains shall be provided, at all low points and vents at all high points as per actual layout regardless of whether the same have been shown in the flow diagrams or not. Pipelines shall be sloped towards the drain points. 5.4.8 Besides at low points, tell tale drains shall be provided at other points as necessary to remove on-line valves and specialties from piping for repair and replacement. Wherever spray water is introduced into steam piping,		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 5 OF 22

At a suitable location downstream, drain pots shall be envisaged along with motor operated drain valves and high and low level switches. The drain valves shall be interlocked with the level switches for automatic operation. For operating temperatures of greater than 400°C, drip leg with drains, operated by a motor operated valve shall be provided. At all other drain locations (operating temperatures less than 400°C) traps shall be provided. All traps shall be provided with strainers, isolating, bypass and free blow valves. Traps shall be thermodynamic type.

5.4.9 Provision shall be made while preparing piping layout to accept control valves, flow measurement element and any other on-line specialty or equipment. Sufficient upstream and downstream lengths shall be provided for flow measuring devices, control valves, de-superheaters and other specialties as required by the respective equipment manufacturer.

5.4.10 At all the screwed valves and screwed connections on equipment, unions shall be provided to facilitate disassembly. Likewise, unions shall also be provided at suitable points on straight length of screwed pipelines.

5.4.11 At all points where pipes pass through concrete floors or brick or other walls, suitable floor collars or wall boxes shall be provided. The CONTRACTOR shall design and furnish the details of the floor collars to the ENGINEER/OWNER.

5.4.12 In the case of flanged pipe work, boxes shall be large enough to permit the passage of the flange.

5.4.13 All pipe racks shall be provided with walkways of 750 mm wide.

5.4.14 Edge preparation shall be as per fig. 4, 5 or 6 of ASME B 16.25 based on the thickness of pipe.

5.5 Hangers and Supports

5.5.1 All piping supports, guides, anchors, turnbuckles, rod hangers, spring hangers, rollers, with incidental structural sub-framing shall be designed by the CONTRACTOR.

5.5.2 The hangers and supports shall be spaced in accordance with standard engineering practice as outlined in applicable codes and standards.

5.5.3 No welded attachments shall be made on the critical piping systems viz. Main steam, Hot reheat, cold reheat, HP / LP Bypass and feed water systems.

5.5.4 The CONTRACTOR shall ensure that the location of the hangers and supports shall not increase the forces and moments on the equipment beyond their allowable values.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 6 OF 22
5.5.5 If severe vibration of piping is encountered in systems over which the CONTRACTOR has control or if the piping system is to be subjected to shock loading, hangers shall be supplemented by vibration-control equipment of an approved design. 5.5.6 At locations where lateral or axial movement is expected, the hangers shall be provided with suitable linkages to permit swing. All hangers shall be designed to be vertical in the hot position unless otherwise approved by the ENGINEER. 5.5.7 In order to minimize any horizontal force components of the dead weight or any binding of the pin or rocker joints used on the hangers, the hanger rods should be as long as possible. In critical piping systems, the length of the hanger assembly capable of swinging shall not be less than 20 times the maximum expected pipe movement in the horizontal plane at the hanger location. It is recommended in case of main steam piping to provide for a hanger rod length of at least 5-6 meters wherever feasible. 5.5.8 Constant support type of hangers shall be adopted at all locations on critical piping excepting where the smallness of vertical movements of pipe justifies the use of variable spring hangers. 5.5.9 As far as practicable, connections of hangers to supporting structure shall be achieved without welding to structural members. If welding is inevitable, adequate factor of safety shall be considered in the design and specification of the weld. 5.5.10 The attachment of support brackets to brick walls shall be avoided as far as possible and where this is not possible, details of the attachment shall be furnished to the ENGINEER for his approval. Under unavoidable circumstances, when medium or heavy brackets are bolted to walls, back plates of adequate size and thickness shall be furnished to distribute the load against the wall. Where the use of a back plate is not practical, the brackets shall, be fastened to the wall in an approved manner. 5.5.11 Diameter of hanger rods for piping NB 50 mm and smaller shall not be less than 10 mm and for piping with size NB 65 mm and larger shall not be less than 13 mm. 5.5.12 All components for hangers such as turn buckles, clamps, etc. shall be of forged steel. 5.6 <u>Fittings and Flanges</u> 5.6.1 Branch connections in piping shall be made by the use of wrought or forged seamless fittings such as tees, laterals and crosses. Small stubs as may be required for instrument, drain and vent connection may be provided in the form of weld outlet fittings or forged couplings. Intersection welds are acceptable only in the event of non-availability of fittings.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 7 OF 22

5.6.2 Wherever pipe bends are employed for change of direction the same shall be to a radius of 5 times the pipe diameter.

5.6.3 Mitred bends may be adopted for piping systems upto a design pressure 10 bar (g) only. Mitre angle shall not exceed 22.5 degrees.

5.6.4 Slip-on type of flanges may be only upto a maximum pressure rating of ANSI 300 lbs. In case of higher pressure ratings, weld-neck type of flanges shall be employed.

5.6.5 For critical piping such as main steam, cold reheat, hot reheat, HP / LP Bypass, boiler feed discharge etc, only wrought fitting shall be used. Fabricated fittings are not acceptable.

5.7 **Dimensional Standards**

5.7.1 Uniform dimensional standards for all piping components shall be employed to ensure compatibility with each other.

5.7.2 Nominal pipes sizes and pipe outside diameters shall generally be as per ANSI B36.10. In case of deviation CONTRACTOR shall bring it to the specific attention of ENGINEER for prior approval stating reasons for the deviation.

5.8 **Instrument Connections**

5.8.1 Unless otherwise called for by OWNER all thermowell stubs shall have an internal threading to M33 x 2.

5.8.2 All stubs for pressure or flow measurement for pipelines with a maximum working pressure equal to or above 62 bar (g) or with a maximum working temperature equal to or above 350°C shall be NPS 25 mm and double root valves shall be used.

5.8.3 Stubs for pressure or flow measurement on pipelines with a maximum working pressure less than 62 bar (g) and a maximum working temperature less than 350°C shall be of NPS 15 mm size and single root valves can be used.

5.8.4 Measurement stubs on fuel oil lines shall be of NPS 25 mm size and provided with two root valves.

5.9 **Drain and Vent Connections**

5.9.1 Drain and vent connections on pipelines shall be at least of NPS 25 mm size.

5.9.2 For pressure and temperature conditions as defined in Clause 5.8.2, double isolating valves shall be used on drain and vent lines. For pressure and temperature conditions as defined in Clause 5.8.3, single

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 8 OF 22

isolating valves are considered adequate. Where with single root valve, instrument and root valve are not accessible, double root valve shall be provided with one root valve near the tap off and the second root valve with instrument at accessible point. For fuel oil drain and vent lines double isolation valves shall be provided irrespective of the pressure and temperature.

6.0 **WELDING AND HEAT TREATMENT**

All heat treatment, welding, post and pre weld temperatures shall be as per the code ASME B31.1.

7.0 **INSPECTION & CLEANING**

7.1 All pipes shall be hydro tested at shops for pressures as per standards and all erected piping shall be tested 1.5 times the design pressure. All other inspection requirements shall be as per the enclosed data sheet – A1.

7.2 All hot bent, forged formed, fabricated and straight pipes shall be chemically cleaned, pickled or wire brushed and purged with air blast or shot/grit blast to remove all sand and scale from the inner surface as applicable.

7.3 The Contractor shall carryout the following cleaning after hydro test.

- (a) All piping shall be mass flushed, in addition to the specific cleaning operations as described below, as required.
- (b) Main steam, cold and hot reheat piping and HP & LP bypass piping shall be steam blown.
- (c) Extraction steam, condensate, boiler feed suction and discharge, heater drains and vents shall be alkaline flushed.
- (d) Auxiliary steam piping and associated steam lines, heavy fuel oil piping shall be steam blown.
- (e) Compressed air piping shall be blown by air.
- (f) Turbine lubricating oil piping shall be pickled

8.0 **PAINTING AND CORROSION ON PROTECTION**

8.1 All un insulated piping systems, hangers and supports shall have two coats of red oxide Zinc Chromate primer (conforming to IS 2074) with minimum dry film thickness (DFT) of 25 microns per coat and two coats of finish paints using enamel paint to give a minimum total DFT of 100 microns (after two coats of primer and two coats of finish paint). Shades shall be as per IS 5 or as indicated by Owner /Engineer. Service of the pipe/line designations shall be painted on all pipes at visible locations.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 9 OF 22
8.2	Before application of paint, Contractor shall clean the pipes of all mill scale, dirt dust, soot, grease, rust etc.	
8.3	All pipelines, piping components shall be adequately protected against corrosion during manufacture, fabrication, shipment and storage by appropriate protective paint.	
9.0	UNDERGROUND PROTECTION	
9.1	Where pipelines are buried, underground protection shall be provided for the piping system as indicated any one of the methods given below:	
	(a)	Coal tar primer, coal tar enamel, inner wrap of fibreglass, final outer wrap of enamel impregnated fibreglass. Total thickness of coating shall not be less than 4.0 mm.
	(b)	With anti-corrosive tape of 4 mm thick conforming to IS-10221 and AWWA C 203-93.
9.2	Pipe surfaces shall be cleaned by shot or sand blasting before application.	
9.3	Tests to be carried out after application	
	(a)	Bond/Adhesion test
	(b)	Holiday test
10.0	SPECIFIC REQUIREMENTS OF PIPING SYSTEMS	
	These shall be as detailed out in data Sheet A1	
11.0	THERMAL INSULATION	
11.1	CONTRACTOR shall provide thermal insulation for all hot piping and equipment with fluid temperatures greater than 60°C.	
11.2	Specific requirements of thermal insulation are detailed out in Data Sheet-A2. Further, the insulation thickness indicated in Data Sheet - A2 shall be regarded as minimum acceptable thickness. These minimum acceptable thickness are OWNER's estimate based on use of mineral wool blankets as insulating material with a surface temperature of 60°C or less over the insulation finish and Contractor is advised to ensure that the thickness envisaged by OWNER are adequate to guarantee a surface temperature measured over the finish of not greater than 60°C. In case the Contractor estimates that higher insulation thickness are required, the same shall be included and clearly indicated in the offer under the 'Schedule of Technical Deviations' of this specification.	
11.3	Contractor shall submit with his offer a schedule of insulation thickness proposed by him along with supporting calculations. The calculations	

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 10 OF 22

shall be based on thermal conductivity values certified and guaranteed by the insulation supplier who shall base his guarantee on actual tests conducted by recognized test houses. Calculation of insulation shall be based on standard BS 5970/IS 3677. No credit would be claimed by the insulation manufacturer over and above those actually recognized by international standards. However, if the CONTRACTOR is offering insulation material with superior thermal conductivity this value shall be suitably substantiated by tests.

- 11.4 CONTRACTOR shall demonstrate to the OWNER/ENGINEER the surface temperature of the insulation at site. For indoor piping, the temperature shall be measured at the middle of one segment of pipe run at different points. These temperatures shall be taken as representative temperatures for that length of piping. If the temperature measured is higher than that guaranteed, the whole length shall be replaced or additional thickness added to meet the surface temperature. Two measurements shall be taken at the measuring points (one at the top and another at the bottom).

12.0 VALVES

12.1 DESIGN AND CONSTRUCTION FEATURES

The following design and construction features of valves shall be complied with.

- 12.1.1 All gate and globe valves shall be of rising stem, outside screw and yoke type. The design of valves shall ensure a streamlined passage and gate valves shall have low pressure drop. The seats and discs shall be easily renewable and/or shall be suitable for easy refracting and grinding. Valve discs shall be of such design as to keep the seats tight when the valve body is subjected to pressure, temperature variations and piping stresses. Gate valves shall close in both flow directions.
- 12.1.2 All globe valves shall be capable of being closed against pressure.
- 12.1.3 All valves end details shall be as specified in Data Sheet-A3. In the case of all end-welded valves, the stub ends of the valves shall project from the valve body a sufficient amount to ensure that the welding process will not distort the valve body and internal parts.
- 12.1.4 Valves for regulating duties shall be of the globe type with tapered plug type disc.
- 12.1.5 Hardness of disc seating surface shall be minimum of 350 BHN and a minimum differential hardness of 50 BHN shall be provided between disc and seat to prevent galling. This is not applicable for stellited seats.
- 12.1.6 Check valves of sizes 400 mm NB and larger shall have dash pot arrangement.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 11 OF 22

12.1.7 All gate and globe valves shall have back-seating arrangement to facilitate easy replacement of packing with the valve in service.

12.1.8 All valves shall be so designed that the hand-wheel moves in a clockwise direction to close the valve. The face of the hand-wheel shall be clearly marked with the words 'OPEN' and 'CLOSE' and an arrow to indicate the direction for opening. All hand-wheels shall be fitted with nameplate.

12.1.9 Piston lift check valves shall have accurately guided pistons so that the pistons are cushioned in their cylinders as they move up.

12.1.10 All gate, globe, Y-type and angle valves intended for manual operation and falling under the following categories shall be equipped with a gear operator for ease of operation and to ensure fast and tight closure:

ANSI PRESSURE RATING

VALVE SIZES FOR WHICH GEAR
OPERATOR IS REQUIRED

Class 300 and below
Class 600 and above

350 mm and larger
200 mm and larger

12.1.11 All gate valves falling in the following categories shall be provided with integral bypass valve. Bypass size shall conform to MSS-SP-45 as a minimum standard unless otherwise specified in Data Sheet-A3. The bypass valve shall be hand operated unless otherwise specified in Data Sheet-A3. Pipe for bypass shall be at least Schedule 80 seamless and of a material of the same nominal chemical composition and physical properties as that used for the main line. Orientation of bypass arrangement shall be subject to the approval of OWNER/ENGINEER.

ANSI PRESSURE RATING

VALVE SIZES FOR WHICH
BYPASS IS REQUIRED

Class 600 and over
Class 300 & 150

200 mm and larger
350 mm and larger

12.1.12 All gate valves of ANSI pressure-rating class 150 and 300 shall have solid or flexible wedge and ANSI pressure rating class 600 and above shall have flexible or parallel slide type of wedge.

12.1.13 Valves with flexible wedge shall have provision for relieving the pressure in the neck of the valve when the valve is in the closed position.

12.1.14 All valves of ANSI pressure rating upto class 600 shall have bolted bonnet construction and class 900 and above shall have bonnet construction of the pressure seal type. Pressure seal valves shall have

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 12 OF 22
stainless steel inlay in the gasket area and silver-plated gaskets or other acceptable proven features. 12.1.15 All carbon steel valves of ANSI pressure rating upto class 150 and 300 shall have stainless steel trim (13% Cr) unless otherwise specified in Data Sheet and ANSI pressure rating class 600 and above shall have stellited trim. 12.1.16 All alloy steel valves shall have stellited seats. 12.1.17 All valves of ANSI pressure rating upto class 900 and higher shall have yoke with anti-friction bearing arrangement. 12.1.18 Valves that are to be kept in full 'OPEN'/'CLOSE' position shall be provided with a non-detachable locking arrangement. The locking arrangement provided shall be subject to approval by the OWNER. 12.1.19 Valves operating under vacuum conditions shall have glands with water sealing. The inlet and outlet connections shall be NB 15mm. The CONTRACTOR shall indicate the maximum and minimum sealing water pressure and the required flow rate. 12.1.20 Motor actuators for motor operated valves shall meet requirements indicated elsewhere in the specification. 12.1.21 Edge preparation of valves shall be as per fig. 4, 5 or 6 of ASME B 16.25 based on the connecting pipe thickness. 12.2 CLEANING Prior to factory inspection, all manufacturing waste, such as metal chips and filings, welding rods and stubs, rags, debris and all other foreign matter shall be removed from the interior of each valve. All mill scale, rust, oil, grease, chalk, crayon, paint marks and other deleterious material shall be removed from the interior and exterior surfaces. At the time of shipment, valves shall be clean inside and outside. 12.3 INSPECTION AND TESTS 12.3.1 Inspection and tests shall be as per the Quality Assurance requirements. 12.3.2 Defects in excess of acceptance standards shall be removed by suitable means. If removal of surface defects does not result in reduction in wall thickness below 5% of intended thickness of metal at that location, the area shall be blended smoothly into the surrounding surface. Where defect removal results in a wall thickness below the above, resultant cavity may be repaired by welding. The procedure and operator shall be qualified as per applicable standards. Major weld repairs shall be stress relieved or heat treated in accordance with ASME Section VIII Division I-UCS 56.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 13 OF 22
12.3.3	The required area shall be re-examined and the acceptance standards shall be as in the original examination.	
12.3.4	Weld repairs made as a result of radiographic examination shall be radiographed after welding. Repairing a particular area more than 2 times is not permitted and the component shall be rejected. The acceptance standards for welds shall be as per ASME Boiler and Pressure Vessel Code, Section VIII, Division I, UW - 51.	
12.3.5	Prior approval shall be obtained from the OWNER/ENGINEER before taking up major weld repairs (major weld repair - when depth of repair exceeds 20% of thickness or 1 inch whichever is smaller). Mapping of major weld repairs is also required.	
12.3.6	All valves shall be tested hydrostatically for strength, tightness of seats and tightness of back seating at the pressures indicated in Data Sheet-, in accordance with MSS-SP 61, and "Hydrostatic Testing of Steel Valves". Water used for hydrostatic testing of valves with stainless steel components shall not have chloride content exceeding 20 ppm. Clean potable water may be used for testing of all other valves.	
12.3.7	All valves except check valves shall be tested for seat tightness by air at a pressure of 6-bar (g) on both sides of seat.	
12.3.8	All check valves shall also be hydro tested at 25% of the seat hydro test pressure.	
12.3.9	All valves shall be checked for correctness in respect of specified end details as per applicable standards.	
12.4	PAINTING AND CORROSION PROTECTION Two coats of primer of thickness 35 microns for each coat shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion, after release has been given for painting and before despatch. The use of grease or oil, other than light grades mineral oil, for corrosion protection is prohibited. Bores of all valves shall be covered immediately after testing, draining and drying with suitable plastic end covers to avoid ingress of foreign materials.	
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED				VOLUME: III SECTION: D7	
PART – B		RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES				SHEET 14 OF 22	
<u>DATA SHEET A</u> <u>SPECIFIC REQUIREMENTS FOR PIPING</u>							
<u>SL.NO.</u>	<u>SERVICE</u>	<u>SIZES</u>	<u>PIPES</u>	<u>FITTINGS</u>	<u>FLANGES</u>	<u>GASKETS</u>	<u>LINE JOINT</u>
1	HOSES FOR HFO TANKER HEATING (STEAM/ CONDENSATE)	ALL	CARBON STEEL – ELECTRO ZINC PLATED	NA	NA	NA	NA
2	HOSES FOR FUEL OIL UNLOADING	ALL	NEOPRENE	NA	NA	NA	NA
3	STEAM LINES	≥ NB65	ASTM A106 Gr.B	ASTM A 234 WPB	ASTM A105	SPIRAL WOUND SS	BW
		≤ NB50	ASTM A106 Gr.B	ASTM A105	ASTM A105	SPIRAL WOUND SS	SW
4	CONDENSATE LINES	≥ NB65	ASTM A106 Gr.B	ASTM A 234 WPB	ASTM A105	SPIRAL WOUND SS	BW
		≤ NB50	ASTM A106 Gr.B	ASTM A105	ASTM A105	SPIRAL WOUND SS	SW
5	FUEL OIL UNLOADING LINES	ALL	IS1239 PT-1 FOR ≤ NB 150/ IS3589 FABRICATED FROM IS 2062 PLATES FOR ≥ NB65	ASTM A 234 WPB (FOR > NB65) ASTM A 105 (FOR < NB50)	ASTM A105	GRAPHOIL	BW FOR ≥ NB65 SW FOR ≤ NB50
6	FUEL OIL PUMP DISCHARGE LINES	> NB65	API 5L Gr.B (ERW)	ASTM A 234 WPB	ASTM A105	GRAPHOIL	BW
		< NB50	API 5L Gr.B (ERW)	ASTM A105	ASTM A105	GRAPHOIL	SW
							ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 15 OF 22

7	INSTRUMENT AIR & POTABLE WATER	> NB65	IS1239 GALVANISED	ASTM A 234 WPB GALV.	ASTM A105 GALV.	TEFLON (Asbestos free)	TE
		< NB50	IS1239 GALVANISED	ASTM A105 GALV.	ASTM A105 GALV.	TEFLON (Asbestos free)	SE
8	DEMINERALISE D WATER (Refer Note:6)	NB 50 & BELOW	ASTM A312 TP 304 (ERW)	ASTM A 182 F304	ASTM A 182 F304	TEFLON (Asbestos free)	SW
		NB 65 TO NB 150	ASTM A312 TP 304 (ERW)	ASTM A 403 WP 304	ASTM A 240 TP 304	TEFLON (Asbestos free)	BW
		NB 200 & ABOVE	ASTM A312 TP 304 (ERW)	SAME AS PIPE	ASTM A 240 TP 304	TEFLON (Asbestos free)	BW
9	CONDENSER COOLING / AUXILIARY COOLING WATER AND SERVICE WATER SYSTEM (FRESH WATER APPLICATION)	UPTO NB 150	IS 1239 PT-1 HEAVY GRADE	IS 1239 PT-1 HEAVY GRADE	ASTM A105		BW
		NB 200 TO NB 350	IS 3589 (ERW)	ASTM A 234 WPB	ASTM A 105	TEFLON (Asbestos free)	BW
		400 NB & ABOVE	IS3589 PLATE FORMED	ASTM A 234 WPB OR MITRES	ASTM A 105		BW

Notes:

1. All pipes shall be preferably shop fabricated. However large dia pipes (> 500 mm) shall be site fabricated.
2. Each length of pipe shall be hydro-tested at shop as per the Codes/Standards.
3. Blind flanges on SS Pipe lines shall be to ASTM A 240 TP 304. Stub ends shall be used at flanged connections.
4. All branch connections shall be wrought (seamless) or forged steel based on the size and availability based on ASTM Standards.
5. All gaskets shall be asbestos free type.
6. Cast iron valves shall be provided for water system and cast steel valves shall be provided for compressed air system.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 16 OF 22

7. Ball valves or Plug valves shall be provided for oil and air system.
8. All painting with primer coats (2 coats each) shall be provided for the piping and all hangers.

ESSENTIAL SPARES FOR PIPING SYSTEM

1. Pipes	:	5% of total straight length for each size and material grade of pipe
2. Gaskets	:	100% total requirement of gaskets
3. Fasteners (Flanges, Unions, etc.,) and fittings	:	10% of total requirement of fasteners
4. Hangers and supports	:	5% spare spring box assembly for each type and rating of spring provided
5. Pipe clamps	:	20% spare pipe clamp / attachment for each size & category.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage-V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES		SHEET 17 OF 22
1.0	SPECIFIC REQUIREMENT FOR THERMAL INSULATION		
1.1	Pipes		LIGHTLY BONDED MINERAL WOOL/
1.2	Equipment		ALL EQUIPMENT AS APPLICABLE
2.0	Finishing Cement		NA
3.0	Sheathing Material		ASTM B 757 - 19000
3.1	For Pipes	}	ALUMINUM AS PER 757- 19000 (NEW DESIGNATION)/ Gr SIC ¹ / ₂ H
3.2	For Equipment	}	(OLD) OR ALUMINUM ASTM
		}	SB 209 A9 1060, TEMAR H14 OR EQUIVALENT
		} THICKNESS :	SIZE OVER OUTSIDE
		}	DIA OF INSULATION
		}	NB 450MM & ABOVE - 1.219 MM
		}	NB 150MM & ABOVE - 0.914 MM
		}	NB 150MM & LESS - 0.711 MM
4.0	Design thickness is/should be based on:		
	(a) Station ambient temperature		35°C (FOR INSULATION PURPOSE ONLY)
	(b) Outer surface temperature on surface of sheathing		60°C UNDER STILL AIR CONDITION
5.0	Recommended thickness furnished		NO
6.0	Tests		AS PER CODE
7.0	Codes & Standards		IS 8183 IS 14146 BS 5970 IS 8154 BS 3958

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 18 OF 22

8.0 Density of Insulation

a) LIGHTLY BONDED MINERAL WOOL

TEMP. >400°C - 150
kg/m³

TEMP. <400°C - 100
kg/m³

Notes

For insulation thickness calculation maximum thermal conductivity indicated in relevant Indian Standard (BIS) shall be considered.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED								VOLUME: III SECTION: D7	
PART – B		RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES								SHEET 19 OF 22	
SCHEDULE OF THICKNESS FOR THERMAL INSULATION											
Temp °C	51-100	101-150	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-575
PIPE DIA	INSULATION THICKNESS (IN mm)										
15 mm (1/2")	25	25	40	40	50	65	80	90	100	115	125
20 mm (3/4")	25	25	40	50	50	65	80	90	100	125	125
25 mm (1")	25	40	40	50	65	80	90	100	115	125	140
32 mm (1-1/4")	25	40	40	50	65	80	90	100	115	140	140
40 mm (1-1/2")	25	40	40	50	65	80	90	115	125	140	150
50 mm (2")	25	40	40	50	65	80	100	115	125	150	165
80 mm (3")	25	40	50	50	80	90	100	125	140	165	170
100mm (4")	40	50	50	65	80	90	115	125	150	165	190
150 mm (6")	40	50	50	65	80	100	115	140	165	190	200
200 mm (8")	40	50	50	65	80	100	125	140	165	190	215
250 mm (10")	40	50	50	65	90	115	125	150	175	200	215
300 mm (12")	40	50	65	75	90	115	140	150	190	215	225
350 mm (14")	50	65	75	75	90	115	140	165	190	215	225
400 mm (16")	50	65	75	75	90	115	140	165	190	215	240
450 mm (18")	50	65	75	75	90	115	140	165	190	215	240
500 mm (20")	50	65	75	100	115	115	140	165	200	225	240
600 mm (24")	50	65	75	100	115	115	140	175	200	240	250
625 mm (25")	50	65	75	100	115	115	140	175	200	240	250
650 mm (26")	50	65	75	100	115	115	150	175	200	240	250
700 mm (28")	50	65	75	100	115	115	150	175	215	240	300
800 mm (32")	50	65	75	100	115	125	150	175	215	240	300
900 mm (36")	50	65	75	100	115	125	150	175	215	240	300
950 mm (38")	50	65	75	100	115	125	150	175	215	240	300
1000 mm (40") & above flat surfaces	50	65	75	100	115	140	170	215	250	300	350
INSULATION THICKNESS IS CALCULATED CONSIDERING ALUMINIUM SHEATHING FOR THE AMBIENT TEMPERATURE OF 30 ⁰ C. SURFACE TEMPERATURE 60 ⁰ C.											
											ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 20 OF 22

SPECIFIC REQUIREMENT FOR VALVES

SL NO.	SERVICE	SIZE	BODY/ BONNET	DISC	STEM	HAND WHEEL	VALVE ENDS
1.	STEAM LINES (TEMP<400°C) , FEED WATER, CONDENSATE BLOW DOWN, STEAM TRACING	>65NB	ASTM A216 Gr WCB	ASTM A216 Gr WCB	ASTM A182 Gr F6a	ASTM A47 Gr 32510	BUTT WELDED
		< 50 NB	ASTMA105	ASTM A182 Gr F6a	ASTM A182 Gr F6a	ASTM A47 Gr 32510	SOCKET WELDED
2.	HFO, LDO, LUBE OIL, SLUDGE, OILY WATER DRAIN	>65NB	ASTM A216 Gr WCB	ASTM A216 Gr WCB	ASTM A182 Gr F6a	ASTM A47 Gr 32510	BUTT WELDED
		< 50 NB	ASTMA105	ASTM A182 Gr F6a	ASTM A182 Gr F6a	ASTM A47 Gr 32510	SOCKET WELDED
3.	COOLING WATER, TREATED WATER, FIRE WATER, FIRE FOAM, SERVICE AIR	>65NB	IS 210 FG 260	IS:210 FG260	ASTM B132 Gr-A / IS320 HT2	ASTM A47 Gr 32510	FLANGE D FLAT FACE
		< 50 NB	ASTM B62/ IS318Gr.2	ASTM B62 / IS:318 Gr.2	ASTM B312 Gr-A / IS320 HT2	ASTM A47 Gr 32510	SCREW TYPE
4.	INSTRUMENT AIR SYSTEM, POTABLE WATER SYSTEM (BALL VALVES)	>65NB	ASTM A216 Gr WCB	ASTM A216 Gr WCB	ASTM A182 Gr F6a	ASTM A47 Gr 32510	FLANGE D
		< 50 NB	ASTM B62 / IS 318 Gr.2	ASTM B62 / IS:318 Gr.2	ASTM B312 Gr A / IS320 HT2	ASTM A47 Gr 32510	SCREW TYPE
5.	SERVICE AIR SYSTEM, (BALL VALVES)	>65NB	ASTM A216 Gr WCB	ASTM A216 Gr WCB	ASTM A182 Gr F6a	ASTM A47 Gr 32510	BUTT WELDED
		< 50 NB	ASTM A105	ASTM A182 Gr F6a	ASTM A182 Gr F6a	ASTM A47 Gr 32510	SOCKET WELDED
6.	DM WATER	>65NB	ASTM A 351 CF8M	ASTM A 351 CF8M	ASTM A 351 CF8M	ASTM A47 Gr 32510	BUTT WELDED
		< 50 NB	ASTM A 182 F304	ASTM A 182 F304	ASTM A 182 F304	ASTM A47 Gr.32510	SOCKET WELDED

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 21 OF 22

- NOTE:
1. Testing of body, seat and back seat shall be as per ANSI B16.34
 2. For water system with sizes greater than NB200 butterfly valves shall be used and shall conform to AWWA C-504.
 3. IBR approval for valves shall be provided wherever applicable.
 4. Valve leakage tests shall be as per IS – 6157.
 5. Control valves leakage class shall be V or VI.

SPARES FOR VALVES

START-UP SPARES

1	BONNET/COVER GASKETS :	1 EACH FOR EVERY SET OF 4 VALVES & SPECIALITIES OR PART THEREOF, SUBJECT TO A MINIMUM OF 10 FOR EACH SIZE AND TYPE OF VALVE/SPECIALITY.
2	GLAND PACKINGS	1 SET PER VALVE/SPECIALITY FOR EACH SIZE AND TYPE
3	VALVE STEMS FOR SIZES 50 mm NPS AND SMALLER	2 FOR EVERY SET OF 15 VALVES/ SPECIALITIES OR PART THEREOF, SUBJECT TO A MINIMUM OF 25, FOR EACH SIZE AND TYPE VALVE/ SPECIALITY.
4	FLANGE GASKETS FOR RUBBER EXPANSION JOINTS	4 PER EXPANSION JOINT
5	LAPPING TOOL	ONE NUMBER FOR EACH SIZE/TYPE AND PRESSURE RATING FOR VALVES NB150 AND ABOVE AND ANSI CLASS 600 AND ABOVE.

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D7
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan POWER PLANT PIPING & VALVES	SHEET 22 OF 22

ESSENTIAL SPARES

1	BONNET/COVER GASKETS	1 EACH FOR EVERY SET OF 4 VALVES/ SPECIALITIES OR PART THEREOF, SUBJECT TO A MAXIMUM OF 10, FOR EACH SIZE AND TYPE OF VALVE/ SPECIALITY.
2	GLAND PACKINGS	1 SET PER VALVE/SPECIALITY FOR EACH SIZE AND TYPE.
3	VALVE STEMS FOR SIZE 50 mm NPS AND SMALLER	2 PER SET OF 15 VALVES OR PART THEREOF, SUBJECT TO A MAXIMUM OF 25, FOR EACH SIZE AND TYPE OF VALVE.
4	VALVE STEMS FOR SIZES 65 mm NPS AND LARGER	1 PER SET OF 10 VALVES OR PART THEREOF, SUBJECT TO A MAXIMUM OF 5, FOR EACH SIZE AND TYPE OF VALVE.
5	DISC OR DISC SEAT, AS APPLICABLE, FOR GATE, GLOBE AND SAFETY VALVES AND DISC WITH HINGE PIN FOR CHECK VALVES	1 PER SET OF 10 VALVES OR PART THEREOF FOR EACH SIZE AND TYPE OF VALVE.
6	BODY SEAT RING FOR GAT,E GLOBE AND CHECK VALVES	1 PER SET OF 25 VALVES OR PART THEREOF, FOR EACH SIZE AND TYPE OF VALVE.
7	YOKE BUSHING FOR GATE AND GLOBE VALVES	1 PER SET OF 25 VALVES OR PART THEREOF SUBJECT TO A MAXIMUM OF 5, FOR EACH SIZE AND TYPE OF VALVE.
8	RESERVED	
9	TRAP DISC AND SEAT	1 SET OF DISC AND SEAT FOR EVERY 15 OR PART THEREOF, SUBJECT TO A MAXIMUM OF 50 SETS, FOR EACH SIZE AND TYPE.
10	BUCKET, LEVER AND GUIDE PIN FOR BUCKET TRAPS	1 SET OF BUCKET, LEVER AND GUIDE PIN PER SET OF 10 TRAPS OR PART THEREOF SUBJECT TO A MAXIMUM OF 10, FOR EACH SIZE AND TYPE OF TRAP.
11	S S SCREEN FOR TRAPS WITH INTEGRAL STRAINERS	1 PER SET OF 6 TRAPS OR PART THEREOF, SUBJECT TO A MAXIMUM OF 10, FOR EACH SIZE AND TYPE OF TRAP.
12	CONTROL UNITS FOR EXPANSION JOINTS	2 SETS OF CONTROL UNITS PER EXPANSION JOINT.

ISSUE
R1

D8

COAL HANDLING SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 1 OF 25
1.0 COAL HANDLING SYSTEM 1.1 Scope of Work The scope of work shall include entire coal handling system consisting of unloading of coal from wagons, conveying, screening / crushing, stacking, reclaiming and bunker feeding system. All the auxiliaries like dust extraction, dust suppression, ventilation (tunnels / switchgear rooms) and bunker ventilation systems shall also be included. Conveyor weigh scales, magnetic separators, metal detectors, sampling system etc. shall be part of the coal handling system and included in the scope of work. The coal handling system shall be as per the system description, flow diagram and layout enclosed. CHS shall consist of two parts, each parts consists of two streams with one normally operating and the second stream as stand by with provision for interchanging the paths at every transfer point and between crushers and screens. It shall be possible to operate both the streams simultaneously, in case of emergency. Coal handling system shall be complete in all respects with all mechanical, civil, structural, electrical and instrumentation. 1.2 The extent of supply under the contract shall include all items shown in the drawings, not with standing the fact that such items may have been omitted from the specifications/Data sheets or schedules. Similarly the extent of supply shall also include all items mentioned in the specification/data sheets and / or schedule not with standing the fact that such items may have been omitted in the drawings. 2.0 System Description A brief description of the proposed coal handling system is furnished below: (Refer Coal Handling System – Flow Diagram Drg. No:TCE.5750A-563-FD-1013 and plot plan Drg. No: TCE. 5750A-100-GA-1001). In order to have better redundancy, coal handling system shall be split in to two parts (2X 50%). Each of the coal handling system shall be provided with two Nos wagon tippers, Crushers, screens and one no. stacker reclaimer, one no. additional reclaimer on yard conveyor for blending along with a series of belt conveyors which shall feed the coal to the bunkers in boiler area. Both of the coal handling systems shall be operating simultaneously and independently, while one of the coal handling system shall feed unit 7 from one side, the other shall feed the unit 8 from other end. It shall also be possible to feed either of the units 7 or 8 from any of the two coal handling systems. Each of the coal handling systems shall be provided with two streams of belt conveyors (1W+1S). From Wagon tippler to Stacker cum reclaimer conveyor feeding is to be 2000TPH accordingly conveyor size shall be designed.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 2 OF 25
Two types of coals (i.e. Indian (Washed) & Imported) received at the plant by wagons shall be unloaded, stacked, reclaimed, blended and fed to the boiler bunkers as under 2.1 Coal conveying from Wagon unloading to stock yard a) <u>Indian Coal:</u> Coal of -250mm (-400mm size occasionally) received by rail in open wagons provided by railways shall be unloaded into wagon tippler hoppers. Coal shall be extracted from wagon tippler hopper by apron feeder for onward conveying to the Primary crusher house (PCH). Rotary breaker type Primary crushers shall be provided as a precautionary measure and utilised whenever coal of lump size larger than 250mm size are received. When coal of (-) 250mm size is received, these primary crushers shall be by passed through fixed grizzly or conveyed from conveyor BCN-2B/2C or BCN-22B/22C and the coal is conveyed further to Secondary crusher house, where (-) 20 mm coal from the feed shall be screened out and (+) 20 mm coal shall be fed to the secondary crushers for crushing the same to (-) 20 mm. The crushed coal of (-) 20 mm size shall be conveyed to coal stockyard and stacked using two Nos. bucket wheel type stacker cum reclaimers. Stock piles shall have a minimum capacity of 30 days storage. Provision shall also be kept for feeding the crushed coal directly to the coal bunkers by passing the stacker Reclaimers. One (1) no. additional reclaimer shall be provided on each yard conveyor for blending. There shall be two such systems operating simultaneously. Each of the wagon tipplers shall also be provided with one No JCB / Hydraulic excavator with bucket with rock arm arrangement for breaking large size lumps received if any. A separate coal testing laboratory with facilities for sample preparation, testing and storage of reference samples shall be provided at the wagon tippler area for third party testing of incoming coal. b) <u>Imported Coal:</u> Imported coal of (-) 50mm received by rail in BOX-N wagons would be unloaded into wagon tippler hopper. Coal shall be extracted from wagon tippler hopper by apron feeder for onward conveying to the imported coal stockyard area and stacked using Two (2) nos. bucket wheel type stacker cum reclaimer by passing the screens and crushers. 2.2 Reclaiming, Blending and bunker feeding. Both Indian and imported coals shall be reclaimed from their respective stock piles. Indian coal shall be reclaimed by bucket wheel stacker cum and fed on to trunk conveyor. One (1) no. additional reclaimers shall be provided on each trunk conveyor which reclaims the imported coal and fed on to same trunk conveyor where Indian coal is being fed and thus		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 3 OF 25
blending is achieved on conveyor transfer points. Reclaimed coal shall be further conveyed up to the coal bunkers through a series of belt conveyors and shall be fed into the bunkers by travelling trippers. Trippers shall be provided with bunker sealing arrangement to avoid the dust nuisance. Stockpile shall be arranged in such a way that, total length of each stock pile shall be partitioned in such that it is possible to stock 70% Indian coal & 30% imported coal. 2.3 System capacity Two streams of conveyors shall be provided from wagon tippers to stacker reclaimers and up to the bunker level. One stream shall have three (3) nos. of conveyors (2W + 1 S) from Wagon tippers to primary crusher house and Two (2) nos. of conveyors (1W + 1S) from PCH to Stacker cum reclaimer and thereafter wards as shown in the flow diagram. One streams shall have four streams (4x 50%) of secondary crushers and screens i.e 2W+ 2S. rated capacity of the each conveyors, crushers, screens shall be 2000 TPH. However, the rated capacity of stacker cum reclaimer shall be 2000 TPH while stacking and average reclaiming capacity shall be 1500 TPH. Peak reclaiming capacity of the reclaimers shall be 2000TPH. Separate set of conveyors (1W+1S) from each of the stock yard would carry coal to the coal bunkers of either of the units and feed the bunkers through travelling tripper arrangement. The design capacity of the above shall be 25% more than the rated capacity. However design capacities of crushers and screens shall be 50% more than the rated capacity. 3.0 DESIGN REQUIREMENTS 3.1 Mechanical Equipment / System 3.1.1 All the equipment shall normally handle coal continuously at the rated capacity as indicated in this specification. 3.1.2 The system shall be suitable for following coal lump sizes: uncrushed coal : (-) 250mm Normal and (-) 400mm occasional Crushed coal : (-) 20mm Imported coal : (-) 50 mm 3.1.3 The coal handling system shall normally operate for 14 hours per day. The wagon unloading system shall operate for 20 hours per day.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 4 OF 25
However, the complete coal handling system shall be designed for 24 hours operation. 3.1.4 The inclination of conveyors inside the tunnel shall be limited to 10 degree. The inclination of conveyors above the ground level shall not exceed 14 degree for crushed coal and 12 degree for uncrushed coal. The conveyor shall be horizontal at the feed point as far as possible. In case the same is not possible, the inclination at the feed point shall be limited to 6 degree. Conveyor belt speed shall be as per IS:11592 3.1.5 Bulk density of coal a) For calculation of volume – 800 kg/cum. b) Density of crushed and compacted coal in stockyard – 1000 kg/cum. c) For Structural calculation – 1600 Kg/Cum 3.1.6 All the equipment shall be suitable for handling damp and sticky coal during monsoon season. 3.1.7 Void 3.1.8 The motors, gear boxes, couplings and pulleys for conveyors shall be standardized and no. of types shall be limited to minimum possible. 3.1.9 All equipment drives except crusher drive shall be capable of starting on full load. 3.1.10 The motor rating for all the equipment shall have a minimum margin of 25% over the BKW. The service factor for selection of gearboxes, flexible couplings, brakes, etc. shall be minimum 1.5 on the motor rating. 3.1.11 Speed reduction units for all equipment with drive motor rating of above 10 kW shall be hardened and ground helical / bevel helical type. However, worm gear box shall be provided for the telescopic chutes. 3.1.12 The type of high speed coupling between motor and gear box shall be as follows: (a) For motor rating up to 30 kW - Resilient type flexible coupling (b) For LT motors of above 30 kW - Traction type fluid coupling rating (c) For HT motors - Actuator operated scoop type fluid coupling		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 5 OF 25
For the scoop type fluid coupling should be of Air cooling type and water cooling shall not be provided. 3.1.13 The design of belt conveyors shall be as per IS-11592. The artificial coefficient of friction shall be considered as 0.03 for calculating the power requirement for conveyors. 3.1.14 The side brackets for all idlers shall be of pressed 'C' type. Conveyor idler rollers and pulley shell below the magnetic separators shall be of non-magnetic material (stainless steel). 3.1.15 All conveyor drives shall be single snub pulley drive with minimum angle of wrap of 210 deg. 3.1.16 All idler, rolls shall be sieg resistant manufactured from ERW tubes conforming to latest edition of IS: 9295 or from seamless tubes conforming to IS: 3601 /BS-1775. 3.1.17 Idler rollers shall be waterproof, dust proof and weather proof against a high velocity water jet. All idlers shall be provided with minimum double labyrinth seal. 3.1.18 For a particular size of belt each type of idlers and their components shall be identical to ensure interchangeability. All rollers of same size shall be fully interchangeable. 3.1.19 Self aligning carrying and return idlers shall be provided at 12m from terminal and bend pulley and there after wards an interval of 24 m for self aligning return idlers and 12m for self aligning carrying idlers. 3.1.20 Shell thickness for pulleys shall be minimum 12 mm. The shafts of pulleys shall be of C-40 or better. Thickness of rubber lagging shall be 16 mm herring bone type for drive and 12 mm plain type for non drive pulleys with shore hardness shall be minimum 55 ± 5 on scale 'A'. Shaft diameter at bearing seat of pulley shaft shall not be less than 100mm. 3.1.21 Pulleys shall be mounted on machined and ground surfaces. Suitable guards shall be provided for all tail pulleys and bend pulleys for safety of operating personnel. Bend pulleys shall also be provided on return side at bends. 3.1.22 The pulley shall be statically and dynamically balanced and all the components like hubs, end discs, etc shall be accurately machined to ensure concentricity. 3.1.23 Pulley shafts shall be designed considering the combined shear stress as 500kg/cm², deflection at hub limited to 8° and shaft deflection of 1 in 1200 whichever is higher.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 6 OF 25
3.1.24 Pulley shafts shall be supported on heavy duty, horizontal split type Plummer blocks of 4 bolts construction. The bearings shall be self-aligning spherical roller type having a B-10 life of 50,000 working hours. 3.1.25 Snub pulleys of all conveyors at head end shall be covered in the main discharge chute. 3.1.26 The troughing angle of belt conveyor shall be 35 deg. The belting shall be of Nylon-Nylon/ EP construction with minimum 5 plies. The belts shall be of fire retardant type conforming to Canadian Bureau of Mines. The minimum cover thickness shall be 5 mm at the top and 4 mm at the bottom. 3.1.27 All inclined & unidirectional conveyors shall be provided with hold back integral with the gearbox and Electro-hydraulic thrustor brakes. Electro-hydraulic thrustor brakes shall also be provided for reversible /horizontal conveyors where the coasting time is required to be adjusted. 3.1.28 One sprung blade type and one multi blade torsion arm type belt scrapers at discharge pulleys and one No. V-plough type internal scraper shall be provided for each conveyor. 3.1.29 Deck plate of minimum 3.15 mm thickness shall be provided for full length of all conveyors. Take up arrangement, platform, safety guards, etc. shall be as per relevant Indian standards. 3.1.30 For over ground conveyor, take-up shall not be provided in the pits. Sand pit shall be provided at the ground level. The gravity take up shall be provided with a minimum travel of 2.5% of length of conveyor plus 600mm. Wire mesh guard of 2.5m height above ground level / maintenance platform level around take up shall be provided. Lower end of gravity take up counter weight box shall not be less than 1500mm from ground level. Counter weight shall be of Cast iron block. 3.1.31 Conveyor skirt boards at loading points shall be equipped with rubber dust flaps. Skirt board sealing arrangement shall be of segmented type. Skirt board shall be of modular type. 3.1.32 Conveyor belt pieces shall not be used as skirt rubber. The discharge ends of all conveyors shall be equipped with rubber dust flaps only. The skirt boards shall end on an impact idler. 3.1.33 Continuous skirt boards shall be provided wherever feeds from multiple points on same conveyor are envisaged. Skirts boards shall be in segments so that adjustment can easily be done when rubber strip in any section wear out.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 7 OF 25
3.1.34 From Wagon tippler to Rotary breaker conveyor discharge chute be 16mm MS mother plate and after that 12mm size with 12mm thick Sailhard / TISCRAAL liners. The liner shall be for the full height of the chute on all faces. The cross section of the chute shall be large enough to avoid any build up of coal with high moisture. Opening of size 500 X 500 mm shall be provided in chutes at various elevations to choking / inspection of chutes.. 3.1.35 All over ground conveyors shall be provided with covered galleries. The clear width of walkway shall be 1200 mm on one side and 800 mm on the other side. For double stream conveyors in the gallery, 1200 mm wide walkway at centre and 800 mm walkways on either sides shall be provided. 3.1.36 Inline conveyor belt weigh scales shall be provided on belt conveyors as shown in the flow diagram and boom conveyor of SCR to record the quantity of coal received at the plant, quantity of coal available in stockpile, quantity of coal fed to the boilers and to know the rate (TPH) at which coal is being conveyed. Weigh scales shall be of electronic micro processor type with accuracy of $\pm 0.2\%$ or better. 3.1.37 Inline / suspended magnetic separator shall be provided on belt conveyors feeding coal to the crusher, on conveyors after reclaiming and on conveyors before bunker feeding to separate the magnetic tramp iron. The magnet shall be able to separate M20 bolts, nuts and 50 kg MS plates / MS bars of L/D ratio of less than 5. The minimum size of tramp iron to be separated shall be M20 nut embedded in the coal burden on a moving belt. The force index of the magnet shall be minimum 1,00,000. The tramp iron chute shall be provided upto the ground level. 3.1.38 Metal detectors shall be provided on the conveyor(s) feeding the conveyor bunkers. The capacity of metal detector shall be to detect minimum 25 mm aluminium cube. Indicating marker shall be provided with the metal detector. 3.1.39 Sector gates / flap gates of non-jamming type with electric actuator (with provision for manual operation) shall be provided for diverting the coal in two way chutes. The gate surface shall be provided with Tiscral plate / Sailhard liners. 3.1.40 The wagon tippers shall be of rotaside type with hydraulic drive and hydraulically operated clamps. This shall be suitable for a capacity of 25 tips per hour. Wagon tippler shall be designed as per latest RDSO guideline (G33) R1. Wagon tippler shall be approved by RDSO. 3.1.41 The side arm charger (SAC) shall be designed for hauling full loaded wagons in a rake and tractive effort shall be considered based on track layout. The tractive effort shall not be less than 50 tonnes.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 8 OF 25
3.1.42 The width of the WT hopper outlet shall be minimum 2000mm. The apron feeders below WT hopper shall be heavy-duty type suitable for taking the impact of the falling coal from the wagon. The width of the apron feeder shall be min. 2200 mm. The width of dribble feeder below apron feeder shall be min. 2400 mm. 3.1.43 The crushed coal stock pile shall be suitable for storing coal for a minimum of 30 days MCR requirement with PLF of 0.85 based on worst coal. However, the stockpile capacity shall be minimum 5,50,000 tonnes. Each stockpile shall be divided such that it is possible to stack 70% Indian coal & 30% imported coal. Minimum 20.0 m spacing shall be considered between two types of coals (i.e. Indian and imported) in a pile to avoid mixing of coals in coal pile area 3.1.44 The stacker cum reclaimer shall be uni-directional as shown in the flow diagram, rail mounted, slewing and luffing type with bucket wheel for reclamation. The number of discharges per minute shall be limited to 55. The bucket wheel drive shall be hydraulic type suitable for achieving variation in the capacity. Minimum boom length of stacker reclaimer shall not be less than 40m. Two (2) nos. additional reclaimers shall be provided on trunk conveyor for reclaiming coal for blending. 3.1.45 The minimum track gauge for SCR shall be 8 m. 3.1.46 The secondary crusher shall be suitable for crushing coal from (-) 250 mm to (-) 20 mm size. The maximum speed of the crusher shall be 750 rpm. The output capacity and size shall be guaranteed while handling damp and sticky. The fines content (-) 1 mm in the product shall not exceed 10%. The crusher shall be provided with hydraulic type door opening device. 3.1.47 Spring foundations for the crushers shall be provided. There shall be two access staircases from ground level to different floors in the crusher Houses. Out of the two staircases, one shall be located completely inside the crusher house and the other shall be located outside the crusher house with roof, at two different ends of the crusher house. 3.1.48 Screens shall be of vibrating type with oil filled vibrating tube arrangement / TURFLO. 3.1.49 Above rotary breakers there shall be fixed grizzly screens of 200mm square opening. 3.1.50 The wagon tippler hopper (WTH) shall be provided with minimum 12 mm TISCRAAL liners and the opening in the grid shall be suitable for passing 400 mm coal lumps. The reclaim hopper in the coal yard shall be provided		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 9 OF 25
with 10 mm thick SS-409M liner. The grid over wagon tippler hopper shall be designed for movement of JCB & Hydraulic Excavator. 3.1.51 The reclaim hopper and grid over it shall be designed for the accidental movement of the bull dozers. 3.1.52 WT hopper, reclaim hopper and tunnels shall be provided with submersible sump pumps (1 operating + 1 standby). The sump pumps shall be suitable to handle coal slurry and impeller shall be of non-clog type. 3.1.53 Travelling trippers provided above the coal bunkers shall be of motor operated type. 3.1.54 Tunnel ventilation system provided shall be suitable for a minimum of 12 air changes per. 3.1.55 For natural ventilation of galleries of above-ground conveyors, A gap of 300 mm shall be provided throughout the length of gallery between roof and side cladding at the top and 200 mm at the bottom. Chequered plate walkways shall be provided for galleries. For conveyor inclination more than 10° stepped walkway shall be provided. 3.1.56 Coal sampling system shall be provided for collecting the samples for analysing the coal charged to the boilers. The coal sampling system shall be as per BS-1017 / ISO – 1988. 3.1.57 Bunker level indicators shall be provided for continuous level monitoring in the boiler bunkers. High and low level alarm shall be indicated at the tipper floor and in the coal handling control room. 3.1.58 Adequate number of hoists (manual / electrical) with trolleys and monorails shall be provided for handling the equipment / components, etc. in junction towers, crusher house, transfer houses and other places. The capacity, lift, etc. of each hoist shall be decided by the Bidder depending on the heaviest part of the equipment to be handled. Manual hoists shall be provided for handling items of 500 kg to 1000 kg and upto a lift of 10.0m. Electric hoist shall be provided for handling components of 1000 kg and above and/or a lift over 10.0m. 3.1.59 The bottom portion under the conveyors shall be provided with sealing plate of MS minimum thickness – 3.. 3.1.60 In order to dispose off the dust on the walkway of conveyor galleries and different floors of JT's dust hoppers with grill and discharge chutes up to ground level shall be provided so that dust accumulated will be swept and put into the hoppers. Dust hoppers at 20 metres intervals along the length of conveyor galleries and at least two hoppers in each floor of the		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 10 OF 25
JT's and bunker floor shall also be provided. Dispose of pipe for dust hoppers shall be minimum of 500 mm diameter at head end and tail end for bunker conveyors and 400mm diameter for junction tower. 3.1.61 Rack and pinion gates shall be motor operated with provision for manual operation and the liner on the gate plate shall be 12mm TISCRA. The gates shall be suitable for closing and opening with hoppers full. 3.1.62 The valley angle of chute shall be minimum 60 degree and side plate angle of hoppers shall be minimum 65 deg. 3.1.63 One (1) no. each Belt vulcanising machine of typical belt width and rating shall be included in bidder scope. 3.1.64 General Requirements of Dust Extraction (DE) System (a) Except for the requirements stipulated in this specification, all other design and construction features of DE system shall be generally in conformity with the recommendation of "American Conference of Governmental Industrial Hygienists". The duct sizing and fan selection shall be based on "balancing without blast gate" criterion. (b) All extraction points shall be provided with butterfly type dampers. (c) The DE fans shall have straight but backwardly inclined blades. (d) The bag filter material shall be fire proof, non-woven type with antistatic property. (e) The air to cloth ratio of the bag filter shall not exceed 1.5 cum/min/sqm. The bag filter cleaning system shall be reverse pulse jet air system. (f) Thickness of suction hood, dust collecting hopper and ducts shall be minimum 5mm. Thickness of casing of centrifugal fan shall be minimum 5mm. (g) Dust extraction system shall be provided for bunker ventilation of coal bunkers and crusher house. (h) These shall be operated from the local control panels and interlocked with operation of conveyor equipment. (i) Dust extraction system shall be complete with all accessories like cyclone separator, screw conveyor, rotary air lock valves, air		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 11 OF 25
compressors, drier, air receiver, piping's and fittings and complete duct work as per system requirement. 3.1.65 Dust Suppression (DS) System and Service Water System (a) There shall be two (2) service water pumps (1 working + 1 standby) which supply water to (a) local water storage tanks of D.S system of stockyard (b) service water tap points for plant cleaning, toilets etc. Each DS system shall be provided with two (1 working + 1 standby) pumps. (b) The quantity of water to be sprayed for the stockyard DS system shall be calculated based on minimum 6.25 litres of water per hour per tonne of coal stacked in a section of 90 metres length wherein a set of water monitors provided on sectional headers operate simultaneously. The quantity of water to be sprayed at conveyor transfer points shall be 1.25 litres of water per hour per tonne of coal transfer. Globe valves shall be provided at each water monitor. The operation of each section of water monitor shall be sequential. (c) Service water piping shall be provided all along the tunnels and galleries with tap off points at 30 metres interval to enable cleaning of walkways / deck plates using flexible hose. (d) Service water piping with tap off points (with isolating valve and quick connecting coupling) shall be provided for each floor of junction towers, transfer houses and crusher houses. Two (2) points per floor in junction towers and transfer house and four (4) points per floor in crusher house. Flexible hoses of 20 m long each shall be provided with storage boxes. (e) Each tap off point shall contain isolating valve with quick connecting coupling to enable fixing of hoses. (f) Each water spray header in DS system shall be provided with a diaphragm operated solenoid valve to stop the water spray when the concerned plant and equipment of coal handling system does not operate. (g) Each D.S system shall be operated from the local control panels and shall be interlocked with the respective conveyor / equipment. (j) Dust suppression system shall be provided for coal stockpile, reclaim hopper. (k) Dry fog type dust suppression system shall be provided in all transfer points except Crusher house, however, the bottom most		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 12 OF 25
conveyor emerging from Crusher house shall also be covered by dry fog system. Wagon tippler complex, apron feeders shall be also provided with dry fog type dust suppression system. (l) Compressors, water pumps, water storage tanks, pressure regulating units, spray header and all other accessories required for dry fog dust suppression system shall be included in bidder scope (m) For Horizontal Centrifugal pumps a) Flow rate versus head curves shall be a stable and continuously rising characteristic towards shut off head. In cases of stable (dropping) characteristics the duty point shall be well away from the unstable region, Besides the actual flow rate versus head curve, curves for minimum and maximum impeller diameter shall also be shown. b) The shut-off head shall be at least 110% of the differential head. c) The required NPSH at duty point shall be at least one (1) meter less than the available NPSH. d) Stuffing box shall be of such design that it can be repacked without removing any part other than the gland and lantern ring. e) In addition to static balancing, impeller and balancing drum shall be balanced dynamically at or near the operating speed. f) Pump shall be provided with renewable type casing ring. Pump having capacity 1,000m³/Hr and above shall be provided with impeller ring in addition to casing ring. The hardness of impeller ring shall be 50 BHN higher than that of casing ring. g) Pump casing shall be provided with drain and vent connection with plugged or valve connection. h) Bearing shall be oil-lubricated and shall have a life of 40,000hours of working. In case of oil-lubricated bearings, constant oil leveller with magnetic drain plug shall be provided. i) Replaceable shaft sleeves shall be provided to protect the shaft where it passes through stuffing box. 3.1.66 Painting (for mechanical equipments and technological structures) shall be as per Volume-II.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 13 OF 25
3.1.67 Wherever the conveyor crosses the road, a minimum clearance of 6M clear shall be provided below the structure. At the rail crossings, this clearance shall be as per the Indian Railways requirement. Necessary approval from the respective authorities shall be obtained by the Contractor. 3.1.68 Stockpiles shall be provided with RCC paving. 3.1.69 For day to day maintenance / breakdown maintenance of 6 Nos. Bull dozers, maintenance shed having EOT crane of minimum 5T capacity shall be provided near Stacker reclaimers area. 3.1.70 EOT Crane of minimum 25/5T capacity shall be provided in each Wagon tippler shed. 3.1.71 EOT cranes of minimum 20 T capacity shall be provided in Primary & Secondary crusher houses. 3.1.72 In motion Weighing bridge shall be provided for full rake weight measurement on both the track of incoming railway line. 3.1.73 One (1) passenger cum goods elevator shall be provided in crusher house. 3.1.74 Total four (4) nos. of JCB's (Hydraulic Excavator type) one no. for each wagon tippler for occasional breaking of large lumps shall be provided. 3.1.75 Bunker jali is to be provided of size 170X190mm with 1.5 meter length (each) by MS flat 10X50mm 3.1.76 Two (2) nos. of ERH are to be provided on each stacker. 3.1.77 Coal Yard Drainage Around the coal stock yard, drainage channels will be constructed to take all the effluent from the coal stock yard (rain / leach water) which will be ultimately led to a guard pond. After settlement of coal particles clear water shall be pumped out. Suitable pumps, arrangement for removing coal dust and arrangement for removal of settled sludge from coal runoff pit shall be included in bidder's scope. Run off pit near coal stockpile area shall be designed for 30 minutes retention time considering intensive rainfall recorded. During non monsoon season of the year, plain water sprinkler type system shall be provided in the coal pile area for dust suppression (DS). Some portion of the DS water will be absorbed in crushed coal, some will be percolated to the ground and some portion will evaporate. The remaining		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 14 OF 25
water will come out as a coal pile effluent. This effluent shall be collected in a RCC twinchamber runoff pond through garland drains .In runoff pond, coal particles will settle down and the supernatant will be transferred to effluent treatment plant (ETP). Floor washing waste water from CHP area shall also be transferred to this pond through suitable size open drain, catch pit & pumps as it will also carry high amount of coal particles. During monsoon season, rainfall runoff coming out from the open coal stockpiles will be high and will have huge amount of suspended coal particles. The runoff water from coal piles & floor washing waste water shall be collected in this RCC twin chamber runoff pond. Only effluent from coal piles & floor washing waste water from CHP area shall be collected in coal pile runoff pond. Rain water from the other areas of CHP shall be directly led to storm water drain through properly sloped garland drain. The pond will be underground, earthen at bottom area with edges protected with concrete, side slopes protected by concrete blocks. There shall be two (2) number of header drains coming out from coal piles area; each header drain will be connected to one compartment of pond with necessary manually operated gate for isolation purpose. An overflow drain will also be provided from the runoff pond to take overflow water to the nearby storm water drain. One by pass drain arrangement shall also to be provided at the entry of settling pond with manually operated gate to divert the runoff water to storm water drain whenever required Overflow water from the runoff pond will be collected in Overflow Sump. In overflow sump, there will be two (2) numbers of transfer Pumps for transferring this water to effluent treatment plant (ETP). Excess water at that time will be diverted to nearest storm water drain. Transfer pump shall be of vertical non clog type sump pump. Local control panel & sunshed over pumps shall be provided. One (1) number monorail chain pulley block (manual operated) of suitable capacity shall be provided for handling these pumps/motors. In overflow sump, suitable opening with grating / top cover, rung ladder etc. shall be provided for accessing the sump for cleaning purpose. Suitable facility for removal of coal particles shall be provided to keep the pond performance satisfactory. Stairs shall be provided in each runoff pit. Manual digging and removal of excavated coal particles manually in baskets/containers shall be carried out periodically. Suitable handling arrangements & supporting structure shall be provided for lifting the sludge from sump. 3.2 Electrical		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 15 OF 25
Two (2) Nos. Coal Handling MCC buildings shall be provided to house the Electrical panels of the Wagon Tippler and the Coal handling Plant. Each building shall be of Ground + 2 floor construction. Ground floor shall house the cable gallery and Battery rooms. First Floor shall house the Switchgear and MCCs. Second Floor shall house the Control Panels and shall be provided with false floor for cable entry and also false ceiling. In CHP control room second floor space shall be provided for maintenance engineers and technical staff. Cable gallery floor shall have minimum head room of 2.7 M excluding the beam depth. Switchgear rooms shall have clear head room of 5 M. Control rooms shall have head room of 3 M above false floor to false ceiling. All outdoor cables shall be taken on cable racks. cable racks are in BOP Vendor's scope. However where the number of cable are very few they may be directly buried with adequate protection. All buildings in CHP area such as Electrical switch gear/control rooms, Office cum stores, Pump houses etc., shall be provided with required no. of rooms with toilets at second floor of coal handling system switchgear room for maintenance engineers and technical staff and drinking water facilities. 3.3 Instrument and control system 3.3.1 Field Instruments In addition to the field devices indicated in the Coal Handling flow scheme, the following devices shall be considered and included in the system design. a) Belt sway switches b) Pull chord switches c) Zero speed switches d) Motor overload switches for conveyor drives e) RTDs for conveyor drive motors (PT100) f) Screen - Zero speed switches g) Travelling tripper position controller and indicator. h) Belt watch are to be provided on each conveyor to pull chord switches. i) IP cameras are to be provided at both stacker reclaimers, bunker level and at all the transfer points. Display shall be provided in the CHP control room. 3.3.2 Level Switches in dust suppression system water tanks and other field devices required for operation of compressors and accessories.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 16 OF 25
3.3.3 For the specific Requirements of Instrumentation and Controls, refer, Volume V of Specification. 3.3.4 All electrical equipment like motors, control panels, cables, lighting, junction / marshalling boxes, push button station, earthing, lightning protection, etc., shall conform to the requirements stipulated in Volume IV of Specification. 3.4 For the specific Requirements of civil and structural, refer Volume VI of Specification. 4.0 PERFORMANCE AND AVAILABILITY REQUIREMENTS 4.1 System Performance Requirements The coal handling system and equipment shall perform satisfactorily to meet the guarantee requirements specified in the following chapter and also those specified in this specification. After the coal handling system is ready, the same shall be tested at rated capacity within three (3) months from the date of initial operation preferably during the monsoon season to prove the performance of the system and equipment. The capacity figures specified for the equipment will have to be achieved with tolerance on the positive side. The guarantee requirements shall be met without undue vibrations in the conveyor supports, junction towers, crusher houses, transfer houses, etc. 4.1.1 The wagon unloading system shall be capable of unloading on continuous basis the design number of wagons to achieve the specified capacity. 4.1.2 The coal handling system from stockpile to bunkers shall operate continuously at an average capacity. The 24 hours boiler requirement of coal shall be handled in a maximum of 14 hours. 4.1.3 Each crusher shall be capable of crushing rated capacity with specified maximum lump size of coal even while handling damp and sticky coal (including surface moisture) during monsoon season. The largest size of output particles shall not exceed those specified in the specification. The fines (-1 mm) generated by the crusher shall be limited to 10%. 4.1.4 Screens shall screen out 95% of material having dimension of (-) 20 mm even during rainy season. 4.1.5 Stacker / reclaimer shall be stable under specified design condition and shall meet all the requirements specified. The bucket wheel reclaimer shall reclaim coal at the rated capacity specified while handling well compacted, damp and sticky coal during rainy seasons. The capacity		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8												
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 17 OF 25												
shall be arrived at on working for 4 hours over complete cross section of the stockpile. Also, the stacker shall stack coal at the rated capacity specified. 4.1.6 The capacities of all equipments / conveyors / feeders shall be equal to or more than the specified. 4.1.7 All drive motors shall be suitable for direct-on-line starting and capable of starting fully loaded conveyors / feeders. 4.1.8 Noise level produced by any rotating equipment (other than crusher) individually and collectively should not exceed 85 dBA at a distance of 1.5 metre from it in any direction under any load condition. 4.1.9 Vibration level of equipments at bearings shall not exceed the following limits for different equipment. Vibration levels shall conform to the limits specified below and shall be measured as per VDI 2056 / BS 4675. <table><tr><td><u>Equipment</u></td><td><u>Peak to peak limit</u></td></tr><tr><td>a) At the bearing of drive pulley, motor and gear box for the following equipment:</td><td></td></tr><tr><td> i) Boom conveyor of stacker / reclaimer</td><td>: 115 microns</td></tr><tr><td> ii) All other equipment / conveyors / feeders, etc.</td><td>: 75 microns</td></tr><tr><td>b) On the floors and columns of JTs, crusher houses and conveyor gallery walkways</td><td>: 200 microns</td></tr><tr><td>c) Crusher</td><td>: 160 microns for corresponding rated speed of 750 rpm. For any other lower speeds, the vibration limit shall be calculated as per VDI 2056 / BS 4675</td></tr></table> 4.1.10 Magnetic separator shall separate the magnetic material of the sizes and shapes mentioned in this specification effectively. 4.1.11 Accuracy of belt weigh scale shall be ± 0.2% of actual weighment.			<u>Equipment</u>	<u>Peak to peak limit</u>	a) At the bearing of drive pulley, motor and gear box for the following equipment:		i) Boom conveyor of stacker / reclaimer	: 115 microns	ii) All other equipment / conveyors / feeders, etc.	: 75 microns	b) On the floors and columns of JTs, crusher houses and conveyor gallery walkways	: 200 microns	c) Crusher	: 160 microns for corresponding rated speed of 750 rpm. For any other lower speeds, the vibration limit shall be calculated as per VDI 2056 / BS 4675
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		ISSUE R1												

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 18 OF 25
4.1.12 The flow of coal in the transfer chutes and coal bunkers shall be smooth without any plugging / rat holing even with worst moisture and fines content. 4.1.13 Illumination Levels Minimum illumination levels specified for lighting shall be achieved during normal operation of the plant with dust laden environment for about one month. 4.1.14 Earthing Resistance An earthing resistance of less than 1 ohm shall be achieved when measured after isolating CHP earthing system. 4.1.15 Dust Control System At the outlet of the dust extraction system, the dust concentration should not exceed 50 mg/Ncu.m. 4.1.16 Endurance Test Each stream and each path shall be tested at rated capacity for 24 hours to prove that the system functions satisfactorily without any trip due to overload or system fault. 4.1.17 All necessary instruments including walkie-talkies etc. for carrying out performance testing of coal handling system shall be provided by the Contractor. 4.1.18 The specified performance figures of the equipment shall be proved by the vendor during the performance tests. Should the results of the tests show any variation from the specified values, the vendor shall modify the equipment as required to enable it to meet the requirements. 5.0 LAYOUT AND MAINTENANCE REQUIREMENTS 5.1 Minimum clearance between the bottom of the tail pulley and floor in junction tower / crusher house / transfer house / tunnel shall be 750 mm. 5.2 Centre lines of WT hopper, junction towers, transfer houses, crusher houses, reclaim hopper and elevation of bunker floor shall be finalised by the vendor. The sizes of the junction towers, transfer houses and crusher house and the floor elevations shall be finalised by the vendor considering a minimum clear walkway space of 1200 mm around the equipment in each floor. The clear distance between the floors shall be minimum 3000 mm and the head room shall be suitable for handling / removing the		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 19 OF 25
equipment at the head end and tail end. The floors of junction towers, transfer houses and crusher house shall be designed for keeping the heaviest part of the equipment anywhere on the floor for maintenance purpose. Adequate space for maintenance of equipment shall be provided. The length and elevation of the conveyors shall be finalised by the Vendor based on the limitations for the inclination furnished in the specification. 5.3 Adequate space around the crusher in the crusher house shall be provided for opening the cage of the crusher and for removal of the shaft. 5.4 Partitions with slide doors shall be provided in the crusher house between the crushers to enable maintenance of standby crusher when the other crusher is operating. Adequate maintenance space and handling facilities shall be provided on both sides of the partition wall. 5.5 All conveyor galleries, shall be provided with dust sweeping hoppers covered with removable chequered plates. There shall be one dust hopper for each walkway of gallery and the same shall be provided at each trestle location. Similarly dust hoppers shall be provided for each floor or junction towers / crusher houses. These dust hoppers shall be connected to a dust chute to enable the dust swept to be led to the ground level. 5.6 In case the Bidder proposes a different layout for the coal handling system, the Bidder shall offer the scheme inline with the tender specification and drawing in the base offer. The Bidder may submit an alternative proposal without sacrificing the facilities and the system requirement enumerated in this specification 5.7 Erection hatch and suitable monorail shall be provided for emergency reclaim hoppers for regular maintenance. 6.0 <u>PENALTY</u> 6.1 The BIDDER shall comply with the system specification. No credit will be given in tender evaluation if parameters better than those specified are offered by the BIDDER. In case the BIDDER's recommendation is different from the specification in regard to any aspect, the BIDDER shall quote basically in line with the specification indicating price change for adopting his recommendation, failing which his bid is liable for rejection. 6.2 The BIDDER shall ensure that there are no deviations from technical specifications. In case the BIDDER takes major deviations from the specifications, his Bid will be summarily rejected. No deviation after award of contract from the agreed technical specification will be permitted. Any such deviation noticed by the PURCHASER/ ENGINEER/		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 20 OF 25

CONSULTANT at any stage after award of Contract will not be permitted and the VENDOR shall carry out necessary modifications to bring the system in line with agreed technical specification at no extra cost.

6.3 The BIDDER shall furnish all the data called for various equipments in data sheets in their offer. Offers which do not contain all the data will be treated as incomplete & are liable for rejection. The BIDDER shall also furnish the information called for in the 'schedule of Drive motors and other electrical requirement' giving ratings and number of all electrical equipment under scope of contract.

6.4 In case, the energy consumption by the drive of any equipment exceeds guaranteed energy consumption figures furnished by the CONTRACTOR, the CONTRACTOR will be penalised as specified in Volume – II Section C9

6.5 The prices quoted by the tenderers for the essential spares, start-up spares, maintenance and erection tools & tackles will be included for tender evaluation. Recommended spares quoted by Bidder will not be considered for evaluation.

6.6 Deviations from the specification, if acceptable to the PURCHASER, will be evaluated suitably to compensate for the deviations from the specification

6.0 COAL PROPERTIES

The coal to be received at RRVUNL Suratgarh plant is expected to have the following properties

a) Indian coal

a)	Moisture (%)	:	10 %
b)	Hard grove grind ability index	:	-
c)	Percentage of ash	:	35%
d)	Gross calorific value of coal	:	4000 Kcal / kg
e)	Bulk density of coal to be considered for		
	i. Capacity of equipment	:	800 kg /cu.m
	ii. Drives, belt tensions & supporting structures	:	1200 kg/cu.m

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 21 OF 25

f)	Size of coal to be handled	:	0-400 mm

b) Imported coal

a)	Moisture (%)		:	6 %
b)	Hard grove grind ability index		:	-
c)	Percentage of ash		:	15%
d)	Gross calorific value of coal		:	6000 - 6700 Kcal / kg
e)	Bulk density of coal to be considered for			
	i.	Capacity of equipment	:	800 kg /cu.m
	ii.	Drives, belt tensions & supporting structures	:	1200 kg/cu.m
f)	Size of coal to be handled		:	0-50 mm

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 22 OF 25

SYSTEM DATA SHEET – B

**INFORMATION / GUARANTEED DATA TO BE FURNISHED ALONG WITH THE
BID**

1.1	Rated capacity for conveyors / crushers / stacker cum reclaimer in stacking mode.	TPH
1.2	Average reclaiming capacity over four(4) hours for SCR	TPH
1.3	Capacity of stockpile	T
1.4	Size of coal after crushing	mm
1.5	No. of hours of operation of CHS per day to fill the bunkers	Hrs
1.6	Wagon unloading capacity per hour.	Wagons / Hr.
1.7	Guaranteed power consumption in different paths a) Wagon unloading to stockpile b) Wagon unloading to coal bunkers c) Stockpile to coal bunkers	kW
1.8	Water consumption	
1.9	Motor list for all equipments	

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 23 OF 25

SYSTEM DATA SHEET - C

**CALCULATIONS / TECHNICAL DATA AND DRAWINGS TO BE
FURNISHED FOR APPROVAL / REFERENCE OF PURCHASER /
CONSULTING ENGINEERS AFTER THE AWARD OF CONTRACT**

1.0 **CALCULATION / TECHNICAL DATA TO BE SUBMITTED FOR APPROVAL:**

1.1 Design calculations for typical one belt conveyor to be identified by the purchaser /engineer.

1.2 Lighting design calculations.

1.3 Typical cable sizing calculations and voltage drop calculation.

1.4 Technical data sheet of all equipment including characteristic curves, if any.

1.5 One typical design calculation each for conveyor gallery, tunnel, trestle, junction tower, crusher house, stock pile etc.

1.6 Write-up giving the permissive conditions for starting the coal handling equipment, annunciation conditions etc.

1.7 QAP for all manufactured and sub contracted items.

1.8 Procedure for conducting Performance guarantee test along with all the proforma.

1.9 Sizing of DE / DS system equipments

2.0 **CALCULATIONS / TECHNICAL DATA TO BE SUBMITTED FOR REFERENCE**

2.1 The contractor shall furnish the power requirements of each conveyor, feeder, tripper, magnetic separators, screens, crushers, wagon tippler, stacker reclaimer, side arm charger and other equipment.

2.2 Motor data including curves, starting time with driven equipment coupled at 100% and 80% rated voltage, withstand time at 100% and 110% voltage and withstand characteristics.

2.3 Calculations for number of buckets, bucket sizing, reclaim capacity for stacker / reclaimer.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 24 OF 25
3.0 LIST OF DRAWINGS TO BE SUBMITTED FOR APPROVAL 3.1 Flow diagram of coal handling system. 3.2 Layout plan of coal handling system showing the coordinates of different equipment and structures. 3.3 General arrangement drawings of all the conveyors and feeders. 3.4 General arrangement drawings of Wagon tippler, WT complex showing the elevations, arrangement of apron feeder, dribble feeder, machinery hatches, EOT cranes & hoists shed, grid etc. 3.5 General arrangement drawing of the following structures giving equipment layout in different floors both in plan and sections and location of openings, fixing details, loading data, location of monorails, EOT Cranes & hoists, location of staircases, handrails, details of side sheeting / cladding and roofing, etc. 3.5.1 Crusher houses. 3.5.2 All junction towers. 3.5.3 Transfer houses. 3.6 General arrangement drawing of reclaim hoppers showing elevations of hopper, grid, tunnel below with the arrangement of rack and pinion gates, feeders etc. 3.7 General arrangement drawing of stacker-cum-reclaimer, Reclaimer. / Reclaimer. 3.8 General arrangement drawing of crushers. 3.9 General arrangement drawing of screens, vibrating feeders. 3.10 General arrangement drawing of travelling tripper, fixed tripper and bunker sealing arrangement. 3.11 Flow diagram and GA drawings of dust extraction & dust suppression system. 3.12 GA of crushed coal stock piles and coal pile run off system 3.13 General arrangement drawing of mimic-cum-control panel to scale. 3.14 VOID		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D8
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit 7 & 8, at Suratgarh, Rajasthan COAL HANDLING SYSTEM	SHEET 25 OF 25
3.15 General arrangement of the JCB, Hydraulic Excavator with all details. 3.16 GA drawing of compressors. Pumps 3.17 General arrangement of EOT cranes, Hoists and Chain pulley block. 4.0 DRAWINGS TO BE SUBMITTED FOR REFERENCE / RECORDS 4.1 Component drawings, such as idlers, pulleys, skirt boards, feeders, etc. 4.2 GA drawings of magnetic separator, compressors, belt weigh scale, metal detector, hoists, telescopic chute, sector/flap / R&P gates and other miscellaneous equipments. 4.3 As built drawings for the coal handling plant.		
		ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 1 OF 37

SL.NO.	ITEM	UNITS	
1.0	Capacity of the conveying system	TPH	2000 from Wagon unloading to stockpile & 1000 TPH from stockpile to bunkers
2.0	Fuel firing rate	TPH	405
3.0	Belt Width	Mm	1600 / 1400
4.0	Belt Speed	m/sec	3.55
5.0	Troughing angle	Deg	35
	<u>BELT CONVEYORS</u>		As per the layout and flow diagram.
1.0	<u>Belt</u>		Belt shall be of Nylon-Nylon / EP. The cover shall be Fire resistant grade type (BS 490 Part-I grade N17 rubber). Fire resistant property shall conform to Canadian CAN/CSA/M422-M87.
1.1	Minimum thickness of cover	mm	Top – 5 Bottom – 4
1.2	Minimum no. plies		5
1.3	Ratio of working tension to allowable tension		90 %(maximum)
2.0	<u>Pulley</u>		
2.1	Type		Heavy duty type. Minimum shell thickness 12 mm
2.2	Lagging		16mm thick herring bone grooved type rubber lagging for drive pulleys

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
TCE-5750A-H-500-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
PART : B	DATA SHEET A COAL HANDLING SYSTEM	SHEET 2 OF 37

SL.NO.	ITEM	UNITS	
			and 12 mm thick plain type for non-drive pulleys.
2.3	Bearing life	Hrs.	50,000
2.4	Pulley width	mm	As per IS:8531
2.5	Bearings		Double row self aligning spherical roller bearing
3.0	<u>Idlers</u>		
3.1	Carrying idlers		Carrying idlers shall be of 3 roll, troughing. Roller dia and thickness shall be minimum 152.4 mm & 5.4 mm, Spacing– 1000 mm
3.2	Return idlers		Return idlers shall be of 2 roll V type. Roller dia and thickness shall be minimum 139 & 5.4 mm. Spacing – 3000 mm.
3.3	Impact idlers		Shall be of 3-roll type of 190 mm roll dia with 127 mm steel tube dia and 5.4 mm thickness. Min. 5 Nos. impact idlers shall be provided at each feed point @ 400mm spacing.
3.4	Self aligning carrying and return idlers		Shall be provided on thrust bearing for swiveling. Side guide rollers shall be provided. Spacing shall be 12 m from the terminal pulleys and bend pulleys and 24 m for self aligning return idler and 12m for self aligning carrying idler.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 3 OF 37

SL.NO.	ITEM	UNITS	
3.5	Bearings		Single row deep groove ball bearing, - 30 mm dia minimum for carrying, return & impact idlers with double labyrinth seals
3.6	Testing of rollers		Free rotation friction, Dust & water tests. Friction factor shall be less than 0.015.
3.7	Total Indicative reading (TIR) for all idlers		0.6 mm (max)
3.8	Side brackets for idlers		Pressed 'C' type
4.0	<u>Technological structures</u>		
4.1	Stringers/Short supports		Min. stringer size - ISMC 150 and short support - ISMC 100
4.2	Deck plate		Min. 3.15 mm for full length of conveyors
4.3	Sealing Plate		Min. 3.15 mm
5.0	Belt protection switches a) Pull cord switch b) belt sway switch c) zero speed switches		At 30m interval on both sides of conveyor At 50m interval on both sides. (Minimum 2 pairs per conveyor) Electronic non-contact type Dust ignition Flame proof for bunker conveyor. Non-flame proof enclosure as per IS – 1248. Two (2) nos. on each conveyor at

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 4 OF 37

SL.NO.	ITEM	UNITS	
			head and tail side
6.0	Tensioning arrangement		Gravity type take-up for all conveyors and screw take up for belt feeder.
7.0	Discharge chutes		From Wagon tippler to Rotary breaker MS thick (min)-16mm and thereafter MS 12mm thick, liner-Sailhard / Tiscral thick (min) - 12mm, Valley angle (min)-60°.
8.0	Skirt boards		Skirt boards shall be provided for 3m (min) at each feed point. If the feed points are close by, continuous skirt board shall be provided. Side plate shall be 12mm and top plate shall be 6 mm MS. 6mm SS409M liner shall be provided. Skirt board sealing shall be of segmented type.
9.0	Scrappers		
	a) External Scrapper		One sprung blade type and one torsion arm type scrappers at discharge pulleys.
	b) Internal scrapper		V – Plough type, mild steel flats with hard rubber strips.
10.0	<u>Galleries</u>		
10.1	Type of gallery		Enclosed
10.2	Roof & side cladding material		Pre-coated metal sheet.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 5 OF 37

SL.NO.	ITEM	UNITS	
10.3	Walkway width, clear	mm	
	a) Single conveyor galley		1200mm one side, 800 mm on the other side
	b) Double conveyor gallery		1200mm at the center 800mm on both the sides
10.4	Walkway covering		6 thk chequered plate shall be provided wherever conveyor crosses rail tracks, roads, buildings, etc. Grating for other places
10.5	Cross over		Shall be provided at 100m intervals.
10.6	Hand rail size		32 NB
10.7	Seal plate		MS 3.15 mm thk (minimum) Fully covered from head end to tail end
	<u>DRIBBLE FEEDER</u>		
1.0	Width	Mm	2400
	<u>APRON FEEDER</u>		
1.0	Pans		Should be fabricated from LA- 55 or equivalent material.
2.0	Drive		Apron Feeder should be fitted with Shear Coupling provided between output of Gear Box & Counter Shaft.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
TCE-5750A-H-500-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
PART : B	DATA SHEET A COAL HANDLING SYSTEM	SHEET 6 OF 37

SL.NO.	ITEM	UNITS	
3.0	Width	mm	Minimum 2200
4.0	An Essential Mechanical safety required		Bull Gear be driven by Pinion of Counter Shaft
	<u>STACKER - RECLAIMER</u>		
1.0	Type		Rail mounted, bucket wheel type Stacker-cum-reclaimer (Uni direction)
2.0	Number required		Two (2)
3.0	Capacity while stacking <u>(Rated)</u>	TPH	2000
4.0	Variable Capacity		Reclaiming capacity shall be variable from 20% to 100%
4.1	Average reclaiming capacity	TPH	765
4.2	Peak reclaiming capacity	TPH	1000
5.0	Material handled		Crushed coal while stacking, compacted crushed coal while reclaiming.
6.0	Belt width	mm	1600 min
7.0	Wind pressure(Non-operating)		Max. wind pressure as per IS : 875 (Latest Edition)
8.0	Maximum wheel load permissible with impact	tonnes	30
9.0	Track gauge	m	8.0 (minimum)(length of travel to

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 7 OF 37

SL.NO.	ITEM	UNITS	
			be furnished by bidder)
9.1	Effective stock pile height above graded level	m	10
9.2	Bottom of bucket wheel	M	10m above rail level (minimum)
10.0	Slewing angle of Boom of stacker reclaimer	degree s	± 105° i.e., total 210°
11.0	Length of the boom	m	40m minimum
12.0	Type of drive for :		
12.1	Bucket wheel		Low speed, high torque type Hydraulic drives with variable speed and shall be suitable for inching operation (no. of buckets - 8)
12.2	Slewing		Hydraulic drive
12.3	LT drive		Sq. Cage
12.4	Luffing drive		Hydraulic drive
13.0	Type of brakes		Electro Hydraulic Thrustor
14.0	Type of control of SCR		Automatic operation with PLC shall be provided in addition to manual control
15.0	Material of construction		
	a) Machine body		MS (IS: 2062)

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM				VOLUME : III SECTION : D8 SHEET 8 OF 37	
SL.NO.	ITEM			UNITS			
	b) Wheels				Cast alloy steel / Forged Steel		
	c) Bucket wheel				MS (IS: 2062)		
	d) Buckets				SAILMA 350 H or Equivalent		
	e) Teeth				Manganese steel, Gr.I, IS: 276		
	RECLAIMER						
1.0	Type				Rail mounted Bucket wheel type reclaimer		
2.0	Quantity			Nos.	Two (2)		
3.0	Location				One (1) no. on each Yard conveyor		
4.0	Reclaiming capacity			TPH	Reclaiming capacity shall be variable from 20% to 100%		
4.1	Average reclaiming capacity			TPH	765		
4.2	Peak Reclaiming			TPH	1000		
5.0	Length of the boom			m	40m Minimum		
6.0	All other technical features are as applicable for stacker cum reclaimer mentioned above						
	SCREENS						
1.0	Type				Fixed GRIZZLY type (The Grizzly shall consist of only Horizontal Bars)		
2.0	Location				In Primary Crusher House as shown in the flow diagram		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	HBS				PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS					
DATE	NOV'09	JUN'12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 9 OF 37

SL.NO.	ITEM			UNITS	
3.0	Number required			Nos.	Two (2)
4.0	Screens to separate			mm	(-) 200mm
5.0	Capacity (Rated)			TPH	2000
6.0	Liner plate				TISCRAI / Abrasion resistant steel
	Note : Above rotary breakers there shall be fixed grizzly screens				
	PRIMARY CRUSHER				
1.0	Type				ROTARY BREAKER TYPE
2.0	Quantity required			Nos.	Two (2)
3.0	Capacity (Rated)			TPH	2000
4.0	Maximum Lump size of Input			mm	(-) 400
5.0	Output size required			mm	(-) 200
6.0	Material of Construction				
6.1	Screen Plate				LA – 55/ Mn steel, minimum 20mm thick.
6.2	Tire Ring				42C Mo4 / 080M40
6.3	Lifting Shelf				Mn Steel
6.4	Support wheel				Cast steel
6.5	Shaft for support wheel				42 Cr. M04V / EN8
REV. NO.	R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL
PPD. BY	HBS	HBS			
CHD. BY	SMS	SMS			PROJECT: 2 X 660 MW, Super-Critical
DATE	NOV'09	JUN'12			TPS, Stage- V, Suratgarh, Rajasthan
					ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 10 OF 37

SL.NO.	ITEM			UNITS	
	<u>SECONDARY CRUSHER</u>				
1.0	Type				RING GRANULATOR CRUSHER
2.0	Quantity required		Nos.		Eight (8) (4W + 4S)
3.0	Capacity (Rated)		TPH		1000
4.0	Maximum Lump size of Input		mm		(-) 250
5.0	Output size required		mm		(-) 20
6.0	Drive				Ring Granulator should be driven through Fluid Coupling & Gear Box
7.0	Materials of construction				
7.1	Crusher shafts				Forged and heat treated alloy steel
7.2	Liner plates / for frame				TISCRAI / SAIL-HARD / abrasion resistant steel of 16 mm thick
7.3	Rings				Mn steel IS 276 Gr. III
7.4	Breaker plate				Mn steel IS 276 Gr. III
7.5	Screen plate				SAIL-HARD / SAILMA – 350 HI
8.0	Motor rating		kW		Manufacturer's standard
9.0	Type of Fluid coupling				Traction type fluid coupling
10.0	Maximum speed of Crushers		rpm		750
REV. NO.	R0	R1			
PPD. BY	HBS	HBS			
CHD. BY	SMS	SMS			
DATE	NOV'09	JUN'12			
			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
				PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
					ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 11 OF 37

SL.NO.	ITEM	UNITS	
	<u>SCREENS</u>		
1.0	Type		Vibrating screens feeder with oil filled vibrating tube arrangement / TURFLO
2.0	Location		In Secondary Crusher House
3.0	Number required	Nos.	Eight (8) (4 W + 4 S)
4.0	Screens to separate	mm	(-) 20mm
5.0	Capacity (Rated)	TPH	1000
6.0	Efficiency of screening		95%
7.5	Liner plate		TISCERAL / Abrasion resistant steel
	<u>TRAVELLING TRIPPERS</u>		
1.0	Location		On belt conveyors on the bunker floor
2.0	Quantity	Nos.	Eight (8)
3.0	Type		Motor driven
4.0	Type of discharge chute		Two way / Three Way
5.0	Capacity (Rated)	TPH	1000
6.0	Belt width	mm	1400 min
7.0	Travel speed	m/min	5 with load and 10 under no load condition

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 12 OF 37

SL.NO.	ITEM	UNITS	
8.0	Bunker slot width	mm	700
9.0	Belt details for bunker sealing		800 mm wide, 315/3 nylon, 3 x1.5 mm covers, FR grade
10.0	Buffers		Shall be provided on either end.
11.0	Rail clamp		Heavy duty, hand operated, quick acting for each track.
12.0	Track rails		Min 52 kg/mtr
13.0	Tripper travel length		To suit the coal bunker layout
14.0	Track rails along with fixtures to be supplied		By Bidder
	<u>FIXED TRIPPERS</u>		
1.0	Location		As shown in Flow Diagram
2.0	Quantity	Nos.	As per system requirement
3.0	Type		Motor driven
4.0	Type of discharge chute		Two way
5.0	Capacity (Rated)	TPH	2000 / 1000
6.0	Belt width	mm	1600 / 1400
	<u>INLINE BELT CONVEYOR SCALES</u>		
1.0	Quantity	Nos.	As per the flow diagram

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
DATE	NOV'09	JUN'12						

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
TCE-5750A-H-500-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
PART : B	DATA SHEET A COAL HANDLING SYSTEM	SHEET 13 OF 37

SL.NO.	ITEM	UNITS	
2.0	Location		As per the flow diagram.
3.0	Range		20% to 120% of rated capacity requirement with 100% overload protection
4.0	Accuracy		± 0.2% of actual weighment
5.0	Measurement provisions		Flow rate indicator & totaliser
5.1	Type of totaliser		Digital, six digits
5.2	Local rate indicator		Required
5.3	Remote rate indicator		Required
5.4	Location of totalizer and remote rate indicator		CHS control room (In addition to local indications)
6.0	Type of belt scale		Electronic / Microprocessor based multi idlers type
7.0	Type of load cell		Temperature compensated hermetically sealed and protected against shock and vibration
8.0	No. of weigh idlers		Minimum - 2
	<u>MAGNETIC SEPARATORS</u>		
1.0	Type and quantity	Nos.	As per the flow diagram
2.0	Location		As per the flow diagram
3.0	The minimum flux density at the operating	gauss	1000
REV. NO.	R0	R1	
PPD. BY	HBS	HBS	
CHD. BY	SMS	SMS	
DATE	NOV'09	JUN'12	
JOB NO. TCE. 5750A	CLIENT: RRVUNL		
	PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan		
			ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 14 OF 37

SL.NO.	ITEM	UNITS	
	distance from magnet lower face under hot running conditions		
4.0	Size of tramp iron to be lifted		M20 bolts, nuts/50 kg MS plates/50 kg MS round bars of L/D ratio within 5
5.0	Magnetic coil material		Aluminium
6.0	Magnet core material		CRGO
7.0	Force index		1,00,000
8.0	Type of insulation for coil		H
9.0	Type of rectifier		Silicon
10.0	Max. operating temperature of coil under hot stabilized condition	deg.C	140
11.0	Efficiency of magnetic separator for lifting M20 nuts when the nuts are buried at different depths along the conveyor belt		90%
12.0	Minimum operating height above conv. belt	mm	400
13.0	Tramp iron chute		To be provided upto ground level
14.0	Material of chute work and other parts in magnetic zone		Stainless steel – 8 mm thickness minimum
	<u>METAL DETECTORS</u>		
1.0	Number required	Nos.	As per flow diagram

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 15 OF 37

SL.NO.	ITEM	UNITS	
2.0	Location		As per flow diagram
3.0	Annunciation/hooter		Required
4.0	Audible range of hooter	m	min. 200
5.0	Detecting capacity		min. 25 mm aluminum sphere at conveyors rated capacity
6.0	Whether indicating marker provided		Yes
	<u>SUMP PUMPS</u>		
1.0	Type of pump		Submersible pump
2.0	Liquid to be handled		Coal slurry with specific gravity of 1.1 and maximum lump size of coal will be 25mm and solid content will be 25%
3.0	Location		Tunnels, transfer houses and underground hoppers as per flow diagram
4.0	Quantity		1 working + 1 standby at each place
5.0	Pump accessories requirement		Automatic float level switch for start / stop, suction strainer, sump cover plate etc shall be provided.
6.0	Sump		Shall be twin pit type
7.0	Material of construction		
	a) Casing		CI (210 BHN)

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 16 OF 37

SL.NO.	ITEM	UNITS	
	b) Impeller		Alloy CI
	c) Pump shaft / line shaft		EN-8
	d) Strainer		CI
	e) Pipe terminal point		To the nearest plant drain
	DUST SUPPRESSION SYSTEM		
1.0	Type		
a)	Plain water type		1) Stockpile 2) Pre spraying of waiting wagons 3) Reclaim hopper
b)	Dry fog type		1) Conveyor transfer points, Junction towers / Transfer house. 2) Wagon tippler complex
2.0	Type of nozzles / sprinklers		Swiveling type sprinklers for stockpile, Fog jet spray type for other areas
3.0	Spray nozzle tip and housing		SS 304 and Aluminum alloy
4.0	Quantity of water to be sprayed at stockpile		6.25 ltr of water per hour per tonne of coal stocked in sections of 90m. length of stockyard
5.0	Method of operation of each DS system		Local panels. Solenoid valves shall be provided at each header and

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
TCE-5750A-H-500-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
PART : B	DATA SHEET A COAL HANDLING SYSTEM	SHEET 17 OF 37

SL.NO.	ITEM	UNITS	
			interlocked with the respective conveyor operation.
6.0	Other Equipments		Compressors, Water pumps, Water storage tanks, pressure regulating units, spray header and other all accessories are included in bidder scope.
	<u>HORIZONTAL CENTRIFUGAL PUMPS</u>		
1.0	Requirement		For Dust suppression system
2.0	Liquid handled		Water
3.0	Type		Back pull out
4.0	Location		Indoor
5.0	Shaft		Coupled
6.0	Drive		Direct
7.0	Seal		Gland
8.0	Material of Construction		
	a) Impeller		Bronze
	b)		
	c) Casing		Close grained CI
	d)		
	e) Shaft / Shaft sleeve		EN – 8
	f)		
	g) Impeller ring / casing ring		Bronze

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
DATA SHEET A COAL HANDLING SYSTEM		SHEET 18 OF 37

SL.NO.	ITEM	UNITS	
	<u>DUST EXTRACTION SYSTEMS</u>		
	<u>Bunker ventilation systems / DE system</u>		
1.0	Type of D.E. System		DRY - CYCLONE AND BAG FILTER
2.0	Service		Continuous
3.0	No. of systems		
3.1	No. of D.E. Systems required		2W in Primary Crusher house & 2W+2S in Secondary crusher house
3.2	No. of Bunker ventilation system required		One no. BVS for each set of 3 bunkers.
4.0	Capacity of each DE system		Shall be calculated as per ACGIH manual.
5.0	Capacity of each Bunker Ventilation system		Based on 5 air changes per hour for 100% water fill volume of the bunkers.
6.0	Maximum Emission Level in the Air Exhausted to the Atmosphere	MG/M ³	50
7.0	The dust concentration at the extraction point to be considered for selection of cyclone & bag filter	gm/N M ³	10 (minimum)
8.0	Material of bags		Anti-static, fire proof, non-woven type, polyester needle felt mounted on cages of GI

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 19 OF 37

SL.NO.	ITEM	UNITS	
9.0	Bag Filter Cleaning Arrangement		Automatic on line reverse pulse jet compressed air system. Necessary compressors, piping, valves, timers, etc. shall be provided by Vendor
10.0	Operation of DE system		Shall be started / stopped from the local control panels. Shall be interlocked with the operation of the respective belt conveyor / equipment for stopping.
11.0	Air to Cloth Ratio	M ³ /MIN /M ²	1.5 (Max.)
12.0	Method of discharge of the dust collected in bag filter hopper		To be discharged back to the coal bunker/ out going conveyor through rotary air lock and screw conveyor if required.
13.0	Isolation of extraction point		Manually operated butterfly type dampers.
14.0	Design philosophy for duct sizing and fan selection		Based on "balancing without blast gate" method as per ACGIH handbook. Duct shall be sized based on a velocity of 18 to 23 mps.
15.0	Discharge of exhaust air to atmosphere		Through a chimney with cowl at a height of 3m above the top of nearby building or 30M from ground level whichever is higher.
16.0	Cyclone separator		Efficiency of 90% down to 10-micron particle size. Made of 6 mm thk. MS plate.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 20 OF 37

SL.NO.	ITEM	UNITS	
17.0	Dust collecting hopper		Adequate for storing dust collected in 4 hours operation.
18.0	Thickness of ducting		Minimum 3.15 mm and 5 mm at the bends.
19.0	Centrifugal fan		Ref. Specification for CF fans.
20.0	Thickness of hood		Minimum 5 mm.
21.0	No. Extraction points		Two nos. each for coal bunkers for bunker ventilation system and as per system requirement in crusher house
	Notes:		
	The BIDDER shall calculate independently the total air quantity, sizes of the ducting and fans, pressure drop in the ducting, equipment and air outlets etc., based on conveyor belt speed, width, sizes of various equipment involved and shall select suitable dust extraction units. The minimum extraction quantity at various dust extraction points shall be as per values given below and wherever it is not specified; the same shall be as per recommendations of "American Conference of Governmental Industrial Hygienists" (ACGIH).		
	Location		Quantity of air to be extracted per metre width of belt (Cu.m/Hr).
	a) At the conveyor discharge pulley		
	(i) For belt speed below 1m/s		4000
	(ii) For belt speed above 1m/s		5600
	b) At the loading point of conveyor on the skirt board (for 1m fall of material)		4000*

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 21 OF 37

SL.NO.	ITEM	UNITS	
	("*" In case material fall is more than 1 metre, add 1200 m³/hr for conveyors having less than 900 mm belt width and 1700 m³/hr for those conveyors having belt width more than 900 mm.)		
	c) Screen Inlet		1800 m³/hr per square metre area of screen
	d) Crusher Inlet		3500 m³/hr per metre width of inlet opening
	DE system equipment shall be outdoor type. However necessary weather protection cover / hood shall be provided for the motors, control system for bag filter cleaning etc. Compressor shall be indoor type.		
	<u>AIR COMPRESSORS</u>		
1.0	Type		Oil free screw type
2.0	Purpose		To meet the instrument and service air requirement of the coal handling system includes DE system, Dry fog dust suppression system and other coal handling system requirement.
3.0	Quantity		By bidder
4.0	Capacity		By bidder
5.0	Other accessories		Air dryer, air receiver and all connected air piping and all accessories are in bidder scope.
	<u>CENTRIFUGAL FANS</u>		

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM			VOLUME : III SECTION : D8 SHEET 22 OF 37	
SL.NO.	ITEM			UNITS		
1.0	Service				DE system / Bunker ventilation / Ventilation.	
2.0	Location				Outdoor	
3.0	Type				SWSI / DWDI	
4.0	Blade Type				Backward (min 5mm thick) with self cleaning	
5.0	Gas composition				Air laden with coal dust for DE system & bunker ventilation system.	
6.0	Construction				Class II	
7.0	Drive				V-belt driven	
8.0	Material of Construction					
	a) Case				MS (5mm thick minimum)	
	b) Shaft				EN-8	
	c) Impeller				MS / CS	
9	Accessories Requirement					
	a) Flexible connection at fan outlet, inlet guard, fixed type inlet vane, outlet damper, spring type vibration isolator with minimum isolation efficiency of 80%, ribbed neoprene rubber pads between foundation block and floor, filter, slide rails etc shall be provided.					
	b) Pulleys shall have minimum 2 grooves. Belts shall have minimum SF of 1.5.					
	c) Bearings shall have minimum life of 50,000hrs.					
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL
PPD. BY	HBS	HBS				
CHD. BY	SMS	SMS				
DATE	NOV'09	JUN'12				PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan
						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 23 OF 37

SL.NO.	ITEM	UNITS	
	<u>Tunnel ventilation system</u>		
1.0	No. of air changes/hr.		12 (minimum)
2.0	Type of fan		Centrifugal
3.0	Location		Tunnels / U.G. reclaim hopper
4.0	Velocity of air inside duct	mps	10 (maximum)
5.0	Material of duct		RCC for tunnel portion 18 gauge GI sheet for others
6.0	Grills		GI construction with louvers
	<u>HOPPERS</u>		
1.0	Designation		Wagon Tippler Hopper / Emergency Reclaim Hopper
A)	Emergency Reclaim Hoppers		
1.0	Size (Each)		By Bidder
2.0	Number required		As per flow diagram and plot plan
3.0	No. of Rod Gates required		As per flow diagram
4.0	No. of Rack & Pinion Gates required		As per flow diagram
5.0	No. of Vibrating Feeders required		As per flow diagram
6.0	Whether grid required on top of hopper/ Grid size		Yes

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 24 OF 37

SL.NO.	ITEM	UNITS	
7.0	Size of grid openings	mm	150
8.0	Type of construction of hoppers		RCC
9.0	Shed over hopper required		Yes, colour coated sheets for roof and side cladding. Columns of the shed shall be of RCC construction or RCC encased structural steel construction
10.0	Capacity		Minimum 90.0 T
11.0	Hopper design		By bidder
12.0	Minimum side plate angle		65°
13.0	Liner		10 mm thk SS-409M
B)	Wagon Tippler Hopper		
1.0	Size of Wagon Tippler Hopper (Each)		By Bidder
2.0	Number required		Four (4)
3.0	Whether grid required on top of hopper		Yes
4.0	Size of grid openings	mm	Shall be suitable for passing 400mm coal lump.
5.0	Type of construction of hoppers		RCC
6.0	Shed over hoppers required		Yes
7.0	Liner		12 mm thk TISCRA / SAILMA / Hard Steel Liners for WT-Hoppers

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 25 OF 37

SL.NO.	ITEM	UNITS	
8.0	Shape of Hopper		Wagon Tippler Hopper shall be provided with slopes of at least 65 Deg on all sides for better flow on to the Apron Feeder
9.0	Capacity	T	Minimum 200.0 T
	<u>BUNKER LEVEL INDICATOR</u>		
1.0	Quantity required		Two for each bunker
2.0	Type of Bunker level indicator		Radio frequency type for continuous level monitoring
3.0	Indication of level and annunciation of low level and accessories		On local panel at tripper floor and in main control room in Station Building
4.0	Accessories		Digital display, timers and others if necessary to make the bunker level indication system complete.
5.0	Bunker Level Switches		Low level switches to be provided for giving alarm in the tripper floor and CHS control room for low level
	<u>COAL PILE RUN OFF PIT</u>		
1.0	Purpose		Collecting the coal pile run of water from the coal stockyard. Coal particles shall settle down and clear water shall be pumped out.
2.0	Capacity	Cu.m	Based on max rain fall to suit 10

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS					PROJECT: 2 X 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	SMS						
DATE	NOV'09	JUN'12						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 26 OF 37

SL.NO.	ITEM	UNITS	
			hours storage.
3.0	Construction		Earthen type with proper slope / RCC
	<u>WAGON TIPPLER</u>		
1.0	Designation		WT-1, WT-2 WT-3 & WT-4
2.0	Number required		Four (4) Nos Working
3.0	Type		ROTA SIDE - Weighing
4.0	<u>WAGONS HANDLED</u>		All types of open wagons as stipulated in IS 10095.
4.1	Maximum weight	T	140
4.2	Duty cycle (Wagons Handled)	Tips/Hr	Min 25
4.3	Location		Indoor
4.4	Type of drive		Gear sector
4.5	Main drive		Hydraulic / Electro-mechanical
4.6	Clamping device		Hydraulic Clamping Arrangement of Wagon Tippers for clamping positive Wagon on rail table is required
4.7	<u>INTEGRAL WEIGH BRIDGE</u>		
4.7.1	Weighing range	T	15 to 150

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
TCE-5750A-H-500-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
PART : B	DATA SHEET A COAL HANDLING SYSTEM	SHEET 27 OF 37

SL.NO.	ITEM	UNITS	
4.7.2	Type of Sensing		Electronic Load Cells
4.7.3	Accuracy		Static = $\pm 0.25\%$ Dynamic = $\pm 0.5\%$
5.0	<u>CONTROL AND INTERLOCKS</u>		Hydraulic
5.1	Type of Control		PLC control
5.2	Interlocks		(a) Safety interlocks for controlling the operation and to avoid faulty operation of the wagon tippler from the control room shall be provided. (b) It should be possible to control the operation of the wagon tippler by a single push button. Separate push buttons for raising and lowering of tippler table shall also be provided.
	Whether following associated equipment /structures required for the wagon tippler included?		(c) The interlocks shall include but not be limited to the following: (i) It shall not be possible to operate the side arm charger beyond the specified limit, when the tippler table is not in its charging position (i.e., tippler table being horizontal). (ii) It shall not be possible to

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM	VOLUME : III SECTION : D8 SHEET 28 OF 37

SL.NO.	ITEM	UNITS	
			operate the tippler when the side arm charger is charging the wagon on the table. (iii) Suitable interlocks shall be provided so that the tippler operates only if the wagon is centrally located on the tippler table and tippler table is clear of the side arm charger. (iv) Limit switches shall be provided to stop the travel of the tippler table at the predetermined extreme positions In addition, back up over travel limit switch shall be provided for the tippler. (v) Whenever the tippler table is not ready to receive the loaded wagon (i.e., not in horizontal position) there shall be red signal lamp on the shed glowing. In case the tippler table is horizontal and is ready to receive loaded wagons the same shall be indicated by green lamp located on the shed. This is to caution the shunting loco operator.
6.0	Dust Control Equipment		YES

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 29 OF 37

SL.NO.	ITEM	UNITS	
6.1	Apron Feeder, Dribble Feeder Chutes & Skirts for the same with Liners		YES - 12 mm thk TISCRA / SAILMA / Hard Steel
6.2	Side Arm Charger		YES
6.3	Control Room		YES
6.4	EOT Crane required for maintenance		YES
6.5	Maintenance Hoists Required for WT Accessories like Apron feeders, Dribble Feeders etc.		YES
6.6	Shed Over Wagon Tippler		Yes
6.7	Whether all controls, switchgear, cables and all other electricals included?		Yes If yes, the same shall be constructed out of structural steel with GI side cladding and roofing.
6.8	Retarders on out haul track		Required. To be included as per RDSO norms.
7.0	<u>NOTES</u>		
7.1	The minimum shop inspection requirement shall be as mutually agreed upon during project execution stage.		
7.2	The tippler table shall be designed to allow passage of the standard main line Indian Railway diesel or electric locomotive over the table. Wagon tippler shall be suitable for handling open eight wheeler wagons, one at a time and four wheeler wagons in pairs.		
7.3	The tippler structure shall be designed to conform to the requirements of Indian Railways Research Design and Standards Organization (RDSO) with regard to the nature of loading, impact factor and allowable stresses. (G33 R1)		

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM	VOLUME : III SECTION : D8 SHEET 30 OF 37

SL.NO.	ITEM	UNITS	
7.4	Considering the safety requirement, a second brake of Electro-hydraulic thruster brake shall be provided. The torque capacity of each brake shall be equal to minimum 1.25 times the normal operating torque of the drive motor.		
7.5	The selection of gearboxes & flexible couplings shall be based on a service factor of 1.5. The pinions and gears shall be hardened and heat-treated.		
7.6	Bearings shall have a minimum life expectancy of 30,000 working hours. Bearing housing shall be horizontal spilt type with labyrinth seals.		
7.7	Hydraulic cylinders shall be provided with suitable bellows covering the piston stroke to prevent settling of dust on the piston.		
	<u>SIDE ARM CHARGER</u>		
1.0	Number required		One for each Wagon Tippler
2.0	No. of tips per hour (to be achieved for wagon tippler with Side arm charger)		Minimum 25 Tips/Hr
3.0	Indexer beetle required		Yes/No
4.0	Tractive force required		To pull loaded wagons in a rake of 140 tonnes each & to suit railway track layout. Minimum 50T
5.0	Type of wagons to be handled		All types of open wagons manufactured by Indian Railways

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 31 OF 37

SL.NO.	ITEM	UNITS	
6.0	Type of traction		Rack and Pinion
7.0	Arm & travel drive		Hydraulic
8.0	Travel speed	M/Sec	0.4 to 0.6 (forward) 1.0 to 2.0 (reverse) shall also be adjustable to suit the tipping rate.
9.0	Charger/Indexer Beetle Track rail & rail Fixtures		By bidder
10.0	Integrated control system		By bidder
11.0	Side arm charger controls shall be provided inside an elevated control tower shed. The shed shall be of structural steel construction with CGI sheet roofing and side sheeting		
	<u>COAL SAMPLING UNIT</u>		
1.0	Location		As per Flow diagram
2.0	Method of collection of gross coal sample		As per ASTM D2234
3.0	Quantity		Five (5), One (1) no. in wagon tipping area for sampling as received coal. two (2) nos before crushing and two (2) nos. after crushing

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM	VOLUME : III SECTION : D8 SHEET 32 OF 37

SL.NO.	ITEM	UNITS	
4.0	Primary sampler		
4.1	Type		Scoop type, adjustable scoop timing
4.2	Material of construction a) cutter/scoop b) cutter/scoop tip		MS lined with AISI-304 AISI-304
4.3	Control system		Auto synchronous reset timer
4.4	Bearing type and life		Spherical roller bearing 20,000 hours
5.0	Screw conveyor		
5.1	Reject screw conveyor a) location b) quantity		Below secondary sampler one
5.2	Capacity		Bidder to indicate
5.3	Material of construction a) trough b) cover c) screw d) shaft		MS MS MS EN 8
6.0	Primary crusher		
6.1	Type		Hammer mill
6.2	Particle size handled		(-)50 mm
6.3	Product		(-)8 mesh 95%, (-)4 mesh 100%

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 33 OF 37

SL.NO.	ITEM	UNITS	
6.4	Material of construction a) casing b) shaft c) hopper & its liner with thickness		MS EN 8 MS 20 mm thick
6.5	Bearing type and life		Spherical roller , 20,000 hours
7.0	Secondary sampler		
7.1	Type		Moving hopper
7.2	Cutter teeth material		AISI 304
7.3	Bearing type and life		Spherical roller , 20,000 hours
8.0	Inter connecting chutes		
8.1	Material a) sample chute b) reject material chute		AISI-304 AISI-409
8.2	Min. valley angle		60 deg.
	<u>FLAP GATES \FLOW DIVIDER</u>		
1.0	Type		Linear actuator operated.
2.0	Number		As per flow diagram.
3.0	Travel		60 to 70deg (with limit switches on both sides).
4.0	Drive		Dust tight motor driven with suitable linkages.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A COAL HANDLING SYSTEM	VOLUME : III SECTION : D8 SHEET 34 OF 37

SL.NO.	ITEM	UNITS	
5.0	Actuator		Heavy duty type suitable for operation in the coal flow
6.0	No. of Operation/ Hr		15 (with 10 consecutive switching)
7.0	Protection		Travel and thrust dependent
8.0	Purpose of flow divider		To divert the material partially or fully to the succeeding conveyors.
9.0	Material of Construction		
	a) Flat gate shaft		EN-8
	b) Flat plate		IS: 2062, Grade B – 16 mm thick
	c) Liner (on flap gate)		10 mm Tiscral / Sailhard
	d) Gate shaft		EN-8 (BS-970) / Equal
	<u>RACK AND PINION GATE</u>		
1.0	Designation		As per Flow diagram
2.0	Quantity / Type		As required / Motorized with Manual operation facility
3.0	Location		As per Flow diagram
4.0	Material of flap, liner and shaft		M.S of minimum 16mm thick, with 12 mm thick TISCRAAL liner, shaft - EN-8
5.0	Lump size of material handled	mm	(-) 20 / (-) 50

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 35 OF 37

SL.NO.	ITEM	UNITS	
	<u>HOISTS & CRANES</u>		
1.0	Manual hoist / Chain Pulley Block		As per IS 3832 / BS 3243
2.0	Electric hoist		As per IS 3938
3.0	Crane		As per IS 3177 / IS 807
4.0	Type of hoist-selection basis		Manual hoist for handling items of 300kg to 1000kg and up to a lift of 10m. Electric hoist for handling equipment beyond 1000 kg. And / or a lift of more than 10m.
5.0	Location & type		As per system requirement
	<u>VIBRATING FEEDER</u>		
1.0	Location		As per flow diagram
2.0	Designation		VFD
3.0	Quantity	Nos.	As per flow diagram
4.0	Capacity, each	TPH	By Bidder
5.0	Maximum ash lump size to be handled	mm	(-) 20 for Indian coal / (-) 50 for imported coal
6.0	Material Properties		Refer system write up
7.0	Is capacity required to be adjustable?		Yes, by VVFD
8.0	Material and thickness of feeder trough		MS / 10mm thick.

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
DATA SHEET A COAL HANDLING SYSTEM		SHEET 36 OF 37

SL.NO.	ITEM	UNITS	
9.0	Material and thickness of liner for the trough		10mm thick Abrasion resistant
10.0	Type of drive		Electro – Mechanical
	<u>IN MOTION WEIGHING SYSTEM</u>		
1.0	Location		Before Marshalling yard
2.0	Quantity		Two (2)
3.0	Type of Wagon		Open Wagon
4.0	Type of Weighing system		Bi-Directional
5.0	Purpose		To weigh rake of coal loaded wagons while in motion
6.0	Weighing range	T	15 to 150
7.0	Track guage	Mm	1676
8.0	Type of sensing		Electronic load cell
9.0	Speed of rake	Km/hr	10 during weighing 20 – max non weigh speed
10.0	Recording device		80 Column Dot matrix printer
11.0	Location of PC & Control cabinet		In the weighing system control room near the track.
12.0	Approval by RDSO		Yes. required

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D8
	DATA SHEET A COAL HANDLING SYSTEM	SHEET 37 OF 37

SL.NO.	ITEM	UNITS	

13.0	Stamping by weights and measuring authority		Yes. required
14.0	Accuracy		Static = $\pm 0.25\%$ Dynamic = $\pm 0.5\%$

REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	HBS	HBS						
CHD. BY	SMS	SMS					PROJECT: 2 X 660 MW, Super-Critical	ISSUE R1
DATE	NOV'09	JUN'12					TPS, Stage- V, Suratgarh, Rajasthan	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM			SECTION:D8 SHEET 1 OF 11
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			
1.0	BELT CONVEYORS/ REVERSIBLE BELT CONVEYORS (Bidder to list the data for each conveyor)				
1.1	Belt Width	mm			
1.2	Capacity	TPH			
1.3	Max. Lump Size of Coal Handled	mm			
1.4	Belt Speed	mps			
1.5	Belt Construction (No. of Plies, Rating, Cover Thickness)				
1.6	Idlers Roll Dia, Bearing Dia and Spacing	mm			
1.7	Pulley Dia, Shell thickness, Lagging thickness & Shaft dia	mm			
1.8	Motor rating	Kw			
1.9	Gear box type, ratio & Rating				
1.10	Performance guarantee				
a)	Design capacity at specified belt speed				
b)	Power consumption at design capacity				
2.0	TRAVELLING TRIPPER				
2.1	Capacity				
2.2	Belt width	mm			
2.3	Travel length	mm			
2.4	Rail size				
2.5	Motor rating	Kw			
2.6	Details of bunker sealing arrangement				
3.0	PRIMARY CRUSHER				
3.1	Type				
3.2	Quantity required	Nos.			
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 		

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 2 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
3.3	Capacity (Rated)	TPH		
3.4	Maximum Lump size of Input	mm		
3.5	Output size required	mm		
3.6	Material of Construction			
3.7	Screen Plate			
3.8	Tire Ring			
3.9	Lifting Shelf			
3.10	Support wheel			
3.11	Shaft for support wheel			
3.12	Motor rating	Kw		
4.0	SECONDARY CRUSHER			
4.1	Type			
4.2	Quantity required	Nos.		
4.3	Capacity (Rated)	TPH		
4.4	Maximum Lump size of Input	mm		
4.5	Output size required	mm		
4.6	Drive			
4.7	Materials of construction			
4.8	Crusher shafts			
4.9	Liner plates / for frame			
4.10	Rings			
4.11	Breaker plate			
4.12	Screen plate			
4.13	Motor rating	Kw		
4.14	Type of Fluid coupling			
4.15	Maximum speed of Crushers	rpm		
5.0	SCREENS			
5.1	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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 3 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
5.2	Capacity	TPH		
5.3	Product Size Separation	mm		
5.4	Motor Rating	Kw		
5.5	Efficiency of Screening	%		
6.0	APRON FEEDERS BELOW WT HOPPERS & BELT FEEDERS			
6.1	Type			
6.2	Capacity and Range	TPH		
6.3	Type of Drive and Rating	Kw		
7.0	MAGNETIC SEPARATOR			
7.1	Type & Quantity			
7.2	Location			
7.3	Operating Height			
7.4	Flux Density of Magnet at Surface of Magnet & at the Operating Height under Hot Stabilized Condition			
7.5	Power Consumption under Hot Stabilized Condition	Kw		
8.0	METAL DETECTOR			
8.1	Type & Quantity			
8.2	Location			
8.3	Indicator Type			
8.4	Detection capacity			
9.0	SUMP PUMPS			
9.1	Location			
9.2	Quantity			
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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 4 OF 11	
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM		UNIT		
9.3	Capacity		m ³ /hr		
9.4	Type				
10.0	DUST EXTRACTION SYSTEM				
10.1	Location & Nos.				
10.2	Type				
10.3	Volume of Dust Laden Air Handled		m ³ /hr		
10.4	Cyclone capacity				
10.5	Type of Fan				
10.6	Capacity of Fan		m ³ /hr		
10.7	Motor Rating		Kw		
10.8	Air to cloth ratio				
10.9	Consumption of compressed air for bag cleaning				
10.10	No. of extraction points				
11.0	DUST SUPPRESSION SYSTEM				
11.1	Type and Location				
11.2	Pump Capacity & No		m ³ /hr		
11.3	Motor Rating		Kw		
11.4	Type of Nozzle / sprinklers				
11.5	Total Water requirement		m ³ /hr		
11.6	Total air requirement		m ³ /hr		
11.7	Compressor capacity		m ³ /hr		
11.7	Compressor drive rating		Kw		
11.8	Quantity of water added to coal in DS & Dry fog system				
12.0	VENTILATION SYSTEM				
12.1	Tunnel Ventilation				
<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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 5 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
12.1.1	Type			
12.1.2	Filters			
12.1.3	Air Velocity			
12.1.4	Fans			
12.1.5	Ducting			
12.1.6	Grills			
12.2	Pressure ventilation system			
12.2.1	Type			
12.2.2	Number of air changes per hour			
12.2.3	Positive pressure to be maintained within the area			
12.2.4	Fan			
12.2.5	Louvers			
12.2.6	Filters			
12.2.7	Air Velocity			
12.2.8	Water and spray system			
12.2.9	Ducting and Grills			
13.0	BUNKER VENTILATION SYSTEM			
13.1	Type and Location			
13.2	Capacity of Each System	m ³ /hr		
13.3	Motor Rating	Kw		
13.4	Consumption of Compressed Air For bag cleaning	m ³ /hr		
13.5	No. of air changes per hour considered			
14.0	HOPPERS (WT Hopper / Emergency Reclaim Hopper)			
14.1	Capacity	T		
14.2	Construction			
<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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 6 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
14.3	Grid Opening Size			
14.4	Material and thickness of liner			
15.0	FLAP GATE			
15.1	Type			
15.2	Method of Operation			
15.3	Motor Rating			
16.0	BUNKER LEVEL INDICATOR / SWITCHES			
16.1	Type			
16.2	Indication			
16.3	Quantity	Nos.		
17.0	MANUAL / ELEC. HOISTS & MISC. CRANES			
17.1	Type			
17.2	Quantity			
17.3	Capacity	T		
17.4	Location			
18.0	VIBRATING FEEDER			
18.1	Capacity	TPH		
18.2	Range of capacity			
18.3	Method of variation of capacity			
18.4	Overall dimensions			
18.5	Type of drive			
18.5	Type of drive			
<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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM			SECTION:D8 SHEET 7 OF 11
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			
19.0	RACK AND PINION GATE				
19.1	Quantity / type				
19.2	Location				
19.3	Material				
20.0	STACKER CUM RECLAIMER				
20.1	Type & Nos.				
20.2	Rated capacity while stacking	TPH			
20.3	Reclaiming Capacity	TPH			
20.4	Belt Width	MM			
20.5	Type of drives				
20.6	Boom Length				
20.7	MOC of Major items				
	a)				
	b)				
	c)				
	d)				
20.8	Drive rating				
21.0	WAGON TIPPLER				
21.1	Type & No.				
21.2	Duty Cycle (No, of tips / hr)				
21.3	Maximum handling weight	T			
21.4	Type of Drive				
21.5	Integral weigh bridge included		YES / NO		
21.6	Drive rating	Kw			
22.0	SIDE ARM CHARGER				
22.1	No. of side arm charger				
22.2	No. of tips per hour				
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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 8 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
22.3	Tractive force required			
22.4	Type of drive			
22.5	Drive rating	Kw		
23.0	BELT WEIGH SCALE			
23.1	Type			
23.2	Belt Conveyor Number on which these are provided			
23.3	Accuracy			
23.4	Method of Calibration			
23.5	Type of load cell			
23.6	Rate indicator type			
23.7	Recorder type			
23.8	Make			
24.0	FIXED TRIPPER			
24.1	Type			
24.2	Location			
24.3	Quantity			
24.4	Capacity	TPH		
24.5	Motor rating	Kw		
24.6	Type of chute			
25.0	DRIBBLE FEEDERS BELOW APRON FEEDERS			
25.1	Type			
25.2	Capacity and Range	TPH		
25.3	Type of Drive and Rating	Kw		
26.0	VOID			
<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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 9 OF 11	
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			
27.0	COAL SAMPLING UNIT				
27.1	Location				
27.2	Quantity				
27.3	Primary sampler				
27.4	Type				
27.5	Material of construction a) cutter/scoop b) cutter/scoop tip				
27.6	Control system				
27.7	Bearing type and life				
27.8	Screw conveyor				
27.9	Reject screw conveyor a) location b) quantity				
27.10	Capacity				
27.11	Material of construction a) trough b) cover c) screw d) shaft				
27.12	Primary crusher				
27.13	Type				
27.14	Quantity				
27.15	Particle size handled				
27.16	Product				
27.17	Material of construction a) casing b) shaft c) hopper & its liner with thickness				
27.18	Bearing type and life				
27.19	Secondary sampler				
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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 10 OF 11
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
27.20	Quantity			
27.21	Type			
27.22	Cutter teeth material			
27.23	Bearing type and life			
27.24	Inter connecting chutes			
27.25	Material a) sample chute b) reject material chute			
27.26	Min. valley angle			
28.0	FLOW DIVIDER			
28.1	Type			
28.2	Method of operation			
28.3	Motor Rating	Kw		
29.0	AIR COMPRESSOR			
29.1	Type of compressor			
29.2	Numbers			
29.3	Capacity of compressors	M3/Hr		
29.4	Drive rating	Kw		
29.5	Material of construction			
	a) Rotor			
	b) Air End			
	c) Casing			
29.6	Method of capacity control			
29.7	Details of all other accessories			
	a) Air dryer			
	b) Air receiver			
	c) Air Piping			
<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 	

SPECIFICATION NO.		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 Suratghar, Rajasthan DATA SHEET B COAL HANDLING SYSTEM		SECTION:D8 SHEET 11 OF 11	
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			
IN MOTION WEIGHING SYSTEM					
1.0	Location				
2.0	Quantity				
3.0	Type of Wagon				
4.0	Type of Weighing system				
5.0	Purpose				
6.0	Weighing range	T			
7.0	Track guage	Mm			
8.0	Type of sensing				
9.0	Speed of rake	Km/hr			
10.0	Recording device				
11.0	Location of PC & Control cabinet				
12.0	Approval by RDSO				
13.0	Stamping by weights and measuring authority				
14.0	Accuracy				
<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 	

D9

ASH HANDLING SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 1 OF 14

1.0 **Scope**

The scope shall include complete bottom ash (BA) evacuation, fly ash (FA) evacuation, fly ash storage silos, disposal system for disposing BA into ash pond and FA either into trucks or into the ash pond, Ash water recovery system, All buildings for MCC/Control rooms, Compressor / Blower house, Pump houses etc., The ash handling system shall be supplied as per the system description, flow diagram and data sheets enclosed. The ash handling system shall be complete in all respects with all Mechanical, Civil, Structural, Electrical and Instrumentation.

The extent of supply under the contract includes all items shown in the drawings, not with standing the fact that such items may have been omitted from the specifications or schedules. Similarly the extent of supply also includes all items mentioned in the specification and / or schedule not with standing the fact that such items may have been omitted in the drawings.

2.0 **System description**

Ash formed due to combustion of coal in the pulverised fuel steam generator (SG) shall be collected either as bottom ash in the bottom ash hopper or as fly ash in the fly ash hoppers. The bottom ash shall be collected in the refractory lined water impounded bottom ash hopper. The fly ash shall be collected at the electrostatic precipitator (ESP) hoppers, air-preheater hoppers and stack hoppers provided along the flue gas path. Independent evacuation systems are proposed, one for bottom ash and another for fly ash generated at the SG. The descriptions of ash evacuation and disposal systems proposed are furnished below:

2.1 **Bottom ash evacuation system**

(Refer Bottom Ash handling flow diagram No.TCE. 5750A – 570 – FD – 1014)

A maximum of 30% (i.e. 25% bottom ash and 5% Economizer ash) of the total ash produced by each steam generator would be collected in the water impounded, refractory lined double V-type bottom ash hopper having four (4) outlets. Each outlet shall be connected to a clinker grinder and a jet pump. The bottom ash hopper shall have capacity to store about 8 hours of bottom ash collection. The ash from the hopper shall be fed to the clinker grinders where it shall be crushed to (-) 25mm size. The jet pumps located below the clinker grinders shall convey the crushed ash clinkers using high pressure water to the ash slurry sump through piping.

The outlets of the bottom ash hopper shall be fitted with hydraulically operated (using air-water converter) gates. Normally two clinker grinders and two jet pumps shall be used by opening corresponding outlet gates of bottom ash hopper once in every shift. The other two sets of clinker grinders and jet pumps shall serve as stand by. Suitable makeup water

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 2 OF 14

arrangement for bottom ash hopper shall be provided along with valve & timer. The bottom ash hopper (BAH) overflow shall be collected in a sump from where it shall be pumped to ash slurry sump.

2.2 Fly ash evacuation system

(Refer Fly Ash handling Flow Diagram no. TCE. 5750A – 570 – FD – 1015)

The fly ash handling system shall be of dense phase pressure type pneumatic conveying system.

The fly ash collected in the ESP hoppers, air preheater hoppers and stack hopper shall be evacuated pneumatically. The total ash evacuation system shall be divided into number of parallel paths depending on the total system capacity. In each path, clearance of ash from hoppers connected to common fly ash header shall be done one after another. Shifting of ash clearance cycle from one hopper to the next will be automatic and based on ash level. The ash collected in each fly ash hopper shall be conveyed to two Nos. Intermediate storage silos of minimum 400 Tons capacity. Fly ash collected in the Intermediate storage hoppers shall either be conveyed to FA day silos located outside the plant boundary by pressure pneumatic system or to ash slurry sump in slurry form. Suitable wetting head / Jet pumps required for this purpose shall be provided below Intermediate storage hoppers as indicated in the flow diagram. FA silos shall be provided with all necessary accessories such as pressure relief valve, Bag filter, Level indicators, unloading spouts, ash conditioners, platforms, Electric hoists etc.

Manual evacuation facility in addition to pneumatic conveying system shall be provided with pneumatic / manually operated plate valves for loading in trucks directly from the first four fields of ESP hoppers in case of system break down.

2.3 Fly ash storage silo and disposal of fly ash from silo

There shall be Four (4) fly ash storage silos of capacity 1000 tonnes each Two for each unit. Below each FA silo five (5) outlets shall be provided.

Two (2) outlet for Conditioned ash disposal into open trucks through rotary feeder and paddle type ash conditioner.

Two (2) outlets for dry disposal into closed trucks through motorised telescopic spout.

One (1) outlet would be provided with blind flange.

2.4 Bottom ash and Fly ash slurry disposal system

BA along with economizer ash shall be transported to ash slurry sump by jet pumps. BA collected in the ash slurry sump shall be disposed off to ash disposal area by a series of slurry pumps in lean slurry form.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 3 OF 14

FA shall primarily be disposed off through open trucks / closed trucks for utilization. In case of emergency when there is no utilization of fly ash, FA shall also be transported to ash slurry sump by jet pump system installed below Intermediate storage hoppers. From ash slurry sump, FA shall be disposed off to ash disposal area by a series of slurry pumps in lean slurry form.

Slurry sump and slurry pumps shall be common for both BA and FA generated from all the units.

Bottom ash and Fly ash disposal pipes shall be terminated by Bidder near existing ash pond which is about three (3) kms from plant boundary wall.

Ash slurry piping around the ash dyke shall be in garlanded.

2.5

Ash water recovery system

The water from the stilling ponds shall be let out through the collecting well. Suitable discharge pipes with isolation valves (butterfly type) connected to the collecting wells to lead the effluent outflow to the clarifloculator type clarifier via flash mixer shall be provided. Parshall flume flow measuring instrument shall be provided for measuring the inflow to the clarifier. The clarifloculator shall be located partially above ground. A coagulant dosing system comprising coagulant preparation cum solution tank, dosing pumps with associated accessories shall be provided for the clarifloculator. The dosing system shall pump measured quantity of coagulant solution into flash mixer of clarifloculator. The clarified water from the clarifloculator shall be led into a clear water tank by gravity through open channel located above ground. The clear water tank shall be located below ground. Broad crested weir shall be provided in the open channel going to clear water tank for the measurement of clear water flow. The acceptable limits for suspended solids and pH value of the recovered clear water shall be 20 ppm and 5.5 to 8.5 respectively. There shall be provision in the clarifloculator for chemical dosing, in order to maintain pH value in the specified range, if required.

There shall be two (2) recovery water pumps (1W+1S) with associated accessories and one recovery water pipeline, adequate for the flow rate of ash water recovered from the slurry pumped to the existing ash pond. Capacity of the recovery water pumps shall be decided assuming that 70% of total ash water is being recovered from disposal area. The clarified water shall be pumped to ash water tank located in the plant area for reusing the same for Ash handling system.

3.0

System capacity

3.1

Bottom ash evacuation system

BA evacuation rate shall be designed based on 8 hours storage and 2 hours simultaneous evacuation from BA hoppers of both the units to the ash slurry sump.

Fly ash evacuation system

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 4 OF 14

FA evacuation rate shall be designed for the emergency condition based on 8 hours storage and 4 hours evacuation from various hoppers of both the units simultaneously. FA from all the units shall be evacuated simultaneously and conveyed to the FA silos. However under normal conditions, FA shall be evacuated continuously. Interconnection among the silos shall be provided in such a way that FA from each of the units shall be conveyed to any of the two FA silos provided for that unit. Capacity of the conveying air compressors shall be designed for emergency condition of FA evacuation.

3.2 Bottom ash and Fly ash slurry disposal system

As explained above, In case FA ash is unutilized, same shall be disposed into the ash disposal area by a series of slurry pumps. Under emergency condition, in a shift of 8 hours, BA from both the units shall be disposed into the ash disposal area simultaneously for first 2 hours and FA from both the units i.e. from both the Intermediate silos shall be disposed for next 4 hours. Each time at the end of disposal of ash slurry in a shift, complete disposal line shall be flushed with water for about half an hour in order to prevent settling of ash inside the slurry pipelines.

There shall be four (4) series of slurry pumps (2W+2S) and each series shall consist of required number of slurry pumps to dispose the slurry to the identified disposal area. One pipeline shall be associated with each series of pumps.

Bottom ash and Fly ash disposal pipes shall be terminated by Bidder near existing ash pond which is about three (3) kms from plant boundary wall.

4.0 DESIGN & OTHER GENERAL REQUIREMENTS

4.1 BULK DENSITY OF ASH/ASH CONTENT

(a) Bottom ash

(i) For volume calculation	: 800 kg/cu.m
(ii) For design of structural and support	: 1600 kg/cu.m

(b) Fly ash

(i) For selection of pneumatic handling system	: 500-800 kg/cu.m
Type of material	: Abrasive

(c) Ash content	: 35 %

(d) Bottom ash (25% BA+5% ECO ASH)	: 30%
(For designing the BA evacuation and disposal systems)	

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 5 OF 14

(e) Fly Ash (90% ESP & Chimney ash + 5% APH Ash) : 95%
(for designing the FA evacuation and disposal systems)

- 4.2 Fly ash handling systems and bottom ash handling system shall be designed based on the above specified values and all the concerned equipment shall be selected considering this aspect.
- 4.3 The pneumatic FA handling system shall be of dense phase and the velocity of air ash mixture shall not exceed 10 mps.
- 4.4 All the bends in the pneumatic handling system shall be provided with wear back of either Ni-hard or stone box type.
- 4.5 High and low level probes shall be provided in each ash hopper for measuring the evacuation rate during PG test.
- 4.6 The switchgear room for ash handling system shall be provided with pressurised ventilation system.
- 4.7 Ash handling system control room shall be air-conditioned to maintain inside design conditions similar to main plant control room.
- 4.8 The movements of the fly ash hoppers, due to the expansion shall be considered and the bidder shall include suitable expansion joints as necessary in the fly ash pipe lines. The expansion joints shall be of stainless steel construction.
- 4.10 The radius of 90° bends shall be minimum 5 times the pipe diameter.
- 4.11 Fluidising pads in fly ash silos, ESP hoppers and other vessels shall be preferably of woven stainless steel and should withstand temperature upto 170°C.
- 4.12 Each fly ash silo shall be provided with access ladder inside the silo and pressure relief door, external staircase from ground level to silo top, platform with grating for inter connecting both the silos at unloading platform level and silo top level.
- 4.13 FA silos shall be of RCC construction with flat bottom.
- 4.14 The material of construction of all parts of rotary feeder coming in contact with ash shall be of alloy CI as per IS-4771 type 1A with minimum hardness of 340 BHN.
- 4.14 The motor rating for all the equipment shall have a margin of 10% over the BKW. The service factor for selection of gearboxes, resilient couplings, flexible couplings, brakes etc., shall be 1.5 minimum on the motor rating.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 6 OF 14
4.15	The type of high speed coupling between motor and gear box shall be as follows : (a) For motor rating upto 30 kW : Resilient type (b) For LT motors of above 30 kW rating : Traction type fluid coupling (c) For HT motors : Scoop type fluid coupling	
4.16	The emission level at the outlet of the bag filter shall be limited to 50 mg / cu.m.	
5.0	<u>LAYOUT AND MAINTENANCE REQUIREMENTS</u>	
5.1	<u>LAYOUT REQUIREMENTS</u>	
5.1.1	All the equipment such as HP pumps, LP pumps, , seal water pumps, slurry pumps, conveying air compressors, instrument air compressors, slurry sump, ash water tank, switchgear room and control room shall be located in a single building.	
5.1.2	The layout for water pumps, slurry pumps and compressors shall be such that it shall be possible to maintain any pump set / compressor without disturbing the operating pump set / compressor and also it should not be necessary to dismantle the discharge piping for removing any pump / compressor.	
5.1.3	The layout of water piping for the ash handling system shall ensure that all valves are located so as to be conveniently accessible. All the water piping to bottom ash hopper area, fly ash storage silo area from the pump house shall be routed in the overhead pipe rack only. In no case, the water pipes shall run in the trench. However, the bottom-ash slurry pipelines from the jet pump outlet to slurry sump can be run in the pipe trenches up to the nearest pipe rack and then routed in the pipe rack.	
5.1.3	The overhead piping shall have a minimum working clearance of 2.5m overhead room walkways.	
5.1.4	A minimum head room of 7 m (clear) shall be provided below the pipe rack at the road crossing. The minimum head room required at the rail track crossings shall be as per Indian Railway requirements. The contractor shall obtain approval from the concerned railway authorities before taking up such works.	
5.1.5	All water, slurry and air piping shall be arranged to provide clearance for the removal of equipment requiring maintenance and for easy access to valves and other piping accessories required for operation and maintenance.	
5.1.6	All pipe joints to be provided inside the ash slurry and ash water pump houses shall be flanged type with suitable gaskets.	
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 7 OF 14
5.1.7 In case M.S welded pipes are provided for ash water recovery system, suitable expansion loop / expansion joint shall be provided to care of thermal expansion. 5.1.8 A minimum clear head room of 5.50 m shall be provided below the fly ash silos platform floor for the movement of trucks. 5.1.9 Access walkways / steps in the pump houses, control rooms, compressor rooms, etc., shall be minimum 1000mm wide. Suitable hand railing shall be provided for personnel safety, wherever required. Access/maintenance platform of 1000mm width with chequered plate all around the Bottom Ash hopper shall be provided. 5.1.10 Separate building shall be provided for ash water recovery system near ash disposal area. Necessary handling equipment shall also be provided to maintain various equipment in the building. 5.1.11 All local panels, distribution boards, lighting panels, junction boxes, terminal boxes, marshalling boxes, push button stations, etc., shall be located in accessible locations permitting maintenance. Minimum rear space for local panels and distribution boards shall be 1000mm from the nearest obstruction. Cabling shall be done clearing any interference between collars, greasing points and dust collection. There shall be minimum 2 metres headroom below runoff cable trays. 5.1.12 Local control panels requiring operators attention shall not be located in dust prone areas. Local panels in each area shall be housed in a dust proof cabin to minimise dust nuisance. 5.2 <u>MAINTENANCE REQUIREMENTS</u> 5.2.1 Facilities for carrying out online and off-line maintenance of ash handling plant and auxiliaries shall be provided. In general, this should include adequate handling equipment, working space, platforms and safety devices. Handling equipment such as cranes in Ash water pump house building, ash water recovery system building, Electric hoists on Fly Ash silos top shall be provided. 5.2.2 One complete set of erection and maintenance tools required for ash handling plant shall be included. 5.2.3 The Clinker grinders shall be mounted above ground level on rails to enable easy removal/replacement. 5.2.4 Inspection windows shall be provided for bottom ash hopper and feed gate housing. Water jet connection shall be provided for each of the glass windows for cleaning. 5.2.5 Manual poke holes and access door (with hinged cover) at bottom ash hopper shall be provided. Access hand-hole (with hinged cover) shall be provided for feed gate housing and clinker grinder.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 8 OF 14
5.2.6	Maintenance platform of minimum one meter width with handrails and access ladders shall be provided below hoppers of economiser, air pre-heater and duct.	
5.2.7	Segregating valves in each of the water lines at an easily accessible location shall be provided for the lines going towards bottom ash hopper area and to the equipment located below fly ash storage silo (for the wet disposal of ash from the silo) for easy maintenance.	
6.0	<u>ELECTRICAL</u>	
6.1	For Electrical requirements refer Vol-IV of specifications.	
7.0	<u>INSTRUMENTATION AND CONTROL REQUIREMENTS</u>	
	For I&C requirements refer Vol-VI of specifications.	
8.0	<u>System Performance Requirements</u>	
	The ash handling system equipment shall perform satisfactorily to meet guarantee requirements specified.	
8.1	<u>Performance Tests and Guarantee Requirements</u>	
	After the bottom ash and fly ash handling systems are erected and commissioned successfully and completed in all respects, the systems shall be tested within three (3) months to prove the performance of the system equipment in regard to the following which have to be specifically guaranteed. The capacity figures specified in relevant data sheets for the equipment will have to be achieved with tolerance on the positive side. The guarantee requirements shall be met without undue vibrations in the foundations, structures, etc. The energy consumption of the ash handling plant running at the rated capacity as offered by the BIDDER shall be indicated in the proposal and guaranteed. If the energy consumption of various drive motors exceeds the guaranteed figures indicated by the BIDDER in the proposal, the VENDOR shall investigate the causes of excessive energy consumption and shall rectify or modify the system / equipment so that the guaranteed power consumption figures are not exceeded, without under running in any way the performance of the equipment. Even after necessary alteration and modifications are effected, if the power consumption figures do not conform to the guaranteed figures furnished by the BIDDER, penalty at the rate specified will be levied. In addition, drive motor may have to be replaced if the specified margin is not available between power requirement of pump and motor rating. .	
8.2	The specific tests to be conducted on the equipment are as given below :	
	(i) Bottom ash handling system operation.	
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 9 OF 14

- (ii) Clinker grinder output lump size.
- (iii) Jet pump operation.
- (iv) Fly ash handling system operation.
- (v) Ash water recovery system
- (vi) Fly ash disposal (into trucks) operation
- (vii) Operation of water pumps, if pumps.
- (viii) Operation of compressed air system
- (ix) Functioning of interlocks, protection and sequential control system as required.
- (x) Operation of blowers.
- (xi) Operation of Clarifier.

8.3 Fly Ash Handling – System Operation

The fly ash removal system shall extract fly ash from various fly ash hoppers of steam generators of each Unit at the designed rate . The fly ash removal system shall be capable of evacuating fly ash in 4 hours per shift of 8 hours with no tolerance on positive side.

- (a) Various equipment as mentioned in respective data sheets.
- (b) Emission level of dust extraction system – 50 mg/cu.m (+)0.00
- (c) Auxiliary Power Consumption for equipment shall be as furnished during detail engineering.(+)0.00 %

8.4 Fly Ash Disposal System

- (a) Fly ash disposal system shall be capable of extracting and removing fly ash of varying size and temperature, being collected at different hoppers in the flue gas path.
- (b) Fly ash conditioning and disposal equipment shall be capable of handling ash at the design rate.

8.5 Water Pumps

- (a) Capacity at rated head as per IS : 5120.

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 10 OF 14

- (b) Power consumption as measured at motor terminals at rated head with (+) 0.00 tolerance.

8.6 Compressors

Compressors shall be tested as per relevant IS for capacity (FAD), power consumption as given below:

(a)	<u>Air Compressors</u>	<u>Tolerance</u>
i.	Capacity at rated discharge pressure (At lowest frequency and temperature)	: As per IS:5456-1985 / ASME Power Test Codes
ii.	Energy consumption of motor at	+0.00% Tolerance as duty point & at no load given in IS:5456- 1985 will not be considered
iii.	Volumetric efficiency	+0.00%
iv.	Noise and vibration levels	+0.00%

(b)	<u>Intercooler / Aftercooler Tolerance</u>	<u>Tolerance</u>
i.	Air pressure drop across intercooler	+0.00%
ii.	Water pressure drop	+0.00%

8.7 Functioning of Interlocks, Control and Sequential Control Systems

While the various ash handling systems are being tested, the correct functioning of interlocks, control and sequential control systems shall be checked for proper functioning and also to check, whether correct logics are being achieved.

8.8 Noise Level

Measured noise level produced by any rotating equipment, individually and collectively should not exceed 85 dBA at a distance of 1.5 metre from it in any direction under any load condition.

8.9 Vibration

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 11 OF 14

Vibration level of equipment at bearing shall not exceed the following limits for different equipment. Vibration levels shall be measured and shall be acceptable as per VDI 2056 / BS 4675 or as specified.

- (a) At the bearing of motor and gear box : 75 microns
for the equipment (both driving and non-driving ends).

9.0 **PENALTY**

9.1 The BIDDER shall comply with the system specification. No credit will be given in tender evaluation if parameters better than those specified are offered by the BIDDER. In case the BIDDER's recommendation is different from the specification in regard to any aspect, the BIDDER shall quote basically in line with the specification indicating price change for adopting his recommendation, failing which his bid is liable for rejection.

9.2 The BIDDER shall ensure that there are no deviations from technical specifications. In case the BIDDER takes major deviations from the specifications, his Bid will be summarily rejected. No deviation after award of contract from the agreed technical specification will be permitted. Any such deviation noticed by the PURCHASER/ ENGINEER/ CONSULTANT at any stage after award of Contract will not be permitted and the VENDOR shall carry out necessary modifications to bring the system in line with agreed technical specification at no extra cost.

9.3 The BIDDER shall furnish all the data called for various equipments in data sheets in their offer. Offers which do not contain all the data will be treated as incomplete & are liable for rejection. The BIDDER shall also furnish the information called for in the 'schedule of Drive motors and other electrical requirement' giving ratings and number of all electrical equipment under scope of contract.

9.4 In case, the energy consumption by the drive of any equipment exceeds guaranteed energy consumption figures furnished by the CONTRACTOR, the CONTRACTOR will be penalised as specified in Volume – II Section C9

9.5 The prices quoted by the bidders for the essential spares, start-up spares, maintenance and erection tools & tackles will be included for tender evaluation. Recommended spares quoted by Bidder will not be considered for evaluation.

9.6 Deviations from the specification, if acceptable to the PURCHASER, will be evaluated suitably to compensate for the deviations from the specification

10.0 **DESIGN PARAMETERS**

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 12 OF 14

The details / data furnished in this section shall be considered by the BIDDER for the design of ash handling system.

10.1	Material to be handled	:	Bottom ash & Fly ash
10.2	Bulk Density	:	
(a)	For volume calculation	:	800 Kg/m ³
(b)	For structural calculation	:	1600 Kg/m ³
10.3	System offered	:	
	a) Bottom ash	:	Lean slurry system
	b) Fly Ash	:	Pressure type pneumatic system
10.4	Unit configuration	:	2 x 660 MW Units
10.5	Steam generator worst coal requirement at MCR condition of each Unit	:	380 TPH for SG of each Unit.
10.6	Maximum percentage of ash to be considered for designing of ash handling system	:	35%.
10.7	Bottom ash content	:	30% of ash generated (25% BA+5% ECO ASH)
10.8	Fly ash content	:	95% of ash generated (90% ESP & Chimney ash + 5% APH Ash)
10.9	Fly Ash Silo Capacity	:	1000 T Minimum

SYSTEM DATA SHEET - C

1.0 DATA / DRAWINGS TO BE SUBMITTED FOR APPROVAL

- 1.1 Water balance for ash handling system operation.
- 1.2 Technical data sheets of all equipment including characteristic curves for pumps.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 13 OF 14
1.3	Flow diagrams indicating pipe line sizes, instrumentation, valves and major parameters of the equipment for bottom ash handling system, fly ash handling system, ash disposal system and ash water recovery system.	
1.4	General arrangement - Plans and Sections of the following subsystems:	
	(a) Bottom ash handling system (b) Fly ash handling system (c) Fly ash silo unloading system (d) Fluidising system for fly ash hoppers and silos (e) Pressurised ventilation system for MCC room (f) Ash slurry pumping system (g) Ash water recovery system.	
1.5	General arrangement - Plan and Sections of the following structures:	
	(a) Ash Water Sump (b) Ash Slurry Sump (c) Ash Water pump / Ash slurry pumps / Compressor room complex (d) Ash water recovery pump house (e) Ash Handling System Control / MCC Room (f) Bottom Ash Hopper (g) Fly ash silos (h) Clarifier / flash mixture / sludge sump & pump house (i) Pipe racks (h) Control & Switchgear room layout.	
1.6	QAP and PG test procedure.	
2.0	<u>DATA / DRAWING TO BE SUBMITTED FOR INFORMATION / RECORDS</u>	
2.1	Following piping arrangement drawings:	
	(a) Fly ash piping layout from fly ash hoppers to fly ash silo. (b) H.P. Water & LP water Piping (c) Seal Water Piping and FA conditioning water piping (d) Compressed air piping for both conveying and instrument air (e) Bottom ash slurry piping (f) Water piping for fly ash collection system (to blower and dust conditioner) (g) Ash water recovery piping layout. (h) Sludge pipe layout	
2.2	GA drawings of the following equipment:	
	(a) All pumps (b) Wetting unit (c) Transmitter vessel (d) Slurry line valves	
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D9
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan ASH HANDLING SYSTEM	SHEET 14 OF 14
(e) Fly ash valves (f) Pipe fittings (g) Dust conditioner (h) Rotary feeder (i) Jet pumps (j) Clinker grinder (k) Blowers (l) Air Compressors (m) Fly ash collectors (n) Sludge pumps (o) Sump / drain pumps (p) Heaters		
		ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan			SECTION: D9		
		DATASHEET A1			SHEET 1 OF 2		
BOTTOM ASH HOPPER							
SL. NO.	ITEM			UNIT			
1.0	Number required				2		
2.0	Type of hopper				Water impounded type (W-Type)		
3.0	Number of outlet openings				Four per hopper (2W + 2S)		
4.0	Required storage capacity of ash in hopper 300 mm below operating water level			HOURS	8 HOURS OF BOTTOM ASH GENERATION BY EACH UNIT		
5.0	Density of bottom ash to be considered for calculating volume of hopper			KGS/ CU.M	800		
6.0	Density of bottom ash to be considered for structural & support design			KGS/ CU.M	1600		
7.0	Distance between top of hopper & operating water level in hopper			MM	300		
8.0	Minimum thickness of hopper plate			MM	10		
9.0	Type of lining				Monolithic castable refractory		
10.0	Furnace temperature			°C	800 approx. (at bottom)		
11.0	Material of construction of, 1) hopper plate 2) wear resistant feed plates				1) MS 2) Ni-hard alloy ci (minimum 340 BHN hardness / ceramic)		
12.0	Type of gates at the outlets				Hydraulically operated gates		
13.0	Pressure range of boiler at furnace throat			Mmwc	-2.5 to -10mm of water column (approx.) At normal condition		
14.0	Refractory cooling arrangement				Yes		
15.0	Seal trough arrangement required				Yes. Refer drawing NO. TCE.5750A-570-FD-1014		
16.0	Seal trough make up and flushing arrangement				Yes		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	MP				PROJECT: 2 x 660 MW, Super-	
CHD. BY	SMS	HBS				Critical TPS, Stage- V, Suratgarh,	
DATE	NOV09	MAY' 12				Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan			SECTION: D9	
		DATASHEET A1 BOTTOM ASH HOPPER			SHEET 2 OF 2	
SL. NO.	ITEM			UNIT		
17.0	Seal trough material and thickness				M.S of minimum 6 mm thickness	
18.0	Flushing nozzles in the bottom ash hopper				Yes	
19.0	Inspection window flushing arrangement				Yes	
20.0	Bottom ash hopper filling arrangement with valve, etc. Considered?				Yes	
21.0	Refractory holding anchor				Yes, (MOC – Stainless Steel)	
22.0	Source of water				CT blow down (service water) In Emergency From Raw water reservoir	
23.0	<u>NOTES</u>					
23.1	Each Hopper Gate shall be complete with Air Water Converter, Solenoid Operated Four Way Valves, Piping, etc.					
23.2	Hopper Drain Valves, Overflow and Drain Piping with Seal Box, etc, shall be included by the Bidder.					
23.3	The Hopper Feed Housing shall be Complete with Adequate Internal Lighting, Sufficient Number of Poke Holes, Furnace Water Seal, Access Doors, Observation Windows with Flushing Nozzles for Cleaning Inside Surface of Windows, etc., shall be Provided.					
23.4	Access and Maintenance Platform Minimum 1000 mm Wide with Chequered Plate Covering all Round the Hopper at Suitable Level shall be provided. In addition, Local Platforms as Required for Observation/Poking/Maintenance shall be provided.					
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan
PPD. BY	HBS	MP				
CHD. BY	SMS	HBS				
DATE	NOV09	MAY' 12				
						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A2 ASH DISPOSAL EQUIPMENT – JET PUMP			SECTION: D9 SHEET 2 OF 2		
SL. NO.	ITEM			UNIT			
3.0	<u>Tests to be conducted at manufacturer's works</u>						
3.1	Visual Inspection and Dimensional Check against Manufacturer's Approved Drawing				YES		
3.2	Hydrotest at 1.5 times the design pressure for various components of jet pump				YES		
4.0	<u>Painting</u>						
4.1	Painting of all AHS components at Site by				VENDOR		
4.2	Painting shall be as specified in				As approved by Owner / Consultant		
5.0	<u>General data</u>						
5.1	All the Parts of the Jet Pump shall be suitable to resist				Wear and Corrosion		
6.0	<u>Notes</u>						
6.1	The Jet Pump shall be supplied as a complete assembly with three flanged connections of adequate ratings for connecting to, a) inlet of ash water mixture to be transported b) inlet of water and c) outlet to slurry line						
6.2	The Jet Pump shall be adequately sized to allow a free continuous passage of a number of ash particles of specified size running concurrently.						
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV 09	MAY' 12					
TCE FORM NO. 330 R3							

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A3 CLINKER GRINDER			VOLUME - III SECTION: D9 SHEET 1 OF 1	
SL. NO.	ITEM			UNIT		
1.0	Clinker Grinder					
1.1	Quantity				Four (2W+2S) for each unit	
1.2	Capacity			TPH	120 TPH	
1.3	Type of Grinder				Heavy duty double roll	
1.4	Max. Output Size Permissible			mm	25	
1.5	Is Fluid Coupling Required				YES. Suitable for Reversible Operation	
1.6	Materials of Construction					
1.7	Rolls				Manganese steel, 12-14% IS 276	
1.8	Teeth of Rolls				Manganese steel, 12-14% IS 276	
1.9	Wear Plate / Liner				Alloy CI as per IS-4771, type 1(a)-450 BHN	
1.10	Grinder Chamber				Mild steel, with Mn steel / alloy CI liners	
1.11	Shaft				Alloy steel / EN-8	
1.12	Shaft Sleeves				SS-410 Hardness 400 BHN	
1.13	Chain Guard				6 mm thick MS plates	
Notes	1. The clinker grinder with its drives shall be mounted over the rails. Length of rails shall be adequate to pull out the clinker grinder completely outside and position the other clinker grinder in operating position.					
REV. NO.	R0	R1				
PPD. BY	HBS	MP				
CHD. BY	SMS	HBS				
DATE	NOV'09	MAY'12				
JOB NO. TCE. 5750A		CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan			ISSUE R1	

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 1 OF 7
	DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING	

SL NO	ITEM	UNIT	

1.0	<u>ASH HANDLING SYSTEM CAPACITY</u>	TPH	NORMAL / EMERGENCY 130 TPH / 260 TPH
2.0	<u>NUMBER OF HRS OF OPERATION</u>		NORMAL - CONTINUOUS / EMERGENCY - 4 HRS. IN 8 HRS.
3.0	<u>MATERIAL PROPERTIES</u>		
3.1	Material to be Handled		FLYASH
3.2	Temperature of Material Handled	DEGREE	350 approx.
3.3	Bulk Density	KG/M ³	700
4.0	<u>FLY ASH TRANSMITTERS</u>		
4.1	Type		Suitable for dense phase pressure type pneumatic conveying system
4.2	Quantity		Refer flow diagram
4.3	Duty		24 HRS/DAY
4.4	Holding Capacity of Fly Ash Transmitters		Shall be designed for emergency condition
4.5	<u>Flow Through Transmitter Vessels as Detailed Below</u>		FLY ASH
4.5.1	VOID		
4.5.2	Air preheater hoppers	TPH	Refer flow diagram
4.5.3	ESP hoppers	TPH	Refer flow diagram
4.5.4	Stack Hopper	TPH	Refer flow diagram
4.6	<u>Materials of Construction</u>		
4.6.1	Transmitter vessel		CI / MS fabricated min 10 MM thick (fabricated in accordance to ASME for unfired pressure vessel OR IS-2825)

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 2 OF 7
	DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING	

SL NO	ITEM	UNIT	
4.6.2	Fly ash inlet valves / outlet valves		
	a) Dome valves		
	Body		CI
	Dome		CI
	Shaft		SS 304
	Seal		Inflated rubber / Neoprene (Water cooled)
	b) Swing Disc Valve		
	Disc		Steel chrome plated
	Seat		Rubber (suitable to withstand 250-350°C ash temperature)
	Seal		Rubber (suitable to withstand 250-350°C ash temperature)
	c) Cone valve		
	Body		CI
	Seal		Silicon rubber (suitable to withstand 250-300°C ash temperature)
	d) Hemi centric valve		
	Disc		ALLOY CI – 400 BHN
	Seat		ALLOY CI - 400 BHN
	Seal		Metal to metal
4.6.3	Life of each valve components (seal, seat, disc)		Bidder to indicate
4.7	Type of valve actuation		Pneumatic cylinder operated
4.8	Accessories to be provided		
4.8.1	Level probes for fly ash transmitters		Yes, (level probe to be provided as low level probe in the ash hopper).

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 3 OF 7
	DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING	

SL NO	ITEM	UNIT	
4.8.2	Timers as back upto level probes		YES
4.8.3	Pneumatic panel		YES
4.8.4	Buffer hopper below economiser / APH hopper		Bidder to furnish
5.0	<u>BAG FILTER</u>		
5.1	Location		At the air outlet of fly ash silo and on the dry ash unloading spout (outdoor duty)
5.2	Type		Compressed air cleaned, reverse pulse jet type
5.3	Volume of Dust Laden Air to be Handled	M ³	Shall match the flow rate of ash- air mixture into fly ash silo and flow rate of air ash mixture through dry ash unloading spout
5.4	Air-to-Cloth Ratio	M/MIN.	1.5
5.5	Maximum Dust Concentration in Air that will be Let Out to Atmosphere	mg/NM ³	50
5.6	Duty		Continuous – 24 hours/day
5.7	All Required Accessories Provided		Yes
5.8	Are Controls for Automatic On-line Bag Cleaning System Required?		Yes
5.9	Material of construction		
	a) Bags		Polyester needle felt of antistatic type
	b) Cages		GI
	c) Casing and ducts		MS
6.0	<u>WHETHER THE COMPRESSORS OF REQUIRED CAPACITY AND NUMBER</u>		Compressed air requirement for conveying and Instrument Air

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 4 OF 7
	DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING	

SL NO	ITEM	UNIT	

	<u>NEED TO BE INCLUDED BY THE VENDOR</u>		requirement for complete ash handling system shall be arranged by AHS Vendor
7.0	<u>AIR-ASH TRANSPORT PIPING AND FITTINGS</u>		
7.1	Piping		1) From ash hoppers to silos MS ERW as per IS-1239 of 5.4mm thick upto 125NB and IS- 3589 of 7mm for 150NB & above with 20mm thick Cast Basalt lining.
7.2	Fittings		Ni-Cr alloy Cast iron as per IS:4771, Type 1a with minimum 4.5% Ni and hardness of 550 BHN
7.3	Type of Wear Back for Fittings		Integral with twice the pipe thick.
7.4	Necessary Steel Hangers, Supports for Piping		By the bidder (support spacing max. 3 M)
7.5	Type of the joint		Flanged with sleeve coupling to take care of thermal expansion
7.6	Location		Indoor / Outdoor
7.7	Painting of AHS components at Site by		BIDDER
7.8	Painting shall be		As per Painting section
7.9	Pipelines to be Included		
7.9.1	Piping from fly ash hoppers to fly ash silo		YES, By Bidder
7.10	Radius of 90° bends	:	5 times nominal pipe diameter
7.11	Deflection in pipe at sleeve coupling	:	3 DEG.
8.0	<u>EXHAUST FAN</u>		

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 5 OF 7
	DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING	

SL NO	ITEM	UNIT	

8.1	Location & Quantity		At the air outlet of bag filters , quantity to be furnished by bidder
8.2	Type		Centrifugal
9.0	<u>PERFORMANCE TEST AT SITE</u>		
	Is Capacity Test for Fly Ash Conveying Required to be Conducted?		YES
10.0	<u>CONVEYING AIR PIPES / VALVES</u>		
10.1	Material of construction		
	a) Conveying air		MS ERW pipes as per IS-1239 Heavy Class/IS-3589
10.2	Material of valves		Steel forged
10.3	Pipe sizing basis		Max. Velocity of 10 m/s and max. Pressure drop of 0.3 bar upto the ash pick-up point
10.4	Pipe joint		Upto 50 MM – Screwed type
			Greater than 50 mm – Flanged type
10.5	Flanges		Forged steel with serrated facing
11.0	<u>NOTES</u>		
11.1	The capacity of transmitter vessels shall be decided based on one of the following operating conditions whichever is more conservative:		

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 6 OF 7
DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING		

SL NO	ITEM	UNIT	

11.2	(a) The capacity of transmitter vessels shall be decided based on four (4) hours, continuous operation in a shift of eight (8) hours. (b) Bidder shall calculate 1) Total air quantity required for conveying the ash. 2) Size of conveying pipes. 3) Pressure drop in the pipelines and equipment etc., based on the following - Quantity of ash to be conveyed from each hopper. - Required system capacity. - No. of cycles per hour. - Distance and elevation difference between the ash collecting hopper and the fly ash silo, fly ash density range specified etc. - Cycle time.		
	Accordingly, the BIDDER shall select the pneumatic conveying units of suitable size.		
11.3	The emptying of fly ash hoppers shall be controlled automatically by level probes and timers. However, the controls shall be such that it shall be possible to empty the fly ash hoppers selectively as per the will of the operator.		
11.4	Safety valves set to relieve pressure in excess of the safe working pressure of the vessel should be mounted directly on the vessel and the valve size shall be determined by ASME code requirements.		
11.5	An air-cylinder operated vent valve and vent port shall be provided at the top of the vessel to release displaced air during filling in case fly ash discharge valve is provided.		
11.6	The following are some of the important Indian Standards relevant to this specification		
	IS 1239 (Parts I & II)	-	Mild steel tubes, tubular & other wrought steel fittings
	IS 3589	-	Seamless or Electrically welded steel pipes for water, gas and sewage (168.3 to 2032 mm OD)
	IS 2062	-	Steel for general structural purposes

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

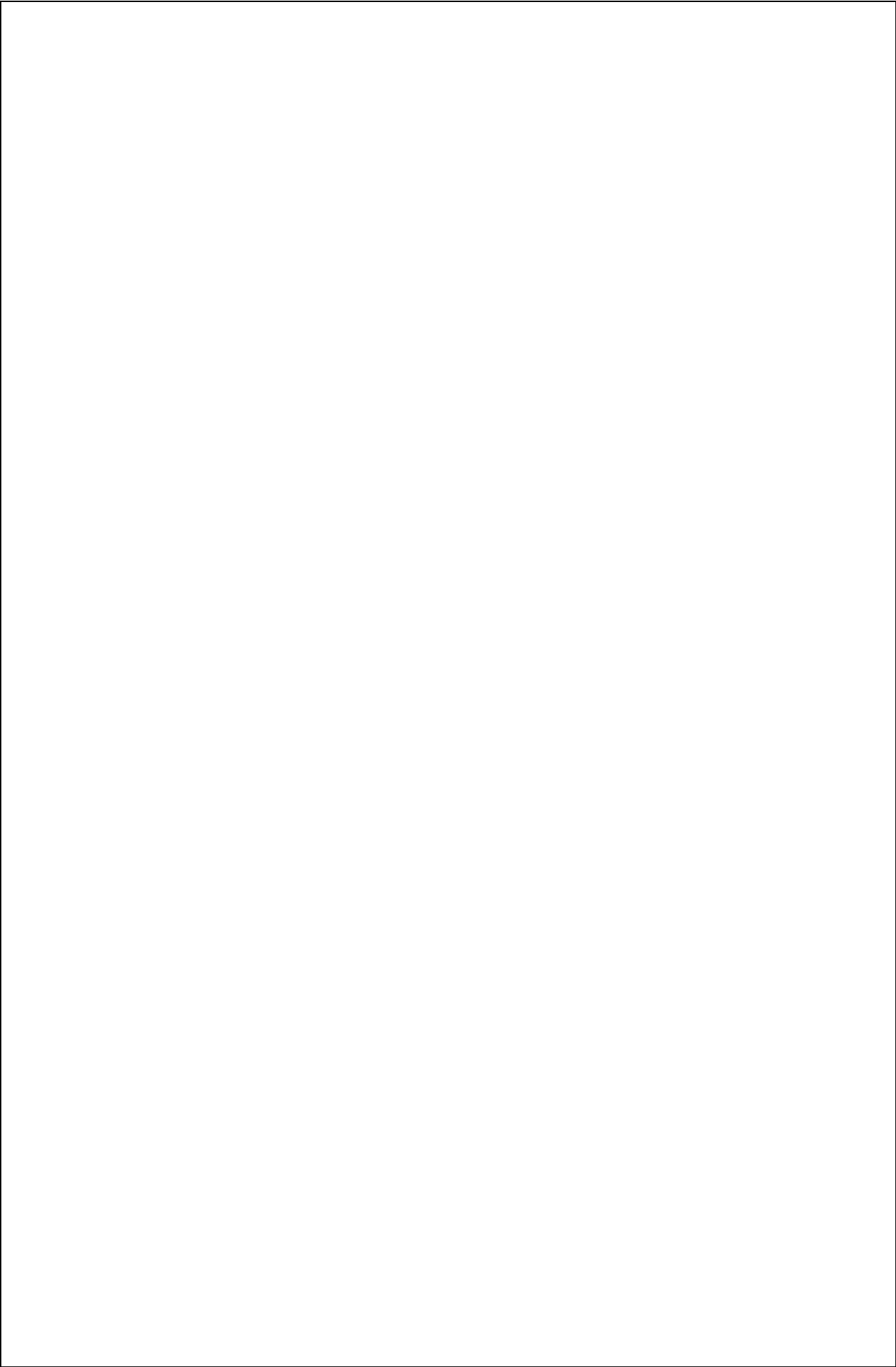
SPECIFICATION NO. TCE-5750A-H- 500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLIME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9 SHEET 7 OF 7
DATASHEET A4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING		

SL NO	ITEM	UNIT	

	IS 2825	-	Code for unfired pressure vessels
	IS 4771	-	Abrasion resistant iron castings
	IS 4894	-	Centrifugal fans
	IS 5456	-	Code of practice for testing of positive displacement type compressors & exhausters
	IS 6206	-	Guide for selection, installation & maintenance of screw / centrifugal compressors upto 10 bars
	IS 7938	-	Air receivers for compressed air installations

Other National standards are also acceptable, if they are proved to be equal or superior to the relevant Indian standards or where equivalent Indian standards do not exist

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V,	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					



SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A5 FLY ASH VALVES			VOLUME - III SECTION: D9 SHEET 1 OF 2		
SL. NO.	ITEM			UNIT			
1.0	<u>FLY ASH EXTRACTION VALVE</u>						
1.1	Type				KNIFE GATE VALVE		
1.2	Location				Below fly ash collecting hoppers /ash surge hopper – outdoor		
1.3	Number required				Two (2) / ash vessel, one below the other		
1.4	Operation				One manually operated (normally open), One pneumatically operated (automatic)		
1.5	Capacity			TPH	As per system requirement		
1.6	Location				Inlet connected to bottom of fly ash hopper by a flanged connection. Necessary flanged adopter if required shall be supplied. Outlet of valve shall be connected to fly ash transport piping		
1.7	<u>Materials of Construction and Hardness</u>						
1.7.1	Valve body				ALLOY CI 350 BHN		
1.7.2	Slide gate				SS – 304 Edge Stellited to min.1mm Thickness		
1.7.3	Valve seat				ALLOY CI 350 BHN		
1.7.4	Valve shaft				SS – 316		
1.7.5	Provision of Operating Handle for Manual Operation and Position Indicator				Yes		
2.0	<u>FLY ASH BRANCH ISOLATION VALVE</u>						
2.1	Type				KNIFE GATE VALVES		
2.2	Operation				Pneumatic Cylinder with Associated		
REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	MP			TCE.	PROJECT: 2 x 660 MW, Super-	
CHD. BY	SMS	HBS			5750A	Critical TPS, Stage- V Suratgarh,	
DATE	NOV09	MAY'12				Rajasthan	
TCE FORM NO. 330 R3							

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A5 FLY ASH VALVES			VOLUME - III SECTION: D9 SHEET 2 OF 2	
SL. NO.	ITEM			UNIT		
					Solenoid Valves	
2.3	Capacity			TPH	As per system requirement	
2.4	Location				Out Door On Fly Ash Pipe Lines	
2.5	<u>Materials of Construction and Hardness</u>					
2.5.1	Valve body				ALLOY CI 350 BHN	
2.5.2	Slide gate				SS – 304 Edge Stellited to min.1mm Thickness	
2.5.3	Valve seat				ALLOY CI 350 BHN	
2.5.4	Valve shaft				SS – 316	
3.0	<u>NOTES</u>					
3.1	All Parts of the Valves coming in Contact with Ash shall be Wear Resistant conforming to IS 4771, Type – 1A					
3.2	Painting shall be as approved by owner / consultant.					
3.3	Plugged poking hole shall be provided					
3.4	Operating handle with position indicator shall be provided					
3.5	Drain hole right below the inlet port to drain off air preheater washed water to be provided for valves below APH hopper.					
3.6	Valve disc shall be designed such that it encounters minimum abrasion					
3.7	Associated solenoid valve shall be provided.					
3.8	<u>The following tests shall be conducted at manufacturer's works on all valves</u>					
3.8.1	Visual Inspection and Dimensional Check Against Approved Manufacturer's Drawings					
3.8.2	Hydrostatic / Vacuum Test for all valves					
REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL
PPD. BY	HBS	MP			TCE.	PROJECT: 2 x 660 MW, Super-
CHD. BY	SMS	HBS			5750A	Critical TPS, Stage- V Suratgarh,
DATE	NOV09	MAY'12				Rajasthan
						ISSUE R1
TCE FORM NO. 330 R3						

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A6 CONVEYING AIR COMPRESSORS				VOLUME - III SECTION: D9 SHEET 1 OF 3	
SL. NO.	ITEM				UNIT		
1.0	<u>CONVEYING AIR COMPRESSORS</u> From ESP, Air pre heater hoppers and stack hoppers to Intermediate silos (First stage conveying) and from Intermediate silo to FA silos (Second stage conveying)						
1.1	Type						Oil free Screw compressor
1.2	Capacity and discharge pressure						Bidder to indicate
1.3	Quantity						For first stage conveying Four (4) nos, Two (2) Working + Two (2) Standby for Each unit For second stage conveying Six (6) nos, Four (4) Working + Two (2) Standby for both unit
							All the compressors capacity shall be based on emergency condition. However bidder to decide the Nos and capacities to meet the system requirement.
1.4	Maximum compressor speed				rpm		As per IS: 6206
1.5	Cooling Water (CW) System						
1.5.1	Type						Closed loop CW system by means of Cooling tower & pumps common for all the units (for all the conveying & Instrument air compressors)
1.5.2	CW pumps, 1) Nos 2) Capacity 3) Head						By bidder
1.5.3	Cooling Tower, 1) Type 2) Nos						1) Fibre Reinforced Plastic(FRP) 2) 1 No.
1.5.4	Make-up water requirement at cooling tower basin						From main Cooling tower blow down
1.5.5	Complete CW Piping						By bidder
1.6	Cooling water Inlet temperature				deg c		By bidder
1.7	Maximum allowable temperature rise				deg c		8
REV. NO.	R0	R1				JOB NO.	CLIENT: RRVUNL
PPD. BY	HBS	MP				TCE.	PROJECT: 2 x 660 MW, Super-
CHD. BY	SMS	HBS				5750A	Critical TPS, Stage- V, Suratgarh,
DATE	NOV09	MAY12					Rajasthan
							ISSUE R1
TCE FORM NO.330 R3							

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A6 CONVEYING AIR COMPRESSORS				VOLUME - III SECTION: D9 SHEET 2 OF 3		
SL. NO.	ITEM				UNIT			
	for cooling water							
1.8	Cooling water inlet pressure available near compressor House				kg/sq.cm (g)	By bidder		
1.9	After cooler, moisture separator and accessories					Yes		
1.10	Type of control system					Common PLC based system for complete Ash handling system		
1.11	<u>AIR RECEIVERS</u>							
1.11.1	Quantity				No.s	Minimum 4 (Four) nos.		
1.11.2	Capacity of each Air receiver (min.)				cu.m	Bidder to indicate		
1.11.3	Code of construction					ASME SEC VIII / IS: 2825		
1.11.4	Pressure gauge, temp. gauge, safety valve, Auto drain trap etc.					Yes		
1.11.5	Corrosion allowance				mm	3		
1.11.6	Design pressure				kg/sq.cm (g)	1.25 times the operating pressure		
1.11	<u>CRANES</u>							
1.11.1	Type of crane					EOT Crane / Underslung Crane		
1.11.2	Quantity					As per system requirement		
1.11.3	Capacity					Bidder to indicate		
1.12	<u>ELECTRIC HOISTS</u>							
1.12.1	Location *					On top of Silo		
1.12.2	Capacity & Lift					Bidder to indicate		
NOTE :								
REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP						
CHD. BY	SMS	HBS						
DATE	NOV09	MAY12						
TCE FORM NO.330 R3								

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B			TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A6 CONVEYING AIR COMPRESSORS			VOLUME - III SECTION: D9 SHEET 3 OF 3		
SL. NO.	ITEM				UNIT			
1) Bidder to include hoisting facilities in other areas also as per requirement. Bidder to furnish the list. 2) For other technical data e.g. Material of construction, performance guarantees...etc., please refer Data sheet for Instrument air compressors								
REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY	HBS	MP					Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	HBS						
DATE	NOV09	MAY12						
TCE FORM NO.330 R3								

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9			
	TCE.5750A-H-500-001		DATA SHEET A7						
	PART B		INSTRUMENT AIR COMPRESSORS			SHEET: 1 OF 6			
GENERAL	1. DESIGNATION: COMPRESSORS FOR INSTRUMENT AIR					DESIGN DATA (CONTD.)	19.1 FOR INTER-COOLER, AFTER-COOLER AND OIL-COOLER: WATER		
	2. NUMBER REQUIRED: 4 (2W+2S) NEAR PLANT AREA AND 2(1W+1S) NEAR SILO.						20. COOLING WATER QUALITY:		
	3. TAG NUMBERS: BY BIDDER						SERVICE WATER		
	4. LOCATION: INDOOR						21. COOLING WATER INLET		
	5. OPERATION: CONTINUOUS						TEMPERATURE: BY BIDDER		
	6. TYPE OF DRIVE: ELECTRIC MOTOR						22. MAXIMUM COOLING WATER OUTLET		
	7. APPLICABLE STANDARDS: API 618/						TEMPERATURE: BY BIDDER		
	IS 6206/IS13124/API 617/API 672/API 619/						23. COOLING WATER PRESSURE AT		
	IS 11780						AT INLET: BY BIDDER Kg/ cm ² (g)		
	8.						24. MAXIMUM COOLING WATER		
	9.					PRESSURE DROP IN THE COMPRESSOR,			
	10. TYPE :					INTER-COOLER, AFTER-COOLER AND			
	1) OIL FREE SCREW TYPE					OIL- COOLER : 0.5 Kg/ cm ²			
						25. COMPRESSOR FRAME LUBRICATION :			
						SPLASH/ PRESSURISED			
	DESIGN DATA	11. FLUID TO BE COMPRESSED : AIR					DUAL TYPE CONTROLS	26. TYPE OF CAPACITY CONTROL :	
		12. CAPACITY (FAD) : BY BIDDER M ³ /Hr						BY SPEED VARIATION/ AT CONSTANT	
		13.						SPEED	
		14. PROPERTIES OF GAS/ GAS COMPO-						27. METHOD OF CAPACITY CONTROL AT	
		SITION : ATMOSPHERIC AIR						CONSTANT SPEED : DUAL TYPE	
15. SUCTION PRESSURE : ATMOSPHERIC					CONTROL / MOVABLE INLET GUIDE				
Kg/ cm ² (g)					VANES				
16. SUCTION TEMPERATURE -									
REFER SEC. B : °C									
17. DISCHARGE PRESSURE : BY BIDDER					30. ADJUSTABLE RANGE FOR PRESSURE				
Kg/ cm ² (g)					SWITCHES : BY BIDDER				
18. MAXIMUM COMPRESSOR SPEED :					31. EXPECTED SETTING OF PRESSURE				
BY BIDDER - RPM					SWITCHES FOR :				
19. COOLING MEDIUM : CT BLOW DOWN					31.1 AUTO LOAD-UNLOAD REGULATION :				
WATER					(a) LOAD: Kg/ cm ² (g) BY BIDDER				
					(b) UNLOAD: Kg/ cm ² (g) BY BIDDER				
REV. NO.		R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL		ISSUE R1
PPD. BY		HBS	MP				PROJECT: 2 x 660 MW, Super-		
CHD. BY		SMS	HBS				Critical TPS, Stage- V		
DATE		NOV09	MAY12				Suratgarh, Rajasthan		

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9		
	TCE.5750A-H-500-001		DATA SHEET A7					
	PART B		INSTRUMENT AIR COMPRESSORS			SHEET: 2 OF 6		
DUAL TYPE CONTROLS (CONTD.)	31.2 AUTO START-STOP REGULATION:					MATERIALS OF CONSTRUCTION FOR CENTRIFUGAL COMPRESSORS (CONTD.)		
	(a) START: Kg/ cm ² (g) BY BIDDER							
	(b) STOP: Kg/ cm ² (g) BY BIDDER							
	31.3 VERY LOW RECEIVER PRESSURE							
	ALARM: BY BIDDER Kg/ cm ² (g)							
	31.4 HIGH RECEIVER PRESSURE							
	ALARM: BY BIDDER Kg/ cm ² (g)							
	32. NUMBER OF STEPS FOR LOAD -							
	UNLOAD REGULATION: 2 / 3 / 4							
	33.							
	34. CYLINDER AND CYLINDER LINER:-							
	— CI IS 210 GR FG 260/ SS/							
	35. PISTON RINGS: CARBON FILLED							
	— TEFLON/ BRONZE / CI/							
	36. VALVE SEATS: SS 420/							
37. VALVE PLATES : SS 420/								
38. VALVE STOPS : SS 420/								
39. VALVE SPRINGS : SS 420/ SPRING								
STEEL/								
40. PISTON : ALUMINIUM/ CI/								
41. CRANK SHAFT, CONNECTING ROD								
— AND PISTON ROD: FORGED STEEL/								
— SG IRON/								
42. CASING : CI IS 210 OR ASTM A 48 OR					MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS			
— A 278 / CAST STEEL ASTM A 216 GR								
— WCB NORMALIZED								
43. DIFFUSER : CI ASTM A 536, GR 60 40 18/								
— CAST ALUMINIUM ASTM B 26, ALLOY								
— 355.0								
44. IMPELLERS: CAST ALUMINIUM ASTM								
— B 26, ALLOY C 355/ CAST SS 410/ CAST								
— SS ASTM A 747, TYPE CB7 Cu 1 OR CB7								
— Cu 2/ FORGED SS 403								
45. BLADES: PLATE STEEL AISI 4130 4140/								
— AISI 4320 4340								
46. GUIDE VANES: CI ASTM A 48 OR A 278,								
— CL 30/ CAST STEEL ASTM A 216, GR								
— WCB/ CAST SS ASTM A 743/744 OR								
— A 351, GR CA15, CF3, CF3M, CF8, CF8M								
47. SHAFT : FORGED STEEL AISI 1040 1050								
— OR ASTM A 470, CL 7/FORGED SS ASTM								
— A 336, GR F6								
48. COVERS AND HUBS : FORGED STEEL								
— AISI TYPE 3140/ PLATE STEEL ASTM A								
— 543/ FORGED SS AISI TYPE 403 OR 410								
49. CASING: CI IS 210 OR ASTM A 278 CL					MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS			
40/ FABRICATED STEEL ASTM A 353/								
CAST STEEL ASTM A 216 GR WCB								
NORMALIZED / CAST SS ASTM A 743					MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS			
AND 744 CA6-NM								
50. ROTOR BODY: CI ASTM A 395								
FORGED STEEL AISI 1030-1045/ CAST					MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS			
ALUMINIUM ASTM B 26 ALLOY 355								
OR C 355								
51. SHAFT: FORGED STEEL AISI 1030-1035/					MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS			
FORGED SS ASTM A151 TYPE 410 SS								
REV. NO.		R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super- Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY		HBS	MP					
CHD. BY		SMS	HBS					
DATE		OCT09	MAY12					

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9				
	TCE.5750A-H-500-001		DATA SHEET A7							
	PART B		INSTRUMENT AIR COMPRESSORS			SHEET: 3 OF 6				
COMPRESSOR ACCESSORIES	52. INTAKE FILTER TYPE : PAPER/ OIL WETTED/ CLOTH/ OIL BATH/ COMBINED DRY AND WET					INTER-COOLERS / AFTER-COOLERS / OIL-COOLERS DESIGN DATA	69. DESIGNATION: INTER-COOLERS/ AFTER-COOLERS			
	52.1 MATERIAL OF CONSTRUCTION: CASING: MS/ ALUMINIUM						70. TAG NUMBERS FOR INTER-COOLERS: -			
	52.2						71. AFTER-COOLERS REQUIRED: YES NUMBER :			
	53. SILENCER REQUIRED : YES						72. TAG NUMBERS FOR AFTER-COOLERS : -			
	54. DRIVE PULLEYS WITH V-BELT AND BELT GUARDS REQUIRED : YES FOR BELT DRIVEN COMPRESSORS						73. CAPACITY OF :			
	55. COUPLINGS AND COUPLING GUARDS REQUIRED : YES FOR DIRECT COUPLED COMPRESSORS						73.1 INTER-COOLERS : BY BIDDER M ³ / Hr 73.2 AFTER-COOLERS : BY BIDDER M ³ / Hr			
	56. SLIDE RAILS FOR MOTOR REQUIRED: YES						74. TYPE : HORIZONTAL/ VERTICAL SHELL AND TUBE TYPE WITH REMOVABLE TUBE BUNDLES/			
	57. CONTROL CABINET REQUIRED : YES						75. TYPE OF FLOW : BY BIDDER			
	58. IMPULSE TUBING : COPPER/ ADMIRALITY BRASS AS PER BS EN 1057 EXCEPT FOR EDDY CURRENT TEST/ STAINLESS STEEL						76. OPERATING PRESSURE FOR AFTER- COOLERS – BY BIDDER			
	59. MOTOR BY : BY BIDDER						76.1 AIR/ GAS SIDE : BY BIDDER 76.2 WATER SIDE : BY BIDDER			
	60. STARTER BY : BY BIDDER						77. DESIGN PRESSURE FOR AFTER- COOLERS 1.25 TIMES OPERATING PRESSURE			
	61.						77.1 AIR/ GAS SIDE : BY BIDDER 77.2 WATER SIDE : BY BIDDER			
	62.						78. MAXIMUM ACCEPTABLE OUTLET AIR TEMPERATURE : 6 ⁰ C ABOVE COOLING WATER INLET TEMP OF AFTER COOLER			
	63.						79. ALLOWABLE PRESSURE DROP OF AIR THROUGH AFTER-COOLER : 0.2 Kg/ cm ²			
	64.						80. DESIGN CODE : ASME SEC. VIII DIV. 1 AND TEMA			
	65.						81. CORROSION ALLOWANCE : 3 mm			
	66.									
	67.									
	68.									
	REV. NO.	R0	R1				JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super- Critical TPS, Stage- V Suratgarh, Rajasthan		ISSUE R1
	PPD. BY	HBS	MP							
	CHD. BY	SMS	HBS							
	DATE	NOV09	MAY12							

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9	
	TCE.5750A-H-500-001		DATA SHEET A7				
	PART B		INSTRUMENT AIR COMPRESSORS			SHEET: 4 OF 6	
	INTER-COOLERS/AFTERCOOLERS/ OIL-COOLERS – M O C	82. SHELL : CS SA 106 GR B/ IS 2002/			RECEIVER DESIGN DATA	90. DESIGNATION : RECEIVERS FOR IA	
		83. TUBES : COPPER/ ADMIRALITY BRASS AS PER BS EN 1057 EXCEPT FOR EDDY CURRENT TEST / SS 316				91. NUMBER REQUIRED : FOUR (4) TWO (2) NEAR PLANT AREA TWO (2) NEAR FA SILO AREA.	
84. TUBE SHEETS : CS SA 105/ IS 2002/ BRASS/ SS 316 /			92. TAG NUMBERS : -				
85. TUBE SUPPORT PLATES : IS 2062/			93. TYPE : VERTICAL CYLINDRICAL WITH WELDED DISHED ENDS				
86.			94. OPERATING PRESSURE : BY BIDDER Kg/ cm ² (g)				
INTER-COOLERS / AFTER-COOLERS ACCESSORIES	87. MOISTURE AND OIL SEPARATOR WITH AUTO DRAIN TRAP TO BE PROVIDED WITH EACH INTER- COOLER AND AFTER-COOLER TO DISCHARGE MOISTURE AND OIL TO DRAIN					95. DESIGN PRESSURE : (1.25 X OPERATING PRESSURE) Kg/ cm ² (g)	
	87.1 TYPE OF MOISTURE AND OIL SEPARATOR : CENTRIFUGAL/ DEMISTER PAD/ BAFFLE					97. NOMINAL VOLUME : BY BIDDER M ³	
	87.2 TYPE OF AUTO DRAIN TRAP : INVERTED BUCKET / BALL FLOAT / SOLENOID OPERATED / ELECTRONIC LEVEL CONTROLLED					98. DIMENSIONS : 98.1 HEIGHT TAN TO TAN : mm	
	88. MATERIAL OF CONSTRUCTION OF MOISTURE AND OIL SEPARATOR					98.2 DIAMETER : mm	
	88.1 BODY/ SHELL : CS SA 106 GR B/ IS 2002/					99. APPLICABLE CODE : IS 2825	
	88.2					100. CORROSION ALLOWANCE : 3 mm	
	89. MATERIAL OF CONSTRUCTION OF AUTO DRAIN TRAP					101. SHELL AND DISHED END MATERIAL : IS 2002/ IS 2062	
	89.1 BODY : CI IS 210/ SS					102. INTERNAL PAINTING : BLACK BITUMINOUS	
	89.2 TRIM : BRONZE/SS/					103. INSULATION : NO	
						104.	
					RECEIVER ACCESSORIES	105. SUPPORT LEGS/ LUGS/ SKIRT REQUIRED : YES	
						106. MANHOLE WITH COVER FOR INSPECTION AND CLEANING REQUIRED : YES	
						107.	
			108.				
REV. NO.		R0	R1		JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY		HBS	MP			Critical TPS, Stage- V	
CHD. BY		SMS	HBS			Suratgarh, Rajasthan	
DATE		NOV09	MAY12			ISSUE R1	

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED				Vol.III, SECTION : D9	
	TCE.5750A-H-500-001		DATA SHEET A7					
	PART B		INSTRUMENT AIR COMPRESSORS				SHEET: 5 OF 6	
MISCELLANEOUS	109. ALL THE VALVES, SPECIALITIES INSTRUMENTS AND ACCESSORIES : REQUIRED					123. ESSENTIAL SPARES : REFER D20		
						124.		
						124.1		
	110. COUNTER FLANGES FOR ALL THE CONNECTIONS AT BATTERY LIMITS WITH NUTS, STUDS, BOLTS, GASKETS AND WASHERS REQUIRED : YES					124.2		
						124.3		
						124.4		
	110.1 FLANGES : AS PER REQUIREMENT					124.5		
	111. FOUNDATION BOLTS FOR ALL THE EQUIPMENT REQUIRED : YES					124.6		
						124.7		
						124.8		
	112. ERECTION BY CONTRACTOR : YES					124.9		
	113. ERECTION SUPERVISION BY CONTRACTOR : YES					124.10		
	114.							
	PAINTING (AS APPROVED BY OWNER)	115. PRIMER : REFER NOTE 1					125.	
115.1 NUMBER OF COATS : REFER NOTE 1					126. PERFORMANCE TEST AT SITE REQUIRED : YES			
115.2 DRY FILM THICKNESS : μ					127. APPLICABLE STANDARDS : IS 5456 / API 618 / API 617 / API 672 / API 619 / IS 11780			
116. FINISH PAINT : REFER NOTE 1								
116.1. NUMBER OF COATS : REFER NOTE 1					128.			
116.2 DRY FILM THICKNESS : μ								
COMPANION SPECIFICATIONS (REFER ELECTRICAL SECTIONS)	117. MOTORS : BY BIDDER					130. CAPACITY OF EACH COMPRESSOR :		
	118. TURBINE :					(+) (–) 0 M ³ /Hr		
	119. PIPING MATERIAL SPECIFICATIONS :					131. DISCHARGE PRESSURE :		
	GI HEAVY CLASS . REFER D7					(+) (–) 0 Kg/ cm ² (g)		
	120. INSTRUMENTATION AND CONTROL					132. POWER CONSUMPTION :		
	(REFER VOLUME VI SECTIONS)					(+) 0 (–) KW		
	121. CONTROL CABINET :					133. TEMPERATURE OF AIR AT OUTLET OF AFTER COOLER : BY BIDDER $\pm$ ° C		
122. CABLES :					134. COOLING WATER FLOW RATE :			
					BY BIDDER $\pm$ M ³ /Hr			
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-		ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V		
CHD. BY	SMS	HBS				Suratgarh, Rajasthan		
DATE	NOV09	MAY12						

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED				Vol.III, SECTION : D9		
	TCE.5750A-H-500-001		DATA SHEET A8						
	PART B		AIR DRYING PLANT				SHEET: 1 OF 3		
GENERAL	1. DESIGNATION : AIR DRYING PLANT FOR INSTRUMENT AIR				DESIGN DATA (CONTD.)	23. PRESSURE AT THE OUTLET OF THE LAST INTERCOOLER OF THE MULTI- STAGE COMPRESSOR (FOR HOC TYPE ONLY) : BY BIDDER Kg/cm²(g)			
	2. NUMBER REQUIRED : 4 (2W+2S) FOR PLANT AREA (1W+1S) FOR SILO AREA					24. QUALITY OF COOLING WATER (CW) : SERVICE WATER			
	3. TAG NUMBERS : -					25. CW INLET TEMPERATURE : BY BIDDER			
	4. OPERATION : CONTINUOUS					26. MAXIMUM ALLOWABLE CW OUTLET TEMPERATURE : BY BIDDER			
	5. LOCATION : INDOOR					27. CW INLET PRESSURE : BY BIDDER Kg/cm²(g)			
	6. INLET AIR QUALITY : OIL AND DUST FREE COMPRESSED AIR					28. MAXIMUM ALLOWABLE CW PRESSURE DROP : 0.5 Kg/cm²			
	7. APPLICABLE CODE : IS 11989					29. CONTROL POWER SUPPLY : V			
	8.					30.			
	9.					31.			
DESIGN DATA	10. TYPE : HEAT OF COMPRESSION TWIN TOWER TYPE				MATERIALS AND CODES OF CONSTRUCTION	32. DESIGN CODES FOR ALL PRESSURE VESSELS : ASME SEC VIII DIV 1/IS 2825			
	11. TYPE OF DESICCANT : SILICA GEL					33. CORROSION ALLOWANCE : 3 mm			
	12. DESIGN CAPACITY(FAD):BY BIDDER					34. DESSICANT CHAMBER : IS 2062 GR B / IS 2002 GR 2 /			
	13. OPERATING PRESSURE:BY BIDDER					35. FILTERS SHELL : SA 106 GR B / IS 2062 GR B / IS 2002 GR 2			
	14. DESIGN PRESSURE : (1.25 X OPERATING PRESSURE) Kg/cm²(g)					36. MOISTURE SEPARATOR SHELL : SA 106 GR B/IS 2062 GR B/IS 2002 GR 2			
	15. MAXIMUM ALLOWABLE PR. DROP ACROSS AIR DRYING PLANT : 0.5 Kg/cm²					37. DISTRIBUTOR SHELL : SA 106 GR B / IS 2062 GR B / IS 2002 GR 2			
	16. AIR INLET TEMPERATURE : BY BIDDER °C					38. ELECTRIC HEATER CHAMBER : SA 106 GR B / IS 2002 GR 2			
	17. AIR OUTLET TEMPERATURE: BY BIDDER °C					39. HEAT EXCHANGER			
	18. OUTLET AIR DEW POINT :					39.1 DESIGN CODES : ASME SEC VIII DIV 1 AND TEMA C			
	18.1 AT ATMOSPHERIC PRESSURE : (-)40°C					39.2 SHELL : SA 106 GR B / IS 2002 GR 2			
	18.2 AT OPERATING PRESSURE : (-)20°C					39.3 TUBES : COPPER/ADMIRALITY BRASS			
	19. MAXIMUM DIFFERENTIAL MOISTURE LOADING (% BY WEIGHT) : 10 %					AS PER BS EN 1057			
	20. TEMPERATURE AT THE OUTLET OF THE LAST INTER COOLER OF THE MULTI-STAGE COMPRESSOR (FOR HOC TYPE ONLY) : BY BIDDER °C					39.4 TUBE SHEET : IS 2002 GR 2 / SA 105			
	21.								
	22.								
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-		ISSUE R1	
PPD. BY	HBS	MP				Critical TPS, Stage- V			
CHD. BY	SMS	HBS				Suratgarh, Rajasthan			
DATE	NOV09	MAY12							

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9	
	TCE.5750A-H-500-001 PART B		DATA SHEET A AIR DRYING PLANT			SHEET: 2 OF 3	
MATERIALS AND CODES OF CONST. (CONTD.)	39.5 BAFFLE PLATES : IS 2062 GR B / IS 2002 GR 2				MISCELLANEOUS	52. BY PASS ARRANGEMENT FOR THE PLANT REQUIRED : YES	
	40.					53. ALL THE VALVES, SPECIALITIES INSTRUMENTS AND ACCESSORIES : REQUIRED	
41.				54. COUNTER FLANGES FOR ALL THE CONNECTIONS AT BATTERY LIMITS WITH NUTS, STUDS, BOLTS, GASKETS AND WASHERS REQUIRED : YES			
42.				55. FLANGES :			
CONTROLS FOR NO PURGE LOSS AND HOC TYPE	43. CONTROL SIGNAL LAMPS FOR				PAINTING (AS APPROVED BY OWNER / CONSULTANT)	56. FOUNDATION BOLTS FOR ALL THE EQUIPMENT REQUIRED: YES	
	43.1 HEATER ON					57. ERECTION BY CONTRACTOR: YES	
	43.2 POWER, CONTROL SUPPLY ON					58. ERECTION SUPERVISION BY CONTRACTOR: YES	
	43.3 CHAMBER 'A' ON ADSORPTION					59.	
	43.4 CHAMBER 'B' ON ADSORPTION					60.	
44 SWITCHES/PUSH BUTTONS FOR				61.			
44.1 ACKNOWLEDGE/RESET/TEST				62. PRIMER : REFER NOTE 2			
44.2 START/STOP OF HEATER				62.1 NUMBER OF COATS : PRIMER : REFER NOTE 2			
44.3 AUTO / MANUAL CHANGE-OVER SELECTOR SWITCH				62.2 DRY FILM THICKNESS PER COAT : μ			
45. ANNUNCIATION SYSTEM				63. FINISH PAINT :			
46. CONTROL SIGNAL LAMPS FOR				63.1 NUMBER OF COATS :			
46.1 HEATER ON				63.2 DRY FILM THICKNESS PER COAT :			
46.2 BLOWER ON				64.			
46.3 POWER, CONTROL SUPPLY ON				65.			
46.4 CHAMBER 'A' ON ADSORPTION				66.			
46.5 CHAMBER 'B' ON ADSORPTION				67. INSULATION :			
47. SWITCHES/PUSH BUTONS FOR				68. BLOWER :			
47.1 ACKNOWLEDGE/RESET/TEST				69. INSTRUMENTATION :			
47.2 START/STOP OF HEATER & BLOWER				70.			
47.3 AUTO/MANUAL CHANGEOVER SEELCTOR SWITCH				71.			
48. ANNUNCIATION SYSTEM				72.			
CONTROLS FOR BLOWER REACTIVATED TYPE	49. CONTROL SIGNAL LAMPS FOR				COMPANION SPECIFICATIONS	73.	
	49.1 POWER, CONTROL SUPPLY ON						
	49.2 CHAMBER 'A' ON ADSORPTION						
	49.3 CHAMBER 'B' ON ADSORPTION						
	50. SWITCHES/PUSH BUTTONS FOR						
50.1 ACKNOWLEDGE/RESET/ TEST							
50.2 AUTO/MANUAL CHANGEOVER SELCTOR SWITCH							
51. ANNUNCIATION SYSTEM							
CONTROLS FOR HEATLESS TYPE	52. BY PASS ARRANGEMENT FOR THE PLANT REQUIRED : YES				JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
	53. ALL THE VALVES, SPECIALITIES INSTRUMENTS AND ACCESSORIES : REQUIRED					Critical TPS, Stage- V Suratgarh, Rajasthan	
	54. COUNTER FLANGES FOR ALL THE CONNECTIONS AT BATTERY LIMITS WITH NUTS, STUDS, BOLTS, GASKETS AND WASHERS REQUIRED : YES						
	55. FLANGES :						
REV. NO.		R0	R1			ISSUE R1	
PPD. BY		HBS	MP				
CHD. BY		SMS	HBS				
DATE		NOV09	MAY12				

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			Vol.III, SECTION : D9	
	TCE.5750A-H-500-001 PART B		DATA SHEET A AIR DRYING PLANT			SHEET: 3 OF 3	

SPARES AND MAINTENANCE TOOLS AND TACKLES	74.	PERFORMANCE GUARANTEES (CONTD.)	81. PRESSURE DEW POINT AT OUTLET :		
	75.		BY BIDDDER (+) 0 °C		
	75.1		(–) °C		
	75.2		82. AIR PRESSURE DROP ACROSS THE		
	75.3		PLANT : (+) 0 Kg/cm ²		
	75.4		BY BIDDDER (–) Kg/cm ²		
	75.5		83. AIR OUTLET TEMPERATURE :		
	75.6		BY BIDDDER (+) 0 °C		
TESTS AND INSPECTION	76.	PERFORMANCE GUARANTEES (CONTD.)	(–) °C		
	77.		84. TOTAL POWER CONSUMPTION PER		
	78.		CYCLE : (+) 0 KW		
			BY BIDDDER (–) KW		
PERFORMANCE GUARANTEES	79. DESIGN CAPACITY (FAD) :		COST LOADING AND PENALTY	85.	
	BY BIDDER (+) M ³ /Hr			86. TOTAL POWER CONSUMPTION/CYCLE:	
	(–) 0 M ³ /Hr			Rs. / KW	
	80. OUTLET AIR DEW POINT AT			87.	
	ATMOSPHERIC PRESSURE :			88.	
	BY BIDDER (+) 0°C			89.	
	(–) °C				

NOTES

1. THE FLOW THROUGH THE AIR DRYING PLANT MAY VARY. HOWEVER, THE SPECIFIED AIR DEW POINT TEMPERATURE SHALL BE ACHIEVED FOR ANY FLOW UPTO DESIGN CAPACITY.
2. FOR PAINTING REFER RESPECTIVE PAINTING SPECIFICATION.

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V	
CHD. BY	SMS	HBS				Suratgarh, Rajasthan	
DATE	NOV09	MAY12					

SPECIFICATION NO TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A9 FLY ASH SILO & ACCESSORIES			SECTION: D9 SHEET 1 OF 3		
SL. NO.		ITEM		UNIT			
1.0 <u>GENERAL DESIGN DATA</u>							
1.1	Type of Silo Construction / No. of silo				RCC / 4		
1.2	Construction of Silo by				Bidder		
1.3	Type of ash in the Silo				Fly ash		
1.4	Bulk Density of Ash for Volume Calculation			Kgs/Cu.m	800		
1.5	Bulk Density of Ash for Structural Design			Kgs/Cu.m	1600		
1.6	Angle of repose			Degree	35°		
1.7	Maximum lump size			mm	1 (One)		
1.8	Quantity of Ash to be Stored			Tonnes	1000 Minimum		
1.9	Type of Silo Level Measurement				Continuous, Ultrasonic type. Data shall be available on local monitor		
1.10	No. of outlets required with Purpose – Fly Ash				i) 2 for conditioner disposal ii) 2 for disposal into container/closed trucks iii) 1 for future		
1.11	Shape of Silo				Cylindrical & Flat Bottom		
1.12	Height of Platform Supporting Silo Unloading Equipment from Ground Level			Clear	5.5 m up to bottom of structure		
1.13	Free board above the ash level			mm	500 (Minimum)		
1.14	Height of conical portion for Flat Bottom Silos for fixing fluidizing air slides.			mm	700 (Minimum)		
2.0 <u>ACCESSORIES AND MOUNTINGS</u>							
2.1	Manhole				Yes. By Bidder		
2.2	Ladder for Access Inside Silo				Yes. By Bidder		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY'12					
TCE FORM NO.330 R3							

SPECIFICATION NO TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A9 FLY ASH SILO & ACCESSORIES			VOLUME - III SECTION: D9 SHEET 2 OF 3	
SL. NO.		ITEM		UNIT		
2.3	Pressure / Vacuum Relief Door / valve			Yes. By Bidder		
2.4	<u>VENT BAG FILTER</u>					
2.4.1	Bag material type			Polyster needle felt of Anti-Static properties		
2.4.2	Air to cloth ratio		m/min	1.5		
2.4.3	Emission level at the outlet of bag filter		mg/Nm ³	50		
2.4.4	Type of bag cleaning arrangement			Reverse pulse jet		
2.5	Terminal Box			Yes. By Bidder		
2.6	Three cell collector			No		
2.7	Access Staircase from Ground Level to Silo top and Intermediate Platforms			Yes. By Bidder		
2.8	Silo Fluidizing Equipment with Air Slides			YES for Fly Ash Silo		
2.9	Adequately Sized Openings for outlet			Yes. By Bidder		
2.10	Operating Floor at Dust Conditioner / Disposal Equipment			Yes. By Bidder		
2.11	Silo Ash Level Indication			Yes. By Bidder		
2.12	Provision for Elevator to Silo Required			NO		
2.13	Elevator Supply			Not Required		
2.14	Hand Rails and Toe Plates all Round Roof Area Required			Yes. By Bidder		
2.15	Silo Lining Material			Nil		
2.16	Shed Over Silo Provided			Yes. By Bidder		
2.17	Monorail and hoist in shed over Silo			Yes. By Bidder		
2.18	Local control panel for unloading system			Yes. By Bidder		
REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan
PPD. BY	HBS	MP			TCE.	
CHD. BY	SMS	HBS			5750A	
DATE	NOV09	MAY'12				
TCE FORM NO.330 R3						

ISSUE
R1

SPECIFICATION NO TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED				VOLUME - III	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A9 FLY ASH SILO & ACCESSORIES				SECTION: D9 SHEET 3 OF 3	
SL. NO.		ITEM			UNIT		
3.0		Painting shall be					Painting shall be as per painting specification
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY	HBS	MP				Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	SMS	HBS					ISSUE R1
DATE	NOV09	MAY'12					
TCE FORM NO.330 R3							

SPECIFICATION
NO. TCE-5750A-
500-H-001
PART B

TATA CONSULTING ENGINEERS LIMITED

RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V,
Unit # 7 & 8 at Suratgarh, Rajasthan
DATA SHEET – A10
ASH DISPOSAL EQUIPMENT
CONTINUOUS DUST CONDITIONER, UNLOADER &
ROTARY FEEDER

VOLUME : III
SECTION : D9
SHEET 1 OF 3

1.0	<u>CONTINUOUS DUST CONDITIONER & UNLOADER</u>		
1.1	Designation		Continuous dust conditioner and Unloader
1.2	Type		Paddle mixer type, which gets feed from silo outlet through a Rotary feeder. Water for conditioning of dust shall be supplied through spray nozzles. Water quantity shall be adjustable.
1.3	Number required	Nos.	8 NOS. (i.e. Two / Silo)
1.4	Capacity	TPH	200
1.5	<u>MATERIAL HANDLED</u>		Fly ash
1.5.1	Type of material		Highly Abrasive
1.5.2	Maximum Lump Size	mm	1
1.6	Location		Below Fly Ash Silo
1.7	Operation		Continuous during each Unloading Operation
1.8	<u>ROTARY AIR LOCK FEEDER</u>		
1.8.1	Location		To be provided upstream of paddle mixer and below outlets of silo.
1.8.2	Capacity	TPH	200
1.8.3	Quantity	Nos.	18
1.8.4	Material of Construction:		
	i) Inlet, outlet and rotor		MS fabricated. The edge of the rotor vanes shall be hardened to 340 BHN for 100 mm width.
	ii) Shaft		EN - 8

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					

SPECIFICATION
NO. TCE-5750A-
500-H-001
PART B

TATA CONSULTING ENGINEERS LIMITED

RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V,
Unit # 7 & 8 at Suratgarh, Rajasthan
DATA SHEET – A10
ASH DISPOSAL EQUIPMENT
CONTINUOUS DUST CONDITIONER, UNLOADER &
ROTARY FEEDER

VOLUME : III
SECTION : D9
SHEET 2 OF 3

1.9	<u>Paddle Mixer</u>		
1.9.1	Trough of paddle mixer		U-TYPE
1.9.2	Type of shaft		Hollow Pipe
1.9.3	Type of shaft support		Spherical roller bearings at ends with thrust bearing at discharge end. Intermediate hanger bearings shall be avoided
1.10	<u>MATERIAL OF CONSTRUCTION</u>		
1.10.1	Trough of mixer		MS with SS-409M liners of 3 mm Thick
1.10.2	Top cover plate		MS 6 MM Thick
1.10.3	Shaft		SS – 316
1.10.4	Paddles		SS – 409 M
1.10.5	Spray nozzles		SS - 316
2.0	<u>NOTES</u>		
2.1	Necessary water supply piping, isolation and globe valves shall be included in Bidder's scope		
2.2	Necessary canvas chute from dust conditioner to the trucks shall be included in Bidder's scope.		
2.3	The paddles in the paddle mixer shall mix ash and water and simultaneously push the mixture of ash and water towards the outlet. The number, pitch of paddles and the length of mixer shall be adequate to form a uniform mixture of ash and water, by the time it is discharged in to the trucks.		
2.4	Drive unit shall be suitable for continuous duty for 24 hours.		
2.5	GA Drawing of Conditioner shall be submitted with the offer.		
2.6	Painting of ferrous surfaces shall be as approved by owner / consultant.		
REV. NO.	R0	R1	
PPD. BY	HBS	MP	
CHD. BY	SMS	HBS	
DATE	NOV09	MAY12	
JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan		ISSUE R1

SPECIFICATION
NO. TCE-5750A-
500-H-001
PART B

TATA CONSULTING ENGINEERS LIMITED

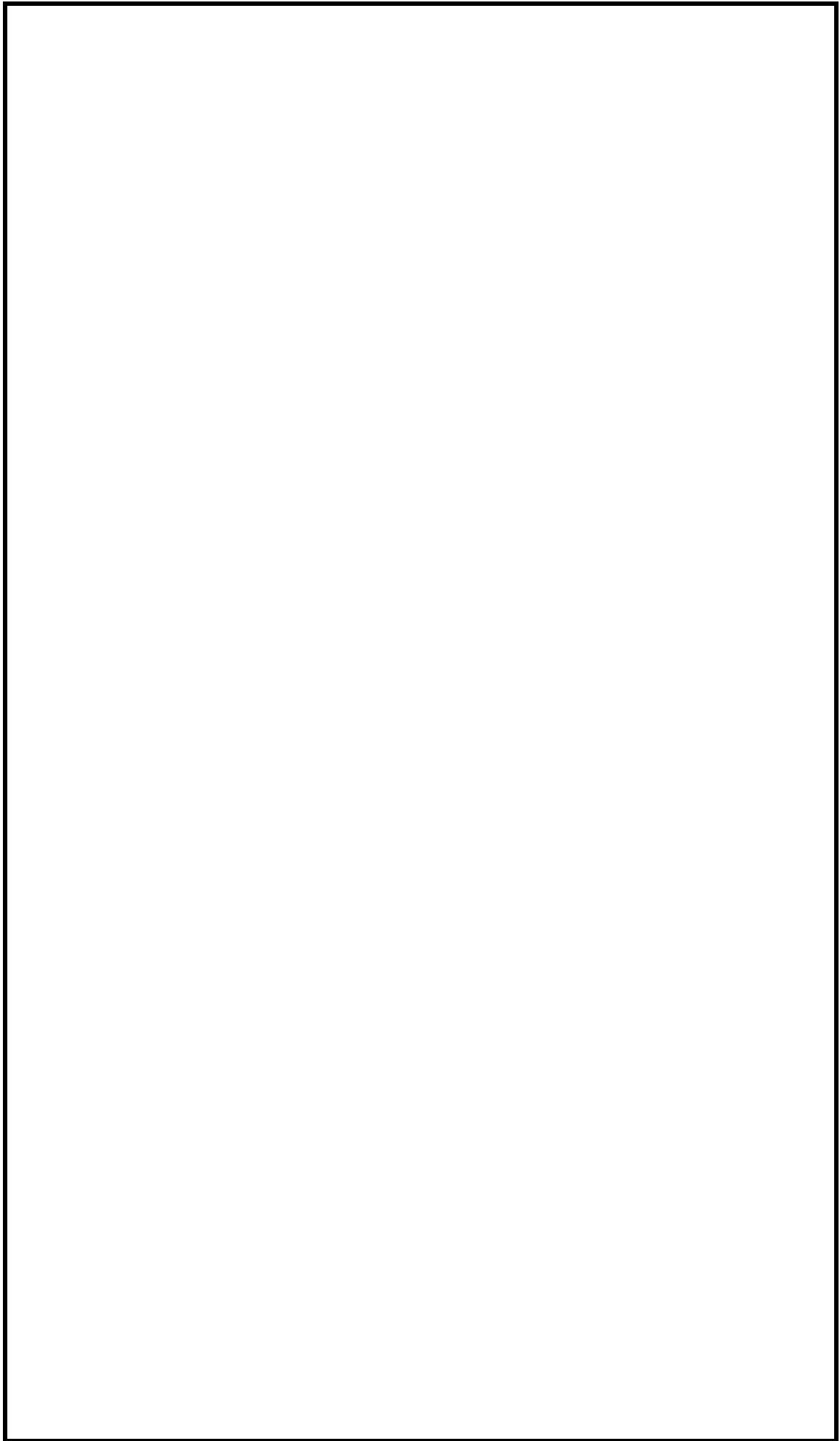
RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V,
Unit # 7 & 8 at Suratgarh, Rajasthan
DATA SHEET – A10
ASH DISPOSAL EQUIPMENT
CONTINUOUS DUST CONDITIONER, UNLOADER &
ROTARY FEEDER

VOLUME : III
SECTION : D9
SHEET 3 OF 3

2.7	The following Tests shall be Conducted :
2.7.1	<u>At Works:</u>
	a) Visual and dimensional check
	b) Check for smooth running of equipment on no load without undue noise and vibration
2.7.2	<u>At Site</u>
	a) Check for the performance to prove the capacity and dust conditioning ability with full load of ash

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super- Critical TPS, Stage- V, Suratgarh, Rajasthan	
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - II	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan			SECTION: D9	
		DATASHEET A11 ASH DISPOSAL EQUIPMENT – WETTING UNIT			SHEET 1 OF 2	
SL. NO.	ITEM			UNIT		
1.0	<u>DESIGN DATA</u>					
1.1	No. required				Two(2)	
1.2	Capacity at which Fly Ash has to be Handled			TPH	150	
1.3	Location				BELOW INTERMEDIATE FLY ASH SURGE HOPPER	
1.4	Body - Material				ALLOY CAST IRON	
	- Hardness				500 BHN MINIMUM	
1.5	Nozzle – Material				HARDENED SS 420	
	- Hardness				500 BHN	
1.6	Nozzle Tips				RENEWABLE	
1.7	Type of Alloy CI				NI HARD CI / NI RESIST C.I	
2.0	<u>Tests To Be Conducted At Works In The Presence Of The Purchaser's Representative</u>					
2.1	Visual Inspection and Dimensional Check Against Approved Manufacturer's Drawings				YES	
2.2	Hydrostatic test				YES	
3.0	<u>NOTES</u>					
3.1	Service life refers to the accumulated operating hours of the equipment					
3.2	Wetting unit shall be complete with water chamber, alloy cast iron liners, inlet and outlet connections for water, fly ash air stream and ash slurry, spray nozzles, chequered plate covered maintenance platforms and ladder. Walkways of 1000 MM width shall be provided					
3.3	Wetting unit shall be suitable for outdoor duty					
3.4	The nozzles for entry of fly ash, water and discharge of slurry shall be provided with flanges. The flanges shall be designed for the pressure standards related to the service.					
3.5	The water shall be admitted into a ring of nozzles to produce a high velocity jet to mix thoroughly with ash.					
3.6	Service life shall be furnished by bidder.					
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan
PPD. BY	HBS	MP				
CHD. BY	SMS	HBS				
DATE	NOV09	MAY12				ISSUE R1



ISSUE NO. R2	SPEC. NO.		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 DATA SHEET A12 AIR BLOWERS & HEATERS			SECTION : D9 SHEET: 1 OF 1		
GENERAL	1. DESIGNATION: AIR BLOWER FOR FLY ASH SILOS AND ESP HOPPERS AERATION				DESIGN DATA (CONTD.)	21. MAXIMUM SPEED OF BLOWER: 1500 RPM		
	2. NUMBER REQUIRED FOR SILOS 8 (EIGHT) (4W + 4S) , i.e 2 (Two) (1W + 1S) FOR EACH SILO, AND NO. REQD. FOR ESP, INTERMEDIATE FLY ASH SILO 8 (EIGHT) FOR ALL UNITS, i.e. (2W + 2 S) FOR EACH UNITS					22. SPARK RESISTANT CONSTRUCTION TYPE AS PER AMCA : A / B / C		
GENERAL	3. TAG NUMBERS :				MATERIALS AND CODES OF CONSTRUCTION	24. CASING : IS 2062 / IS 210		
	4. LOCATION: INDOOR FOR ASH HOPPERS AND ON SILO FLOOR FOR SILOS					25. IMPELLER OR ROTOR : IS 2062		
	5. DUTY : CONTINUOUS 24 Hrs/Day					26. SHAFT : EN 8		
	6. LOCATION IN HAZARDOUS AREA : NO					27. SHAFT SLEEVE : SS 410		
	7. ARRANGEMENT NUMBER AS PER					28. STUFFING BOX : IS 2062		
	AMCA : STD 99-2404-78 OF AMCA HAND BOOK					30. INLET GUARD : YES / NO		
	8. VOID					31. INLET VANE : YES / NO		
	9. TYPE OF BLADE : BACKWARD / RADIAL / FORWARD					32. INLET BOX : YES / NO		
	10. VOID					33. AIR FILTER – PAPER/CLOTH : YES		
	11. VOID					34. INLET CONNECTION : FLANGED		
DESIGN DATA	12. TYPE OF BLOWER : CENTRIFUGAL				ACCESSORIES	35. OUTLET CONNECTION : FLANGED		
	13. MEDIUM HANDLED : AIR WITH DUST					36. RELIEF VALVE : YES		
	14. SUCTION TEMPERATURE : * °C					37. OUTLET DAMPER : YES		
	15. DESIGN TEMPERATURE : BY CONTRACTOR °C					38. VIBRATION DAMPENING PADS: YES		
	16. SUCTION PRESSURE : * Kg/cm ² (g)					39. COMMON BASE FRAME : YES		
	17. SUCTION HUMIDITY (RH %): *					40. FOUNDATION BOLTS : YES		
	18. SPECIFIC GRAVITY OF MEDIUM AT SUCTION TEMPERATURE : AIR					43. HEATER DETAILS BY BIDDER		
	19. CAPACITY (FAD) – BY BIDDER					44. MOTOR : BY BIDDER		
	19.1 NORMAL : BY BIDDER (M ³ /Hr)					45. STARTER : BY BIDDER		
	19.2 MAXIMUM : BY BIDDER (M ³ /Hr)					46. TYPE OF COUPLING : FLEXIBLE /AND OR V BELT		
20. DISCHARGE PRESSURE : BIDDER				47. * - REFER PROJECT INFORMATION				
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-		ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V Suratgarh,		
CHD. BY	SMS	HBS				Rajasthan		
DATE	NOV 09	MAY12						

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A13 ASH DISPOSAL EQUIPMENT SUMPS & TANKS			VOLUME - III		
					SECTION: D9 SHEET 1 OF 3		
SL. NO.	ITEM			UNIT			
1.0	<u>Type of construction</u>						
1.1	Ash Water Tank				R.C.C. Over ground		
1.2	Ash Slurry Sump				R.C.C. Over ground		
2.0	<u>Detailed design and construction of all civil works of</u>						
2.1	Ash Water Tanks				by the Bidder		
2.2	Ash Slurry Sumps				by the Bidder		
3.0	<u>Capacity of Sump / Tank required</u>						
3.1	Ash Water Tank				1 Hours		
3.2	Ash Slurry Sumps for bottom ash & fly ash (including drain inflow)				5 Minutes		
3.3	Overflow & Drain sump at BAH area (including floor drain inflow)				10 Minutes		
4.0	<u>Ash Water Tank</u>						
4.1	Dimensional drawings of sump/tank indicating loading, equipment locations, minimum clearances required.				Shall be furnished by BIDDER		
4.2	Foundation bolts, nuts, base frame, insert plates, embedments, etc. For fixing ash water pumps, level switches and other equipment mounted on sump/tank				YES		
4.3	Suction sleeves to be embedded in concrete to be included				YES		
4.4	Complete set of structural steel required for supporting pipes to be included				YES		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					
TCE FORM NO. 330 R3							

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A13 ASH DISPOSAL EQUIPMENT SUMPS & TANKS			VOLUME - III SECTION: D9 SHEET 2 OF 3	
SL. NO.	ITEM			UNIT		
4.5	Complete set of ash water tank level switches				YES	
4.6	Overflow connection sleeve (overflow pipe shall be designed for full ash water flow)				YES	
4.7	Drain connection sleeve				YES	
4.8	Opening for make up water pipes from plant water supply system provided				YES	
5.0	<u>Ash Slurry Sump</u>					
5.1	Dimensional drawing of sump indicating clearly details of liner and wear plates, ash slurry pump suction pipe pieces and other items required shall be furnished				YES	
5.2	Alloy cast iron plates having a minimum hardness of 340 BHN together with fixtures to be fixed at bottom of ash slurry sump				YES	
5.3	Alloy cast iron wear plates having a minimum hardness of 340 BHN together with fixtures to be fixed on sump face wherever ash slurry is discharged				YES	
5.4	Ultrasonic type sump level control				YES	
5.5	Slurry pump suction pipes of alloy cast iron construction to be embedded in sump				YES	
5.6	Structural steel required for supporting pipes and other accessories				YES	
5.7	Overflow connection sleeve (overflow pipe shall be designed for the ash slurry flow)				YES	
REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL
PPD. BY	HBS	MP			TCE.	PROJECT: 2 x 660 MW, Super-
CHD. BY	SMS	HBS			5750A	Critical TPS, Stage- V Suratgarh,
DATE	NOV09	MAY12				Rajasthan
						ISSUE R1
TCE FORM NO. 330 R3						

[illegible]

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A14 ASH DISPOSAL EQUIPMENT – PIPING & FITTINGS	SECTION: D9 SHEET 1 OF 5

SL. NO.	ITEM	UNIT	

1.0	<u>Design data for fly ash pipelines - pressure type pneumatic conveying system</u>		
2.1	Material of pipe for: - FA pipelines from FA hoppers (ESP, APH etc.) to FA silo		MS ERW as per IS – 1239 of 5.4 mm upto 125 NB AND IS – 3589 of minimum 7.0 mm thick for 150 NB and above with 20 mm Cast Basalt lining
2.2	<u>Type & thickness of Wearback for Fittings:</u>		
2.2.1	Bends		20 mm thick, Ni-Cr Alloy Cast Iron as per IS-4771 type 1A / 1B OR MS casing of minimum 7 mm thick with 20 mm Cast Basalt lining
2.2.2	Laterals		Ni-Cr Alloy cast iron IS-4771 type 1A/1B – 20 mm thick
2.3	Radius of 90° Bends		Minimum five times normal pipe diameter
3.0	<u>Design data for compressed air pipeline</u>		
3.1	Material of pipes for conveying air		MS ERW pipes as per IS – 1239 Heavy class / IS – 3589
3.2	Material of pipes for Instrument air		GI as per IS – 1239 Heavy class and Seamless Copper tubing conforming to ASTM – 875 for individual tapping

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY	HBS	MP				Critical TPS, Stage- V, Suratgarh,	
CHD. BY	SMS	HBS				Rajasthan	ISSUE
DATE	NOV09	MAY12					R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A14 ASH DISPOSAL EQUIPMENT – PIPING & FITTINGS			SECTION: D9 SHEET 2 OF 5	
SL. NO.	ITEM			UNIT		
3.3	Material of fittings				Upto 50 NB, 300 lbs rating, forged carbon steel to ASTM – 105 OR IS – 1875 Class – II, with screwed ends dimensional standard ANSI B-16.11. For 65 NB and above A 234 Gr. WPB material with flanged ends dimensional standards ANSI – B 16.9. Flanges to conform to ANSI – 150 lbs forged steel ASTM – 105, B-16.5 Flat face.	
4.0	<u>Design data for ash water pipeline</u>					
4.1	Material of pipes				MS ERW, conforming to IS– 1239 Heavy class OR . IS – 3589 of 9.5 mm thick.	
4.2	Material of Fittings				Ni-Cr alloy cast iron with Minimum 500 BHN with min 4.5% nickel as per IS – 4771 type –1A or 25 thk. Basalt / DRC liners	
5.0	<u>Design data for slurry pipeline</u>					
5.1	<u>Material of pipes for the following application</u>					
5.1.1	Piping from Bottom Ash (BA) jet pumps to BA slurry sump				M.S. ERW, as per IS – 3589, of min 9.5 mm thk	
5.1.2	Piping from Fly Ash Silo to slurry sump				M.S. ERW as per IS –3589, of min 9.5 mm thk	
5.1.3	Piping from Drain Sump to Slurry Sump				M.S. ERW as per IS –3589, of min 9.5 mm thk	
5.2	Piping from Slurry Pumps to Slurry Disposal Area				M.S. ERW as per IS –3589, of min 9.5 mm thk	
5.3	<u>Type & thickness of Wearback for Fittings –</u>					
5.3.1	- Bends				MS casing of 9.5 mm thk	
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan
PPD. BY	HBS	MP				
CHD. BY	SMS	HBS				ISSUE R1
DATE	NOV09	MAY12				

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A14 ASH DISPOSAL EQUIPMENT – PIPING & FITTINGS			SECTION: D9 SHEET 3 OF 5		
SL. NO.	ITEM			UNIT			
5.3.2	- Laterals				Ni-Cr Alloy Cast Iron as per IS-4771 type 1A/1B with min 3.5% Ni – 20 mm thick		
5.4	Pipe Joints				Ash Slurry Piping shall have Flanged Joints at Every 6 m (Approx.) and sleeve coupling at every 18 m		
5.5	Span of Pipe Supports			M	1 M on either side of the sleeve coupling and 5.5 M (min.) interval thereafter		
5.6	Radius of 90° Bends				Minimum five Times Normal Pipe Diameter		
6.0	<u>DESIGN DATA FOR ASH WATER RECOVERY PIPES AND SLUDGE PIPES</u>						
6.1	Material of pipe for recovered water pipelines				MS ERW, conforming to IS– 1239 Heavy class OR. IS – 3589 of 6 mm thick		
6.2	Material of Fittings for recovered ash water				MS ERW, conforming to IS– 1239 Heavy class OR. IS – 3589 of 6 mm thick		
6.3	Material of pipe for sludge disposal pipelines				MS ERW, conforming to IS– 1239 Heavy class OR. IS – 3589 of 6 mm thick		
6.4	Material of fitting for sludge disposal				MS ERW, conforming to IS– 1239 Heavy class OR. IS – 3589 of 6 mm thick		
6.5	Pipe Joints				Recovered water Piping shall have welded joints / flanged Joints with suitable expansion loops		
6.6	Span of supports for Recovered water pipelines			M	5.5 m (Min)		
6.7	Span of supports for sludge pipelines			M	5 m (Min)		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	ISSUE R1
PPD. BY	HBS	MP				Critical TPS, Stage- V, Suratgarh,	
CHD. BY	SMS	HBS				Rajasthan	
DATE	NOV09	MAY12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A14 ASH DISPOSAL EQUIPMENT – PIPING & FITTINGS			SECTION: D9 SHEET 4 OF 5	
SL. NO.	ITEM			UNIT		
7.0	Necessary Steel Hangers, Supports and Inserts in Concrete for Piping				IN BIDDER'S SCOPE	
8.0	Painting for Ferrous Surfaces at Site by				BIDDER	
9.0	Painting shall be				As approved by owner / consultant	
10.0	<u>Sleeve coupling</u>					
10.1	Deflection in Sleeve Coupling			DEG	3 (Min)	
10.2	Gap between Ends of Pipes at Couplings				Sufficient to take care of expansion of pipes	
10.3	Material of Sleeve Coupling				Steel sleeve with steel / CI flanges, Rubber gaskets and SS bolts and nuts.	
10.4	Thickness of flange				20 mm for flat flange and 16 mm for ribbed flange	
11.0	<u>Gasket Material</u>				Asbestos free	
12.0	<u>Tests and test certificates</u>					
131	Test Certificates for Materials of Construction of Piping and Fittings				YES	
13.2	Hydrostatic Test at Works for Piping and Fittings				YES	
14.0	<u>NOTES</u>					
14.1	Any other ash slurry and fly ash piping not specifically listed here but required to make the system complete shall be included in the Bidder's scope.					
14.2	Bidder shall consider the piping applicable to the type of system specified and accordingly fill Data Sheet-B.					
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan
PPD. BY	HBS	MP				
CHD. BY	SMS	HBS				ISSUE R1
DATE	NOV09	MAY12				

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A14 ASH DISPOSAL EQUIPMENT – PIPING & FITTINGS	SECTION: D9 SHEET 5 OF 5

SL. NO.	ITEM	UNIT	

14.3	Expansion due to thermal stress : - Loops shall be provided for welded / flanged joints for water pipelines, wherever required, as per the thermal analysis - Suitable expansion joints shall be provided for dry ash conveying pipelines.
14.4	Protection for pipes at road crossings: RCC Hume pipes / culvert shall be provided depending on the site conditions

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY	HBS	MP				Critical TPS, Stage- V, Suratgarh,	
CHD. BY	SMS	HBS				Rajasthan	ISSUE R1
DATE	NOV09	MAY12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION: D9
	DATASHEET A15 SLURRY LINE VALVES	SHEET 1 OF 2

SL. NO.	ITEM	UNIT	

1.0	<u>General Data</u>		
1.1	Type		Motor / Pneumatic cylinder operated
1.2	Number required		By Bidder
1.3	Type of water used in ash slurry		CT Blow down
1.4	Ash Slurry Flow Through Valve	Cu.m/hr	To suit slurry pump capacity
2.0	<u>Materials of Construction</u>		
2.1	<u>Knife Gate Valves</u>		
2.1.1	Body material and hardness		SS 316 Nitrided to 500 to 600 BHN
2.1.2	Plate/flap : Material and hardness		SS 316 EDGE stellited to min. 1 MM thickness
2.1.3	Shaft Material		SS 316
2.1.4	Deflector cone		Alloy cast iron 450 BHN
2.2	<u>Taper Plug Valves</u>		
2.2.1	Body material and hardness		Alloy Cast Iron, 340 BHN
2.2.2	Plug material and hardness		Corrosion resistant Alloy Cast Iron with PTFE coating
3.0	Type of actuation for remote operated valves		Motor/Cylinder operated
4.0	Hydrostatic Test for Valve Body and Seat Tightness		Zero leakage should be achieved

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED				VOLUME - III	
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan				SECTION: D9 SHEET 2 OF 2	
DATASHEET A15 SLURRY LINE VALVES							
SL. NO.	ITEM				UNIT		
5.0	All parts of valves coming in contact with slurry shall be					Wear and corrosion resistant	
6.0	All valves shall be provided with operating hand wheel and position indicator. Hand chain shall be provided if the wheel is not reachable from the operating platform.						
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-	
PPD. BY	HBS	MP				Critical TPS, Stage- V Suratgarh, Rajasthan	
CHD. BY	SMS	HBS				ISSUE R1	
DATE	NOV09	MAY12					
TCE FORM NO.330 R3							

SPECIFICATION NO. TCE-5749A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A16 CLARIFIERS			VOLUME - III		
					SECTION: D9		
					SHEET 1 OF 3		
SL. NO.	ITEM			UNIT			
1.0	<u>Clarifier</u>						
1.1	Type				CLARIFLOCCULATOR		
1.2	Number Required				One(1)		
1.3	Rated Capacity			cu.m/hr	Bidder to indicate		
1.4	Rise Rate			m/hr	1.5 (max.)		
1.5	Retention Time			hrs	3 hrs. (2½ for clarification & ½ for the flocculation)		
1.6	Material of Construction				RCC		
1.7	Bypass Arrangement to be Provided by Vendor			YES/NO	YES		
1.8	Total Suspended Solids			PPM			
1.8.1	At inlet to clarifier				By bidder		
1.8.2	At outlet from clarifier				20 PPM,		
1.9	Oil & grease				Bidder to confirm		
1.10	Output water pH				6.5 to 8.5		
1.11	Chemical dosing				Alum & Poly Electrolite		
2.0	<u>Inlet Control Valve</u>						
2.1	Size				By bidder		
2.2	Type				Butterfly Valve		
2.3	Operation				Electric Operated		
2.4	Standard				AWWA C504 / BS5155		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					
TCE FORM NO.330 R3							

SPECIFICATION NO. TCE-5749A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A16 CLARIFIERS			VOLUME - III SECTION: D9 SHEET 2 OF 3		
SL. NO.	ITEM			UNIT			
2.5	Design Pressure			kg/sq.cm	10 kg/cm ² (Max. Diff. Pressure of 50 MWC)		
2.6	Material of Construction						
2.6.1	Body / disc				CI-IS 210 with Ebonite lining		
2.6.2	Shaft				SS-316		
2.7	Number / Clarifier				One		
2.8	Companion Flanges by VENDOR				YES		
	If No, Valve Flange shall conform to				Not applicable		
2.9	Isolating and Bypass Valve Required / Provided				Required		
2.10	Type of Isolating Valves				Butter fly valve		
2.11	Material of Construction of Isolating Valves				CI Ebonite Lined		
2.12	Valve Pit				Depending upon pipe routing as decided by Contractor.		
3.0	<u>Effluent Flow Through:</u>				Channel		
4.0	<u>Shutter / Isolating Valve at outlet of Clarifier</u>				YES		
5.0	<u>Flash Mixer</u>						
5.1	Number / Clarifier				One (1)		
5.2	Material of Construction			RCC	RCC		
5.3	Motorised Agitator				Required		
6.0	<u>Sludge Chamber</u>						
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	MP					
CHD. BY	SMS	HBS					
DATE	NOV09	MAY12					
TCE FORM NO.330 R3							

SPECIFICATION NO. TCE-5749A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A16 CLARIFIERS			VOLUME - III SECTION: D9 SHEET 3 OF 3	
SL. NO.	ITEM			UNIT		
6.1	Number/Clarifier				One (1)	
6.2	Material of Construction			RCC	RCC	
6.3	Storage Required			Mts	2 hrs.	
7.0	<u>Sludge Disposal/ Recirculation Pump</u>					
7.1	Type				} Refer flow diagram	
7.2	Number/Clarifier					
7.3	Capacity			cu.m/hr		
7.4	Head			mlc	By bidder	
8.0	<u>Piping (Note-1)</u>					
8.1	Terminal Points				Complete recovery system (as indicated flow diagram)	
8.2	Inlet Piping to Clarifier				IS:3589 with Ebonite lining (Hard rubber)	
8.3	Piping From Flash Mixer to Clarifier				RCC HUME Pipes to IS:458 Class P2	
8.4	Sludge piping				MS ERW 9.5MM Thick as per IS 1239 or IS 3589	
9.0	<u>Flow Measuring device required at</u>				Inlet and outlet of clarifier	
<u>Notes</u>						
(1)	In case of underground piping the pipes shall be suitably protected by coating & wrapping.					
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan
PPD. BY	HBS	MP				ISSUE R1
CHD. BY	SMS	HBS				
DATE	NOV09	MAY12				
TCE FORM NO.330 R3						

SSUE NO. R6	TCE.M4-105-12		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III	
	ENQ.SPEC.NO. TCE-5750A-H-500-001		DATA SHEET A18		SECTION : D9	
	PART : B		SUMP PUMPS		SHEET : 1 OF 2	
GENERAL		1. DESIGNATION: SUMP PUMPS IN BOTTOM ASH HOPPER AREA. FLY ASH SILO AREA AND AS REQUIRED		CONSTRUCTION FEATURES (CONTD.)	22. FLANGE DRILLING STANDARD :	
		2. NUMBER REQUIRED : AS PER SYSTEM REQUIREMENT			/ QUICK RELEASE COUPLING	
DESIGN DATA		3. TAG NUMBERS :			23. MOTOR : BY PURCHASER / VENDOR	
		4. OPERATION : INTERMITTENT				
		5. LOCATION : INDOOR & OUTDOOR				
		7. LIQUID PUMPED : WATER MIXED WITH ASH			25. PUMP CASING& IMPELLER : :ALLOY CAST IRON OF 340 HARDNESS	
		8. SPECIFIC GRAVITY :1.02			27. PUMP SHAFT : EN8	
		9.			28. SHAFT SLEEVE : EN8	
		10. % SOLID BY WEIGHT :25%(estimated)			29. LINE SHAFT : EN8	
		11. MAXIMUM SIZE OF SOLID : 25mm			30. SHAFT ENCLOSING PIPE AND DISCHARGE PIPE :ALLOY CAST IRON TO 340 BHN HARDNESS	
		12. DESIGN CAPACITY : BY BIDDER			32. SUCTION STRAINER :YES	
		13. HEAD AT DISCHARGE FLANGE : BY BIDDER			33. SUPPORT PLATE :YES	
		14.			34. STUFFING BOX :YES	
		16.			35. PACKING :ASBESTOS FREE	
					36. COMPANION FLANGE :YES	
					37. NUTS/BOLTS/. GASKETS :YES	
CONSTRUCTION FEATURES		17. TYPE OF PUMP : FIXED		ACCESSORIES	39. COUPLING :YES	
		18. IMPELLER : NON CLOG TYPE OPEN			40. SUPPORT PLATE : YES	
		19. TYPE OF BEARING LUBRICATION GREASE			41. FOUNDATION BOLTS :YES	
		20. COUPLING : FLEXIBLE			42. COMPANION FLANGES WITH NUTS, BOLTS, GASKETS : YES	
		21. FLANGE FACE :			43. SUCTION STRAINER : YES	
					44. DISCHARGE PRESSURE GAUGE: YES	
					45. AUTOMATIC FLOAT LEVEL SWITCH FOR START/STOP : YES	
REV.NO.	R0	R1		PPD.BY :HBS	JOB NO.	CLIENT :RRVUNL
DATE	NOV'09	MAY12		CHD.BY :SMS	TCE.5750A	PROJECT: 2x6600 MW Super Critical TPS, Stage - V Suratgarh. Rajasthan
REV BY						ISSUE R1

ISSUE NO. R6	TCE.M4-105-12		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III	
	ENQ.SPEC.NO. TCE-5750A-H-500-001		DATA SHEET A18		SECTION : D9	
	PART : B		SUMP PUMPS		SHEET : 2 OF 2	
	46. MOTOR STARTER : YES					
	HYDROTEST DURATION : 30MIN					
<u>NOTES</u> 1.0 Material test certificates shall be furnished for all the components 2.0 Rating of motor shall be at least 125% of power required by pump at shaft. 3.0 Motor for sump pump shall be installed 1000mm above floor level to prevent damage to pump motor during flooding.						
REV.NO	R0	R1		PPD.BY :HBS	JOB NO.	CLIENT :RRVUNL
DATE	OCT'09	MAY'12		CHD.BY :SMS	TCE.5750A	PROJECT: 2x6600 MW Super
REV. BY						Critical TPS, Stage V Suratgarh. Rajasthana
						ISSUE R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB1 BOTTOM ASH HOPPER		VOLUME : III SECTION:D9 SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	BOTTOM ASH HOPPER			
1.1	Number			
1.2	Size	MxMxM		
1.3	Storage Capacity (Below Ash Level)	TONNES		
1.4	<u>Material and Thickness of:</u>			
1.4.1	Hopper Plates	MM		
1.4.2	Nozzles	MM		
1.4.3	Refractory	MM		
1.5	Are Inspection Doors Flood Lit?		YES/NO	
2.0	FEED GATES			
2.1	Number per Hopper			
2.2	Material			
2.3	Method of Operation			
2.4	Air-Water Converter Tank with Gauge Glass, Fill Connection and Drain Valve Included		YES/NO	
2.5	Interconnecting Piping with 4-Way Valve and Globe Valves Included?		YES/NO	
3.0	Quantity & pressure of water required for:			
3.1	Hopper make up			
3.2	Seal trough make up			
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB1 BOTTOM ASH HOPPER		SECTION:D9 SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
3.3	Seal trough flushing			
3.4	Hopper inspection window flushing			
3.5	Flushing nozzles in bottom ash hopper			
3.6	Refractory cooling			
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED		VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB2 ASH DISPOSAL EQUIPMENT- JET PUMP		SECTION:D9 SHEET 1 OF 1
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	
1.0	Manufacturer		
2.0	Number		
3.0	Capacity	Tph	
4.0	Velocity at throat of jet pump	M/Sec.	
5.0	Quantity of water required	Cu.m/hr	
6.0	Pressure of water required at jet pump inlet	MLC	
7.0	Discharge flow rate of slurry	Cu.m/hr	
8.0	Pressure drop across jet pump	MLC	
10.0	Velocity of slurry in the discharge pipe	M/Sec.	
11.0	<u>Service life (accumulated operating hours)</u>		
11.1	Throat	Hrs.	
11.2	Nozzle	Hrs.	
11.3	Body	Hrs.	
12.0	Any other important data		
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

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB3 CLINKER GRINDER	SECTION:D9 SHEET 1 OF 1

ENQUIRY/SPECIFICATION NO.:	BIDDER:

SL. NO.	ITEM	UNIT	
1.0	No. of Clinker grinder		
2.0	Type		SINGLE / DOUBLE ROLL
3.0	Make		
4.0	Capacity		
		T/hr	
5.0	Material of Construction		
5.1	Grinder Chamber		
5.2	Rolls		
5.3	Teeth of Rolls		
5.4	Breaker Plate		
5.5	Shaft		
6.0	Expected life for replacement of grinding teeth and liners		
7.0	Speed of grinder	rpm	

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

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING		VOLUME : III SECTION:D9 SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	General			
1.1	Type of System Offered			
1.2	Total Capacity of Conveying System from Fly Ash Hoppers to Fly Ash Silo	TPH		
1.3	Compressed Air Requirement			
1.3.1	Flow rate	NM ³ /min		
1.3.2	No. of operating hours	HRS		
1.3.3	Pressure	Bar		
1.4	Ash to air ratio			
2.0	Ash Transmitters			
2.1	Make and Type			
2.2	Capacity of Ash Transmitter Vessel	M ³		
2.3	Diameter of Fly Ash Conveying Pipes from Various Hoppers	MM		
2.4	Pick-up Velocity of ash	M/S		
2.5	Velocity of Air-Ash Mixture in the Pipeline	M/S		
2.6	Type of Ash Inlet Valves & discharge valve			
2.7	Material of construction for the inlet valve / discharge valve components			
2.8	Life of valve components in no. of operating hrs.			
2.9	Time Required for Emptying individual Ash Transmitter Vessel	Sec		
2.10	Average Ash Conveying Rate from Transmitter to Silo / Buffer Hopper			
	a) ESP ash transmitter vessel	TPH		
	b) Air preheater ash transmitter	TPH		
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB4 PRESSURE TYPE PNEUMATIC CONVEYING SYSTEM FOR FLY ASH HANDLING		SECTION:D9 SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
2.11	Average Ash Conveying Rate from Buffer Hopper to Fly Ash Silo	TPH		
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB5 ASH DISPOSAL EQUIPMENT – FLY ASH VALVES		VOLUME : III SECTION:D9 SHEET 1 OF 4
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	Fly Ash Extraction Valve			
1.1	Manufacturer			
1.2	Type			
1.3	No. of Valves			
1.4	Size	MM		
1.5	Materials of Construction and Hardness (The composition of materials of construction should be furnished)			
1.5.1	Valve body			
1.5.2	Slide gate / flap face			
1.5.3	Valve / flap seat			
1.5.4	Valve shaft			
1.5.5	Spring			
1.6	Type of Pneumatic Operating Device			
1.7	Quantity of Compressed Air	Nm ³ /hr		
1.8	Pressure of Compressed Air	Kg/cm ² (g)		
1.9	Are the Following Included?			
1.9.1	Plugged poking hole		YES	
1.9.2	Operating handle with position		YES	
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 	
FILE NAME: F294R3.DOC			TCE FORM NO. 294 R3	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB5 ASH DISPOSAL EQUIPMENT – FLY ASH VALVES		VOLUME : III SECTION:D9 SHEET 2 OF 4
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
	indicator			
1.9.3	Drain holes right below inlet port for the valves to be located below air preheater hopper		YES	
2.0	Fly Ash Branch Isolating Valve			
2.1	Manufacturer			
2.2	Type			
2.3	Number of Valves			
2.4	Size	MM		
2.5	Materials of Construction and Hardness (The composition of materials of construction should be furnished)			
2.5.1	Valve body			
2.5.2	Slide plate			
2.5.3	Valve seat			
2.5.4	Valve shaft			
2.5.5	Spring			
2.6	Type of Pneumatic Operating Device			
2.7	Quantity of Compressed Air	Nm ³ /hr		
2.8	Pressure of Compressed Air	Kg/cm ² (g)		
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 	
FILE NAME: F294R3.DOC			TCE FORM NO. 294 R3	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB5 ASH DISPOSAL EQUIPMENT – FLY ASH VALVES		VOLUME : III SECTION:D9 SHEET 3 OF 4
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
2.9	Are Operating Handle and Position Indicator Included?		YES/NO	
3.0	Air Intake Valve			
3.1	Manufacturer			
3.2	Number of Valves			
3.3	Size			
3.4	Location			
3.5	Materials of Construction and Hardness			
3.5.1	Valve body			
3.5.2	Valve seat			
3.5.3	Valve plate			
3.5.4	Valve shaft			
3.5.5	Spring			
4.0	Vacuum Breaker			
4.1	Manufacturer			
4.2	Type			
4.3	Number			
4.4	Size			
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 	
FILE NAME: F294R3.DOC			TCE FORM NO. 294 R3	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB5 ASH DISPOSAL EQUIPMENT – FLY ASH VALVES		VOLUME : III SECTION:D9 SHEET 4 OF 4
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
4.5	Location			
4.6	Materials of Construction and Hardness (The composition of material of construction should be furnished)			
4.6.1	Valve body			
4.6.2	Valve plate / disc			
4.6.3	Valve seat			
4.6.4	Valve shaft			
4.7	Type of Pneumatic Operating Device			
4.8	Quantity of Compressed Air	Nm ³ /hr		
4.9	Pressure of Compressed Air	Kg/cm ² (g)		
5.0	Type of Coupling for Fly Ash Piping			
6.0	Painting included as specified?		YES/NO	
7.0	Are catalogues enclosed		YES/NO	
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 	
FILE NAME: F294R3.DOC			TCE FORM NO. 294 R3	

ISSUE NO. R5	SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
			DATA SHEET DB6 CONVEYING AIR COMPRESSORS			SHEET : 1 OF 7	
GENERAL	SL. NO.	ITEM	BIDDER				
	1.	DESIGNATION		COMPRESSORS FOR			
	2.	NUMBER OFFERED		(W+S)			
	3.	TAG NUMBERS					
	4.	TYPE OF COMPRESSOR		RECIPROCATING/CENTRIFUGAL/SCREW LUBRICATED / NON-LUBRICATED			
	5.	MAKE AND MODEL NUMBER					
	6.						
COMPRESSOR DATA	7.						
				RECIP	CENT	SCREW	
	8.	NUMBER OF STAGES					
	9.	NUMBER OF CYLINDERS PER STAGE			NA	NA	
	10.	TYPE OF CYLINDER		VER / HOR	NA	NA	
	11.	CYLINDER LINER PROVIDED		YES / NO	NA	NA	
	12.	SINGLE ACTING /DOUBLE ACTING		SINGLE/ DOUBLE	NA	NA	
	13.	CAPACITY (FAD)	M ³ / Hr				
	14.	MASS FLOW RATE	Kg/Hr	NA		NA	
	15.	TYPE OF SUCTION AND DISCAHRGE VALVE		PLATE / CHANNEL TYPE	IGV/ BUTTERFLY VALVE (OP) AT SUCTION	BUTTERFLY / PISTON VALVE (OP) AT SUCTION	
	16.	SUCTION PRESSURE	Kg/ cm ² (g)				
	17.	DISCHARGE PRESSURE	Kg/ cm ² (g)				
	LEGEND : RECIP = RECIPROCATING, CENT= CENTRIFUGAL, VER = VERTICAL, HOR = HORIZONTAL,IGV = INLET GUIDE VANES, OP = OPTIONAL, NA = NOT APPLICABLE						
NOTES TO BIDDER			SIGNATURE OF BIDDER				
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE				

ISSUE NO. R5	SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
			DATA SHEET DB6 CONVEYING AIR COMPRESSORS			SHEET : 2 OF 7	
COMPRESSORS DATA (CONTD.)	SL. NO.	ITEM	BIDDER				
				RECIP	CENT	SCREW	
	18.	SUCTION TEMPERATURE - EACH STAGE	⁰ C				
	19.	DISCHARGE TEMPERATURE - EACH STAGE	⁰ C				
	20.	SELECTED COMPRESSOR SPEED	RPM				
	21.	BKW AT SELECTED COMPRESSOR SPEED	KW				
	22.	RECOMMENDED MAXIMUM SPEED	RPM				
	23.	BKW AT RECOMMENDED MAXIMUM SPEED	KW				
	24.	VOLUMETRIC EFFICIENCY	%				
	25.	MECHANICAL EFFICIENCY	%				
	26.	MOTOR RATING AND SPEED	KW/RPM	/	/	/	
	27.	LUBE OIL CONSUMPTION FOR EACH COMPRESSOR	LPM				
	28.	LUBE OIL PUMP DRIVEN BY COMPRESSOR MOTOR		YES/ NO	YES/ NO	YES/ NO	
	29.	MOTOR RATING, IF LUBE OIL PUMP IS DRIVEN BY SEPARATE MOTOR	KW				
	30.	AUXILIARY LUBE OIL PUMP TO BE PROVIDED		WHETHER PROVIDED YES/ NO			
	31.	AUXILIARY LUBE OIL PUMP MOTOR RATING AND SPEED	KW/RPM	/	/	/	
	32.	TYPE AND MAKE OF BEARINGS					
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER				
			DATE				

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9		
	TCE-5750A-H-500-001		DATA SHEET DB6					
	PART : B		CONVEYING AIR COMPRESSORS			SHEET : 3 OF 7		
ENQUIRY OR SPECIFICATION NO.								
COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER	RECIP	CENT	SCREW		
	33.	COOLING WATER REQUIREMENTS (NOTE 1)						
	33.1	FOR COMPRESSOR COOLING						
	33.1.1	FLOW RATE	M ³ / Hr					
	33.1.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/		
	33.1.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/		
	33.1.4							
	33.1.5							
	33.1.6							
	33.2	FOR BEARING COOLING - IF REQUIRED						
	33.2.1	FLOW RATE	M ³ / Hr					
	33.2.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/		
	33.2.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/		
	33.2.4							
	33.2.5							
	34.	INTAKE FILTER TYPE						
	34.1	FILTER ELEMENT						
	34.2	RATED CAPACITY	M ³ / Hr					
	34.3	EFFICIENCY	%					
	34.4	DESCRIPTIVE LITERATURE TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO				
	34.5							
	NOTES TO BIDDER			SIGNATURE OF BIDDER				
	1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE				

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB6 CONVEYING AIR COMPRESSORS			SHEET : 4 OF 7	
	ENQUIRY OR SPECIFICATION NO.						

COMPRESSOR DATA (CONTD.)	SL. NO.	BIDDER				
		ITEM		RECIP	CENT	SCREW
	35.	CAPACITY CONTROL				
	35.1	TYPE AND NUMBER OF STEPS		BY SPEED VARIATION / AT CONSTANT SPEED AND		
	35.2	METHOD EMPLOYED IN CASE OF CONSTANT SPEED TYPE				
	35.3	CONTROL SYSTEM WRITE-UP TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO		
	35.4	WIRING AND TUBING DIAGRAM WITH CONTROL SCHEME TO BE ENCLOSED		WHETHER ENCLOSED YES / NO		
	36.	EQUIPMENT AND ACCESSORIES MOUNTED ON COMMON BASE FRAME WITH THE COMPRESSOR				
	36.1	WEIGHT OF ENTIRE UNIT MOUNTED ON COMMON BASE FRAME	Kg			
	36.2	OVERALL DIMENSIONS OF COMMON BASE FRAME L X W	M	X	X	X
	37.	EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME				
	37.1	WEIGHT OF EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME	Kg			
	37.2	OVERALL DIMENSIONS OF SEPARATE BASE FRAME L X W	M	X	X	X
	38.	NAME AND OVERALL DIMENSIONS OF SINGLE LARGEST COMPONENT TO BE LIFTED L X W X H	M	X	X	X
	39.	NAME AND WEIGHT OF HEAVIEST SINGLE COMPONENT TO BE LIFTED	Kg			

NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER
	DATE

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME:III	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB6 CONVEYING AIR COMPRESSORS				SECTION : D9 SHEET : 5 OF 7	

COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER				
				RECIP	CENT	SCREW	
	40.	SUCTION FLANGE - FIRST STAGE SIZE/ STANDARD/ RATING	mm NB/				
	41.	DISCHARGE FLANGE -FINAL STAGE - SIZE/ STANDARD/ RATING	mm NB/				
	42.	IF DRIVE MOTOR IS TO BE FURNISHED BY THE PURCHASER					
	42.1	RATING/ SPEED	KW/RPM				
	42.2	STARTING TORQUE	Kg M				
	42.3	DIRECTION OF ROTATION OF MOTOR AS VIEWED FROM COUPLING END		/	/	/	
	43.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO			
	44.						
INTER-COOLERS / AFTER-COOLERS				I/C			A/C
				1 STG	2 STG	3 STG	
	45.	DESIGNATION					
	46.	NUMBER OFFERED					
	47.	TAG NUMBERS					
	48.	TYPE		VER/ HOR			VER/HOR
	49.	CAPACITY (FAD)	M ³ /Hr				
	50.	COOLING WATER FLOW RATE	M ³ / Hr				
	51.	AIR/ GAS INLET/OUTLET TEMPERATURE	⁰ C	/	/	/	/
	52.	COOLING WATER INLET/ MAXI- MUM OUTLET TEMPERATURE	⁰ C	/	/	/	/

NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER	
	DATE	

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB6 CONVEYING AIR COMPRESSORS				SHEET : 6 OF 7	
	ENQUIRY OR SPECIFICATION NO.							
INTER-COOLERS / AFTER-COOLERS (CONTD.)	SL. NO.	BIDDER						
		ITEM		I/C			A/C	
	53.	AIR/ GAS INLET AND OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	54.	COOLING WATER INLET/ MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	55.	COOLING SURFACE AREA	M ²					
	56.	DESIGN PRESSURE - AIR/ GAS SIDE	Kg/cm ² (g)					
	57.	DESIGN PRESSURE - WATER SIDE	Kg/cm ² (g)					
	58.	CODE OF CONSTRUCTION						
	59.	CORROSION ALLOWANCE	mm	3	3	3	3	
	60.	NUMBER OF PASSES						
	61.	EMPTY WEIGHT	Kg					
	62.	OPERATING WEIGHT	Kg					
	63.	WATER FILLED WEIGHT	Kg					
	64.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO				
	RECEIVERS	65.	DESIGNATION		RECEIVERS FOR			
66.		NUMBER OFFERED						
67.		TAG NUMBERS						
68.		TYPE		VER/ HOR	VER/ HOR	VER/ HOR		
69.		CAPACITY	M ³					
70.		SIZE						
70.1		DIAMETER	mm					
70.2		HEIGHT TAN TO TAN	mm					
71.		DESIGN PRESSURE	Kg/cm ² (g)					
72.		CODE OF CONSTRUCTION						
73.	CORROSION ALLOWANCE	mm						
NOTES TO BIDDER			SIGNATURE OF BIDDER					
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE					

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB6 CONVEYING AIR COMPRESSORS		SHEET : 7 OF 7	
	ENQUIRY OR SPECIFICATION NO.					
RECEIVERS (CONTD.)	SL. NO.	ITEM				
	74.	THICKNESS				
	74.1	SHELL	mm			
	74.2	DISHED ENDS	mm			
	75.	WEIGHT				
	75.1	EMPTY	Kg			
	75.2	OPERATING	Kg			
	75.3	FILLED WITH WATER	Kg			
MISCELLANEOUS	76.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO		
	77.	ALL THE VALVES, SPECIALITIES, INSTRUMENTS, COUNTER FLANGES, FOUNDATION BOLTS ETC. AS CALLED FOR IN DATA SHEET A AND AS PER ENCLOSED P & I D TO BE INCLUDED		WHETHER INCLUDED YES / NO		
PERFORMANCE GUARANTEES	78.	CAPACITY OF COMPRESSOR	M ³ / Hr	(+)	(-)	
	79.	DISCHARGE PRESSURE	Kg/cm ² (g)	(+)	(-)	
	80.	POWER CONSUMPTION	KW	(+)	(-)	
	81.	TEMPERATURE OF AIR AT OUTLET OF AFTER-COOLER	⁰ C	(+)	(-)	
	82.	COOLING WATER FLOW RATE	M ³ / Hr	(+)	(-)	
	83.	COOLING WATER OUTLET TEMP.	⁰ C	(+)	(-)	
	84.	COOLING WATER PRESSURE DROP	Kg/cm ² (g)	(+)	(-)	
	85.					
NOTES 1. IF AIR COOLED COMPRESSOR IS OFFERED, BIDDER TO FURNISH COOLING SYSTEM DETAILS LIKE NATURAL OR FORCED COOLING, FAN CAPACITY, MOTOR RATING ETC. LEGEND : I/C = INTER-COOLER, A/C = AFTER-COOLER, STG = STAGE						
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER			
			DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB7 INSTRUMENT AIR COMPRESSORS			SHEET : 1 OF 7	
	ENQUIRY OR SPECIFICATION NO.						
GENERAL	SL. NO.	BIDDER					
	1.	DESIGNATION		COMPRESSORS FOR			
	2.	NUMBER OFFERED		(W+S)			
	3.	TAG NUMBERS					
	4.	TYPE OF COMPRESSOR		RECIPROCATING/CENTRIFUGAL/SCREW LUBRICATED / NON-LUBRICATED			
	5.	MAKE AND MODEL NUMBER					
	6.						
COMPRESSOR DATA	7.						
				RECIP	CENT	SCREW	
	8.	NUMBER OF STAGES					
	9.	NUMBER OF CYLINDERS PER STAGE			NA	NA	
	10.	TYPE OF CYLINDER		VER / HOR	NA	NA	
	11.	CYLINDER LINER PROVIDED		YES / NO	NA	NA	
	12.	SINGLE ACTING /DOUBLE ACTING		SINGLE/ DOUBLE	NA	NA	
	13.	CAPACITY (FAD)	M ³ / Hr				
	14.	MASS FLOW RATE	Kg/Hr	NA		NA	
	15.	TYPE OF SUCTION AND DISCAHRGE VALVE		PLATE / CHANNEL TYPE	IGV/ BUTTERFLY VALVE (OP) AT SUCTION	BUTTERFLY / PISTON VALVE (OP) AT SUCTION	
	16.	SUCTION PRESSURE	Kg/ cm ² (g)				
	17.	DISCHARGE PRESSURE	Kg/ cm ² (g)				
	LEGEND : RECIP = RECIPROCATING, CENT= CENTRIFUGAL, VER = VERTICAL, HOR = HORIZONTAL,IGV = INLET GUIDE VANES, OP = OPTIONAL, NA = NOT APPLICABLE						
NOTES TO BIDDER			SIGNATURE OF BIDDER				
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE				

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB7 INSTRUMENT AIR COMPRESSORS			SHEET : 2 OF 7	
	ENQUIRY OR SPECIFICATION NO.						
COMPRESSORS DATA (CONTD.)	SL. NO.	BIDDER					
		ITEM		RECIP	CENT	SCREW	
	18.	SUCTION TEMPERATURE - EACH STAGE	⁰ C				
	19.	DISCHARGE TEMPERATURE - EACH STAGE	⁰ C				
	20.	SELECTED COMPRESSOR SPEED	RPM				
	21.	BKW AT SELECTED COMPRESSOR SPEED	KW				
	22.	RECOMMENDED MAXIMUM SPEED	RPM				
	23.	BKW AT RECOMMENDED MAXIMUM SPEED	KW				
	24.	VOLUMETRIC EFFICIENCY	%				
	25.	MECHANICAL EFFICIENCY	%				
	26.	MOTOR RATING AND SPEED	KW/RPM	/	/	/	
	27.	LUBE OIL CONSUMPTION FOR EACH COMPRESSOR	LPM				
	28.	LUBE OIL PUMP DRIVEN BY COMPRESSOR MOTOR		YES/ NO	YES/ NO	YES/ NO	
	29.	MOTOR RATING, IF LUBE OIL PUMP IS DRIVEN BY SEPARATE MOTOR	KW				
	30.	AUXILIARY LUBE OIL PUMP TO BE PROVIDED		WHETHER PROVIDED YES/ NO			
	31.	AUXILIARY LUBE OIL PUMP MOTOR RATING AND SPEED	KW/RPM	/	/	/	
32.	TYPE AND MAKE OF BEARINGS						
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER				
			DATE				

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9		
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB7 INSTRUMENT AIR COMPRESSORS			SHEET : 3 OF 7		
	ENQUIRY OR SPECIFICATION NO.							
COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER		RECIP	CENT	SCREW	
	33.	COOLING WATER REQUIREMENTS (NOTE 1)						
	33.1	FOR COMPRESSOR COOLING						
	33.1.1	FLOW RATE	M ³ / Hr					
	33.1.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/		
	33.1.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/		
	33.1.4							
	33.1.5							
	33.1.6							
	33.2	FOR BEARING COOLING - IF REQUIRED						
	33.2.1	FLOW RATE	M ³ / Hr					
	33.2.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/		
	33.2.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/		
	33.2.4							
	33.2.5							
	34.	INTAKE FILTER TYPE						
	34.1	FILTER ELEMENT						
	34.2	RATED CAPACITY	M ³ / Hr					
	34.3	EFFICIENCY	%					
	34.4	DESCRIPTIVE LITERATURE TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO				
	34.5							
	NOTES TO BIDDER							
	1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				SIGNATURE OF BIDDER			
					DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB7 INSTRUMENT AIR COMPRESSORS			SHEET : 4 OF 7	
	ENQUIRY OR SPECIFICATION NO.						

COMPRESSOR DATA (CONTD.)	SL. NO.	BIDDER				
		ITEM		RECIP	CENT	SCREW
	35.	CAPACITY CONTROL				
	35.1	TYPE AND NUMBER OF STEPS		BY SPEED VARIATION / AT CONSTANT SPEED AND		
	35.2	METHOD EMPLOYED IN CASE OF CONSTANT SPEED TYPE				
	35.3	CONTROL SYSTEM WRITE-UP TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO		
	35.4	WIRING AND TUBING DIAGRAM WITH CONTROL SCHEME TO BE ENCLOSED		WHETHER ENCLOSED YES / NO		
	36.	EQUIPMENT AND ACCESSORIES MOUNTED ON COMMON BASE FRAME WITH THE COMPRESSOR				
	36.1	WEIGHT OF ENTIRE UNIT MOUNTED ON COMMON BASE FRAME	Kg			
	36.2	OVERALL DIMENSIONS OF COMMON BASE FRAME L X W	M	X	X	X
	37.	EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME				
	37.1	WEIGHT OF EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME	Kg			
	37.2	OVERALL DIMENSIONS OF SEPARATE BASE FRAME L X W	M	X	X	X
	38.	NAME AND OVERALL DIMENSIONS OF SINGLE LARGEST COMPONENT TO BE LIFTED L X W X H	M	X	X	X
	39.	NAME AND WEIGHT OF HEAVIEST SINGLE COMPONENT TO BE LIFTED	Kg			

NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		SIGNATURE OF BIDDER DATE	

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001		DATA SHEET DB7					
	PART : B		INSTRUMENT AIR COMPRESSORS				SHEET : 5 OF 7	
ENQUIRY OR SPECIFICATION NO.								
COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER					
				RECIP	CENT	SCREW		
	40.	SUCTION FLANGE - FIRST STAGE SIZE/ STANDARD/ RATING	mm NB/					
	41.	DISCHARGE FLANGE -FINAL STAGE - SIZE/ STANDARD/ RATING	mm NB/					
	42.	IF DRIVE MOTOR IS TO BE FURNISHED BY THE PURCHASER						
	42.1	RATING/ SPEED	KW/RPM					
	42.2	STARTING TORQUE	Kg M					
	42.3	DIRECTION OF ROTATION OF MOTOR AS VIEWED FROM COUPLING END		/	/	/		
	43.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO				
	44.							
	INTER-COOLERS / AFTER-COOLERS				I/C			A/C
					1 STG	2 STG	3 STG	
45.		DESIGNATION						
46.		NUMBER OFFERED						
47.		TAG NUMBERS						
48.		TYPE		VER/ HOR			VER/HOR	
49.		CAPACITY (FAD)	M ³ /Hr					
50.		COOLING WATER FLOW RATE	M ³ / Hr					
51.		AIR/ GAS INLET/OUTLET TEMPERATURE	⁰ C	/	/	/	/	
52.		COOLING WATER INLET/ MAXI- MUM OUTLET TEMPERATURE	⁰ C	/	/	/	/	
NOTES TO BIDDER				SIGNATURE OF BIDDER				
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				DATE				

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB7 INSTRUMENT AIR COMPRESSORS				SHEET : 6 OF 7	
	ENQUIRY OR SPECIFICATION NO.							
INTER-COOLERS / AFTER-COOLERS (CONTD.)	SL. NO.	BIDDER						
		ITEM		I/C			A/C	
	53.	AIR/ GAS INLET AND OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	54.	COOLING WATER INLET/ MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	55.	COOLING SURFACE AREA	M ²					
	56.	DESIGN PRESSURE - AIR/ GAS SIDE	Kg/cm ² (g)					
	57.	DESIGN PRESSURE - WATER SIDE	Kg/cm ² (g)					
	58.	CODE OF CONSTRUCTION						
	59.	CORROSION ALLOWANCE	mm	3	3	3	3	
	60.	NUMBER OF PASSES						
	61.	EMPTY WEIGHT	Kg					
	62.	OPERATING WEIGHT	Kg					
	63.	WATER FILLED WEIGHT	Kg					
	64.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO				
RECEIVERS	65.	DESIGNATION		RECEIVERS FOR				
	66.	NUMBER OFFERED						
	67.	TAG NUMBERS						
	68.	TYPE		VER/ HOR	VER/ HOR	VER/ HOR		
	69.	CAPACITY	M ³					
	70.	SIZE						
	70.1	DIAMETER	mm					
	70.2	HEIGHT TAN TO TAN	mm					
	71.	DESIGN PRESSURE	Kg/cm ² (g)					
	72.	CODE OF CONSTRUCTION						
73.	CORROSION ALLOWANCE	mm						
NOTES TO BIDDER			SIGNATURE OF BIDDER					
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE					

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001		DATA SHEET DB7			
	PART : B		INSTRUMENT AIR COMPRESSORS		SHEET : 7 OF 7	
ENQUIRY OR SPECIFICATION NO.						
RECEIVERS (CONTD.)	SL. NO.	ITEM	BIDDER			
	74.	THICKNESS				
	74.1	SHELL	mm			
	74.2	DISHED ENDS	mm			
	75.	WEIGHT				
	75.1	EMPTY	Kg			
	75.2	OPERATING	Kg			
	75.3	FILLED WITH WATER	Kg			
MISCELLANEOUS	76.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO		
	77.	ALL THE VALVES, SPECIALITIES, INSTRUMENTS, COUNTER FLANGES, FOUNDATION BOLTS ETC. AS CALLED FOR IN DATA SHEET A AND AS PER ENCLOSED P & I D TO BE INCLUDED		WHETHER INCLUDED YES / NO		
PERFORMANCE GUARANTEES	78.	CAPACITY OF COMPRESSOR	M ³ / Hr	(+)	(-)	
	79.	DISCHARGE PRESSURE	Kg/cm ² (g)	(+)	(-)	
	80.	POWER CONSUMPTION	KW	(+)	(-)	
	81.	TEMPERATURE OF AIR AT OUTLET OF AFTER-COOLER	⁰ C	(+)	(-)	
	82.	COOLING WATER FLOW RATE	M ³ / Hr	(+)	(-)	
	83.	COOLING WATER OUTLET TEMP.	⁰ C	(+)	(-)	
	84.	COOLING WATER PRESSURE DROP	Kg/cm ² (g)	(+)	(-)	
	85.					
NOTES 1. IF AIR COOLED COMPRESSOR IS OFFRERED, BIDDER TO FURNISH COOLING SYSTEM DETAILS LIKE NATURAL OR FORCED COOLING, FAN CAPACITY, MOTOR RATING ETC. LEGEND : I/C = INTER-COOLER, A/C = AFTER-COOLER, STG = STAGE						
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER			
			DATE			

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB8 AIR DRYING PLANT		VOLUME : III SECTION:D9 SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
	Design Data			
1.	Designation		Air drying plant for	
2.	Number offered			
3	Tag numbers			
4.	Make / Model number		/	
5.	Type of air drying plant			
6.	Maximum capacity at operating condition (FAD)	m ³ /hr		
7.	Type of dessicant			
8.	Quantity of desiccant per Chamber	kg		
9.	Expected life of desiccant	yr		
10.	Air pressure drop across air drying plant at maximum flow	kg/cm ²		
11.	Outlet air temperature	°c		
12	Outlet air dew point			
12.1	At atmospheric pressure	°c		
12.2	At operating pressure	°c		
13.	Cooling water (cw) flow rate	m ³ /hr		
13.1	CW outlet temperature	°c		
13.2	CW pressure drop	kg/cm ²		
14.	Adsorption cycle time	hr		
15.	Reactivation cycle time	hr		
15.1	Heating	hr		
15.2	Cooling	hr		
15.3	Purging	min.		
16.	Weight of water removed per cycle	kg		
17.	Regeneration air temperature	°c		
18.	Number / Rating of each heating element	kw	/	
19.	Heater power consumtpion per cycle	kwhr		
20.	Blower capacity	m ³ /hr		
21.	Blower power consumption per Cycle / motor rating	kw	/	
22.	Purge air quantity	m ³ /hr		
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	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB8 AIR DRYING PLANT		VOLUME : III SECTION:D9 SHEET 2 OF 2	
ENQUIRY/SPECIFICATION NO.:				BIDDER:	
SL. NO.	ITEM	UNIT			
23.	Overall dimensions L x W x H	m	x	x	
24.	Total weight	kg			
25.	Detailed description of				
	operating sequence, controls,		whether enclosed		
	interlocks to be enclosed		yes / no		
26.	Whether supply of valves,				
	specialities and instruments as		whether included		
	per data sheet a and P&I		yes / no		
	diagram is included?				
27.					
	Performance Guarantees				
28.	Design Capacity (FAD)	m ³ / hr	(+)	(-)	
29.	Outlet air dew point at				
	atmospheric pressure	°c	(+)	(-)	
30.	Pressure dew point at outlet	°c	(+)	(-)	
31.	Air pressure drop across the plant	kg/cm ²	(+)	(-)	
32.	Air outlet temperature	°c	(+)	(-)	
33.	Total power consumption/cycle	kw	(+)	(-)	
34.	Purge air quantity	m ³ / hr	(+)	(-)	
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		

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB9 ASH DISPOSAL EQUIPMENT – FLY ASH SILO AND ACCESSORIES		VOLUME : III SECTION:D9 SHEET 1 OF 2					
ENQUIRY/SPECIFICATION NO.:			BIDDER:						
SL. NO.	ITEM	UNIT							
1.0	Construction of silo by:								
2.0	Quantity of ash to be stored	Tonnes							
3.0	Method of venting conveying air from silo								
4.0	Silo lining material, if provided								
5.0	Is painting as specified included		YES/NO						
6.0	<u>Vent filter:</u>								
6.1	Manufacturer								
6.2	Material of Filter Bags								
6.3	Type of Bag Cleaning Arrangement								
6.4	Materials of Construction								
6.4.1	Casing								
6.4.2	Hopper								
7.0	Type and make of silo level indicating device								
8.0	Is catalogue for level indicator enclosed?		YES/NO						
9.0	No of outlets provided								
<table border="1"> <tr> <td colspan="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="3"> SIGNATURE OF BIDDER & DATE </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		
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SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB10 ASH DISPOSAL EQUIPMENT CONTINUOUS DUST CONDITIONER UNLOADER & ROTARY FEEDER		VOLUME : III SECTION:D9 SHEET 1 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	<u>Continuous dust conditioner & unloader</u>			
1.1	Number			
1.2	Capacity	T/hr		
1.3	Water quantity required	m ³ /hr		
1.4	Pressure of inlet water	Kg/cm ²		
1.5	Location of spray headers			
1.6	Paddle Mixer			
1.6.1	Diameter of paddle mixer			
1.6.2	Speed			
1.6.3	Outlet type			
1.6.4	Shaft of mixer (Type & diameter)			
1.6.5	Type of trough			
1.6.6	Type of shaft			
1.6.7	Material of Construction			
	i) Trough/top cover ii) Paddles			
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB10 ASH DISPOSAL EQUIPMENT CONTINUOUS DUST CONDITIONER UNLOADER & ROTARY FEEDER		VOLUME : III SECTION:D9 SHEET 2 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
	iii) Shaft iv) Spray nozzles			
1.7	Head room required for installing the conditioner including metering device (Enclose a sketch)			
2.0	Rotary Feeder			
2.1	Capacity	T/hr		
2.2	Speed of feeder	RPM		
2.3	Pressure differential for which feeder can seal			
2.4	Material of Construction and thickness of			
2.4.1	Feeder housing			
2.4.2	Inlet piece			
2.4.3	Rotor Vanes			
2.5	Material of rotor shaft			
2.6	Drive Unit			
2.6.1	KW rating of motor	kW		
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB10 ASH DISPOSAL EQUIPMENT CONTINUOUS DUST CONDITIONER UNLOADER & ROTARY FEEDER		SECTION:D9 SHEET 3 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
2.6.2	Type of enclosure for the motor			
2.7	Feeder inlet opening size			
2.8	Feeder outlet opening size			
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	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB11 ASH DISPOSAL EQUIPMENT WETTING UNIT		VOLUME : III SECTION:D9 SHEET 1 OF 1
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	Manufacturer			
2.0	Quantity			
3.0	Capacity	T/hr		
4.0	Water requirement at operating point	M ³ /hr.		
5.0	<u>Materials of construction/ hardness</u>			
	(Furnish the composition of materials of construction)			
5.1	Body			
5.2	Nozzle			
6.0	<u>Accumulated operating life in hours</u>			
6.1	Nozzles	Hrs.		
6.2	Body	Hrs.		
7.0	Indicate the standards to which the inlet and outlet connection flanges conform:			
8.0	Is the drawing enclosed		Yes / no	
9.0	Is the vendor agreeable to conduct all tests as specified?		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 NO. R3	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III	
	TCE-5750A-H-500-001		DATA SHEET DB12		SECTION : D9	
	PART : B		AIR BLOWERS & HEATERS		SHEET : 1 OF 3	
	SL. NO.	BIDDER				
GENERAL	1.	DESIGNATION			AIR BLOWER FOR ESP & SILO	
	2.	NUMBER OFFERED				
	3.	TAG NUMBERS				
	4.	MAKE AND MODEL NUMBER				
	5.	AMCA ARRANGEMENT NUMBER				
	6.	VOID				
	7.	VOID				
	8.	VOID				
DESIGN AND PERFORMANCE	9.	CAPACITY (FAD) NORMAL / MAXIMUM		M ³ /Hr		
	10.	VACUUM CREATED				
	11.	DISCHARGE PRESSURE		Kg/cm ² g		
	12.	SELECTED SPEED OF BLOWER		RPM		
	13.	CASING MATERIAL / THICKNESS				
	14.	IMPELLER OR ROTOR DIAMETER		Mm		
	15.	IMPELLER OR ROTOR MATERIAL / THICKNESS				
	16.	SHAFT MATERIAL / DIAMETER				
	17.	TYPE AND NO. BEARINGS				
ACCESSORIES	18.	MATERIAL OF CONSTRUCTION / EFFICIENCY OF AIR FILTER		} mmWC		
	19.	PRESSURE DROP ACROSS AIR FILTER				
	20.	SIZE / MATERIAL OF CONSTRUCTION OF CASING DRAIN VALVE				
	21.	SIZE / MATERIAL OF CONSTRUCTION OF RELIEF VALVE				
	22.	SIZE / MATERIAL OF CONSTRUCTION OF OUTLET DAMPER				
	23.	VIBRATION DAMPENING PADS				
	24.	BASE PLATE MATERIAL				
<u>NOTES TO BIDDER</u> DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, VENDOR SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID DOCUMENT.				SIGNATURE OF BIDDER		
				DATE		

ISSUE NO. R3	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION:D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB12 AIR BLOWERS & HEATERS		SHEET:2 OF 3	
HEATERS	SL. NO.	ITEM	BIDDER			
	25	TYPE				
	26	NO. OF HEATER PROVIDED				
	27	MATERIAL OF CONSTRUCTION				
	28	RATING	KW			
	29	TYPE				
	30	MAKE				
	31	MODEL NUMBER				
	32	ABSORBED POWER AT SHAFT	KW	}		
	33	POWER INPUT AT DUTY POINT	KW			
	34	RATING	KW			
	35	SPEED	RPM			
	36	REDUCTION RATIO				
	37	EFFICIENCY	%			
38	SERVICE FACTOR					
MISCELLANEOUS	39	NOISE LEVEL AT 1.0 M DISTANCE FROM BLOWER	dB(A)			
	40	WEIGHT OF ENTIRE UNIT MOUNTED ON COMMON BASE PLATE	Kg	}		
	41	TOTAL DYNAMIC LOAD	Kg			
	42	DOCUMENTS TO BE ENCLOSED				
	43.1	GENERAL ARRANGEMENT DRAWING WITH MAJOR DIMENSIONS				
	43.2	PART LIST WITH CODES AND MATERIALS OF CONSTRUCTION				
	43.3	PERFORMANCE CURVE WITH DUTY POINT MARKED				
	43.4	SELECTION CHARTS OR CURVES				
	43.5	LIST OF START-UP SPARES				
	43.6	LIST OF RECOMMENDED SPARES FOR 2 YEARS NORMAL OPERATION				
LEGEND : NA : NOT APPLICABLE						
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID DOCUMENT.				SIGNATURE OF BIDDER		
				DATE		

ISSUE NO. R3	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III	
	TCE-5750A-H-500-001		DATA SHEET DB12 AIR BLOWERS & HEATERS		SECTION : D9	
	PART : B				SHEET:3 OF 3	
ENQUIRY/ SPECIFICATION NO. TCE.						
PERFORMANCE GUARANTEES	SL. NO.	BIDDER				
		ITEM				
	44.	CAPACITY (FAD)		M ³ /Hr	}	
	45.	DISCHARGE PRESSURE		Kg/cm ² g		
	46.	POWER CONSUMPTION		KW		
	47.					
	48.					
	NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID DOCUMENT.				SIGNATURE OF BIDDER	
				DATE		

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB13 ASH DISPOSAL EQUIPMENT SUMPS/TANKS		VOLUME : III SECTION:D9 SHEET 1 OF 1	
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
SL. NO.	ITEM	UNIT			
			ASH WATER TANK	ASH SLURRY SUMP	
1.0	Capacity	Cu.m			
2.0	Dimensions				
2.1	Length	M			
2.2	Breadth	M			
2.3	Depth	M			
3.0	Are all the accessories included as specified?				
4.0	Accumulated operating life of liner plates in the ash slurry sump	Hrs.			
5.0	Thickness and material of construction (with composition and hardness) of liners	Mm			
<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 		

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB14 ASH DISPOSAL EQUIPMENT PIPING & FITTINGS		VOLUME : III SECTION:D9 SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	Manufacturer of			
1.1	Pipes			
1.2	Fittings			
2.0	<u>Pipe lines size</u>			
2.1	Slurry disposal			
2.2	Drain pipe			
2.3	Jet pumps to slurry sump			
2.4	Vacuum tank / air washer to slurry sump			
2.5	FA conveying line (Vacuum type)			
2.6	FA conveying line (Pressure pneumatic type)			
2.7	Ash water recovery system			
2.8	Sludge pipeline			
2.9	Pipe load for each application	Kg / M		
3.0	Recommended support spacing for FA pipe lines	M		
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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB14 ASH DISPOSAL EQUIPMENT PIPING & FITTINGS		VOLUME : III SECTION:D9 SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
4.0	Material Of Construction Of Bends			
5.0	Maximum Velocity Of Air-Ash Mixture	M/sec.		
6.0	Pickup and terminal velocity for fly ash conveying	M/sec.		
7.0	Velocity of ash-water mixture in slurry pipe			
7.1	From Jet Pump to Slurry Sump / Slurry Pond / Hydrobin	M/sec.		
7.2	From Vacuum Tank to Slurry Sump	M/sec.		
7.3	From Ash Slurry Pumps to Ash Slurry Pond	M/sec.		
7.4	Sludge pipeline	M/sec.		
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB15 ASH DISPOSAL EQUIPMENT- ASH SLURRY LINE VALVES		VOLUME : III SECTION:D9 SHEET 1 OF 2	
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
SL. NO.	ITEM	UNIT			
1.0	Manufacturer		KNIFE GATE VALVE	TAPER PLUG VALVE	
2.0	Number of valves				
3.0	Line size	MM			
4.0	Ash slurry flow rate through valve	Cu.m/hr			
5.0	Valve body				
5.1	Material				
5.2	Hardness	BHN			
6.0	Plate / Plug				
6.1	Material				
6.2	Hardness	BHN			
7.0	Shaft material				
8.0	<u>If remote operated type, indicate</u>				
8.1	Type of Actuation				
8.2	Quantity of Compressed Air Required if any	Nm ³ /hr			
8.3	Pressure of Compressed Air Required if any	Kg/cm ² (g)			
8.4	Motor rating incase of electrically actuated valve				
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 		

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME : III
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB15 ASH DISPOSAL EQUIPMENT- ASH SLURRY LINE VALVES		SECTION:D9 SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
9.0	Whether catalogues enclosed?		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 NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III	
	TCE-5750A-H-500-001		DATA SHEET DB16		SECTION : D9	
	PART : B		CLARIFIERS		SHEET: 1 OF 4	
ENQUIRY / SPECIFICATION NO.						
	SL. NO.	ITEM	BIDDER			
GENERAL	1.	SYSTEM DESIGNATION		CLARIFIERS FOR		
	2.	TYPE OF CLARIFIER		CONVENTIONAL/ CLARIFLOCCULATOR/ SOLIDS CONTACT		
	3.	NUMBER OFFERED				
	4.	TAG NUMBERS				
FLASH MIXER	5.	RESIDENCE TIME	Min			
	6.	TANK SIZE-INSIDE DIMENSIONS	M	× ×		
	7.	MATERIAL OF CONSTRUCTION OF TANK				
	8.	IMPELLER TYPE		TURBINE/PROPELLER		
	9.	NUMBER OF IMPELLERS PER TANK				
	10.	IMPELLER SHAFT MATERIAL				
	11.	PADDLE OR BLADE MATERIAL				
	12.	EACH MOTOR RATING	KW			
	13.	MOTOR MAKE-AS PER APPROVED SUB-VENDOR LIST				
CLARIFIER	14.	DESIGN INFLUENT FLOW RATE	M ³ /Hr			
	15.	MAXIMUM INFLUENT FLOW RATE	M ³ /Hr			
	16.	SURFACE FLOW RATE		M ³ /Hr/M ²		
	17.	RESIDENCE TIME	Hr			
	18.	SLUDGE CONSISTENCY	%			
	19.	INSIDE DIAMETER × SIDE WATER DEPTH	M	×		
	20.	OVERALL HEIGHT	M			
	21.	SLOPE OF CLARIFIER FLOOR		1 IN		
	22.	PRESURE DROP ACROSS CLARIFIER (FROM INLET TO FLASH MIXER TO OUTLET OF CLARIFIER INCLUDING FLOW MEASURING DEVICE)	MWC			
<u>NOTES TO BIDDER</u> 1.DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER			
			DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001		DATA SHEET DB16 CLARIFIERS		SHEET: 2 OF 4	
	PART : B					
ENQUIRY/ SPECIFICATION NO. TCE.						
CLARIFIER (CONTD.)	SL. NO.	BIDDER				
	ITEM					
	23.	MATERIAL OF CONSTRUCTION		RCC/		
	24.	LAUNDER		INTERNAL/EXTERNAL		
	25.	SIZE OF LAUNDER-WIDTH × DEPTH	M	×		
	26.					
	27.					
	28.					
	FLOCCULATOR	29.	RESIDENCE TIME	Hr		
		30.	TYPE		TURBINE/PROPELLER	
		31.	NUMBER PER CLARIFIER			
		32.	MATERIAL OF CONSTRUCTION OF TANK			
		33.	SHAFT MATERIAL			
		34.	PADDLE MATERIAL			
		35.	TIP SPEED	RPM		
		36.	EACH MOTOR RATING	KW		
		37.	MOTOR MAKE-AS PER APPROVED SUB-VENDOR LIST			
	SCRAPER MECHANISM	38.	TYPE		FIXED/ROTATING	
		39.	SPEED	RPM		
		40.	MATERIAL OF CONSTRUCTION			
		40.1	BRIDGE			
		40.2	SCRAPERS			
		41.	TRACTION DRIVE MOTOR RATING (FOR ROTATING BRIDGE)	KW		
		42.	SCRAPER MOTOR RATING	KW		
		43.	MOTOR MAKE- AS PER APPROVED SUB-VENDOR LIST			
		44.				
		45.				
	NOTES TO BIDDER			SIGNATURE OF BIDDER		
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION : D9	
	TCE-5750A-H-500-001 PART : B		DATA SHEET DB16 CLARIFIERS		SHEET: 3 OF 4	
	PART : B					
	SL.N O.	BIDDER ITEM				
SLUDGE REMOVAL	46.	SLUDGE DISPOSAL		GRAVITY/PUMP		
	47.	CAPACITY OF SLUDGE CHAMBER	M ³			
	48.	SIZE OF SLUDGE CHAMBER L × B × H	M	×	×	
	49.	MATERIAL OF CONSTRUCTION OF SLUDGE CHAMBER				
	50.	SLUDGE BLOW-OFF RATE	M ³ /Hr			
	51.	BLOW-OFF DURATION	Min			
	52.	BLOW-OFF VALVE TYPE				
	53.	BLOW-OFF VALVE MATERIAL OF CONSTRUCTION				
PERFORMANCE GUARANTEES	54.	DESIGN INFLUENT FLOW RATE	M ³ /Hr	+	-	
	55.	OUTLET TURBIDITY	NTU	+	-	
	56.	OUTLET SUSPENDED SOLIDS	mg/l	+	-	
	57.	OUTLET COLLOIDAL SILICA	mg/l	+	-	
	58.	RESIDENCE TIME IN CLARIFIER	Hr	+	-	
	59.	SLUDGE CONSISTENCY	%	+	-	
	60.	CHEMICAL CONSUMPTION PER DAY		+	-	
	60.1	COAGULANT	Kg	+	-	
	60.2	POLYELECTROLYTE	Kg	+	-	
	60.3	(ANY OTHER)	Kg	+	-	
61.	TOTAL ELECTRICAL LOAD	KW	+	-		
DOCUMENTS		TO BE ENCLOSED		WHETHER ENCLOSED		
	62.	HYDRAULIC FLOW DIAGRAM INDICATING THE SCHEME AND WATER LEVEL AT FLASH MIXER, CLARIFIER AND AT CLARIFIER OUTLET(LAUNDER)		YES/NO		
	63.	P&I D INDICATING ALL EQUIPMENT, PIPING, VALVES, SPECIALITIES AND INSTRUMENTS, ETC. INCLUDED IN CONTRACTOR'S SCOPE		YES/NO		
NOTES TO BIDDER 1.DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER			
			DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
	TCE-5750A-H-500-001		DATA SHEET DB16 CLARIFIERS		SECTION : D9
	PART : B				SHEET: 4 OF 4
ENQUIRY/SPECIFICATION NO. TCE.					
DOCUMENTS (CONTD.)	SL. NO.	ITEM	BIDDER		
		TO BE ENCLOSED		WHETHER ENCLOSED	
	64.	EQUIPMENT LAYOUT DRAWING		YES/NO	
	65.	CROSS-SECTION DRAWING WITH COMPLETE PART LIST AND MATERIALS OF CONSTRUCTION		YES/NO	
	66.	LIGHTING, ILLUMINATION AND WIRING DIAGRAM WITH POWER CABLE ROUTING		YES/NO	
	67.				
NOTES TO BIDDER 1.DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER		
			DATE		

SPECIFICATION NO. TCE-5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET DB17 ASH DISPOSAL EQUIPMENT UNLOADING SPOUT		VOLUME : III SECTION:D9 SHEET 1 OF 1
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	Manufacturer			
2.0	Quantity			
3.0	Capacity	T/hr		
4.0	Materials of construction			
5.0	<u>Vent filter details</u>			
8.0	Is the drawing enclosed		Yes / No	
9.0	Is the vendor agreeable to conduct all tests as specified?		Yes / No	
10.0	Are openings with covers provided for inspection of internals		Yes / No	
11.0	Is the painting scheme as specified included?		Yes / No	
12.0	Are the materials of construction suitable for service intended		Yes / No	
13.0	If no, please elaborate			
<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 NO. R6	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:IIIS
	TCE-5750A-H-500-001		DATA SHEET DB18		SECTION:D9
	PART: B		SUMP PUMPS		SHEET : 1 OF 3
SL. NO.	BIDDER				
	ITEM				
1.	DESIGNATION				
2.	NUMBER OFFERED				
3.	TAG NUMBERS				
4.	PUMP MAKE AND MODEL NUMBER				
5.	DESIGN CAPACITY	M ³ /Hr			
6.	TOTAL HEAD DEVELOPED BY IMPELLER	MLC			
7.	LOSSES IN COLUMN PIPE UPTO DISCHARGE FLANGE	MLC			
8.	SHUT-OFF HEAD	MLC			
9.	HYDROSTATIC TEST PRESSURE	Kg/cm ² (g)			
10.	NUMBER OF STAGES				
11.	MINIMUM SUBMERGENCE REQUIRED	MLC			
12.	PUMP SPEED	RPM			
13.	PUMP EFFICIENCY AT DUTY POINT	%			
14.	POWER INPUT TO PUMP AT DUTY POINT	KW			
15.	MAXIMUM PUMP POWER REQUIREMENT	KW			
16.	POWER INPUT TO MOTOR AT DUTY POINT	KW			
17.	MOTOR EFFICIENCY AT DUTY POINT	%			
18.	MOTOR RATING	KW			
19.	MOTOR SPEED	RPM			
20.	MOTOR MAKE AND MODEL NUMBER				
21.	COOLING WATER (IF REQUIRED)				
21.1	QUANTITY	M ³ /Hr			
21.2	PRESSURE	Kg/cm ² (g)			
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			SIGNATURE OF BIDDER		
			DATE		

ISSUE NO. R6	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME:III	
	TCE-5750A-H-500-001		DATA SHEET DB18			SECTION : D9	
	PART: B		SUMP PUMPS			SHEET :2 OF 3	
SL. NO.	BIDDER						
	ITEM						
22.	TYPE OF IMPELLER						
23.	MAXIMUM SIZE OF SOLIDS PERMISSIBLE		mm				
24.	DISCHARGE NOZZLE SIZE H		mm NB				
25.	RECOMMENDED SUMP DIMENSIONS : L x W		M	x			
26.	DIMENSIONS AS INDICATED IN SH 3 OF 3 OF DATA SHEET A		mm	A =	B =	C =	
				D =	E =	MIN.F =	
				G =	I =	J =	
27.	OPENING DIMENSIONS ON COVER SLAB		mm	x			
28.	WEIGHT OF PUMP + SUPPORT PLATE		Kg				
29.	WEIGHT OF MOTOR		Kg				
30.	OUTLINE DIMENSIONAL DRAWING TO BE ENCLOSED			WHETHER INCLUDED YES/NO			
31.	FOUNDATION DRAWING WITH STATIC AND DYNAMIC LOADS TO BE ENCLOSED			WHETHER ENCLOSED YES/NO			
32.	CROSS-SECTION DRAWING OF PUMP WITH PART LIST AND MATERIALS OF CONSTRUCTION AND RELEVANT STANDARDS TO BE ENCLOSED			WHETHER ENCLOSED YES/NO			
33.	PERFORMANCE CURVES FLOW RATE Vs HEAD, BkW , EFFICIENCY AND TORQUE-SPEED CURVE TO BE ENCLOSED			WHETHER ENCLOSED YES /NO			
34.	CATALOGUE FOR AUTOMATIC FLOAT LEVEL SWITCH TO BE INCLUDED			WHETHER ENCLOSED YES/NO			
NOTES TO BIDDER			SIGNATURE OF BIDDER				
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A.							
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE				

ISSUE NO. R6	SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
	TCE-5750A-H-500-001	DATA SHEET DB18		SECTION: D9
	PART: B	SUMP PUMPS		SHEET:3 OF 3
SL. NO.	ITEM	BIDDER		
35.	PERFORMANCE GUARANTEE			
35.1	CAPACITY	M ³ /Hr		
35.2	HEAD AT DISCHARGE FLANGE	MLC		
35.3	POWER CONSUMPTION	KW		
NOTES TO BIDDER		SIGNATURE OF BIDDER		
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.		DATE		

D10

CRANES & HOISTS SYSTEM

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

1.0

SCOPE

1.1

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

1.2

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

1.3

Equipment to be supplied:

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

2.0

EQUIPMENT SIZING AND DESIGN CRITERIA

ISSUE

R1

FLIENAME:F329R5.DOC

TCE FORM 329 R5

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 2 OF 7
2.1 <u>EOT Cranes</u> Following double girder EOT cranes of suitable capacity is included in bidder scope of work. 2.1.1 Two (2) Nos. double girder E.O.T Crane of minimum 150/40 T capacity with accessories and associated drives, motors and other auxiliaries required for erection and maintenance of main steam turbine components, condensers, generators, coolers, condensate pumps, lube oil units and boiler feed water pumps etc located within the station building. The auxiliary hoists will be used to handle smaller components more rapidly. 2.1.2 The CW pump house EOT crane shall be rated for the heaviest component to be handled in the CW pump house (viz. Drive motor of the pump). 2.1.3 The height of lift for the Circulating Water Pump house EOT crane shall be based on lifting the circulating water pump out of the pump suction flume onto the maintenance floor area. Dedicated monorails and lifting arrangements shall be provided for the chlorine tonner area. 2.1.4 The EOT cranes shall be of the plate box girder construction. 2.1.5 The EOT cranes shall be able to be operated from pendant push button station hanging from the crane. TG building crane shall be able to operate from radio remote control and cabin 2.1.6 BIDDER's scope of supply shall essentially include but not limited to the following: a) Shrouded type copper bus bars for LT motion with insulators and fixtures for the crane runway length specified in Datasheet-A including current collectors. b) Crane runway rails with associated fixtures comprising of fixing clamps, bolts, Nuts, etc., for the crane runway length specified in Datasheet-A c) Hand or foot operated brakes operable from operator's cabin shall be adequately arranged in such a way that a force exceeding 12 kg at the handle or 20 kg at the foot pedal is required for effective operation. d) Essential spares as per Section D20. e) Crane buffer stops, these shall include the buffers on the crane itself as well as the buffers to be fixed (by BIDDER) on the building frame, and wheel stops at either end of the crane runway. f) One set of Maintenance tools and tackles including special tools which shall be Included in the base price for the crane.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 3 OF 7
g) The start up/ commissioning spares as required during the commissioning of the equipment till handing over of the crane to the PURCHASER shall be included in the base price for the crane. h) In addition to the spares mentioned above the BIDDER shall quote for any additional spare parts recommended for a period of 3 years of trouble free operation of the crane. i) The height of lift of the TG building EOT crane shall be based on lifting the tallest piece from the operating floor to grade, with consideration of sufficient clearances over other equipment on operating floor. j) All the necessary electrical equipments including but not limited to Isolating switch, all power, control and instrumentation cabling from isolating switch to various EOT crane services including lighting and industrial sockets, Squirrel Cage induction motors, Control & Protection circuits, 12 pulse VFD drives for speed control and direction of rotation reversal of motors, 24V AC and 400V 3 phase and 230V single phase AC industrial sockets, 24V AC hand lamp, 400/24V AC transformer for providing supply to the socket, 230V AC under bridge lighting including 400/230V AC lighting transformer etc. shall be in the scope of the bidder. The bidder shall submit cable sizing calculations for LT power cables and technical particulars of all major electrical items used, for PURCHASER'S/ENGINEER'S approval during detailed engineering. k) Slings required for the crane shall be included in the bidder's scope. l) The BIDDER's scope of work shall include painting, testing at shop, proper packing, loading, transport to site, transit insurance, unloading from carriers/wagons, inspection, storing at site, storage and erection insurance, transport to site of erection and complete erection, testing at site, painting and commissioning of the cranes and accessories as specified. m) Painting of cranes, hoists and chain pulley block shall be as specified in Volume II. 2.1.7 <u>Crane Classification</u> The EOT cranes shall be designed as per Class M5 for Mechanical and structural components and Class M7 for all electrical components (IS: 807) 2.1.8 <u>Speeds of EOT Cranes</u> 10% of main speed shall be creep speed and shall be provided for all motions of the EOT crane viz. long travel, cross travel, auxiliary hoist and main hoist through VVVF Drives. 2.1.9 <u>PERFORMANCE, AND LAYOUT REQUIREMENTS</u>		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 4 OF 7

a) Performance Requirements

- 1.0 The equipment is normally expected to operate intermittently in all three shifts.
- 2.0 Fluctuations in Power Supply Conditions
Although the rated frequency is 50 Hz. it is expected that reduced frequencies will prevail over sustained periods of time owing to possible shortage of power in the region. All motor driven auxiliary equipment and accessories shall be capable of continuously delivering the rated outputs for a voltage variation of +/- 10% and frequency variation of +/- 5% occurring separately or combined voltage and frequency variation of 10%.

b) Layout Requirements

- 1.0 The location of cabin, shrouded bus bars and the orientation of main and auxiliary hooks with respect to powerhouse columns shall be indicated in the crane clearance diagram.
- 2.0 Hook approaches for main and auxiliary hooks shall be as indicated in the crane clearance diagram with adequate space around the equipment.
- 3.0 Access walkways with safety hand railing shall be provided along the full span length on both sides of the crane bridge girders.
- 4.0 The span of EOT cranes shall be derived based on the building layout with considerations to clearances and hook approach.

2.1.10 Other Features

The EOT crane main hook shall be Ramshorn type. The auxiliary hoist hook shall be plain shank type with safety latch.

The EOT cranes shall be designed to operate at 100% of rated load. The overload testing of the crane shall be at 125% of rated load without any permanent deformation.

The EOT cranes are designed with a maximum deflection of 1/900 of crane span at rated load.

2.2 Hoists and Trolleys with Monorails

For items weighing 500 kg and above, hoists and trolleys along with monorails shall be provided throughout the plant where cranes cannot be utilised. For items weighing less than 1000 kg, manual hoists shall be provided. For items weighing 1000 kg, and more, electric hoists shall be provided. In case the lifting height is more, than 10 m, electric hoist shall be provided.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 5 OF 7

2.3 **Capacity of Cranes & Hoists**

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

3.0 **PERFORMANCE GUARANTEES & TESTS**

3.1 **Performance Guarantees**

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

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

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME - III SECTION: D10
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan CRANES & HOISTS	SHEET 6 OF 7

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

3.2 Performance Test

- 3.2.1 Performance tests shall carried out to prove the guarantees indicated as above.
- 3.2.2 The BIDDER shall conduct at shop and site tests on the cranes as indicated in Datasheet-A
- 3.2.3 Control interlock and sequential operation of the control schemes shall be demonstrated both at shop and at site.
- 3.2.4 100% radiographic test shall be carried for butt welds in tension zone.
- 3.2.5 Energy consumption of motors at different motions while handling safe working loads at the rated speed

Data / Drawings to be submitted after Award of Contract

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

- 1.1 List of drawings/documents to be submitted for review, approval and information with scheduled submission dates.
- 1.2 Quality assurance plan (QAP)
- 1.3 Motor power calculations, Wire rope, Rope drum Calculation.
- 1.4 Girder deflection calculations.
- 1.5 Brake selection calculations
- 1.6 Detailed to-scale dimensioned GA drawing of crane showing all the components like bridge girder, end carriages, travelling trolley, rope drums, wire ropes, sheaves, hooks, rails, end stops, buffers etc. Drawing shall also include part list of all the crane components along with materials and codes of construction.
- 1.7 GA drawing of long travel & cross travel arrangement.
- 1.8 GA drawing indicating crane rail fixing arrangement.
- 1.9 GA drawing of runway conductors.
- 1.10 Flexible trailing cable arrangement drawing.

ISSUE R1

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

1.11 Write-up & recommended logic schemes for interlock protection and sequential controls for Crane and its auxiliaries.

1.12 Characteristic of temperature elements included under VENDOR's scope.

1.13 List of alarm and trip settings,

1.14 Installation, operation and maintenance manual with lubrication schedule.

1.15 General arrangement of lifting beam with all details.

1.16 Detailed explanatory functional write-up of control scheme, wiring diagrams and control cabinet drawings.

1.17 Component drawings for (a) rope drums (b) sheaves (c) wheel assembly (d) Hooks (e) End stops (f) buffers (g) wheel stops (h) rail clamps. etc

ISSUE
R1

ISSUE NO. R3	TCE.M4-113-54		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	ENQ.SPEC.NO. TCE.5750A-H-500-001		DATA SHEET -A ELECTRICALLY OPERATED HOIST		SECTION : D10 SHEET : 1 OF 2	
	PART : B					
GENERAL	1. DESIGNATION: HOIST AND TROLLEY FOR BY BIDDER			DESIGN DATA (CONTD.)	22. METHOD OF OPERATION : PENDANT PUSH BUTTON	
	2. NUMBER REQUIRED: BY BIDDER				23. HOISTING SPEED: 4 M/MIN	
	3. TAG NOS: BY BIDDER				24.TROLLEY TRAVEL SPEED: 4 TO 5 M /MIN	
	4. LOCATION IN HAZARDOUS AREA: BY BIDDER				25. CREEP SPEED REQUIRED FOR: 25.1 HOIST: YES 25.2 TROLLEY: YES	
	5. HAZARDOUS AREA CLASSIFICATION AS PER IS 5572 ZONE 0/1/2 NA				26. FLEXIBLE TRAILING CABLE FOR TRAVEL BY : BY BIDDER	
	6. LOCATION: BY BIDDER				27.	
	7. APPLICABLE STANDARD: IS 3938				28.	
	8. DUTY CLASS: 2				29.	
	9.					
DESIGN DATA	10. CAPACITY: BY BIDDER			MATERIALS AND CODES OF CONSTRUCTION	30. HOIST : AS PER IS 3938	
	11. RANGE OF LIFTING: BY BIDDER				31. TROLLEY FRAME: ROLLED STRUCTURAL STEEL WITH SIDE PLATES EXTENDED BEYOND WHEEL FLANGES TO PROTECT WHEELS	
	12. OPERATING FLOOR ELEVATION: BY BIDDER				32. TROLLEY WHEELS: HEAT TREATED CARBON STEEL/ LOW ALLOY STEEL/ GRADED CAST IRON. SINGLE FLANGED WITH TAPERED TREAD	
	13. BOTTOM OF MONORAIL ELEVATION: BY BIDDER				33. ROPE DRUM AND SHEAVES: CAST IRON/ CAST STEEL/ MILD STEEL AS PER IS 3177	
	14. MONORAIL LENGTH: BY BIDDER				34. WIRE ROPE: CONSTRUCTION 6 x 37 AS PER IS 2266. MINIMUM FACTOR OF SAFETY 5	
	15. MONORAIL TRACK: CURVED / STRAIGHT				35. SHAFTS AND AXLES: CARBON STEEL	
	16. RADIUS OF CURVATURE OF MONORAIL: BY BIDDER				36. GEARS AND PINIONS: SPUR/ HELICAL AS PER IS 4460/ BS 436/ BS 721/ AGMA STANDARDS	
	17. MONORAIL BY: BY BIDDER					
	18. SIZE OF MONORAIL (IF PROVIDED BY PURCHASER): BY BIDDER					
	19. TYPE OF HOIST: WORM / SPUR GEAR					
	20. TYPE OF TROLLEY: MOTOR DRIVEN					
21.						
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO. TCE. 5750A	CLIENT: RRVUNL
DATE	NOV 09	MAY'12		CHD. BY: SMS		PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE:MAY'12		SURATGARH, RAJASTHAN
						ISSUE R1

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

ISSUE
R1

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

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION : D10	
	PART : B		ELECTRICALLY OPERATED HOISTS		SHEET : 2 OF 3	
	ENQUIRY/ SPECIFICATION NO. TCE.					
ELECTRICAL REQUIREMENTS (CONTD.)	SL. NO.	ITEM	BIDDER			
	17.	TYPE OF DOWN SHOP LEAD				
	17.1	MAKE				
	17.2	SIZE				
	17.3	LENGTH	M			
	17.4	SUPPORTING ARRANGEMENT				
	17.5	IF CURVED MONORAIL, NUMBER OF CABLE TROLLEYS PROVIDED AND WIDTH OF EACH TROLLEY	NO./ mm			
	18.					
	19.					
	20.					
	21.					
	DIMENSIONS	22.	MONORAIL IF PROVIDED BY VENDOR : INDICATE BEAM SIZE MINIMUM/ MAXIMUM SUITABLE FOR TROLLEY MOVEMENT	mm	ISMB	/ ISMB
23.		MONORAIL IF PROVIDED BY PURCHASER : IS SIZE SPECIFIED IN DATA SHEET A SUITABLE FOR TROLLEY MOVEMENT		YES/ NO	IF NO, INDICATE SUITABLE SIZE ISMB	
24.		DISTANCE BETWEEN HIGHEST HOOK POSITION TO BOTTOM OF MONORAIL	mm			
25.		IF MONORAIL IS CURVED, MINIMUM RADIUS TROLLEY CAN NEGOTIATE	mm			
26.						
MATERIALS OF CONSTRUCTION	27.	IF HOIST IS IN HAZARDOUS AREA :				
	27.1	TROLLEY WHEELS				
	27.2	ROPE DRUM AND SHEAVES				
	27.3	GEARS AND PINIONS				
	28.					
29.						
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			DATE		ISSUE R1	

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

TCE.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 <u>SCOPE</u> 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 <u>CODES AND STANDARDS</u> 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 <u>CONSTRUCTION FEATURES</u> 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 <u>BRIDGE GIRDER</u> 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 thrustor 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 <u>PROTECTION</u> 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 LIMIT SWITCHES

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 CONDUCTORS

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 COLLECTORS

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 LIGHTING AND MISCELLANEOUS ACCESSORIES

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 SAFETY SWITCHES

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 CABLES AND CONDUITS

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) CRANE				SECTION : D10 SHEET : 1 OF 3	
GENERAL	1. DESIGNATION: ELECTRICALLY OPERATED TRAVELLING CRANE FOR TG BUILDING				DESIGN DATA (CONTD.)	15. SPEEDS: M / MIN		MAIN	CREEP
	2. NUMBER REQUIRED: TWO (2)					15.1 MAIN HOIST		2.0	0.2
	3. LOCATION: INDOOR					15.2 AUX. HOIST		4.0	0.4
	4. CRANE CLASSIFICATION AS PER IS:13834:					15.3 LONG TRAVEL		8.0	0.8
	5. MECHANICAL CLASS : M5				15.4 CROSS TRAVEL		6.0	0.6	
	6. ELECTRICAL CLASS : M7				16. METHOD OF OPERATION: CLOSED CABIN AND RADIO REMOTE CONTROL OPERATION				
	7. TYPE : OVERHEAD / DOUBLE GIRDER				16.1 RANGE OF RADIO REMOTE CONTROL : 100 M				
	8. TYPE OF GIRDER : BOX				17. LONG TRAVEL WALKWAY REQUIRED: YES, BY BIDDER				
	9. CAPACITY :				18. DESIGN SEISMIC COEFFICIENT FOR THE CRANE : AS PER PROJECT INFORMATION. SECTION B OF ENQUIRY SPECIFICATION				
	9.1 MAIN HOIST : 150 T (MIN)				MATERIALS AND CODES OF CONSTRUCTION	19. DESIGN OF CRANE SHALL BE AS PER IS: 807 & IS: 3177			
9.2 AUXILIARY HOIST : 40 T (MIN)				20. ROPE DRUMS AND SHEAVES : IS: 3177					
				21. WIRE ROPE : IS: 2266					
10. SPAN : BY BIDDER mm				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					
11. RUNWAY LENGTH : BY BIDDER mm				23. CRANE RAILS : IS: 3443					
12. RANGE OF LIFTING FOR :				24. LUBRICATION :					
12.1 MAIN HOIST:				GROUP LUBRICATION WITH HAND OPERATED GREASE PUMP					
ELEVATION FROM BY BIDDER									
12.2 AUXILIARY HOIST :									
ELEVATION FROM BY BIDDER									
13. OPERATING FLOOR ELEVATION : BY BIDDER				BRAKES	25. MAIN HOIST : ELECTRO HYDRAULIC – 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 : RAMS HORN									
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 2012	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) CRANE				SECTION : D10 SHEET : 2 OF 3	
ELECTRICALS	BRAKES (CONTD.)	27. LONG TRAVEL AND CROSS TRAVEL: ELECTRO HYDRAULIC			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							
	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 2012	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) CRANE				SECTION : D10 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 C VOLUME - II OF ENQUIRY SPECIFICATION 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 2012	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 : 1 OF 3			
GENERAL	1. DESIGNATION: ELECTRICALLY OPERATED TRAVELLING CRANE FOR REFER WRITE UP			DESIGN DATA (CONTD.)	15. SPEEDS: M / MIN		MAIN	CREEP
	2. NUMBER REQUIRED: BY BIDDER				15.1 MAIN HOIST		2.0	0.2
	3. LOCATION: INDOOR				15.2 AUX. HOIST		4.0	0.4
	4. CRANE CLASSIFICATION AS PER IS:13834:				15.3 LONG TRAVEL		8.0	0.8
	5. MECHANICAL CLASS : M5			15.4 CROSS TRAVEL		6.0	0.6	
	6. ELECTRICAL CLASS : M7			16. METHOD OF OPERATION: CLOSED CABIN AND PENDANT PUSH BUTTON				
	7. TYPE : OVERHEAD /UNDER SLUNG SINGLE/ DOUBLE GIRDER			17. LONG TRAVEL WALKWAY REQUIRED: YES,				
	8. TYPE OF GIRDER : BOX			18. DESIGN SEISMIC COEFFICIENT FOR THE CRANE : AS PER PROJECT INFORMATION.				
	9. CAPACITY :			19. DESIGN OF CRANE SHALL BE AS PER IS: 807 & IS: 3177				
	9.1 MAIN HOIST : BY BIDDER			20. ROPE DRUMS AND SHEAVES : IS: 3177				
	9.2 AUXILIARY HOIST : BY BIDDER			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				
	11. RUNWAY LENGTH : BY BIDDER			23. CRANE RAILS : IS: 3443				
	12. RANGE OF LIFTING FOR :			24. LUBRICATION :				
12.1 MAIN HOIST:			GROUP LUBRICATION WITH HAND OPERATED GREASE PUMP					
ELEVATION FROM BY BIDDER								
12.2 AUXILIARY HOIST :								
ELEVATION FROM BY BIDDER								
13. OPERATING FLOOR ELEVATION :								
BY BIDDER								
14. TYPE OF HOOK :			BRAKES	25. MAIN HOIST :				
14.1 MAIN : RAMS HORN				ELECTRO HYDRAULIC – 2 NOS. SHALL BE PROVIDED (1 W + 1 S)				
14.2 AUXILIARY : PLAIN SHANK WITH STANDARD DEPRESS TYPE SAFETY LATCH				26. AUXILIARY HOIST :				
			ELECTRO HYDRAULIC – 2 NOS. SHALL BE PROVIDED (1 W + 1 S)					
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.) ELECTRICALS ERECTION PAINTING	27. LONG TRAVEL AND CROSS TRAVEL: ELECTRO HYDRAULIC			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						
	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		
	36. ERECTION OF CRANE RAIL WITH FIXTURES: BY BIDDER			PERFORMANCE GUARANTEES	43. SPEED CHECK FOR ALL MOTIONS: YES		
	37. ERECTION OF RUNWAY CONDUCTORS WITH FIXTURES : BY BIDDER				44. INSULATION TEST FOR ALL ELECTRICAL EQUIPMENT : YES		
	38. PRIMER : REFER NOTE - 1 38.1 NUMBER OF COATS : REFER NOTE - 1				45. CAPACITY : T – 0 %		
	38.2 DRY FILM THICKNESS PER COAT : REFER NOTE – 1				46. LIFT : M – 0%		
					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		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 : 1 OF 5		
ENQUIRY / SPECIFICATION NO.TCE							
	SL. NO.	BIDDER					
	ITEM						
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			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		DATA SHEET B			SECTION : D10	
	PART : B		ELECTRICALLY OPERATED TRAVELLING (OVERHEAD & UNDERSLUNG) CRANE			SHEET : 2 OF 5	
ENQUIRY / SPECIFICATION NO.TCE							
	SL. NO.	ITEM	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 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 : 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					
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. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			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 : 4 OF 5	
ENQUIRY / SPECIFICATION NO.TCE							
	SL. NO.	ITEM	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				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. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				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	

ISSUE NO. R3	TCE.M4-113-50		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	ENQ.SPEC.NO. TCE.5750A-H-500-001 PART : B		DATA SHEET -A CHAIN PULLEY BLOCK			SECTION: D10 SHEET: 1 OF 2
	1. DESIGNATION: CHAIN PULLEY BLOCK FOR BY BIDDER		20. TYPE OF TROLLEY: MANUAL GEARED			
GENERAL	2. NUMBER REQUIRED: BY BIDDER		DESIGN DATA (CONTD.)	21. HAND CHAINS LOCATION: THE HAND-CHAIN FOR THE HOISTING AND TRAVERSING MECHANISM SHALL BE WELL CLEAR OF THE HOOK AND BOTH CHAINS SHALL BE ON THE SAME SIDE		
	3. TAG NOS.: BY BIDDER					
	4. LOCATION IN HAZARDOUS AREA: NO					
	5. HAZARDOUS AREA CLASSIFICATION: AS PER IS 5572 ZONE 0/1/2 BY BIDDER					
	6. LOCATION: INDOOR			22.		
	7. APPLICABLE STANDARD: IS 3832/BS 3243			23.		
	8. DUTY CLASS: 1 / 2			24.		
	9.					
DESIGN DATA	10. TYPE : TROLLEY		MATERIALS AND CODES OF CONSTRUCTION	25. CHAIN PULLEY BLOCK: AS PER IS 3832/ BS 3243		
	11. CAPACITY: BY BIDDER			26. TROLLEY FRAME: ROLLED STRUCTURAL STEEL WITH SIDE PLATES EXTENDED BEYOND WHEEL FLANGES TO PROTECT WHEELS		
	12. RANGE OF LIFTING: BY BIDDER			27. TROLLEY WHEELS: HEAT TREATED CARBON STEEL/ LOW ALLOY STEEL/ GRADED CAST IRON. SINGLE FLANGED WITH TAPERED TREAD		
	13. OPERATING FLOOR ELEVATION: BY BIDDER			28. LOAD CHAIN: ALLOY STEEL IS 3109/ IS 6216/ BS 1663/ BS 3114		
	14. BOTTOM OF MONORAIL ELEVATION: BY BIDDER			29. LOAD CHAIN WHEEL AND MAIN ARM: HEAVY DUTY MALLEABLE CASTING/ PRESSED SHEET STEEL		
	15. MONORAIL TRACK: STRAIGHT / CURVED			30. HAND CHAIN : AS PER IS 2429/ BS 6405		
	16. RADIUS OF CURVATURE OF MONORAIL: BY BIDDER			31. HAND CHAIN WHEEL : PRESSED SHEET STEEL		
	17. MONORAIL BY: BY BIDDER			32. SHAFTS AND AXLES : CARBON STEEL		
	18. SIZE OF MONORAIL (IF PROVIDED BY PURCHASER) : BY BIDDER					
	19. TYPE OF CHAIN PULLEY BLOCK: WORM / SPUR GEAR					
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV 09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE: MAY'12	5750A	SURATGARH, RAJASTHAN
						ISSUE R1

ISSUE NO. R3	TCE.M4-113-50		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	ENQ.SPEC.NO. TCE.5750A-H-500-001 PART : B		DATA SHEET -A CHAIN PULLEY BLOCK		SECTION: D10 SHEET: 2 OF 2	
MATERIALS AND CODES OF CONSTRUCTION (CONTD.)	33. GEARS AND PINIONS : SPUR/ HELICAL AS PER IS 4460/ BS 436/ BS 721/ AGMA ATANDARDS			PAINTING	43. FINISH PAINT: REFER VOLUME - II	
	34. LIFTING HOOK : HOOK WITH STANDARD DEPRESS SAFETY LATCH AND LOCK TO PREVENT HOOK FROM SWIVELING. HOOK SHALL BE FORGED ALLOY STEEL/ CARBON STEEL AS PER IS 15560 / BS 2903				44.	
					45.	
					46.	
	35. BEARINGS: BALL OR ROLLER AS PER IS 5669/ IS 5692/ IS 5932/ IS 5935			TESTS AND INSPECTION	47.	
	36. BRAKE: SCREW AND FRICTION DISC TYPE SELF ACTUATING LOAD PRESSURE BRAKE				49. OVERLOAD TEST WITH 125 % OF SPECIFIED LOAD	
	37. LUBRICATION OF MOVING PARTS SHALL BE DONE MANUALLY BY HAND OPERATED GREASE PUMPS THROUGH RESPECTIVE GREASE NIPPLES				50.	
	38.				51.	
	39.				52.	
	40.				53.	
	41.				54.	
	42.				55.	
					56.	
					57.	
					58.	
			59.			
			60.			
			61.			
			62.			
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV 09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW TPP AT
REV. BY				DATE: MAY'12	5750A	SURATGARH, RAJASTHAN
						ISSUE R1

ISSUE NO. R6	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION: D10	
	PART : B		CHAIN PULLEY BLOCKS		SHEET: 1 OF 2	
ENQUIRY / SPECIFICATION NO. TCE.						
	SL. NO.	BIDDER				
		ITEM				
GENERAL	1.	DESIGNATION			CHAIN PULLEY BLOCK FOR	
	2.	NUMBER OFFERED				
	3.	TAG NUMBERS				
	4.	CAPACITY		T		
	5.					
CHAIN PULLEY BLOCK	6.	MANUFACTURER				
	7.	MAKE				
	8.	MODEL NUMBER				
	9.					
	10.					
TROLLEY	11.	MANUFACTURER				
	12.	MAKE				
	13.	MODEL NUMBER				
	14.					
DIMENSIONS	15.	MONORAIL IF PROVIDED BY VENDOR: INDICATE BEAM SIZE MINIMUM/ MAXIMUM SUITABLE FOR TROLLEY MOVEMENT		mm	ISMB /ISMB	
	16.	MONORAIL IF PROVIDED BY PURCHASER: IS SIZE SPECIFIED IN DATA SHEET A SUITABLE FOR TROLLEY MOVEMENT			YES/NO IF NO INDICATE SUITABLE SIZE ISMB	
	17.	DISTANCE BETWEEN HIGHEST HOOK POSITION TO BOTTOM OF MONORAIL		mm		
	18.	IF MONORAIL IS CURVED, MINIMUM RADIUS TROLLEY CAN NEGOTIATE		mm		
	19.					
	20.					
NOTES TO BIDDER 1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.				SIGNATURE OF BIDDER		
				DATE		

ISSUE NO. R6	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME III	
	TCE.5750A-H-500-001		DATA SHEET B		SECTION: D10	
	PART : B		CHAIN PULLEY BLOCKS		SHEET: 2 OF 2	
ENQUIRY / SPECIFICATION NO. TCE.						
	SL. NO.	ITEM	BIDDER			
MATERIALS OF CONSTRUCTION (CONTD.)	21.	IF CHAIN PULLEY BLOCK IS IN HAZARDOUS AREA:				
	21.1	TROLLEY WHEELS				
	21.2	LOAD CHAIN WHEEL AND MAIN ARM				
	21.3	HAND CHAIN WHEEL				
	21.4	GEARS AND PINIONS				
	22.					
	23.					
MISCELLANEOUS	24.	WEIGHT OF COMPLETE CHAIN PULLEY BLOCK AND TROLLEY ASSEMBLY		Kg		
	25.	WEIGHT OF CHAIN PULLEY BLOCK		Kg		
	26.	EFFORT REQUIRED TO LIFT THE LOAD		Kg		
	27.	WHEEL LOAD WITH IMPACT AND WITHOUT IMPACT		Kg	/	
	28.	PRELIMINARY DIMENSIONED GENERAL ARRANGEMENT DRAWING OF CHAIN PULLEY BLOCK AND TROLLEY ALONG WITH WHEEL STOP DETAILS TO BE FURNISHED			WHETHER FURNISHED YES/NO	
	29.					
	30.					
NOTES TO BIDDER			SIGNATURE OF BIDDER			
1. DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			DATE			

D11

COMPRESSED AIR SYSTEM

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 1 OF 9
1.0 <u>SCOPE</u> The Contractor shall provide compressed air plant (both plant service air and control air) and accessories required for the complete power plant generally as detailed out below. 2.0 <u>SELECTION CRITERIA</u> 2.1 <u>Type of Compressors</u> The type of compressors shall be Oil free screw type 2.2 <u>Capacity of Air Compressors</u> Capacity of air compressors shall be selected considering all the plant requirements. However, the capacity of each compressor shall not be less than 2000 Nm³/hr. For ready reference, partial list of services is given below: Plant Service air - Turbine generator building at all floors - Service building at all floors - Workshop area - Boiler platforms including air required for air heater, air motor drive, pulverised coal sampling, feeder bulls eye cleaning, soot blower, atomising air, burner retraction. - Ware house - DM plant and CPU Regeneration area - Emergency DG set room - CW Pump house - Raw water pump house - ESP area - Fuel oil unloading, storage and forwarding areas		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 2 OF 9
- Fire tender building - Mill bay - Complete coal handling area - Fire Water pump house Control / Instrument Air - All pneumatic dampers / valves operation for boiler and accessories, TG and accessories (One terminal point each for the boilers and TG building) - All other systems such as DM plant, CW Pump area and others - Instrumentation and Control system in the control room - Instrument laboratory, electrical laboratory and chemical laboratory in the service building - All EP converters 2.3 <u>Discharge Pressure</u> Contractor to select suitable discharge pressure duly considering requirements of consumption points, pressure drops in driers, valves, piping, etc. and certain amount of leakages. Minimum discharge pressure of 8.8 kg/cm² (g) shall be provided. 2.4 <u>Number of Compressors</u> Instrument Air : 2x100% (1 working+1 standby) for each unit Service Air : 2x100% (1 working+1 standby) for each unit 3.0 <u>DESIGN REQUIREMENTS</u> 3.1 The compressors, drier and air receivers shall be sized as indicated in Annexure – 1. The compressor shall be selected considering the maximum air requirement during various operating conditions of the plant.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 3 OF 9

3.2 All the compressors outlets shall be headered. At a suitable location in the header, a control valve shall be provided such that control / instrument air consumption will first get the priority under all conditions. The required control / instrument air shall be passed through air driers before conveying to consumption point. The scheme of compressed air system in brief is attached for the ready reference of the Bidder. Refer compressed air system flow diagram TCE.5750A – 640 – FD -1011

3.3 For the air drier, a control panel shall be installed which will permit local manual and automatic settings for operating the dryers.

An on-off valve shall be installed in the compressed air header. In case of fall in instrument air header pressure this valve will be opened by a pressure transmitter installed in the instrument air supply header ensuring that control / instrument air supply receives priority under all operating conditions.

Out of the two working instrument air compressors, one shall be continuously operating on 'load' condition while the other compressor will operate on 'load – unload' regulation. In this mode of operation, the first compressor will be running and compressing air continuously while the other compressor will be running on 'no-load'. At a pre-set level of pressure drop in the instrument air header the compressor operating on 'no-load' will cut-in and start compressing the air along with the first compressor. At a pre-set level of pressure increase in the header, the compressor will come back to 'no-load' condition.

4.0 **LIST OF EQUIPMENT**

4.1	Air receivers	There shall be minimum four (4) air receivers – one, each for operating Service Air and one each for operating Instrument Air compressors.” As per IS 7938.
4.2	Air driers	Four (4) nos. (Two operating + Two standby). Air driers shall be of HOC type.
4.3	Accessories / Auxiliaries	Inter / after coolers, moisture separators etc. as required
4.4	Control panel	One (1) common PLC based control system to be provided for Compressed Air System. Certain important annunciations / alarms shall be connected to main unit control panel room
4.5	Piping fittings and valves	Complete piping, fittings and valves for cooling water, compressed air lines and

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 4 OF 9

		impulse lines
4.6	Electrical works	All drive motors, switch gear units / starters, earthing, power / control / instrument cables and all miscellaneous works.

5.0 **MATERIALS OF CONSTRUCTION**

The materials of construction for piping, fittings and valves shall conform to those specified in Section-D7 'Power Plant Piping and Valves' . Materials of construction of air receivers shall be IS-2062.

6.0 **SPECIFIC GUARANTEES**

At shop : 1. Capacity and discharge pressure of each air compressor.
2. Power consumption of each air compressor at its rated duty point with its own motor.

At site : 1. Parallel operations of air compressors.
2. Capacity & dew point of air at the outlet of air drying plants of instrument air compressors.
3. Pressure drop across the air drying plants of air compressors.
4. Vibration & noise level of air compressors, blowers of air drying plant (if applicable)

7.0 **PENALTY**

7.1 The BIDDER shall comply with the system specification. No credit will be given in tender evaluation if parameters better than those specified are offered by the BIDDER. In case the BIDDER's recommendation is different from the specification in regard to any aspect, the BIDDER shall quote basically in line with the specification indicating price change for adopting his recommendation, failing which his bid is liable for rejection.

7.2 The BIDDER shall ensure that there are no deviations from technical specifications. In case the BIDDER takes major deviations from the specifications, his Bid will be summarily rejected. No deviation after award of contract from the agreed technical specification will be permitted. Any such deviation noticed by the PURCHASER/ ENGINEER/ CONSULTANT at any stage after award of Contract will not be permitted and the VENDOR shall carry out necessary modifications to bring the system in line with agreed technical specification at no extra cost.

7.3 The BIDDER shall furnish all the data called for various equipments in data sheets in their offer. Offers which do not contain all the data will be treated as

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 5 OF 9

incomplete & are liable for rejection. The BIDDER shall also furnish the information called for in the 'schedule of Drive motors and other electrical requirement' giving ratings and number of all electrical equipment under scope of contract.

- 7.4 In case, the energy consumption by the drive of any equipment exceeds guaranteed energy consumption figures furnished by the CONTRACTOR, the CONTRACTOR will be penalised as specified in Volume – II Section C9
- 7.5 The prices quoted by the tenderers for the essential spares, start-up spares, maintenance and erection tools & tackles will be included for tender evaluation. Recommended spares quoted by Bidder will not be considered for evaluation.
- 7.6 Deviations from the specification, if acceptable to the PURCHASER, will be evaluated suitably to compensate for the deviations from the specification

ANNEXURE I

1.0 COMPUTATION OF AIR COMPRESSOR CAPACITY AND AIR RECEIVERS CAPACITY AND AIR DRIER CAPACITY

SL. NO.	<u>DESCRIPTION</u>	<u>UNITS</u>	<u>VALUES</u>
1.0	CAPACITY (FAD) CALCULATION		
1.1	Total air requirement	Nm ³ /hr	
1.2	Margin for leakage at 10%	Nm ³ /hr	(0.1 x Item 1.1)
1.3	Total air quantity considering leakage losses	Nm ³ /hr	(1.1 + 1.2)
1.4	Margin for contingency demand at 10%	Nm ³ /hr	0.1 x Item 1.3
1.5	Total capacity of working compressors		Sum of Items 1.3 and 1.4

NOTE:

The FAD capacity shall be calculated after suitable correction for the air quantity at Normal Temperature and Pressure (NTP) conditions.

2.0 CAPACITY OF AIR RECEIVERS

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 6 OF 9

The capacity of air receivers shall be calculated by following (2) methods and the highest value shall be adopted.

Method 1

$$V = 1.6 \times \sqrt{\frac{V_1}{60}}$$

Method 2

$$V = \frac{T \times V_1 \times P_A}{P_{rmax} - P_{rmin}}$$

Where

V = Volume of air receiver (m³)

V₁ = FAD of instrument / service air (m³/hr)

T = Time for standby compressor to come in
and reach rated speed (10 seconds)

P_A = Atmospheric pressure – kg/cm²

P_{rmax} – P_{rmin} = Difference between maximum and minimum receiver pressures shall be maximum 0.4 kg/cm².

3.0	<u>CAPACITY OF AIR DRYERS</u>	
3.1	Total instrument air requirement of all units in worst condition. In Nm ³ /hr	-----
3.2	Leakage at 10% on item 3.1 (item 3.1 x 0.1) Nm ³ /hr	-----
3.3	Total quantity of instrument air considering leakage @ 10% (Sum of items 3.1 and 3.2) Nm ³ /hr	-----
3.4	Contingency demand @ 10% (item 3.3 x 0.1) in Nm ³ /hr	-----
3.5	Total quantity of instrument air considering contingency demand (sum of items 3.3 and 3.4) Nm ³ /hr	-----

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 7 OF 9

3.6	Margin on capacity of air dryer considered for fall in efficiency (50% of item 3.5) Nm ³ /hr	-----
3.7	Total capacity of air dryer required (sum of items 3.5 and 3.6) Nm ³ /hr	-----

SYSTEM DATA SHEET-C

1.0 CALCULATIONS/ TECHNICAL DATA TO BE FURNISHED BY THE BIDDER AFTER AWARD OF CONTRACT

1.1 Drawings/Data/Design Calculations which will be reviewed and approved

- i) PERT chart.
- ii) P & I diagram for compressed air system.
- iii) GA drawings of compressor with details of all accessories.
- iv) Write up for air dryer.
- v) P & I diagram for air dryer.
- vi) GA drawings for air dryer.
- vii) Write up on control system of air compressors.
- viii) Drawings related to control system.
- ix) Drawings/data sheets for valves, instruments, filters, strainers, air, water, impulse and lube oil piping etc.
- x) GA drawing of compressor room showing layout of compressors, air, water, lube oil impulse and any other piping within Battery limits of the compressors and accessories, after coolers, air dryers and air receivers.
- xi) Quality Assurance Plans & Procedures for all the equipment.

1.2 Drawings/Data/Design Calculations which will not be approved and will be used for reference only

- i. GA drawings of inter-coolers and after-coolers.
- ii. Foundation drawings with load data of air compressor.
- iii. Design calculations for arriving at guaranteed parameter for inter-coolers, after-coolers and air dryers.
- iv. Shell thickness calculations for intercoolers, after-coolers and air receivers.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 8 OF 9
v Design calculations for arriving at parameter for inter-coolers, after-coolers and air dryers. vi GA drawing of air receivers. vii Operation and Maintenance manuals for all equipment. viii RTFs & CD-ROMs of all the as built drawings for the compressed air system. <u>General</u> a) Contract network schedule b) Flow diagram for all equipment indicating piping valves, specialities and instrumentation including performance test scheme, technical write -ups and performance test procedure c) Details of paints and painting material. d) Final technical data sheets for all equipment e) Installation drawings and manuals for all equipment/systems f) Detailed write-up for shop tests and site performance tests g) Integrated operation and maintenance manuals for the complete plant as well as for all individual equipment h) Test certificates for type/routine and standard acceptance tests i) As-built drawings for all equipment/systems supplied under this contract and all buildings / structures / works executed under this contract incorporating all changes/modifications up to the time of commissioning / handling over to the Owner. j) Project Design Manual consisting of studies of all the systems, design criteria, sizing calculations of all major equipment/systems etc. k) Materials test certificates and performance test certificates for all equipment tested at works l) Detailed interface schedule for all terminal points identifying terminal point no., size, material, type of connection, design flow, pressure and temperature at the terminal points m) Storage instructions for all equipment n) Drawings/data to be required /submitted to statutory authorities		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D11
PART : B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan COMPRESSED AIR SYSTEM	SHEET 9 OF 9

o) Schedule of instruments for performance tests

p) Schedule of shop tests/inspections on all equipment

q) Schedules of places of shop test and inspection for all equipment

r) Detailed write-up on all pre-commissioning and commissioning activities.

s) Cable schedules and interconnection schedules.

All documents, data sheets, drawing, schedules, lists, etc., to be submitted by the Contractor/Sub-Contractor against this Contract shall be submitted on CD-ROMs in addition to the required number of prints/ reproducible. Any other documents as required will be intimated to the successful bidder during detailed engineering.

ISSUE
R1

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III			
	TCE. 5750A-H-500-001		DATA SHEET A		SECTION : D11			
	PART : B		AIR / GAS COMPRESSORS		SHEET: 1 OF 6			
GENERAL	1. DESIGNATION: COMPRESSORS FOR INSTRUMENT AIR AND SERVICE AIR				DESIGN DATA (CONTD.)	19.2 FOR INTER-COOLER, AFTER-COOLER AND OIL-COOLER: WATER		
	2. NUMBER REQUIRED : 4 (2W+2S) FOR INSTRUMENT AIR & 4 (2W+2S) FOR SERVICE AIR					20. COOLING WATER QUALITY: PASSIVATED DM WATER		
	3. TAG NUMBERS: -					21. COOLING WATER INLET TEMPERATURE: BY BIDDER		
	4. LOCATION: INDOOR					22. MAXIMUM COOLING WATER OUTLET TEMPERATURE: BY BIDDER		
	5. OPERATION: CONTINUOUS Hrs/Day					23. COOLING WATER PRESSURE AT AT INLET: BY BIDDER)		
	6. TYPE OF DRIVE: ELECTRIC MOTOR					24. MAXIMUM COOLING WATER PRESSURE DROP IN THE COMPRESSOR, INTER-COOLER, AFTER-COOLER AND OIL- COOLER : 0.5 Kg/ cm ²		
	7. APPLICABLE STANDARDS: IS 6206/IS13124/API 617/API 672/ IS 11780/					25. COMPRESSOR FRAME LUBRICATION : PRESSURISED		
	8.					26. TYPE OF CAPACITY CONTROL : LOAD/UNLOAD AT CONSTANT SPEED		
	9.					27. METHOD OF CAPACITY CONTROL AT CONSTANT SPEED : BASED ON THE PRESSURE IN THE MAIN HEADER		
	DESIGN DATA	10. TYPE : OIL FREE SCREW TYPE				DUAL TYPE CONTROLS	28.	
		11. FLUID TO BE COMPRESSED : AIR					29.	
		12. CAPACITY (FAD): 2000 M ³ /Hr - MINIMUM					30. ADJUSTABLE RANGE FOR PRESSURE SWITCHES : By bidder Kg/ cm ²	
		13.					31. EXPECTED SETTING OF PRESSURE SWITCHES FOR :	
		14. PROPERTIES OF GAS/ GAS COMPOSITION : ATMOSPHERIC AIR					31.1 AUTO LOAD-UNLOAD REGULATION :	
		15. SUCTION PRESSURE : ATMOSPHERIC Kg/ cm ² (g)					(a) LOAD: 8.6 Kg/ cm ² (g)	
		16. SUCTION TEMPERATURE - MINIMUM / MAXIMUM : AMBIENT / °C					(b) UNLOAD: 8.8 Kg/ cm ² (g)	
		17. DISCHARGE PRESSURE : 8.8 Kg/ cm ² (g)						
		18. MAXIMUM COMPRESSOR SPEED : By bidder RPM						
		19. COOLING MEDIUM :						
19.1 FOR COMPRESSOR : WATER/ NOTE-1								
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL		
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN		
REV. BY				DATE: MAY'12	5750A	R1		

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET A		SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS		SHEET: 2 OF 6	
DUAL TYPE CONTROLS (CONTD.)	31.2 AUTO START-STOP REGULATION: (a) START: 8.4 Kg/ cm ² (g) (b) STOP: 8.8 Kg/ cm ² (g)		MATERIALS OF CONSTRUCTION FOR CENTRIFUGAL COMPRESSORS (CONTD.)		44. IMPELLERS: CAST ALUMINIUM ASTM — B 26, ALLOY C 355/ CAST SS 410/ CAST — SS ASTM A 747, TYPE CB7 Cu 1 OR CB7 — Cu 2/ FORGED SS 403/	
	31.3 VERY LOW RECEIVER PRESSURE ALARM: 8.4 Kg/ cm ² (g)				45. BLADES: PLATE STEEL AISI 4130-4140/ — AISI 4320 4340/	
	31.4 HIGH RECEIVER PRESSURE ALARM: 8.8 Kg/ cm ² (g)				46. GUIDE VANES: CI ASTM A 48 OR A 278, — CL 30/ CAST STEEL ASTM A 216, GR — WCB/ CAST SS ASTM A 743/744 OR — A 351, GR CA15, CF3, CF3M, CF8, CF8M/	
	32. NUMBER OF STEPS FOR LOAD - UNLOAD REGULATION: 2 / 3 / 4 /				47. SHAFT : FORGED STEEL AISI 1040 1050 — OR ASTM A 470, CL 7/ FORGED SS ASTM — A 336, GR F6/	
	33.				48. COVERS AND HUBS : FORGED STEEL — AISI TYPE 3140/ PLATE STEEL ASTM A — 543/ FORGED SS AISI TYPE 403 OR 410 /	
	VOID		MATERIALS OF CONSTRUCTION FOR SCREW COMPRESSORS		49. CASING: CI IS 210 OR ASTM A 278 CL 40/ FABRICATED STEEL ASTM A 353/ CAST STEEL ASTM A 216 GR WCB NORMALIZED / CAST SS ASTM A 743 AND 744 CA6-NM	
					50. ROTOR BODY: CI ASTM A 395/ FORGED STEEL AISI 1030-1045/ CAST ALUMINIUM ASTM B 26 ALLOY 355 OR C 355/	
					51. SHAFT: FORGED STEEL AISI 1030-1035/ FORGED SS ASTM A151 TYPE 410 SS /	
MATERIALS OF CONST. FOR CENTRIFUGAL COMPRESSORS		42. CASING : CI IS 210 OR ASTM A 48 OR — A 278 CLASS 40 / CAST STEEL ASTM A — 216 GR WCB NORMALIZED/				
43. DIFFUSER : CI ASTM A 536, GR 60 40 18/ — CAST ALUMINIUM ASTM B 26, ALLOY — 355.0 /						
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN
REV. BY				DATE: MAY'12	5750A	R1

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III		
	TCE. 5750A-H-500-001		DATA SHEET A		SECTION : D11		
	PART : B		AIR / GAS COMPRESSORS		SHEET: 3 OF 6		
COMPRESSOR ACCESSORIES	52. INTAKE FILTER TYPE : PAPER/ OIL WETTED/ CLOTH/ OIL BATH/ COMBINED DRY AND WET				INTER-COOLERS / AFTER-COOLERS / OIL-COOLERS DESIGN DATA	69. DESIGNATION FOR INTER-COOLERS/ AFTER-COOLERS : NA	
	52.1 MATERIAL OF CONSTRUCTION: CASING: MS/ ALUMINIUM					70. TAG NUMBERS FOR INTER-COOLERS: -	
	52.2					71. AFTER-COOLERS REQUIRED: YES NUMBER : BY BIDDER'S	
	53. SILENCER REQUIRED : YES					72. TAG NUMBERS FOR AFTER-COOLERS : -	
	54. DRIVE PULLEYS WITH V-BELT AND BELT GUARDS REQUIRED : YES FOR BELT DRIVEN COMPRESSORS					73. CAPACITY OF :	
	55. COUPLINGS AND COUPLING GUARDS REQUIRED : YES FOR DIRECT COUPLED COMPRESSORS					73.1 INTER-COOLERS : To suit Compressor capacity M ³ / Hr	
	56. SLIDE RAILS FOR MOTOR REQUIRED: YES					73.2 AFTER-COOLERS : To suit Compressor capacity M ³ / Hr	
	57. CONTROL CABINET REQUIRED : YES (Microprocessor Controls)					74. TYPE : HORIZONTAL/ VERTICAL SHELL AND TUBE TYPE WITH REMOVABLE TUBE BUNDLES	
	58. IMPULSE TUBING : COPPER/ ADMIRALITY BRASS AS PER BS EN 1057 EXCEPT FOR EDDY CURRENT TEST/ STAINLESS STEEL/					75. TYPE OF FLOW : COUNTER-CURRENT	
	59. MOTOR BY : BIDDER					76. OPERATING PRESSURE FOR AFTER- COOLERS – BY BIDDER	
	60. STARTER BY : BIDDER					76.1 AIR/ GAS SIDE :BYBIDDER Kg/ cm ² (g)	
	61.					76.2 WATER SIDE : BYBIDDER Kg/ cm ² (g)	
	62.					77. DESIGN PRESSURE FOR AFTER- COOLERS 1.25 TIMES OPERATING PRESSURE	
	63.					77.1 AIR/ GAS SIDE : Kg/ cm ² (g)	
	64.					77.2 WATER SIDE : Kg/ cm ² (g)	
	65.					78. MAXIMUM ACCEPTABLE OUTLET AIR/ GAS TEMPERATURE : 8 ⁰ C ABOVE COOLING WATER INLET TEMP OF AFTER COOLER	
	66.					79. ALLOWABLE PRESSURE DROP OF AIR/ GAS THROUGH AFTER-COOLER : 0.2 Kg/ cm ²	
	67.					80. DESIGN CODE : ASME SEC. VIII DIV. 1 AND TEMA	
	68.					81. CORROSION ALLOWANCE : 3 mm	
	REV.NO.	R0	R1			PPD. BY: HBS	JOB NO.
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN	
REV. BY				DATE: MAY'12	5750A	R1	

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET A			SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS			SHEET: 4 OF 6	
INTER-COOLERS/AFTERCOOLERS/ OIL-COOLERS – M O C	82. SHELL : CS SA 106 GR B/ IS 2002/				RECEIVER DESIGN DATA	90. DESIGNATION : RECEIVERS FOR IA AND SA	
	83. TUBES : COPPER/ ADMIRALITY BRASS AS PER BS EN 1057 EXCEPT FOR EDDY CURRENT TEST / SS 316					91. NUMBER REQUIRED : TWO (2) FOR IA TWO(2) FOR SA	
	84. TUBE SHEETS : CS SA 105/ IS 2002/ BRASS/ SS 316					92. TAG NUMBERS : -	
	85. TUBE SUPPORT PLATES : IS 2062					93. TYPE : HORIZONTAL/ VERTICAL/ CYLINDRICAL WITH WELDED DISHED ENDS	
	86.					94. OPERATING PRESSURE : 7.8 Kg/ cm ² (g)	
	87. MOISTURE AND OIL SEPARATOR WITH AUTO DRAIN TRAP TO BE PROVIDED WITH EACH INTER-COOLER AND AFTER-COOLER TO DISCHARGE MOISTURE AND OIL TO DRAIN 87.1 TYPE OF MOISTURE AND OIL SEPARATOR : CENTRIFUGAL/ DEMISTER PAD/ BAFFLE 87.2 TYPE OF AUTO DRAIN TRAP : INVERTED BUCKET / BALL FLOAT / SOLENOID OPERATED / ELECTRONIC LEVEL CONTROLLED 88. MATERIAL OF CONSTRUCTION OF MOISTURE AND OIL SEPARATOR 88.1 BODY/ SHELL : CS SA 106 GR B/ IS 2002 88.2 89. MATERIAL OF CONSTRUCTION OF AUTO DRAIN TRAP 89.1 BODY : CI IS 210/ SS 89.2 TRIM : BRONZE/SS					95. DESIGN PRESSURE : 9.75S Kg/ cm ² (g)	
						96. DESIGN TEMPERATURE : BIDDER ° C	
						97. NOMINAL VOLUME : 12 M ³ MINIMUM	
						98. DIMENSIONS : BY BIDDER	
						98.1 HEIGHT TAN TO TAN : BY BIDDER mm	
						98.2 DIAMETER : BY BIDDER mm	
						99. APPLICABLE CODE : IS 2825	
100. CORROSION ALLOWANCE : 3 mm							
101. SHELL AND DISHED END MATERIAL : IS 2002/ IS 2062							
102. INTERNAL PAINTING : BLACK BITUMINOUS /							
INTER-COOLERS / AFTER-COOLERS ACCESSORIES				RECEIVER ACCESSORIES	103. INSULATION : NO		
					104.		
					105. SUPPORT LEGS/ LUGS/ SKIRT REQUIRED : YES		
					106. MANHOLE WITH COVER FOR INSPECTION AND CLEANING REQUIRED : YES		
107.SAFETY VALVE YES				108.			
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL	
DATE	NOV09	MAY12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN	
REV. BY				DATE: MAY'12	5750A	R1	

ISSUE NO. R5	ENQ.SPEC.NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME - III		
	TCE. 5750A-H-500-001		DATA SHEET A				SECTION : D11		
	PART : B		AIR / GAS COMPRESSORS				SHEET: 5 OF 6		
MISCELLANEOUS	109. ALL THE VALVES, SPECIALITIES INSTRUMENTS AND ACCESSORIES AS PER ENCLOSED P&I D TCE. : REQUIRED				SPARES AND MAINTENANCE TOOLS AND TACKLES	123. AS PER SECTION D20			
	110. COUNTER FLANGES FOR ALL THE CONNECTIONS AT BATTERY LIMITS WITH NUTS, STUDS, BOLTS, GASKETS AND WASHERS REQUIRED : YES					124.			
	110.1 FLANGES : AS PER REQUIREMENT					124.1			
	111. FOUNDATION BOLTS FOR ALL THE EQUIPMENT REQUIRED : YES					124.2			
	112. ERECTION BY BIDDER :YES					124.3			
	113. ERECTION SUPERVISION BY BIDDER : YES					124.4			
	114.					124.5			
						124.6			
						124.7			
						124.8			
	PAINTING	115. PRIMER : REFER NOTE – 2				TESTS AND INSPECTION	125.		
		115.1 NUMBER OF COATS : REFER NOTE – 2					126. PERFORMANCE TEST AT SITE REQUIRED : YES		
		115.2 DRY FILM THICKNESS:REFER NOT – 2 μ					127. APPLICABLE STANDARDS : IS 5456 / API 618 / API 617 / API 672 / API 619 / IS 11780 /		
		116. FINISH PAINT : REFER NOTE – 2					128.		
		116.1. NUMBER OF COATS : REFER NOTE – 2					129.		
		116.2 DRY FILM THICKNESS: REFER NOTE-2 μ							
	COMPANION SPECIFICATIONS	117. MOTORS : REFER VOLUME IV				PERFORMANCE GUARANTEES	130. CAPACITY OF EACH COMPRESSOR : (+) (-) 0 M ³ /Hr		
		118.					131. DISCHARGE PRESSURE : 8.8 (+) (-) 0 Kg/ cm ² (g)		
		119. PIPING MATERIAL SPECIFICATIONS : . GI HEAVY CLASS					132. POWER CONSUMPTION : (+) 0 (-) KW		
		120. INSTRUMENTATION AND CONTROL REFER VOLUME-V					133. TEMPERATURE OF AIR AT OUTLET OF AFTER COOLER : BY BIDDER ± ° C		
		121. CONTROL CABINET : REFER VOLUME IV					134. COOLING WATER FLOW RATE : BY BIDDER ± M ³ /Hr		
		122. CABLES : REFER VOLUME IV							
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL			
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN			
REV. BY				DATE: MAY'12	5750A	R1			

ISSUE NO. R5	ENQ.SPEC.NO. TCE. 5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
			DATA SHEET A		SECTION : D11	
			AIR / GAS COMPRESSORS		SHEET: 6 OF 6	
PERFORMANCE GUARANTEES (CONTD.)	135. COOLING WATER OUTLET TEMPERARURE : BY BIDDER $\pm$ ° C			COST LOADING AND PENALTY	139. POWER CONSUMPTION :	
	136. COOLING WATER PRESSURE DROP : BY BIDDER $\pm$ Kg/ cm ² (g)				140. COOLING WATER CONSUMPTION :	
	137.				141.	
	138.				142.	
LIST OF SUB-VENDORS FOR BOUGHT-OUT AND CRITICAL ITEMS	143. BEARINGS					
	144. MOTORS					
	145. TURBINE					
	146. ENGINE					
	147. COUPLINGS					
	148. V- BELTS					
	149. VALVES & SPECIALITIES					
	150. AUTO DRAIN TRAPS					
	151. VIBRATION DAMPENING PADS					
	152. CONTROL PANEL AND INSTRUMENTS :					
	153. MCC					
	154.					
	155.					
	156.					
NOTES 1. FOR COMPRESSORS UPTO MOTOR RATING OF 7.5 KW, BIDDER MAY OFFER AIR COOLED COMPRESSOR AS AN ALTERNATIVE TO WATER COOLED COMPRESSOR. 2. FOR PAINTING REFER VOLUME II 3. QUALITY OF COMPRESSED AIR SHALL BE CLASS – 0 /1 AS PER ISO – 8573 – 1						
REV.NO.	R0	R1		PPD. BY: HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV09	MAY'12		CHD. BY: SMS	TCE.	PROJECT: 2 x 660 MW SUPER CRITICAL STAGE – V, SURATGARH, RAJASTHAN
REV. BY				DATE: MAY'12	5750A	

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B			SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS			SHEET : 1 OF 7	
GENERAL	SL. NO.	ITEM	BIDDER				
	1.	DESIGNATION		COMPRESSORS FOR			
	2.	NUMBER OFFERED		(W+S)			
	3.	TAG NUMBERS					
	4.	TYPE OF COMPRESSOR		RECIPROCATING/CENTRIFUGAL/SCREW LUBRICATED / NON-LUBRICATED			
	5.	MAKE AND MODEL NUMBER					
	6.						
	7.						
				RECIP	CENT	SCREW	
	COMPRESSOR DATA	8.	NUMBER OF STAGES				
9.		NUMBER OF CYLINDERS PER STAGE			NA	NA	
10.		TYPE OF CYLINDER		VER / HOR	NA	NA	
11.		CYLINDER LINER PROVIDED		YES / NO	NA	NA	
12.		SINGLE ACTING /DOUBLE ACTING		SINGLE/ DOUBLE	NA	NA	
13.		CAPACITY (FAD)	M ³ / Hr				
14.		MASS FLOW RATE	Kg/Hr	NA		NA	
15.		TYPE OF SUCTION AND DISCAHRGE VALVE		PLATE / CHANNEL TYPE	IGV/ BUTTERFLY VALVE (OP) AT SUCTION	BUTTERFLY / PISTON VALVE (OP) AT SUCTION	
16.		SUCTION PRESSURE	Kg/ cm ² (g)				
17.		DISCHARGE PRESSURE	Kg/ cm ² (g)				
	LEGEND : RECIP = RECIPROCATING, CENT= CENTRIFUGAL, VER = VERTICAL, HOR = HORIZONTAL,IGV = INLET GUIDE VANES, OP = OPTIONAL, NA = NOT APPLICABLE						
NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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		

ISSUE NO. R5	SPECIFICATION NO. TCE. 5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
			DATA SHEET B AIR / GAS COMPRESSORS			SECTION : D11 SHEET : 2 OF 7	
COMPRESSORS DATA (CONTD.)	SL. NO.	ITEM	BIDDER				
				RECIP	CENT	SCREW	
	18.	SUCTION TEMPERATURE - EACH STAGE	⁰ C				
	19.	DISCHARGE TEMPERATURE - EACH STAGE	⁰ C				
	20.	SELECTED COMPRESSOR SPEED	RPM				
	21.	BKW AT SELECTED COMPRESSOR SPEED	KW				
	22.	RECOMMENDED MAXIMUM SPEED	RPM				
	23.	BKW AT RECOMMENDED MAXIMUM SPEED	KW				
	24.	VOLUMETRIC EFFICIENCY	%				
	25.	MECHANICAL EFFICIENCY	%				
	26.	MOTOR RATING AND SPEED	KW/RPM	/	/	/	
	27.	LUBE OIL CONSUMPTION FOR EACH COMPRESSOR	LPM				
	28.	LUBE OIL PUMP DRIVEN BY COMPRESSOR MOTOR		YES/ NO	YES/ NO	YES/ NO	
	29.	MOTOR RATING, IF LUBE OIL PUMP IS DRIVEN BY SEPARATE MOTOR	KW				
	30.	AUXILIARY LUBE OIL PUMP TO BE PROVIDED		WHETHER PROVIDED YES/ NO			
	31.	AUXILIARY LUBE OIL PUMP MOTOR RATING AND SPEED	KW/RPM	/	/	/	
	32.	TYPE AND MAKE OF BEARINGS					
NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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		

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B		SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS		SHEET : 3 OF 7	
COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER			
				RECIP	CENT	SCREW
	33.	COOLING WATER REQUIREMENTS (NOTE 1)				
	33.1	FOR COMPRESSOR COOLING				
	33.1.1	FLOW RATE	M ³ / Hr			
	33.1.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/
	33.1.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/
	33.1.4					
	33.1.5					
	33.1.6					
	33.2	FOR BEARING COOLING - IF REQUIRED				
	33.2.1	FLOW RATE	M ³ / Hr			
	33.2.2	INLET AND MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/
	33.2.3	INLET AND MAXIMUM OUTLET TEMPERATURE	⁰ C	/	/	/
	33.2.4					
	33.2.5					
	34.	INTAKE FILTER TYPE				
	34.1	FILTER ELEMENT				
	34.2	RATED CAPACITY	M ³ / Hr			
	34.3	EFFICIENCY	%			
	34.4	DESCRIPTIVE LITERATURE TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO		
	34.5					
	NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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		ISSUE R1
				DATE		

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B		SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS		SHEET : 4 OF 7	
COMPRESSOR DATA (CONTD.)	SL. NO.	ITEM	BIDDER			
				RECIP	CENT	SCREW
	35.	CAPACITY CONTROL				
	35.1	TYPE AND NUMBER OF STEPS		BY SPEED VARIATION / AT CONSTANT SPEED		
	35.2	METHOD EMPLOYED IN CASE OF CONSTANT SPEED TYPE				
	35.3	CONTROL SYSTEM WRITE-UP TO BE ENCLOSED		WHETHER ENCLOSED YES/ NO		
	35.4	WIRING AND TUBING DIAGRAM WITH CONTROL SCHEME TO BE ENCLOSED		WHETHER ENCLOSED YES / NO		
	36.	EQUIPMENT AND ACCESSORIES MOUNTED ON COMMON BASE FRAME WITH THE COMPRESSOR				
	36.1	WEIGHT OF ENTIRE UNIT MOUNTED ON COMMON BASE FRAME	Kg			
	36.2	OVERALL DIMENSIONS OF COMMON BASE FRAME L X W	M	X	X	X
	37.	EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME				
	37.1	WEIGHT OF EQUIPMENT AND ACCESSORIES MOUNTED ON SEPARATE BASE FRAME	Kg			
	37.2	OVERALL DIMENSIONS OF SEPARATE BASE FRAME L X W	M	X	X	X
	38.	NAME AND OVERALL DIMENSIONS OF SINGLE LARGEST COMPONENT TO BE LIFTED L X W X H	M	X	X	X
	39.	NAME AND WEIGHT OF HEAVIEST SINGLE COMPONENT TO BE LIFTED	Kg			
NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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		ISSUE R1	
			DATE			

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III		
	TCE. 5750A-H-500-001		DATA SHEET B			SECTION : D11		
	PART : B		AIR / GAS COMPRESSORS			SHEET : 5 OF 7		
COMPRESSOR DATA (CONTD.)	SL. NO.	BIDDER						
				RECIP	CENT	SCREW		
	40.	SUCTION FLANGE - FIRST STAGE SIZE/ STANDARD/ RATING	mm NB/					
	41.	DISCHARGE FLANGE -FINAL STAGE - SIZE/ STANDARD/ RATING	mm NB/					
	42.	IF DRIVE MOTOR IS TO BE FURNISHED BY THE PURCHASER						
	42.1	RATING/ SPEED	KW/RPM					
	42.2	STARTING TORQUE	Kg M					
	42.3	DIRECTION OF ROTATION OF MOTOR AS VIEWED FROM COUPLING END		/	/	/		
	43.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO				
	44.							
	INTER-COOLERS / AFTER-COOLERS				I/C			A/C
					1 STG	2 STG	3 STG	
		45.	DESIGNATION					
		46.	NUMBER OFFERED					
47.		TAG NUMBERS						
48.		TYPE		VER/ HOR			VER/HOR	
49.		CAPACITY (FAD)	M ³ /Hr					
50.		COOLING WATER FLOW RATE	M ³ / Hr					
51.		AIR/ GAS INLET/OUTLET TEMPERATURE	⁰ C	/	/	/	/	
52.		COOLING WATER INLET/ MAXI- MUM OUTLET TEMPERATURE	⁰ C	/	/	/	/	
NOTE TO VENDOR								
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)			SIGNATURE OF BIDDER					
2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.								
			DATE			ISSUE R1		

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B				SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS				SHEET : 6 OF 7	
INTER-COOLERS / AFTER-COOLERS (CONTD.)	SL. NO.	ITEM	BIDDER	I/C			A/C	
	53.	AIR/ GAS INLET AND OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	54.	COOLING WATER INLET/ MINIMUM OUTLET PRESSURE	Kg/cm ² (g)	/	/	/	/	
	55.	COOLING SURFACE AREA	M ²					
	56.	DESIGN PRESSURE - AIR/ GAS SIDE	Kg/cm ² (g)					
	57.	DESIGN PRESSURE - WATER SIDE	Kg/cm ² (g)					
	58.	CODE OF CONSTRUCTION						
	59.	CORROSION ALLOWANCE	mm	3	3	3	3	
	60.	NUMBER OF PASSES						
	61.	EMPTY WEIGHT	Kg					
	62.	OPERATING WEIGHT	Kg					
	63.	WATER FILLED WEIGHT	Kg					
	64.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO				
	RECEIVERS	65.	DESIGNATION		RECEIVERS FOR			
66.		NUMBER OFFERED						
67.		TAG NUMBERS						
68.		TYPE		VER/ HOR	VER/ HOR	VER/ HOR		
69.		CAPACITY	M ³					
70.		SIZE						
70.1		DIAMETER	mm					
70.2		HEIGHT TAN TO TAN	mm					
71.		DESIGN PRESSURE	Kg/cm ² (g)					
72.		CODE OF CONSTRUCTION						
73.		CORROSION ALLOWANCE	mm					
NOTE TO VENDOR			SIGNATURE OF BIDDER			ISSUE R1		
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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.			DATE					

ISSUE NO. R5	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B		SECTION : D11	
	PART : B		AIR / GAS COMPRESSORS		SHEET : 7 OF 7	
	SL. NO.	ITEM	BIDDER			
RECEIVERS (CONTD.)	74.	THICKNESS				
	74.1	SHELL	mm			
	74.2	DISHED ENDS	mm			
	75.	WEIGHT				
	75.1	EMPTY	Kg			
	75.2	OPERATING	Kg			
	75.3	FILLED WITH WATER	Kg			
	76.	ALL THE ACCESSORIES AS CALLED FOR IN DATA SHEET A TO BE INCLUDED		WHETHER INCLUDED YES / NO		
MISCELLANEOUS	77.	ALL THE VALVES, SPECIALITIES, INSTRUMENTS, COUNTER FLANGES, FOUNDATION BOLTS ETC. AS CALLED FOR IN DATA SHEET A AND AS PER ENCLOSED P & I D TO BE INCLUDED		WHETHER INCLUDED YES / NO		
PERFORMANCE GUARANTEES	78.	CAPACITY OF COMPRESSOR	M ³ / Hr	(+)	(-)	
	79.	DISCHARGE PRESSURE	Kg/cm ² (g)	(+)	(-)	
	80.	POWER CONSUMPTION	KW	(+)	(-)	
	81.	TEMPERATURE OF AIR AT OUTLET OF AFTER-COOLER	⁰ C	(+)	(-)	
	82.	COOLING WATER FLOW RATE	M ³ / Hr	(+)	(-)	
	83.	COOLING WATER OUTLET TEMP.	⁰ C	(+)	(-)	
	84.	COOLING WATER PRESSURE DROP	Kg/cm ² (g)	(+)	(-)	
	85.					
	NOTES 1. IF AIR COOLED COMPRESSOR IS OFFERED, BIDDER TO FURNISH COOLING SYSTEM DETAILS LIKE NATURAL OR FORCED COOLING, FAN CAPACITY, MOTOR RATING ETC. LEGEND : I/C = INTER-COOLER, A/C = AFTER-COOLER, STG = STAGE					
NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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	

ISSUE NO. R5	ENQ. SPEC. NO. TCE. 5750A-H-500-001 PART : B				TATA CONSULTING ENGINEERS LIMITED				VOLUME - III	
					DATA SHEET A				SECTION : D11	
					AIR DRYING PLANT				SHEET : 1 OF 3	
HOC TYPE										
GENERAL	1. DESIGNATION : AIR DRYING PLANT FOR INSTRUMENT AIR				DESIGN DATA (CONTD.)	23. PRESSURE AT THE OUTLET OF THE LAST INTERCOOLER OF THE MULTI- STAGE COMPRESSOR (FOR HOC TYPE ONLY) : BIDDER Kg/cm ² (g)				
	2. NUMBER REQUIRED : 4 (2W+2S) /					24. QUALITY OF COOLING WATER (CW) : PASSIVATED DM Water				
	3. TAG NUMBERS : -					25. CW INLET TEMPERATURE : BY BIDDER				
	4. OPERATION : CONTINUOUS / ~~INTERMITTENT~~ Hrs/DAY					26. MAXIMUM ALLOWABLE CW OUTLET TEMPERATURE : BY BIDDER				
	5. LOCATION : INDOOR / ~~OUTDOOR~~					27. CW INLET PRESSURE : 5.0 Kg/cm ² (g) (TENTATIVE)				
	6. INLET AIR QUALITY : OIL AND DUST FREE COMPRESSED AIR					28. MAXIMUM ALLOWABLE CW PRESSURE DROP : 0.5 Kg/cm ²				
	7. APPLICABLE CODE : IS 11989					29. CONTROL POWER SUPPLY : REFER VOLUME IV				
	8.					30.				
	9.					31.				
DESIGN DATA	10. TYPE : HOC TYPE				MATERIALS AND CODES OF CONSTRUCTION	32. DESIGN CODES FOR ALL PRESSURE VESSELS : ASME SEC VIII DIV 1/IS 2825				
	11. TYPE OF DESICCANT : SILICA GEL/ ACTIVATED ALUMINA/ MOLECULAR SIEVE					33. CORROSION ALLOWANCE : 3 mm				
	12. DESIGN CAPACITY (FAD) : BY BIDDER					34. DESSICANT CHAMBER : IS 2062 GR B / IS 2002 GR 2				
	13. OPERATING PRESSURE : 7.8 Kg/cm ² (g)					35. FILTERS SHELL : SA 106 GR B / IS 2062 GR B / IS 2002 GR 2				
	14. DESIGN PRESSURE : 9.75 Kg/cm ² (g)					36. MOISTURE SEPARATOR SHELL : SA 106 GR B/IS 2062 GR B/IS 2002 GR 2				
	15. MAXIMUM ALLOWABLE PRESSURE DROP ACROSS AIR DRYING PLANT : 0.3 Kg/cm ²					37. DISTRIBUTOR SHELL : SA 106 GR B / IS 2062 GR B / IS 2002 GR 2				
	16. AIR INLET TEMPERATURE : BIDDER °C					38. ELECTRIC HEATER CHAMBER : SA 106 GR B / IS 2002 GR 2				
	17. AIR OUTLET TEMPERATURE: BIDDER °C					39. HEAT EXCHANGER				
	18. OUTLET AIR DEW POINT (NOTE 1) :					39.1 DESIGN CODES : ASME SEC VIII DIV 1 AND TEMA C				
	18.1 AT ATMOSPHERIC PRESSURE : (-)40°C					39.2 SHELL : SA 106 GR B / IS 2002 GR 2				
	18.2 AT OPERATING PRESSURE : (-)20°C					39.3 TUBES : COPPER/ADMIRALITY BRASS AS PER BS EN 1057				
	19. MAXIMUM DIFFERENTIAL MOISTURE LOADING (% BY WEIGHT) : 10 %					39.4 TUBE SHEET : IS 2002 GR 2 / SA 105				
	20. TEMPERATURE AT THE OUTLET OF THE LAST INTER COOLER OF THE MULTI-STAGE COMPRESSOR (FOR HOC TYPE ONLY) : BIDDER °C									
	21.									
22.										
REV.NO.	R0	R1		PPD. BY : HBS	JOB NO.	CLIENT: RRVUNL				
DATE	NOV 09	MAY'12		CHD. BY : SMS	TCE.	PROJECT: 2 x 660 MW SUPERCRITICAL				
REV. BY				DATE : MAY'12	5750A	STAGE V, SURATGARH, RAJASTHAN				ISSUE R1

ISSUE NO. R5	ENQ. SPEC. NO. TCE. 5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED			VOLUME - III	
			DATA SHEET A AIR DRYING PLANT HOC TYPE			SECTION : D11 SHEET : 2 OF 3	
MATERIALS AND CODES OF CONST. (CONTD.)	39.5 BAFFLE PLATES : IS 2062 GR B / IS 2002 GR 2				MISCELLANEOUS	52. BY PASS ARRANGEMENT FOR THE PLANT REQUIRED : YES / ~~NO~~	
	40. PIPING : REFER SECTION D7					53. ALL THE VALVES, SPECIALITIES INSTRUMENTS AND ACCESSORIES : AS REQUIRED	
41.				54. COUNTER FLANGES FOR ALL THE CONNECTIONS AT BATTERY LIMITS WITH NUTS, STUDS, BOLTS, GASKETS AND WASHERS REQUIRED : YES / ~~NO~~			
42.				55. FLANGES : AS PER REQUIREMENT			
CONTROLS FOR NO PURGE LOSS AND HOC TYPE	43. CONTROL SIGNAL LAMPS FOR				MISCELLANEOUS	56. FOUNDATION BOLTS FOR ALL THE EQUIPMENT REQUIRED: YES / ~~NO~~	
	43.1 HEATER ON					57. ERECTION BY CONTRACTOR: YES/ ~~NO~~	
	43.2 POWER, CONTROL SUPPLY ON					58. ERECTION SUPERVISION BY CONTRACTOR: YES/ ~~NO~~	
	43.3 CHAMBER 'A' ON ADSORPTION					59.	
	43.4 CHAMBER 'B' ON ADSORPTION					60.	
44 SWITCHES/PUSH BUTTONS FOR				61.			
44.1 ACKNOWLEDGE/RESET/TEST				62. PRIMER : REFER NOTE – 2			
44.2 START/STOP OF HEATER				62.1 NUMBER OF COATS : REFER NOTE – 2			
44.3 AUTO / MANUAL CHANGE-OVER SELECTOR SWITCH				62.2 DRY FILM THICKNESS PER COAT : REFER NOTE – 2			
45. ANNUNCIATION SYSTEM				63. FINISH PAINT : REFER NOTE – 2			
CONTROLS FOR BLOWER REACTIVATED TYPE	VOID				PAINTING	63.1 NUMBER OF COATS : REFER NOTE – 2	
						63.2 DRY FILM THICKNESS PER COAT : REFER NOTE - 2	
						64.	
						65.	
						66.	
						67. VOID	
						68.	
CONTROLS FOR HEATLESS TYPE	VOID				COMPANION SPECIFICATIONS	69.	
						70.	
						71.	
						72.	
						73.	
REV.NO.	R0	R1		PPD. BY : HBS	JOB NO.	CLIENT: RRVUNL	
DATE	NOV 09	MAY'12		CHD. BY : SMS	TCE.	PROJECT: 2 x 660 MW SUPERCRITICAL	
REV. BY				DATE : MAY'12	5750A	STAGE V, SURATGARH, RAJASTHAN	
						ISSUE R1	

ISSUE NO. R5	ENQ. SPEC. NO. TCE. 5750A-H-500-001 PART : B		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
			DATA SHEET A AIR DRYING PLANT HOC TYPE		SECTION : D11 SHEET : 3 OF 3	
SPARES AND MAINTENANCE TOOLS AND TACKLES	74. AS PER SECTION D20		PERFORMANCE GUARANTEES (CONTD.)	81. PRESSURE DEW POINT AT OUTLET :		
	75.			(+) °C		
	75.1			(-) °C		
	75.2			82. AIR PRESSURE DROP ACROSS THE		
	75.3			PLANT : (+) Kg/cm ²		
	75.4			(-) Kg/cm ²		
	75.5			83. AIR OUTLET TEMPERATURE :		
	75.6			(+) °C		
				(-) °C		
				84. TOTAL POWER CONSUMPTION PER		
TESTS AND INSPECTION	76.		COST LOADING AND PENALTY	CYCLE : (+) KW		
	77.			(-) KW		
	78.			85. PURGE AIR QUANTITY :		
PERFORMANCE GUARANTEES	79. DESIGN CAPACITY (FAD) :			(+) M ³ /Hr		
				(-) 0 M ³ /Hr		
	80. OUTLET AIR DEW POINT AT			86. TOTAL POWER CONSUMPTION/CYCLE:		
	ATMOSPHERIC PRESSURE : (-)40°C			Rs. / KW		
				87.		
				88.		
				89.		
LIST OF SUB-VENDORS FOR BOUGHT-OUT ITEMS	90. DESICCANT		BY BIDDER			
	91. HEATING ELEMENTS		BY BIDDER			
	92. BLOWERS		BY BIDDER			
	93. ACTUATORS		BY BIDDER			
	94. VALVES & SPECIALITIES		BY BIDDER			
	95. AUTO DRAIN TRAPS		BY BIDDER			
	96. DEW POINT METERS		BY BIDDER			
	97. CONTROL PANEL AND INSTRUMENTS : BY BIDDER					
	98.					
NOTES 1. THE FLOW THROUGH THE AIR DRYING PLANT MAY VARY. HOWEVER, THE SPECIFIED AIR DEW POINT TEMPERATURE SHALL BE ACHIEVED FOR ANY FLOW UPTO DESIGN CAPACITY. 2. FOR PAINTING REFER VOLUME II 3. QUALITY OF AIR SHALL BE CLASS 0 / 1 AS PER ISO – 8573 – 1, 4. TWIN TOWER HOC DRIER OF DESICCANT TYPE SHALL BE PROVIDED						
REV.NO.	R0	R1		PPD. BY : HBS	JOB NO.	CLIENT: RRVUNL
DATE	NOV'09	MAY'12		CHD. BY : SMS	TCE.	PROJECT: 2 x 660 MW SUPERCRITICAL
REV. BY				DATE : MAY'12	5750A	STAGE V, SURATGARH, RAJASTHAN
						ISSUE R1

ISSUE NO. R4	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B		SECTION : D11	
	PART : B		AIR DRYING PLANT		SHEET : 1 OF 2	
HOC TYPE						
	SL. NO.	ITEM	BIDDER			
DESIGN DATA	1.	DESIGNATION		AIR DRYING PLANT FOR		
	2.	NUMBER OFFERED				
	3	TAG NUMBERS				
	4.	MAKE / MODEL NUMBER		/		
	5.	TYPE OF AIR DRYING PLANT				
	6.	MAXIMUM CAPACITY AT OPERATING CONDITION (FAD)	M ³ /Hr			
	7.	TYPE OF DESSICANT				
	8.	QUANTITY OF DESICCANT PER CHAMBER	Kg			
	9.	EXPECTED LIFE OF DESICCANT	YR			
	10.	AIR PRESSURE DROP ACROSS AIR DRYING PLANT AT MAXIMUM FLOW	Kg/cm ²			
	11.	OUTLET AIR TEMPERATURE	°C			
	12	OUTLET AIR DEW POINT				
	12.1	AT ATMOSPHERIC PRESSURE	°C			
	12.2	AT OPERATING PRESSURE	°C			
	13.	COOLING WATER (CW) FLOW RATE	M ³ /Hr			
	13.1	CW OUTLET TEMPERATURE	°C			
	13.2	CW PRESSURE DROP	Kg/cm ²			
	14.	ADSORPTION CYCLE TIME	Hr			
	15.	REACTIVATION CYCLE TIME	Hr			
	15.1	HEATING	Hr			
15.2	COOLING	Hr				
15.3	PURGING	MIN.				
16.	WEIGHT OF WATER REMOVED PER CYCLE	Kg				
17.	REGENERATION AIR TEMPERATURE	°C				
NOTE TO VENDOR			SIGNATURE OF BIDDER			
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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.			DATE			
					ISSUE R1	

ISSUE NO. R4	SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME - III	
	TCE. 5750A-H-500-001		DATA SHEET B		SECTION : D11	
	PART : B		AIR DRYING PLANT		SHEET : 2 OF 2	
HOC TYPE						
	SL. NO.	ITEM	BIDDER			
DESIGN DATA (CONTD.)	18.	NUMBER / RATING OF EACH HEATING ELEMENT	KW	/		
	19.	HEATER POWER CONSUMPTION PER CYCLE	KWHr			
	20.	BLOWER CAPACITY	M ³ /Hr			
	21.	BLOWER POWER CONSUMPTION PER CYCLE / MOTOR RATING	KW	/		
	22.	PURGE AIR QUANTITY	M ³ /Hr			
	23.	OVERALL DIMENSIONS L x W x H	M	x x		
	24.	TOTAL WEIGHT	Kg			
	25.	DETAILED DESCRIPTION OF OPERATING SEQUENCE, CONTROLS, INTERLOCKS TO BE ENCLOSED		WHETHER ENCLOSED YES / NO		
	26.	WHETHER SUPPLY OF VALVES, SPECIALITIES AND INSTRUMENTS AS PER DATA SHEET A AND P & I DIAGRAM IS INCLUDED ?		WHETHER INCLUDED YES / NO		
	27.					
PERFORMANCE GUARANTEES	28.	DESIGN CAPACITY (FAD)	M ³ / Hr	(+) (-)		
	29.	OUTLET AIR DEW POINT AT ATMOSPHERIC PRESSURE	°C	(+) (-)		
	30.	PRESSURE DEW POINT AT OUTLET	°C	(+) (-)		
	31.	AIR PRESSURE DROP ACROSS THE PLANT	Kg/cm ²	(+) (-)		
	32.	AIR OUTLET TEMPERATURE	°C	(+) (-)		
	33.	TOTAL POWER CONSUMPTION/CYCLE	KW	(+) (-)		
	34.	PURGE AIR QUANTITY	M ³ / Hr	(+) (-)		
	35.					
	36.					
NOTE TO VENDOR 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (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		ISSUE R1	
			DATE			

D12

AC AND VENTILATION SYSTEM

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 1 OF 28

1.0 **SCOPE**

This specification covers design, supply and installation, commissioning and testing of Air-conditioning and Ventilation system for 2X660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan.

AIR-CONDITIONING SYSTEM

1.1 The following are the areas to be Air-conditioned

- (i) Main control room comprising unit control room, electronic cubicle rooms, shift in-charge engineers room, maintenance engineers room, printer room, UPS room, conference room, and analyser room in T.G. building.
- (ii) The entire service and administration buildings.
- (iii) ESP Control room, DM Plant Control room, Coal handling system control room, Ash handling system control room, Switchyard control room, Switchyard relay room, PLC rooms of other areas.
- (iv) Chemical lab (in DM plant building), Chemical House (in pre treatment plant), Conference Rooms.

1.2 The following are the various Input data considered in the Design of Air-conditioning system:

1.2.1 Outside design conditions :

	DRY BULB TEMPERATURE *	WET BULB TEMPERATURE *
SUMMER	45 °C	23.9 °C
MONSOON	37.2 °C	26.7 °C
WINTER	7.2 °C	5 °C

* Bidder to consider the latest prevailing outside design condition for preparation of heat load estimation.

1.2.2 Inside design conditions to be maintained in Air-conditioned area:

- a) Dry bulb temperature : 22 °C ± 1 °C
- b) Relative Humidity : Not exceeding 60% for office areas and 50% for all control rooms.

1.2.3 For Air conditioned areas, fresh air would be provided at the rate of one (1) air change per hour or 35 cu.m per hour per person inline with ASHRAE-62,

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 2 OF 28

whichever is higher.

- 1.2.4 Make-up water for AC and Ventilation system equipments (cooling tower, expansion tank and air washer/UAF make up water tank) shall be supplied through dedicated softening plant (ion exchange type). The softening plant is in bidder scope.

2.0 **REFERENCE CODES AND STANDARDS**

All materials and equipments provided shall comply with the following Standards:

ASHRAE 15	Safety code for mechanical refrigeration
ASHRAE 30	Methods of testing Liquid chilling package
ARI 430	Central station Air Handling Units
ARI 410	Forced Circulation Air-Cooling and Air Heating coils
IS 277	Galvanised Steel Sheets
IS 325	Three phase induction motors
IS 655	Metal Air ducts
IS 7613	Method of testing panel type air filters for air-conditioning and Ventilation process.
ARI 550	Water chilling package using the Vapour compression cycle
IS 4671	Expanded polystyrene for thermal insulation purposes.
IS 3588	Electric axial fans
IS 4894	Centrifugal fans
UL 555	Fire dampers
IS 7098 Part-1	Power cables
IS 1554 Part-1	Control cables
IS 4237	MCC
IS 6875	PB Stations
Control panel	Individual electrical components conform to respective IS

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 3 OF 28

3.0 **SYSTEM DESCRIPTION**

3.1 Air-Conditioning Systems

- a) TG building Main control rooms and other air-conditioning areas shall be air conditioned by water cooled Chilled water packages with rotary screw compressors (Two Operating + One Standby) shall be considered to meet the above requirements. The various areas to be air conditioned are given in Appendix – I
- b) The entire Service building and administration building shall be air conditioned by suitable number of rotary screw compressors or water cooled Package units with cooling towers and cooling water pumps. The final equipment configuration shall be decided by the bidder.
- c) ESP Control room, DM Plant Control room, Chemical lab in DM plant building, Coal handling system control room, Ash handling system control room, Switchyard control room and Switchyard relay room shall be air-conditioned by means of adequate number of a separate DX plant (water cooled) or water cooled Packaged air-conditioners (with cooling towers and cooling water pumps) with suitable numbers of working and common standby unit. The capacity and quantity required shall be finalized by the bidder.
- d) Chemical House (PT plant) and Conference Rooms will have to be air-conditioned by Means of adequate number of water cooled Packaged air-conditioners (with cooling towers and cooling water pumps) suitable numbers of working and common standby unit. The capacity and quantity required shall be finalized by the bidder.
- (e) For chemical lab, the air-conditioning system shall be designed for 100% outdoor air (the room air is exhausted and not recirculated through the A/C unit).
- (f) 10% margin in equipment capacity over peak heat load calculated considering solar load and all internal loads due to equipment, lighting, fresh air, occupants, etc shall be considered.

3.1.1 **AC Plant : Central Chilled Water Plant catering A/C areas of TG building**

The central chilled water plant shall cater to the air-conditioning of Main control room, electronic cubicle room, shift in-charge engineers room, maintenance engineers' room, printer room, UPS room, conference room and analyser rooms.

Chilled water at 7 °C from these units would be supplied to Air handling units located in the AHU room adjacent to different areas to be Air-conditioned. Chilled water from the air handling units after picking up heat load will be at 12 °C approx. which will be returned to the chiller units for cooling and re circulated to air handling units. If any AC area will be located at a far off location from the AHU room or if AHU room located at the roof of the AC area, then it will be air-conditioned with ducted supply from AHU location and the return air will taken through insulated return air duct back to the AHU room.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage-V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 4 OF 28

The cool air is supplied to the A/C area from AHU through ducting and the warm air from the A/C area after heat pick is taken to the AHU room through space between false ceiling and roof. In the AHU room, the warm air is cooled by the chilled water at the cooling coil of AHU and the cooled air is supplied to the A/C area and the process repeats.

The cooling towers for the Air-conditioning plant would be located near the AC plant room, or on the roof of AHU room along with expansion tank and its necessary accessories.

The AC plant would essentially comprise of the following equipment :

- i. Three (3) nos. (Two Operating and one standby) water Chilling units with R134a Refrigerant Rotary screw compressors, each of suitable capacity.
- ii. Three (3) nos. (Two Operating and one standby) Chilled water pump sets of adequate capacity to match chilling unit chilled water flow rate.
- iii. Three (3) nos. (Two Operating and one standby) condenser water pump sets of adequate capacity to match chilling unit condenser water flow rate.
- iv. Three (3) nos. (Two Operating and one standby) Induced draft FRP Cooling towers of adequate capacity to match chilling unit.
- v. Suitable nos. of air handling units (Numbers Operating and one standby), each of suitable capacity are located in the AHU room (location of AHU rooms to be decided by Bidder).
- vi. Air distribution system comprising ducting, diffuser / grilles, thermal and acoustic insulation for ducting.
- vii. Main control panel, local control panel and local push button station
- viii. Insulated Expansion tank with all necessary accessories.
- ix. Electrical strip heaters with controls. Humidification package with pan humidifiers (if required) for system.
- x. Piping, valves and specialities for chilled water and condenser cooling water systems with thermal insulation for chilled water systems.
- xii. Make up water for the air-conditioning system to be supplied to the cooling tower sumps and to expansion tank from clarified water through water softening plant (Ion exchange type) and strainers.
- xiii. Fresh air system consisting of pre filters, fine filters, tube axial fan, ducting, volume control dampers etc., shall be provided in the AHU rooms. The efficiency of pre-filters shall be 90% down to 10 microns and that of fine filters shall be 99% down to 5 microns.
- xiv. Necessary drain piping up to the nearest floor drains for each AHU with thermal insulation.
- xv. Monorail with hoist will be provided in the A/C plant room for handling. (The chiller units shall be housed in a dedicated building)

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 5 OF 28

4.0 EQUIPMENT TO BE SUPPLIED

4.1 Screw Chilling unit – AC plant

The capacity of chilling unit will be based on the following :

- i) Fouling factors - Cooler : 0.0001 hr.ft².°F / BTU / (0.018 M² Hr °C / Kcal)
- ii) Chilled water In / Out temperature : 12 °C / 7 °C
- iii) Chilled water flow rate : 0.7 M³/hr / TR

Each Screw chilling unit shall comprise of the following :

- a) Microprocessor controlled water cooled water chiller package suitable for R134a having single/multiple semi hermetic screw type compressor, motor, unit mounted starter, crankcase heater, automatic capacity control etc.
- b) One (1) no. shell and tube type water cooled condenser complete with hot gas inlet, liquid outlet, relief and purge connection for refrigerant, water inlet and water outlet connection, drain connection with valve suitable for above selected capacity.
- c) One (1) no. Shell and tube type / flooded water chiller suitable for above selected capacity complete with liquid inlet, Vapour outlet connection for refrigerant, water inlet and water outlet connection, drain connection with valve and chiller insulation.
- d) Thermostatic expansion valve, Refrigerant piping, valves and fittings interconnecting Chiller, compressor, condenser and expansion device and refrigerant piping including insulation etc
- e) Refrigerant piping, valves and fittings interconnecting Chiller, compressor, condenser and expansion device.
- f) First charge of refrigerant gas and oil, base frames, vibration isolation pad, integral wiring and unit mounted isolator / fuse switch.
- g) Flexible connection (Corirubber with retainer rods and flanges suitable to operate at the design pressure) between chilling unit and piping.
- h) Lot-Controls comprising the following:
 - HP/LP cut-outs
 - Oil pressure failure switch
 - Solenoid valve
 - Antifreeze thermostat
 - Cooling thermostat
 - Water flow switch at the outlet of condenser and chiller.
- i) Vibration isolators for chillers, pumps, motors and cooling towers.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 6 OF 28

4.2 Centrifugal water pump set

The centrifugal pump set shall be Horizontal split casing centrifugal pump set and each centrifugal water pump set shall comprise of the following :

- One (1) no. Horizontal split casing centrifugal pump.
- One (1) no. adequately sized Induction motor suitable for 415 V, 3 phase, 50 Hz supply.
- One (1) set of base plate, coupling guard, anti vibration pads and foundation bolts.
- Chilled water pump set will include thermal insulation of pump.
- Flexible connection (Corirubber with retainer rods and flanges suitable to operate at the design pressure) between pump and piping.
- Drain piping from pump to nearest floor drain

4.3 Air Handling Unit (AHU)

The AHU shall be of double skin construction with Filter section, cooling coil section and fan section. Each AHU shall comprise of the following:

- Fan section complete with forward curved/Backward curved Double Inlet Double Width (DIDW) centrifugal fan mounted on spring type vibration isolators. Fan outlet velocity not to exceed 11 m/s. AHU mounted on vibration pads.
- One (1) no. adequately sized Induction motor suitable for 415 V, 3 phase, 50 Hz supply with drive package comprising of fan pulley and V-belt.
- Cooling coil section with suitably sized chilled water cooling coil made of copper tubes and aluminium fins complete with purge valve at top and drain plug at bottom. Velocity across cooling coil not to exceed 2.5 m/s.
- Filter section containing washable synthetic type air filters having GSS frame. Pre filters shall be provided in front of cooling coils and fine filters shall be provided in the common supply duct.
- Drain piping from AHU to floor drain.
- Flexible connection between fan and ducting.
- One common set of electrical strip heater package of suitable capacity complete with contact, humidistat, safety thermostat, heater box with insulation etc for monsoon reheat mounted inside the A/c plenum / duct.
- Controls comprising :
 - One (1) no. 3 way mixing valve with actuator for each AHU (wherever applicable).
 - One (1) no. proportioning thermostat for each AHU

4.4 Cooling Tower

- Design wet bulb temperature : 26.7 °C
- Approach : 4 °C
- Cooling tower water outlet temperature : 31 °C
- The condenser water flow rate : 1 M³/hr / TR

The cooling tower shall be Induced draft (single cell) FRP cooling tower and shall comprise of Fan, fan motor, drive package, FRP basin, FRP / HDGS louver, fills, drift

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 7 OF 28

eliminators, nozzles, make-up connection, over flow connection, drain connection, ladder and supporting structure.

4.5 **Packaged Air Conditioners**

Packaged Air conditioning (PAC) systems for air conditioning of areas as listed in Appendix - I shall be air conditioned by a number of water-cooled condenser type PAC units. Each water-cooled PAC unit comprises of scroll refrigerant compressor with motor, water cooled type condenser and cooling coil with air handling fan and associated controls and accessories.

Cooling water for the condensers of PAC units shall be supplied from cooling towers located on top of the building and after heat pick-up; this water is circulated back to cooling tower by the condenser cooling water pumps for cooling and recirculation. Make up water connection from softening plant (Ion exchange) will be included.

Cooled and dehumidified air from the PAC units of the respective A/C area will be circulated by means of supply air ducting and diffusers from PAC units to A/C area. This air after heat pickup from the A/C area is sucked through return air grilles located in false ceiling into PAC units by means of air handling fan suction for cooling and recirculation. Fresh air is supplied through fresh air fan filter arrangement located in PAC plant room.

If any AC area will be located at a far off location or PAC room is located at the roof of the AC area, then it will be air-conditioned with ducted supply from AHU location and the return air will taken through insulated return air duct back to the AHU room.

4.6 **Piping and Valves**

a) Piping shall be

- ERW, Black, IS-1239 heavy class for pipe sizes up to 150 NB
 - ERW, IS 3589 fabricated from IS 2062 plates for pipe sizes 200 NB to 450 NB
- b) Isolating valves shall be butterfly valve type for valve size 50 NB and above.
- c) Isolating valves shall be gate valve type for valve size below 50 NB.
- d) Strainers shall be Y-type
- e) Chilled water and Condenser water Piping shall be designed such that, for pipe sizes of 50 NB and under, maximum velocity is 1.2 m/s and friction rate is not exceeding 250 Pa/m. For pipe sizes above 50 NB, maximum velocity is 3 m/s and friction rate is not exceeding 400 Pa/m.
- f) Isolating valves shall be provided at inlet and outlet piping of Chilling units, pumps, cooling towers and Air Handling Units.
- g) Strainers shall be provided at the inlet piping to AHU and Pump.
- h) Non return valves shall be provided at the outlet of Pumps.
- i) Volume control dampers shall be provided in all branch ducts and in the main ducts from AHU/PAC to throttle the air volume.

4.6.1 **Air distribution system**

- Rectangular Duct: GSS supply air ducting and return air ducting with Zinc coating 200 Gms /sq.m or better.

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 8 OF 28

- The supply air ducting to be designed based on equal friction method to have an initial velocity not exceeding 9 m/s and friction rate 0.8 Pa/m.
- The return air ducting to be designed based on equal friction method to have an initial velocity not exceeding 7.5 m/s and friction rate 0.66 Pa/m.
- Duct aspect ratio for rectangular ducts. Not exceeding 1:4.
- Maximum neck velocity for supply air diffusers 2.0 m/s.
- Maximum neck velocity for return air diffusers 1.5 m/s.
- Maximum face velocity for supply air grills 2.0m/s.
- Maximum neck velocity for return air / exhaust grilles 1.5 m/s.
- Maximum airflow velocity across flat type pre filters (90% efficiency down to 10 microns) shall be 1.75 m/s.
- Maximum velocity across louvers 2.5 m/s.
- Motorized fire dampers to be provided in the supply air duct, return air ducts, all wall and floor crossings to isolate the area in the event of fire. The space around the ducts and pipes to be sealed with fire retardant material.

4.7 **Thermal and Acoustic insulation**

- Thermal insulation of ducting : Entire supply air duct will be thermally insulated with 25 mm thick fibre glass of density 32 kg/cu.m
- Acoustic insulation for first 6 m length from AHU outlet with 12mm thick resin bonded fibre glass wool of density 48 kg/cu.m covered with RP tissue and 30 G perforated Aluminium sheet.
- Chilled water piping shall be thermally insulated with expanded polystyrene of density 20 kg/cu.m and finished with sand cement plaster. The thickness of piping insulation shall be as follows:
 - Pipe diameter up to 25 NB : 40 mm thick insulation
 - Pipe diameter above 25 NB and up to 125 NB : 50 mm thick insulation
 - Pipe diameter 150 NB : 75 mm thick insulation
- All exposed roof in AC areas/AHU/PAC rooms shall be insulated on under side by 50 mm thick insulation by bidder.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage-V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 9 OF 28

4.8 **Pressure gauges ***

Direct reading, pipe mounted Dial type Pressure gauges with Six (6) inch phenolic dial (White dial with black numerals) will have to be provided at :

- One (1) each at Suction and discharge side of each pump set.
- One (1) each at chilled water inlet and outlet of each AHU.
- One (1) each at chilled water inlet and outlet of each chilling unit.
- One (1) each at condenser water inlet and outlet of each chilling unit.

4.9 **Temperature gauges* / Stem type thermometer***

Direct reading, field mounted Six (6) inch dial (White dial with black numerals) temperature gauge will have to be provided at :

- One (1) each at chilled water inlet and outlet of each chilling unit.
- One (1) each at condenser water inlet and outlet of each chilling unit.
- One (1) each at condenser water inlet and outlet of each cooling tower.
- Steam type thermometer at chilled water inlet and outlet of each AHU.
- Steam type thermometer at condenser water inlet and outlet of each PAC.

* - The quantity may vary depends on the requirement.

4.10 **Fresh air unit**

One (1) no. Fresh air unit each for separate AHU room supplies fresh air to the AHU room and is located in the AHU room. Each fresh air unit shall comprise of :

- One (1) no. Tube axial fan with motor
- Pre filter with HDPE media having 18 G GSS frame. The efficiency of the filters shall be 90% down to 10 microns. Maximum Velocity across pre filter 1.75 m/s.
- Fine filter with HDPE media having 18 G GSS frame. The efficiency of the filters shall be 99% down to 5 microns. Maximum Velocity across Fine filter 1.25 m/s.
- Fresh air Louver, Volume control damper and connecting duct.

4.11 **Louvers / Wall Cowl with bird screen**

Louver / Wall Cowl with bird screen shall be provided for supply air inlet and for exhaust with Tube Axial fans. The louvers shall consist of parallel metallic blades. For louvers, the minimum projected width of blades in horizontal plane shall be 150mm with the blades inclined at minimum 35 degrees. Design face velocity for louvers is 2.5 m/s.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 10 OF 28

Bird screen of 10 sq.mm and minimum 16 G wire mesh is to be provided on the outer face of Louvers.

4.12 **Expansion tank**

MS expansion tank insulated complete with vent, make-up water connection, overflow and drain line.

4.13 **Direct Expansion System (DX System)**

Independent central air conditioning system of direct expansion (DX) type with Screw compressor has to be considered as an alternative if the resulting TR is very high and cannot be met by using package units for the following areas.

- i. ESP control room
- ii. DM plant control Room and Chemical Lab
- iii. Coal handling system control room
- iv. Ash handling system control room
- v. Switchyard control room

The water cooled condensing unit along with the condenser cooling water pumps and cooling towers shall be provided. The number of condenser cooling water pumps, cooling towers shall be equal to the number of condensing units. The number of condensing units shall be decided by the Contractor. In addition, one common standby condensing unit and the associated equipment shall be provided. The air conditioning system shall also include adequate number of air handling units, associated air distribution system, condenser water piping, valves and fittings, insulation, strip heaters, humidifier and all other accessories and controls. A central control panel within air conditioning plant room is to be provided. Local control panel for individual AHU rooms and other areas to be provided. Make up water from water softening plant (Ion exchange type) for the condenser cooling water system to be provided at the air conditioning cooling towers as per required pressure and flow. Fresh air system shall be provided in all the AHU rooms.

- a. The air handling units shall be draw through type and casing shall be of double skin construction. Fans shall be double width double inlet (DWDI) centrifugal type. Fans shall have forward or backward curved blades. The cooling coil face air velocity shall not exceed 2.5 m/sec.
- b. Strip heaters of suitable capacity with controls shall be provided in the supply air duct plenum.
- c. Humidification package with all necessary controls.
- d. Air distribution system including ducting, grills, diffusers fresh air unit, fire dampers, volume control dampers, thermal and acoustic insulation for ducts and accessories.
- e. Monorail and hoist for handling the A/C units, pumps, etc.
- f. Safety and protective devices as specified.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 11 OF 28

- g. The condensing plant and pumps shall be located in a separate room and the A/C plant room layout shall be made such that adequate space is provided for maintenance of condensing units, pumps etc.

5.0 **CONTROL PHILOSOPHY FOR AC SYSTEM**

- 5.1 Separate PLC based control system is envisaged for AC plant in TG building and AC plant in ESP building also the interface connection for monitoring all the PLC shall be provided to DCS.
- 5.2 One collective fault signal from each AC plant control system shall be hardwired to DDCMIS for annunciation in UCR.
- 5.3 All operations are to be performed by the operator, control system will take care of safety and protection interlocks.
- 5.4 Description of control system for each AC plant :
- 5.4.1 PLC based local control system shall be provided for the operation and control of following AC plant auxiliaries:
- Chiller water pumps
 - Condenser water pumps
 - AHU
 - Fresh air fan
 - Temperature and humidity control inside A/C area.
- 5.4.2 The control system will consist of necessary operating and safety controls, pushbuttons, indicating lamps, annunciator for annunciating trip of each auxiliary in AC plant etc.
- 5.4.3 All auxiliaries mentioned above can be operated from the control panel, in addition each drive shall be provided with local push button station for start & stop, the stop push button shall be lockable.
- 5.4.4 Each Chiller unit shall have its own skid mounted microprocessor based control system. It consists of unit-mounted starter, crankcase heater, automatic capacity control etc. This integral control system shall have following minimum protective cut outs :
- HP/LP cut outs
 - Oil pressure failure switch
 - Antifreeze thermostat
 - Water flow switch at the outlet of condenser and chiller.
 - Any other control recommended by the vendor.
- 5.5 Chiller control system will be complete with instruments and cabling to perform above functions.
- 5.6 Chiller control system shall have necessary signal exchange with AC plant control panel to build required safety interlocks.
- 5.7 Chiller unit can not be started unless chiller water pump, condenser water pump, and AHU are started.
- 5.8 Each AHU shall be provided by PLC based local control panel which shall be suitably interfaced with A/C Plant main control panel.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 12 OF 28

- 5.9 A/C Plant room main control panel shall accept fire alarm signal from fire detection system and shall trip all A/C plant on fire alarm and shall close fire dampers.
- 5.10 Fire damper controls shall be implemented in AHU local control panel. Fire damper position shall be indicated on LCP with the help of limit switches.

6.0 **MATERIAL OF CONSTRUCTION**

6.1 **Chilling Unit:**

- Shell - condenser : Carbon steel
- Shell – cooler : Carbon steel
- End Cover : Carbon steel
- Tube sheets : Carbon steel
- Tubes : Seamless copper

6.2 **Air Handling Unit:**

- AHU casing : 1.2 mm thick GSS
- Cooling coil : Copper tube and Aluminium fins
- Fan casing : Galvanized steel
- Fan shaft : EN 8

6.3 **Centrifugal Pump Set:**

- Casing : Cast iron, IS:210 Gr. FG 260
- Impeller : Bronze IS 318 Gr 2
- Shaft : EN 8
- Base plate : Fabricated MS

6.4 **Cooling Tower:**

- Casing : FRP
- Air inlet Louver : FRP / HDGS
- Fill : PVC
- Nozzles : Bronze/Polypropylene
- Cold water basin : FRP

6.5 **Air Distribution system:**

- Ducting : GSS Zinc coating 200gms /sq.m or better
- Diffuser : Aluminium powder coated
- Grille : Aluminium powder coated
- Volume control damper blade & frame : 18 G GSS
- Fire damper blades and frame : 16 G GSS
- Louver Frame : 16 G GSS
- Louver Blade : 20 G GSS

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 13 OF 28

6.6 **Piping and Valves:**

- Pipe sizes up to 150 NB : ERW, Black, IS-1239 heavy class
- Pipe sizes 200 NB to 450 NB : ERW, IS 3589 fabricated from IS 2062 plates
- Valves 50 NB and Below : Gun metal construction or Bronze
- Valves above 50 NB : Cast Iron, IS 210 Gr FG 260

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 14 OF 28

APPENDIX - I *

***- A/C LOAD BREAK-UP (To be furnished by the bidder)**

SL No	Name of the Area	Area(ft2)	TR	CFM
1	Main control room comprising the below(TG building) to be air conditioned by Chilled water plant		Based on Summer conditions	
1.1	Unit control room (common for both units)			
1.2	Electronic cubicle room			
1.3	Shift in charge engineers room			
1.4	Maintenance engineers room			
1.5	Printer room			
1.6	Conference room			
1.7	Analyser room			
	Total			
2	Air cooled Split A/Cs (As required, each 2 TR)			
2.1	Miscellaneous offices / work spaces			
3	A separate direct expansion plant OR package units will be provided for the following areas			
3.1	DM Plant Control room & Chemical lab			
3.2	Coal handling system control room			
3.3	Ash handling system control room			
3.4	Switchyard control room.			
3.5	All PLC rooms			
4	Screw chiller/Packaged air conditioner shall be provided for the following buildings / areas :			
4.1	Administration Building			
4.2	Service Building			
4.3	Chemical House (PT Plant)			
4.4	Conference Rooms			
4.5	ESP Control room			
	Note			
1	The bidder shall indicate the capacity of strip heaters and humidifier for winter heating.			

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 15 OF 28

APPENDIX - II

BUILDING CONSTRUCTION DETAILS *

SL.NO.	ITEM	CONSTRUCTION
1.0	Roof (*) Cast in-situ Roof	150 mm thick RCC +50 mm to 100 mm screed + water proofing
2.0	a) Floor (RCC) b) Floor in station building (steel beams with RC floor)	150 mm thick RCC + 50 mm thick floor finish. 150 mm thick RCC + 50 mm thick floor finish.
3.0	Outside walls	230 mm thick brick wall + 13 mm thick inside plaster + 20 mm thick outside plaster
4.0	Glass for window and partition (except unit control room)	Single sheet plain glass 6 mm thick
5.0	Glass for unit control room (partitions)	Double plate glass 6 mm thick towards facing T.G hall for unit control room area and single sheet plain glass 6 mm thick for other partitions.

(*) Considered in the calculation of A/C load/ bidder to confirm.

Roof of all AC areas and AHU rooms / PAC Plant rooms will be insulated on the underside by 50 mm thick standard thermal insulation. The under deck insulation of exposed roof slab is to be carried out by civil contractor.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 16 OF 28

VENTILATION SYSTEM

1.0 AREAS TO BE VENTILATED

1.1.1 TG Building and TG MCC room

Evaporative cooling ventilation system for the Turbine building. The inside temperature shall be 5°C to 6°C less than ambient dry bulb temperature during peak summer considering all heat loads.

1.1.2 ESP Switchgear room

For the ventilation of ESP switchgear room, unitary air filtration unit is envisaged. The inside temperature shall be 5°C to 6°C less than the ambient dry bulb temperature during peak summer considering all heat loads.

1.1.3 Ventilation of other areas: The following areas are proposed to be ventilated by dry ventilation.

- (a) D. M. Plant, CPU regeneration building, PT plant buildings
- (b) C. W pump house
- (c) River and Plant Raw water pump house
- (d) Service & Administration building (other than AC areas)
- (e) Air compressor room
- (f) AC plant room
- (g) D.G set room
- (h) Battery and battery charger rooms
- (i) Security & time house
- (j) Canteen
- (k) All other MCC rooms & cable vaults
- (l) All toilets
- (m) Stores
- (n) Fuel oil pump house, LDO/HFO unloading pump house
- (o) Ash water and slurry pump houses
- (p) Clarified water pump houses & Filtered water pump houses

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 17 OF 28

(q) Coal handling Switch gear room

(r) Elevator machine room

(s) All other areas not air conditioned

(i) For all the above mentioned areas, the supply air fans/louvers and exhaust air fans/roof extractors or combination shall be provided. The ventilation system for each area shall be sized based on either air flow rate calculated considering a room temperature of 3⁰C (Maximum) above ambient DBT during peak summer considering all heat loads or air flow rate calculated considering minimum number of air changes / hour as mentioned else where in the document, whichever results in higher air flow rate shall be considered.

(t) Blowdown pump house

1.2 The following are the various Input data considered in the design of Ventilation system:

1.2.1 Outside design conditions (sourced from the ISHRAE 1997 Handbook):

	DRY BULB TEMPERATURE *	WET BULB TEMPERATURE *
SUMMER	45 ⁰ C	23.9 ⁰ C
MONSOON	37.2 ⁰ C	26.7 ⁰ C
WINTER	7.2 ⁰ C	5 ⁰ C

* Bidder to consider the latest prevailing outside design condition for preparation of heat load estimation.

2.0 REFERENCE CODES AND STANDARDS

All materials and equipments provided shall comply with the following Indian Standards

IS 277	Galvanised Steel Sheets
IS 325	Three phase induction motors
IS 655	Metal Air ducts
IS 7613	Method of testing panel type air filters for air conditioning and Ventilation process.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 18 OF 28

IS 2312	Propeller type AC ventilation fans
IS 3588	Electric axial fans
IS 4894	Centrifugal fans
UL 555	Fire dampers
IS 7098 Part-1	Power cables
IS 1554 Part-1	Control cables
IS 4237	MCC
IS 6875	PB Stations
Control panel	Individual electrical components conform to respective IS

3.0 **DESCRIPTION OF THE SYSTEMS**

- a) Four (4) nos. (2 nos per TG building) suitable capacity and minimum of 70 mm WC static pressure Evaporative cooling system for Ventilation of TG building and TG MCC room, switch gear, cable vault shall to be provided.
- b) One (1) no. Suitable capacity and minimum of 50 mm static pressure capacity Evaporative cooling system with Unitary Air Filtration Unit for Ventilation of ESP switch gear room and Cable spreader room is to be provided.
- c) Ambient Air Ventilation (Dry) system for Miscellaneous areas.

3.1 **Evaporative Cooling System for T G Building, Cable vault, switch gear and MCC room of Power house building**

In this system, fresh filtered air is drawn through air washers and evaporatively cooled before being supplied through the supply air distribution system. The filtered air while passing through the air washers would be cooled and humidified. This cooled and humidified air is distributed by Air washer fan to different parts of the Station building through ducting would absorb the prevailing internal heat load due to equipment, piping etc. before being exhausted. Four (4) nos. of adequate capacity Spray/ Pad type air washer are to be proposed for ventilation of TG building including electrical bay, cable gallery and Switch gear rooms. For all the evaporative cooled areas the air quantity shall be based on the following Air changes per hour or heat loads whichever is higher.

- a) TG hall - 8 Air changes / Hr
- b) Electrical switchgear/MCC/Cable vaults - 15 Air changes / Hr

The system comprises of the following equipment :

- a) Four (4) nos. air washer unit each of suitable capacity. (2 nos per TG building)
- b) Each air washer comprising Two (2) no. Double Inlet Double Width (DIDW)

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 19 OF 28

type centrifugal fan of suitable capacity and minimum 70 mm WC static pressure, Two (2) nos (1 Operating and 1 standby) circulating water pumps of Horizontal split casing type / End suction top discharge type, each of adequate capacity.

- c) Spray / Pad type Air washers with water distribution arrangement etc.
- d) Pre filter with HDPE media having 18 G GSS frame. The efficiency of the filters shall be 90% down to 10 microns.
- e) Inlet louvers and bird screen.
- f) Air distribution system comprising of GSS ducting, dampers, Grilles etc
- g) Suitable nos. of (for both TG buildings) Motor Driven Roof Extractors/ Wind Driven Turbo ventilators each of suitable capacity and minimum 15 mm static pressure mounted on TG hall roof for exhausting the hot and ventilated air.
- h) Necessary blow down/makeup arrangement to ensure proper water quality.
- i) Suitable nos with (for both TG buildings) adequate capacity and minimum 15 mm static pressure power Roof Ventilators mounted on TG hall roof for Exhausting the hot and ventilated air from TG hall. The hot air from Cable Gallery and Switchgear room is taken to the TG hall through Gravity dampers. Propeller fans of suitable capacity may be added to improve the performance if Required.

3.2 **Unitary Air Filtration (UAF) Unit for Non A/C Areas of ESP Control Building**

UAF unit shall consist of intake louvers, filters, Evaporative cooling pads, sump tank, circulating water pumps, piping and valves, eliminators, centrifugal fans, outlet damper and plenum section. The entire components stated above shall be neatly arranged and skid mounted and provided with GI sheet enclosure of adequate thickness. Each section i.e., filters, Evaporative cooling pad and pump section etc. to be provided with access door for maintenance, fans and all other components shall be supported on properly designed beams/l sections. For the fan discharge duct as well as fan section accordingly sizing to be done on the inside so as to limit the noise level to 85dB within 1 m of the fan room enclosure. On the whole the assembly of UAF should be designed so as to be structurally sound, air tight and also aesthetically pleasing.

In this system, fresh filtered air is drawn through UAF and evaporatively cooled before being supplied through the supply air distribution system. The filtered air while passing through the air washers shall be cooled and humidified to minimum 70% saturation efficiency. This cooled and humidified air when supplied to Switch gear area would absorb the prevailing internal heat load due to equipment before being exhausted. One (1) no. Suitable capacity UAF are to be proposed for ventilation of ESP / VFD control building Non A/C areas.

The hot air from the of ESP control building Non A/C areas shall be exhausted by means of gravity dampers.

The system comprises of the following equipments :

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 20 OF 28

j) One (1) no. UAF unit of suitable capacity and minimum 50-mm static pressure complete with all components and accessories with the entire components neatly arranged and skid mounted and provided with GI sheet enclosure of adequate thickness.

k) Packaged air washer unit comprises of One (1) no. Double Inlet Double Width (DIDW) / Single Inlet Single Width (SISW) type centrifugal fan of suitable capacity, Two (2) nos (1 Operating and 1 standby) circulating water pumps of Horizontal split casing type / End suction top discharge type, each of adequate capacity, Evaporative cooling pads, piping, valves, Pre filter with HDPE media and efficiency 90% down to 10 microns, Inlet louvers, Drift eliminators and bird screen.

3.3 **Ambient Air Ventilation (DRY) System for Miscellaneous Areas**

3.3.1 For Ventilation of other miscellaneous areas, the ambient Mechanical Ventilation (dry) system shall be designed to maintain Dry bulb temperature not exceeding 3 °C above ambient dry bulb temperature in peak summer. The air quantity shall be arrived based on number of air-changes/hr, or heat loads whichever results in higher air flow rate as indicated below.

- DG house: 40 air-changes/hr.
- Switch gear room & cable volt room: 25 air-changes/hr.
- All other areas 15 air-changes/hr.

3.3.2 All other areas as mentioned in clause 1.1.3, shall be provided with supply system comprising supply air fans or supply air intake louvers (without fan) and exhaust system comprising wall mounted exhaust fans OR roof extractors mounted on the roof of the respective building, depending upon the layout of the building. The type of system is detailed under Appendix-III.

3.3.3 For Battery rooms, air intake is through louvers and exhaust by means of 20G MS Epoxy painted ducted exhaust by exhaust fans shall be provided. Higher exhaust air flow rates compared to supply air flow rate shall be maintained within the Battery room to maintain negative pressure. All fans, motors, ducting and grilles in this area shall be given acid proof treatment and epoxy painted. The fans shall be of anti spark construction with flame proof motors. Each battery room shall be provided with 2 nos. exhaust fan each of 50% capacity.

3.3.4 Pressurised Ventilation for Switchgear rooms / MCC rooms & cable gallery: Filtered air is supplied to Switchgear rooms / MCC rooms through ducting and grilles by means of supply air fan and the air is exhausted through gravity dampers, propeller fans of suitable capacity will be added if necessary. Supply air shall be higher than exhaust air to maintain positive pressure in side.

3.3.5 For elevator machine room, filtered air shall be supplied by supply air fan. Exhaust shall be through gravity dampers.

ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 21 OF 28

4.0 **EQUIPMENT TO BE SUPPLIED**

4.1 **Air Washer for TG Building**

Design wet bulb temperature : 26.7 °C

Saturation efficiency: 90%

Each Air washer comprises of the following :

- a) Two (2) no. (2x50% capacity) Double Inlet Double Width (DIDW) type centrifugal fan of suitable capacity and complete with drive package and motor.
- b) Two (2) nos (1 Operating and 1 standby) circulating water pumps of Horizontal split casing type, each of adequate capacity
- c) Spray chamber with double banks spray nozzles, flooding nozzles, distribution plates, moisture eliminator assembly, etc.
- d) Pre filter with HDPE filter media
- e) Inlet louvers with bird screen.
- f) Sump complete with make-up connection, over flow connection, drain connection and water level switch.
- g) Controls comprising the following:
 - Sump Level switch, to trip pump at low water level in the sump.

4.2 **Unitary Air Filtration Unit (UAF)**

Design wet bulb temperature : 26.7 °C

Minimum Saturation efficiency: 70%

The UAF comprises of the following :

- a) One (1) no. DIDW / SISW type centrifugal fan of capacity suitable capacity and complete with drive package and motor.
- b) Two (2) nos (1 Operating and 1 standby) circulating water pumps of each of adequate capacity
- c) Evaporative cooling Pad with water distribution arrangement etc.
- d) Pre filter with HDPE filter media.
- e) Inlet louvers and bird screen.
- f) Sump complete with make-up connection, over flow connection, drain connection and water level switch.
- g) Controls comprising the following:

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 22 OF 28

- Sump Level switch, to trip pump at low water level in the sump.

4.3 **Centrifugal water pump set**

The centrifugal pump set will be Horizontal split casing / End suction top discharge centrifugal pump set and each centrifugal water pump set shall comprise of the following :

- One (1) no. Horizontal split casing centrifugal pump.
- One (1) no. adequately sized Induction motor suitable for 415 V, 3 phase, 50 Hz supply.
- One (1) set of base plate, coupling guard, anti vibration pads and foundation bolts.
- Flexible connection between pump and piping.
- Drain piping from pump to nearest floor drain

4.4 **Centrifugal Fan**

The centrifugal fan shall be designed for :

- Fan RPM : Not exceeding 1000 RPM
- Fan type : Backward curved DIDW / SISW
- Fan outlet Velocity: Not exceeding 12 m/s.

Each centrifugal fan comprises of :

- One (1) no. adequately sized Induction motor suitable for 415 V, 3 phase, 50 Hz supply with drive package comprising of fan pulley and V-belt.
- Common base frame with spring type vibration isolators.
- Inlet guard, outlet damper and flexible connection between duct and fan

4.5 **Axial fan**

The Axial fan shall be designed for :

- Fan type: Tube Axial / Propeller.
- The impeller shall have blades of an aerofoil design.
- The speed of the fans shall be 1500 rpm for impeller diameter 450 mm or less and 1000 rpm for impeller diameter above 450 mm.

Axial fans will be of propeller type, for fans with 5 mm of wc fan static pressure and Tube Axial type for fans with static pressure above 5 mm of wc.

Each Axial fan comprises of fan, fan motor, inlet and outlet cone (for Tube axial), Louvered shutter (exhaust fans), bird screen and supporting arrangement.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 23 OF 28

4.6 **Power Roof Extractor**

The Power Roof Extractor shall be designed for :

- i) Fan type : Tube Axial
- ii) The impeller shall have blades of an airfoil design
- i) The speed of the fans shall be 1500 rpm for impeller diameter 450 mm or less and 1000 rpm for impeller diameter above 450 mm.
- ii) Hood shall be hinged type.

Each Power Roof Extractor comprises of fan, fan motor, hood with disconnect switch and supporting arrangement.

4.7 **Air distribution system**

- a) Rectangular Duct: GSS supply air ducting and return air ducting with Zinc coating 200 Gms /sq.m or better.
- b) The supply air ducting will be designed based on equal friction method to have an initial velocity not exceeding 11 m/s and friction rate 0.8 Pa/m.
- c) The exhaust air ducting will be designed based on equal friction method to have an initial velocity not exceeding 9 m/s and friction rate 0.66 Pa/m.
- d) Supply air grilles will be with volume control damper
- e) Return air grilles will be without volume control damper
- f) Neck velocity for supply air grille and return air grille shall be 2.5 m/s (max).
- g) Fusible link type fire dampers shall be provided in the supply air ventilation duct and return air ventilation duct crossing wall / floor.

4.8 **Piping and Valves**

- a) Piping shall be
 - ERW, Black, IS-1239 heavy class for pipe sizes up to 150 NB
 - ERW, IS 3589 fabricated from IS 2062 plates for pipe sizes 200 NB-450 NB
- b) Isolating valves will be butterfly valve type for valve size 50 NB and above.
- c) Isolating valves will be Gate valve type for valve size below 50 NB.
- d) Strainers will be Pot strainer type
- e) Air washer circulating water piping shall be designed such that, for pipe sizes of 50 NB and under, maximum velocity is 1.2 m/s and friction rate is not exceeding 250 Pa/m. For pipe sizes above 50 NB, maximum velocity is 3 m/s and friction rate is not exceeding 400 Pa/m.

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 24 OF 28

f) Isolating valves will be provided at inlet and outlet piping of pumps.

g) Strainers will be provided at the inlet piping to pump.

h) Non return valves will be provided at the outlet of Pumps.

4.9 **Pressure gauge**

Direct reading, pipe mounted Dial type Pressure gauges with Six (6) inch phenolic dial (White dial with black numerals) and will be provided at One each at Suction and discharge side of the pump set.

4.10 **Temperature gauge**

Direct reading, field mounted Six (6) inch dial (White dial with black numerals) temperature gauge and will be provided at Air washer circulating water pump discharge header.

4.11 **Louvers / Wall Cowl with bird screen**

Louver / Wall Cowl with bird screen will be provided for supply air inlet and for exhaust with Tube Axial fans. The louvers shall consist of parallel metallic blades. For louvers, the minimum projected width of blades in horizontal plane shall be 150mm with the blades inclined at minimum 35 degrees. Design face velocity for louvers is 2.5 m/s.

Bird screen of 10 sq.mm and minimum 16 G wire mesh is provided on the outer face of Louvers.

5.0 **CONTROL PHILOSOPHY FOR VENTILATION SYSTEM**

5.1 PLC based control system shall be envisaged for air washers ventilation system. All the air washers PLC shall be interfaced with the main control system for monitoring.

5.2 Following control function are to be proposed :

5.2.1 Tripping of Air washer circulating water pumps at low water level in the air washer sump.

5.2.2 Annunciation on the status of Run/trip status of Air washer pumps and Air washer fans.

5.2.3 Air washer pump and fan shall be provided with local lockable start/stop push button.

5.2.4 Air washer shall be interlocked with fire protection system to trip under fire condition and associated solenoid operated fire dampers shall close

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 25 OF 28

6.0 MATERIAL OF CONSTRUCTION

6.1 Air Washer Internals

- Evaporative pad : Cellulose material chemically treated for antiriot and rigidifying resins.
- Evaporative pad casing : GSS or Fibre Reinforced Plastic
- Suction screen : 24 G brass

6.2 Centrifugal Pump Set:

- Casing : Cast iron, IS:210 Gr. FG 260
- Impeller : Bronze IS 318 Gr 2
- Shaft : EN 8
- Base plate : Fabricated MS

6.3 Air Distribution system:

- Ducting : GSS Zinc coating 200 gms /sq.m or better
- Grille : MS painted complete with supporting framework.
- Volume control damper blade & frame : 18 G GSS
- Fire damper blades and frame : 16 G GSS
- Louver Frame : 16 G GSS
- Louver Blade : 20 G GSS

6.4 Piping and Valves:

- Pipe sizes up to 150 NB : ERW, Black, IS-1239 heavy class
- Pipe sizes 200 NB to 450 NB : ERW, IS 3589 fabricated from IS 2062 plates
- Valves 50 NB and Below : Gun metal construction or Bronze
- Valves above 50 NB : Cast Iron, IS 210 Gr FG 260

6.5 Centrifugal Fan:

- Casing : Mild steel sheets / plate to IS 2062
- Impeller : Mild steel sheets / plate to IS 2062
- Shaft : EN 8
- Outlet damper : GSS
- Fan supports, frames and structure : Mild steel plate to IS 2062

6.6 Axial Fan:

- Casing : Mild steel plate to IS 2062
- Impeller : Cast Aluminium
- Shaft : EN 8
- Inlet Cone / Outlet cone : Mild steel

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 26 OF 28

6.7 **Roof Extractor:**

- Casing : Mild steel plate to IS 2062
- Impeller : Cast Aluminium
- Shaft : EN 8
- Hood : MS

6.8 **Pre filter & Fine Filter:**

- Filter Media : High Density Poly ethylene (HDPE)
media.
- Frame : 18 G GSS

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 27 OF 28

(APPENDIX III)

The type of Ventilation system to be provided

SL.NO	NAME OF AREA	TYPE OF VENTILATION SYSTEM	SUPPLY AIR SYSTEM	EXHAUST AIR SYSTEM
1	TG Building	Evaporative cooling system	From Air washer through ducting	Roof extractors / exhaust fans
2	Cable gallery and switch gear room of TG building	Evaporative cooling system	From Air washer through ducting	Gravity dampers/propeller fans
3	Non AC areas of ESP control room	Evaporative cooling system	From Unitary air filters through ducting	Gravity dampers
4	DM plant	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
5	C W Pump House	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
6	River and Raw water pump house	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
7	Administration building	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
8	Air compressor room	Ambient Air Ventilation (DRY) System	Filtered air supplied by supply air fan	Gravity dampers
9	AC plant room	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
10	D.G set room	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans / Roof extractors
11	Battery and battery charger rooms	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans with ducting
12	Security and time house	Ambient Air Ventilation (DRY) System	Fresh air through door Louvers/door under cuts	Exhaust fans
13	Canteen	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D12
PART – B	RRVUNL, 2x660 MW, Super-Critical TPS, Stage–V Unit # 7 & 8 at Suratgarh, Rajasthan AIR-CONDITIONING & VENTILATION	SHEET 28 OF 28

14	All MCC room & cable vaults	Ambient Air Ventilation (DRY) System	Filtered air supplied by supply air fan	Gravity dampers
15	Toilets of all buildings	Ambient Air Ventilation (DRY) System	Through door undercuts/door louvers	Exhaust fans
16	Stores	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
17	Fuel oil pump house, LDO/HFO	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
18	Ash water pump house, Slurry pump house	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
19	Clarified / Filtered water pump house	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans
20	Coal handling Switch gear room	Ambient Air Ventilation (DRY) System	Filtered air supplied by supply air fan	Gravity dampers
21	Elevator machine room	Ambient Air Ventilation (DRY) System	Filtered air supplied by supply air fan	Gravity dampers
22	Blow down pump house	Ambient Air Ventilation (DRY) System	Fresh air through Louvers	Exhaust fans

ISSUE
R1

D13

EMERGENCY DG SET

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EMERGENCY DIESEL GENERATOR SETS	SHEET 1 OF 5
1.0 <u>SCOPE</u> Contractor's scope includes THREE NOS emergency diesel generator sets. (1 working for each unit and 1 common standby for both units) Scope of the diesel generator set generally covers the following: - 1.1 Diesel engine with all engine mounted accessories 1.2 Alternator rated for 415V, 3 phase, 3 wire, 50 Hz supply 1.3 Intake air system 1.4 Exhaust system with insulation for exhaust pipe and stack 1.5 Radiator cooled jacket water system for engine cooling and lube oil cooling. 1.6 Fuel oil system 1.7 Electrical starting system for the engine suitable for 5 (five) starts in quick succession. 1.8 Instrumentation system including engine and generator protection system 1.9 Complete piping, valves, fittings and specialties for fuel oil, lube oil, cooling water, intake air and exhaust system 1.10 All foundation channels, bolts, anchors, shims, resilient mounting pads. 1.11 Structural supports with anchors, platforms, ladders, handrails and isolators, resilient supports from the building / building structures for prevention of vibration transmission. 1.12 Electrical system complete with neutral grounding equipment, engine and generator protection and control panel, synchronising panel, automatic voltage regulator and AMF panel. (The equipment / meters pertaining to control, protection, synchronising, AVR etc. may be located in the AMF panel). 1.13 415V, 3 phase, 3 wire motor control centre and local push button stations. 2.0 <u>SPECIFIC REQUIREMENTS</u>		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EMERGENCY DIESEL GENERATOR SETS	SHEET 2 OF 5
The DG set shall start automatically upon loss of normal AC power and after an adjustable time delay. DG shall be capable of going from cold condition reaching synchronous speed and rated voltage in 15 seconds from the start impulse, then the DG shall take full rated load within 30 seconds without undue vibration and over-heating of the engine. The DG circuit breaker will automatically close to energise the essential loads which shall start automatically. 2.1 Automatic Mains Failure (AMF) panel for the DG set shall be completely pre-wired, comprising controls, relays, instruments, annunciations, wiring etc. as indicated below: - 2.1.1 Three (3) ammeters 2.1.2 One (1) voltmeter with selector switch 2.1.3 One (1) wattmeter to read three phase power 2.1.4 One (1) frequency meter 45 – 55 Hz 2.1.5 One (1) kilowatt hour meter 2.1.6 One (1) DC voltmeter for field voltage 2.1.7 One (1) DC ammeter with shunt for field current 2.1.8 One (1) control switch, impulse contacts spring return to centre for closing and opening the diesel generator breaker located in the normal emergency switchgear. 2.1.9 Two (2) cluster LED type-indicating lamps for indication of diesel generator breaker close (red) and open (green). 2.1.10 Two (2) control switches as above for raise / lower of the voltage and frequency / load of the unit. 2.1.11 One (1) synchronising switch, two position, 12-ways, stay-put type 2.1.12 One (1) set synchronising equipment as listed below for paralleling the DG set with plant power supply. One (1) rotary synchroscope One (1) double frequency meter of range 47-52 Hz One (1) double AC voltmeter of range 0-500 volts Two (2) lamps 2.1.13 Two (2) push buttons for starting and stopping the D.G set.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EMERGENCY DIESEL GENERATOR SETS	SHEET 3 OF 5
2.1.14 Single-phase voltage transformers 415 / 110V, Class 1.0, mounted in the AMF panel shall cater to the VA burden of the voltmeter, frequency meter, watt-hour meter, wattmeter and synchronising equipment mounted on AMF panel and voltmeter on the remote control panel. The VT bank shall be connected star/star with Y-phase earthed on the secondary side. The over voltage factor shall be 1.2 continuous and 1.9 for 8 hours. 2.1.15 Generator voltage regulator, field breaker and field discharge resistor with associated control switches and indicating lamps. This may be provided in separate machine cubicles to be mounted alongside the control panels. Spare hot – standby AVR shall also be provided. 2.1.16 One (1) set of facia type audio type window annunciators with 3 push buttons for “acknowledge”, “Reset” and “Lamp Test”. 2.1.17 One (1) set of auxiliary relays as required for functional requirements. 2.1.18 The Contractor shall make necessary provisions on the AMF panel for the following indications / measurements and such meters shall be available at the remote control panel. (a) Voltmeter with selector switch for generator terminal voltage (b) Diesel Generator Trouble annunciation, i.e., annunciation for the complete group of troubles (c) Diesel Generator Autotrip annunciation. Annunciation for the complete group of trips Note: Annunciation contacts to be rated for 220 V DC. 2.1.19 Current transformers, for purposes of protection shall be mounted on the generator neutral side leads and before formation of neutral. The CT primary shall not be less than 120 percent of the generator rated current. Separate current transformers shall be provided for metering & protection. 2.1.20 Push buttons for operation of DG set auxiliaries 2.1.21 Indicators for lube oil pressure and temperature, engine jacket water temperature, etc. 2.2 The diesel generators shall be provided with the following protection: 2.2.1 Over-current protection 2.2.2 Ground over-current protection 2.2.3 Engine over-speed protection		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EMERGENCY DIESEL GENERATOR SETS	SHEET 4 OF 5
2.2.4 Generator differential protection 2.2.5 Reverse power protection 2.2.6 RKVAR protection. 2.2.7 Under frequency protection. 2.2.8 Over voltage protection. 2.2.9 Lockout relays along with their supervision relays & under voltage protection relays 2.3 The neutral point shall be earthed through a suitable neutral resistor & isolator. 2.4 Battery of adequate rating suitable for 5 (five) successive quick starts with associated battery charger for black start of the diesel generator. 2.5 The Emergency Diesel Generator sets and accessories shall be capable of closely maintaining the voltage and frequency, as specified from no-load to full load. 2.6 The characteristics of the engine governing and the generator excitation system shall be such as to permit the following operations satisfactorily: Starting and running of the largest connected squirrel cage induction motor (rating to be finalised by the Contractor) connected to the 415V emergency bus (for which the EDG set is the source of supply) without exceeding the permissible voltage (15%) and frequency dips on the 415V emergency bus when all other connected running loads on the bus are in service and also when the EDG set is running at no-load. 2.7 <u>DG Sizing</u> 2.7.1 The diesel generator provided (to cater to the 415V emergency power supply during the failure of Normal AC supply) shall be sized to cater to the emergency loads such as AC lube oil pump for turbine generator, Turbine lube oil pumps, jacking oil pumps, main steam stop valves, scanner air fan, HP/LP by-pass supply unit, Oil vapour extractor unit, Station EOT crane, DG set auxiliaries, UPS system rectifier / chargers, turning gear, generator seal oil pumps, Unit / station battery chargers, scanner air fans, APH drive motor and its lube oil system, emergency AC lighting, telephone system rectifies / charger etc. 2.7.2 The capacity shall be estimated considering suitable load factor and power factor with a maximum of 0.8 and 0.8 respectively.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan EMERGENCY DIESEL GENERATOR SETS	SHEET 5 OF 5
3.0 <u>SPECIAL PERFORMANCE REQUIREMENTS</u> 3.1 The DG set shall be capable for start up from cold condition reaching synchronous speed and rated voltage in 15 seconds from the start impulse. The DG set thereafter shall also be capable for taking the full rated load, within 30 seconds, without undue vibration and overheating of the engine. 3.2 The DG sets shall be suitable for parallel operation with the 415V auxiliary system. Necessary protection as required shall be provided to ensure satisfactory parallel operation. 3.3 The maximum permissible voltage and frequency variations of output supply for the DG set shall be limited to + 10 percent and - 5 percent respectively and combined voltage and frequency fluctuation of 10 percent. 3.4 Facilities shall be provided to start manually the DG set for test purposes from unit control room which will however be not connected to the emergency switchgear at the time, with the generator breaker in open position. 3.5 Stack height of DG sets = Height of building + 0.2 square root of KVA rating of DG sets. 3.6 Air emission standards as per latest MOEF norms. 4.0 LAYOUT REQUIREMENTS • Acoustic enclosure (NEMA 1) / MOEF with screens shall be provided to reduce noise level. • Space requirements and clearances around the equipment shall allow adequate air circulation, operation, inspection and maintenance of equipment. A minimum of 1500 mm clearance shall be provided around each DG set. 5.0 FUEL – The DG engine shall be capable of operating at rated load on HSD as per IS 1460: 1995. The day tank shall be of carbon steel and the piping shall be of ASTM A53 Grade B material.		
		ISSUE R1

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME: III	
TCE.5750A-500-H-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D13	
PART B		DATASHEET A		SHEET 1 OF 3	
EMERGENCY DIESEL GENERATOR					
SL. NO.	ITEM		UNIT		

1.0	Fuel		HSD as per IS – 1460: 1995
2.0	Design Data		
2.1	Operating Speed	RPM	Not to exceed 1500 rpm
2.2	Overload capability for 1 hour in 12 consecutive hours operation	%	10
2.3	Generator Data		
2.3.1	Power supply		415V, 50 Hz, 3 Phase
2.3.2	Winding connection		Star with neutral earthed through resistor and isolator (Refer Note 1 on Sh 2 of 2)
2.3.3	Type of enclosure		IP 54
2.3.4	Type of Institution: Armature & field windings		Class B or better
2.3.5	Permissible voltage variation at rated kVA, speed and p.f		±10%
2.3.6	Permissible frequency variation at rated kVA, speed and p.f.		±5%
2.3.7	Method of neutral grounding		Non-effectively grounded
2.3.8	Excitation System		Brushless
2.3.9	Maximum permissible drop in rated voltage at generator terminals with largest motor being started		15%

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
CHD. BY					5750A		ISSUE R1
DATE							

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME: III	
TCE.5750A-500-H-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A EMERGENCY DIESEL GENERATOR		SECTION: D13	
PART B				SHEET 2 OF 3	
SL. NO.	ITEM		UNIT		

2.3.10	Maximum permissible drop in rated frequency at generator terminals with largest motor being started		±5%
2.3.11	Limitation on combined voltage and frequency drop for starting of the largest motor		10%
2.3.12	Governor		Class – A1
3.0	ACCESSORIES TO BE FURNISHED		
3.1	Common base frame for engine and generator		
3.2	Foundation bolts / anchor bolts		
3.3	Antivibration pads and Mountings		
3.4	Tacho Generator		
3.5	Battery Voltmeter		
3.6	Fuel oil storage inside D.G Building		(One 990 litre capacity tank)
3.7	Shop Primer and Finish Painting		
3.8	Lube oil and fuel oil priming, as required		
4.0	CODES & STANDARDS		
4.1	BS-5514/ISO-3046 Specification for reciprocating internal combustion engine (Part (I-VI)		Yes

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
CHD. BY							
DATE							

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME: III	
TCE.5750A-500-H-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D13	
PART B		DATASHEET A		SHEET 3 OF 3	
EMERGENCY DIESEL GENERATOR					
SL. NO.	ITEM		UNIT		

4.2	BS-5000 : Part 99 – Machines for miscellaneous application		Yes
4.3	IS-4722 – Rotary electrical machinery		Yes
4.4	VDI – 2063 : Measurement and evaluation of mechanical vibrations of reciprocating piston engines and piston compressors		

Note : The earth fault current shall be limited by the use of a resistor to a suitable value such that, in the event of an earth fault, the stator core shall not be damaged. An isolator shall be provided to isolate the resistor from the neutral of the generator.

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
CHD. BY					5750A		
DATE							

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B EMERGENCY DIESEL GENERATOR		SHEET 1 OF 5
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

1.0	EMERGENCY DIESEL GENERATOR SET		
1.1	Make		
1.2	Type		
1.3	Method of cooling		
1.4	Type of lubrication system		
1.5	Type of engine starting system		
1.6	Maximum continuous rating under site condition and at 0.8 power factor	kW	
1.7	Electrical power consumption of the running auxiliaries of the DG set	kW	
1.8	Type & class of Insulation (for both stator & rotor)		
1.9	<u>Excitation</u>		
1.9.1	Voltage	Volts	
1.9.2	Current	Amps	
1.9.3	Terminal voltage at rated load	kV	
1.9.4	Permissible variation of terminal voltage	%	
1.9.5	Permissible variation of frequency	%	
1.9.6	Type of Excitation System		
1.10	<u>AMF Panel - Type</u>		
1.10.1	Time required for starting the DG set from the point of initiating the		

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

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B EMERGENCY DIESEL GENERATOR		SHEET 2 OF 5
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

	command to start upto reaching full load under blackout conditions		
1.11	<u>Battery – Type & Rating</u>		
2.0	<u>DIESEL ENGINE</u>		
2.1	Name of manufacturer		
2.2	Type of Engine		
2.4	Continuous rating (BHP) with fan		
	(a) at design condition		
	(b) at site condition		
3.0	<u>MATERIAL OF CONSTRUCTION</u>		
3.1	Crank case & body		

<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

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B EMERGENCY DIESEL GENERATOR		SHEET 3 OF 5
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

3.2	Engine block & cylinder head		
3.3	Cylinder Liner		
3.4	Crank shaft		
3.5	Connecting rod		
3.6	Piston		
3.7	Piston ring		
3.8	Fly wheel		
3.9	Cam shaft		
3.10	Valve gear		

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

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B EMERGENCY DIESEL GENERATOR		SHEET 4 OF 5
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

3.11	Bearings		
4.0	<u>Air Intake & Exhaust</u>		
4.1	Air intake at rated BHP of engine	(m ³ /hr)	
4.2	Exhaust gas volume rated BHP	(kPa)	
4.3	Maximum exhaust back pressure in		
5.0	<u>Fuel Oil & Lub Oil System</u>		
5.1	Fuel oil grade		
5.2	Fuel injection pressure		
6.0	<u>After cooler - Type</u>		

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	

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D13
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B EMERGENCY DIESEL GENERATOR		SHEET 5 OF 5
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

7.0	<u>Governor</u>		
7.1	Type		
7.2	Standard followed		
7.3	Speed drop		

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

D14

FUEL OIL SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 1 OF 10
1.0 <u>OIL DECANTING AND STORAGE SYSTEM</u> 1.1 HFO shall be brought to site by railway wagons each of 35 T capacity. One rake of wagons consisting of 80 wagons shall split and placed on two tracks of 40 wagons each. The HFO unloading pump house shall be located adjacent to the railway tracks as shown in the Property Plan. 1.2 LDO shall be brought to site by road tankers each of 10 T capacity. The LDO unloading pumps shall be housed along with the forwarding pumps. The pump house shall be adjacent to the tank farm area. 1.3 The CONTRACTOR shall provide a complete unloading system comprising of the following: 1.3.1 Adequate number of decanting points with spare connections shall be provided for decanting the heavy oil /light oil from wagons /road tankers. 1.3.2 For HFO unloading consider a wagon retention time of 5 hours for heavy oil unloading. Pump capacity is calculated considering 3 hours of active pumping time and balance 2 hours would be accounted for initial heating and shunting of locomotives etc. 1.3.3 Nine (5 x 200 + 4 x 50 m³/hr) nos., HFO unloading pumps of twin screw type, complete with suction hoses, strainers, isolation valves, fittings, instruments, drip pans, etc. The capacity of unloading pumps shall be as follows : Unloading pumps : 5 x 200 m³/hr capacity Decanting pumps : 4 x 50 m³/hr capacity 1.3.4 Two (2) nos., HFO storage tank, each of 3000 kL net capacity, complete with level and temperature gauges, level and temperature indicators and switches, transmitters, overflow & drain connections, spare nozzles, flame arrestor and necessary venting systems. 1.3.5 For unloading and storage of HFO the heating steam shall be tapped off from the auxiliary steam header and suitably reduced to the required condition using 2 nos. of PRVs (one at unloading area + one at tank form area) and sized adequately for the requirements specified in technical data table (Clause. 3.0). 1.3.6 Three (3) nos., LDO unloading pumps of twin screw type, complete with suction hoses, strainers, isolation valves, fittings, instruments, drip pans, etc. The capacity of unloading pumps shall be as follows : - Working pumps : 2 x 25 m³/hr capacity - Standby pumps : 1 x 25 m³/hr capacity		
		ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 2 OF 10
1.3.7 One (1) no., LDO storage tank, of 750 kL net capacity, complete with level and temperature gauges, level and temperature indicators and switches, transmitters, overflow & drain connections, spare nozzles, flame arrestor and necessary venting systems. 1.4 The complete HFO system (pipe lines, pumps, strainers, storage tanks etc.) shall be provided with steam tracers (floor coil heaters for tanks). Insulation shall be provided for HFO system (steam traced pipe lines and HFO tanks upto 2m height from base plate) 1.5 The complete oil water collection and separation and condensate collection system shall be provided for proper collection, separation of oil water and pumping back the oil collected to HFO storage tank. The condensate formed in unloading and tank farm area shall be utilized for heating in oil water separator. 1.6 One (1) no. condensate flash tank shall be provided in the unloading area. 1.7 One (1) no. HFO drain oil tank shall be provided in the HFO unloading pump house 1.8 Oil water separators shall be provided to separate oil and water from the unloading and storage area. The system shall include 2x100% pumps for each, oil and water. The recovered oil shall be pumped to the storage tanks, while the separated water shall be pumped to the effluent treatment plant. 1.9 A fuel oil dyke area shall be provided as per PETROLEUM ACT & RULES, NFPA & TAC. 1.10 The complete oil storage and supply system shall meet the requirements of Indian Petroleum Rules. Specific approval from Chief Controller of Explosives shall be obtained by the CONTRACTOR.		
		ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 3 OF 10

2.0 **I & C REQUIREMENTS**

PLC based control system is envisaged for HFO unloading, oil & water recovery pumps, water recovery sump pumps and oil water transfer pump in HFO unloading area.

All pressure indicators and differential pressure indicators for HFO service will be provided with diaphragm seals.

PLC based control system is envisaged for LDO unloading, oil water sump pumps, oil and water recovery pumps in LDO unloading area.

All pressure indicators and differential pressure indicators for LDO service will be provided with diaphragm seals.

Local temperature and pressure indicators will be provided as per the system requirement for both LDO & HFO unloading system.

HFO & LDO tank instruments, fuel oil pumping and heating system are monitored & controlled from DCS, mounted in main control room of TG building. HFO & LDO tanks are provided with float and chord type level indicator, level transmitter, low level switch for alarm, high level switch for alarm, temperature gauge and temperature element, and other instruments to make the system complete. However, the above mentioned indications shall be duplicated and shall be provided in the local control panel.

ISSUE
R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 4 OF 10

3.0 TECHNICAL DATA / MATERIALS OF CONSTRUCTION

HFO TANKS	
1) NO. OF TANKS	TWO (2)
2) TANK CAPACITY	3000kL, each
3) DESIGN CODE	IS 803 / API 650
4) OPERATING / DESIGN TEMP.	55 / 120°C
5) DESIGN PRESSURE	10% MARGIN ON WORST OPERATING CONDITION
6) TYPE OF CONSTRUCTION	VERTICAL CYLINDRICAL FIXED ROOF TYPE WITH ATMOSPHERIC VENTS
7) MATERIAL OF CONSTRUCTION	PLATES : IS2062
8) INSULATION	REQUIRED UPTO 2 M HEIGHT FROM BASE PLATE
9) VENTING CAPACITY	AS PER API:2000 / IS803
10) TANK DIMENSIONS	BY BIDDER
11) FLOOR COIL HEATERS (USING STEAM)	DESIGNED TO RAISE TEMPERATURE OF OIL FROM MINIMUM AMBIENT TEMPERATURE TO STORAGE TEMPERATURE (55°C) IN 72 HOURS TIME AND MAINTAINING THE TEMPERATURE OF 55°C DURING NORMAL COURSE OF OPERATION.

LDO TANKS	
1) NO. OF TANKS	ONE (1)
2) TANK CAPACITY	750 kL
3) DESIGN CODE	IS 803 / API 650
4) OPERATING / DESIGN TEMP.	55 °C
5) DESIGN PRESSURE	10% MARGIN ON WORST OPERATING CONDITION
6) TYPE OF CONSTRUCTION	VERTICAL CYLINDRICAL FIXED ROOF TYPE WITH ATMOSPHERIC VENTS

ISSUE
R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM		SHEET 5 OF 10

LDO TANKS	
7) MATERIAL OF CONSTRUCTION	PLATES : IS2062
8) INSULATION	NOT APPLICABLE
9) VENTING CAPACITY	AS PER API:2000 / IS803
10) TANK DIMENSIONS	BY BIDDER
11) FLOOR COIL HEATERS	NOT APPLICABLE

HFO DRAIN TANKS	
1. NO. OF TANKS	ONE (1)
2. TANK CAPACITY	BIDDER to indicate (shall not be less than 5 CU.M)
3. DESIGN CODE	IS 800
4. OPERATING / DESIGN TEMP.	55 / 120 °C
5. DESIGN PRESSURE	10% MARGIN ON WORST OPERATING CONDITION
6. TYPE OF CONSTRUCTION	RECTANGULAR
7. MATERIAL OF CONSTRUCTION	PLATES : IS2062
8. INSULATION	NOT APPLICABLE
9. VENTING CAPACITY	AS PER API:2000 / IS803
10. TANK DIMENSIONS	BY BIDDER
11. FLOOR COIL HEATERS (STEAM TRACNG)	NOT APPLICABLE

ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 6 OF 10

CONDENSATE FLASH TANK

1. NO. OF TANKS	ONE (1)
2. TANK CAPACITY	BIDDER to indicate (shall not be less than 4 CU.M)
3. DESIGN CODE	IS 2825
4. OPERATING / DESIGN TEMP.	BY BIDDER
5. DESIGN PRESSURE	10% MARGIN ON WORST OPERATING CONDITION
6. TYPE OF CONSTRUCTION	VERTICAL / CYLINDRICAL WITH DISHED ENDS
7. MATERIAL OF CONSTRUCTION	PLATES : IS 2002 GR.2A
8. INSULATION	REQUIRED
9. TANK DIMENSIONS	BY BIDDER

HFO / LDO / DRAIN OIL PUMPS

1) TYPE OF PUMPS	HORIZONTAL TWIN SCREW FOR UNLOADING PUMPS. (STEAM JACKETED FOR HFO) HORIZONTAL SINGLE SCREW FOR OTHER OIL SERVICES PUMPS
2) DUTY	INTERMITTENT / PARALLEL OPERATION
3) TYPE OF DRIVE	DIRECT DRIVEN BY ELECTRIC MOTOR
4) CASING & ROTOR HOUSING MATL.	CI AS PER IS.210 GR.260
5) ROTOR	SS
6) SHAFT	SS
7) DRIVING GEAR	HARDENED AND TEMPERED ALLOY STEEL WITH MACHINE CUT TEETH AND GROUND FINISH

SUMP PUMPS

ISSUE
R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM		SHEET 7 OF 10

SUMP PUMPS	
1) TYPE OF PUMPS	WET PIT, VERTICAL, NON CLOG, CENTRIFUGAL
2) DUTY	INTERMITTENT
3) TYPE OF DRIVE	DIRECT DRIVEN BY ELECTRIC MOTOR
4) CASING & ROTOR HOUSING MATL.	Ni-CAST IRON (250BHN)
5) IMPELLER	Ni-CAST IRON (250BHN)
6) SHAFT	B.S.970 EN8 / EQUIVALENT

PRESSURE REDUCING STATIONS	
1) NO. OFF	TWO (2) [One at tank farm area and one at HFO unloading area]
2) AUX. STEAM PARAMETERS	BY BIDDER
3) MAX. REQUIRED DESIGN FLOW	BY BIDDER
4) GENERAL REQUIREMENTS	THE PRESSURE REDUCING STATIONS WILL BE COMPLETE WITH TWO (2) NOS., SELF ACTUATED PILOT OPERATED PRV, EACH SIZED FOR 60% OF TOTAL STEAM FLOW RATE. EACH PRV WILL BE COMPLETE WITH ISOLATION VALVES SIZED FOR THE SAME DUTY AS THAT FOR PRV.THE COMPLETE STATION WILL ALSO HAVE A MANUAL BYPASS, TO BE SIZED FOR 100% OF THE STEAM FLOW RATE DURING START UP CONDITION. RELIEF VALVES WITH 100% RELIEVING CAPACITY WILL BE PROVIDED ON THE DOWNSTREAM.
5) MATERIAL OF CONSTRUCTION	CAST CS BODY ASTM A 216 WCB, SS316 STELLITED TRIM, WELDED ENDS.

PIPING / FITTING MATERIALS

ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM		SHEET 8 OF 10
PIPING / FITTING MATERIALS			
1) STEAM & CONDENSATE FLEXIBLE HOSES FOR WAGON HEATING		CARBON STEEL – ELECTRO ZINC PLATED	
2) FLEXIBLE HOSES FOR FUEL UNLOADING		NEOPRENE	
3) STEAM & CONDENSATE PIPES		SA 106 GR.B	
4) F.O. UNLOADING PIPES		IS 1239 / IS 1978 / API 5L Gr.B (ERW) / IS 3589 FABRICATED FROM IS 2062 PLATES	
5) F.O. PUMP DISCHARGE PIPING / OTHER FO/ PIPING		API 5L GR.B (ERW)	
6) PIPE FITTINGS		ASTM A 234 WPB (FOR >=65NB) ASTM A 105 (FOR <= 50NB)	
7) GASKETS		GRAFOIL FOR F.O. SYSTEM SPIRAL WOUND SS FOR STEAM / CONDENSATE SYSTEMS	
8) <u>OIL SERVICE</u> GATE VALVES (≥NB350) GLOBE VALVES & CHECK VALVES <u>OTHER SERVICES</u> GATE,GLOBE & CHECK VALVES		BODY & BONNET : ASTM A 216 WCB (≥NB65) BODY & BONNET : ASTM A 105 (<=NB50) STEM : ASTM A 182 F6a DISC : ASTM A 216 WCB (≥NB65), ASTM A 182 F6a (<=NB50) BODY & BONNET : ASTM A 216 WCB (≥NB65) BODY & BONNET : ASTM A 105 (<=NB50) STEM : ASTM A 182 F6a DISC : ASTM A 216 WCB (≥NB65),	
			ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM		SHEET 9 OF 10

PIPING / FITTING MATERIALS	
	ASTM A 182 F6a (<=NB50)
9) <u>OIL SERVICE</u> BALL VALVES (≤NB200) PLUG VALVES (NB250-300)	BODY & BONNET : ASTM A 216 WCB (≥NB65) BODY & BONNET: ASTM A 105 (<=NB50) STEM : ASTM A 182 F6a PLUG : 13% Cr. + Stellite BALL : SS316
10) STRAINERS	SIMPLEX TYPE, FABRICATED FROM IS2062 PLATES, FILTER WILL BE OF SS304.

OIL WATER SEPARATORS	
HFO UNLOADING AREA	ONE (1) NO. CAPACITY : BY BIDDER
TANK FARM AREA	ONE (1) NO. CAPACITY : BY BIDDER

OIL WATER COLLECTION PITS	
UNLOADING PUMP HOUSES	ONE (1) NO. AT EACH PUMP HOUSE CAPACITY : 15 MINUTES
DYKE AREA	ONE (1) NO. CAPACITY : 15 MINUTES

ISSUE R0

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D14
PART - B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan FUEL OIL SYSTEM	SHEET 10 OF 10

STEAM TRAPS	
TYPE	THERMODYNAMIC / INVERTED BUCKET
QTY / CAPACITY	BY BIDDER
BODY MATERIAL	SA 105
TRIM MATERIAL	SS316
SCREEN	SS316
STRAINER	INTEGRAL WITH TRAP
END CONNECTIONS	WELDED

CONDENSATE COLLECTION PITS	
TANK FARM AREA	ONE (1) NO. CAPACITY: BY BIDDER

ISSUE
R0

D15

NATURAL DRAFT COOLING TOWER

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 1 OF 7
1.0 <u>APPLICABLE CODES AND STANDARDS</u> 1.1 The design, material, manufacture, construction and performance of the natural draught cooling tower with its associated appurtenances and equipment shall conform to the following standard specifications and codes of practice. All the standard specifications and codes of practice referred to herein, shall be the latest editions including all applicable official amendments and revisions. A. <u>MATERIALS</u> i. IS:269 33 grade ordinary portland cement. ii. IS:383 Coarse and fine aggregates from natural sources for concrete. iii. IS:432 Mild steel and medium tensile steel and bars (parts 1 & 2) and hard drawn steel wire for concrete reinforcement. iv. IS:702 Industrial bitumen. v. IS:780 Sluice valves for water works purposes (50-300 mm size). vi. IS:1536 Centrifugally cast (spun) iron pressure pipes for water, gas and sewage. vii. IS:1554 (part 1) PVC insulated (Heavy duty) electric cables. viii. IS:1592 Asbestos cement pressure pipes - specification. ix. IS:1785 (parts 1&2) Plain hard drawn steel wire for pre-stressed concrete. x. IS:1786 High strength deformed steel bars and wires for concrete reinforcement. xi. IS:1834 Hot applied sealing compound for joint in concrete. xii. IS:1838 (part 1) Preformed fillers for expansion joint in concrete pavements and structures (non-extruding and resilient type: Part I bitumen impregnated fibre).		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 2 OF 7
xiii. IS:2062 Steel for general structural purposes. xiv. IS:2267 Polystyrene moulding and extrusion materials. xv. IS:3042 Single faced sluice gates (200-1200 mm size) xvi. IS:3384 Specification for bitumen primer for use in water proofing and damp proofing. xvii. IS:3589 Seamless or electrically welded steel pipes for water, gas and sewage (168.3mm - 2032mm). xviii. IS:5620 Recommendations for structural design criteria for low head slide gates. xix. IS:5666 Etch primer. xx. IS:8112 43 Grade Ordinary Portland Cement xxi. IS:9862 Ready mixed paint brushing, bituminous, black, lead free acid, alkali, water and chlorine resisting. xxii. IS:12330 Sulphate resisting portland cement. B. <u>CODES OF PRACTICE</u> i. IS:456 Code of practice for plain and reinforced concrete. ii. IS:800 Code of practice for general construction in steel. iii. IS:875 (part 1 to part 5) Code of practice for design loads (other than earthquakes for building and structures). iv. IS:1080 Code of practice for design and construction of simple spread foundations. v. IS:1343 Code of practice for pre-stressed concrete. vi. IS:1893 Criteria for earthquake resistant design of structures. vii. IS:2204 Code of practice for construction of reinforced concrete shell roof.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 3 OF 7
viii. IS:2210 Criteria for the design of reinforced concrete shell structures and folded palates. ix. IS:2309 Code of practice for the protection of buildings and allied structures against lightning. x. IS:2395 (parts 1 & 2) Code of practice for painting, concrete, masonry and plaster surfaces. xi. IS:2502 Code of practice for bending and fixing bars for concrete reinforcement. xii. IS:2571 Code of practice for laying in situ cement concrete flooring. xiii. IS:2629 Recommended practice for hot dip galvanising on iron and steel. xiv. IS:2633 Methods of testing uniformity of coating of zinc coated articles. xv. IS:2751 Recommended practice for welding of mild steel bars for reinforced concrete construction. xvi. IS:2911 (part 1 to 4) Code for practice for design and construction of pile foundations. xvii. IS:2950 (part 1) Code for practice for design and construction of raft foundation. xviii. IS:3043 Code of practice for earthing. xix. IS:3370 (part 1 to 4) Code of practice for concrete structures for storage of liquids. xx. IS:4558 Code of practice for under drainage of lined canals. xxi. IS:11504 Criteria for structural design of reinforced concrete natural draught cooling towers. xxii. IS:12200 Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 4 OF 7
xxiii. IS:13920 Ductile detailing of reinforced concrete structures subjected to seismic forces - code of practice. xxiv. BS:4485 Specification for water cooling towers. (All parts) xxv. VGB Guidelines Structural design of cooling towers. xxvi. ATC - 105 Specification for Cooling Towers - Cooling Tower Institute - USA 1.2 The applicability of the provisions for conformity to the various codes and standards stipulated shall be in the following order. a. Bureau of Indian Standards. b. British Standards Institution. 1.3 Wherever the above Standards are in conflict with the stipulations of this specification, the latter shall govern. 1.4 This specification shall be also read in conjunction with other technical specifications of section - D. In case of any conflict, the provisions of this specification shall govern. 1.5 Further, all currently applicable statutes, regulations and safety codes for the locality where the cooling tower will be installed, shall be complied with fully. 2.0 <u>GENERAL REQUIREMENTS</u> 2.1 The cooling tower shall be capable of cooling the rated capacity of water through the specified thermal range at the design wet bulb temperature and it shall conform to the other design parameters as stipulated in Data Sheet - A. 2.2 The scope of the Contractor's work for a cooling tower shall include preparation of detailed designs and construction drawings and execution of work including but not limited to supply of all material for foundations, shell, basin, fill with its supporting structure, staircases/walkways/platforms with handrailing, cold water outlet channels including gates, screens with handling arrangement, painting, access doors, water distribution system, aviation warning system, lighting, lightning protection system, with their associated hardware, etc., complete		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 5 OF 7
all as required to give satisfactory performance and as stipulated in various clauses. 3.0 <u>PERFORMANCE TESTS</u> 3.1 After the cooling tower is completely erected and commissioned, tests on its performance shall be conducted. The method of testing shall generally conform to provisions of BS:4485 : Part 2 or procedures of Cooling Tower Institute, USA, unless otherwise specified in Data Sheet-A. 3.2 Contractor shall submit the detailed test procedure, correction curves, etc. for performance testing for Owner's approval iafter award of contract. 33 The test shall be carried out on a day when the atmospheric condition and heat load on the tower are as close to the design conditions as possible. While efforts would be made to arrange the tests within the guarantee period, Bidder shall agree to conduct the test at any time after the guarantee period as mutually agreed between him and the Owner, subject to the tower being in good condition. For this purpose, each half of the tower would be isolated for inspection before the test. 3.4 Owing to the difficulty of reproducing on the test, the exact conditions of wet bulb temperature, wind and heat load under which the tower duty is to be guaranteed, a compromise formula shall be reached that will be acceptable to both the Contractor and the Owner. Bidder, in their proposal, shall submit formulae for Owner's consideration, it being understood that agreement shall be reached between the Contractor and the Owner on the acceptability of the formulae or a revision thereof, before the contract is signed. 3.5 It shall be the responsibility of the Contractor to carryout all the tests as specified to the full satisfaction of the Owner and the cost of such tests including supervision shall be borne by him entirely and is deemed to be included in the quoted lumpsum price. Contractor shall be fully responsible to make good any and every deficiency in the guaranteed performance of the cooling tower. 3.6 Vendor shall include in his bid for the supply on loan and mounting with all necessary fixtures/accessories, of all the instruments required for performance testing including the following instruments. Owner shall only provide connection on his piping, for mounting these instruments as indicated in Data Sheet-A. a) Two calibrated pitot tubes for each of the water risers of each tower along with associated isolating valves as indicated in Data Sheet-A, for measurement of flow.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 6 OF 7
b) Three Assman type identical aspirated psychrometers or wet/dry bulb thermometers for measuring wet bulb and dry bulb temperatures. The thermometers shall be with graduations not exceeding 0.1 deg C and located at three equi-distant stations near the tower. c) Mercury in glass thermometers, with graduations not exceeding 0.1 deg C for measurement of hot and cold water temperatures. d) Anemometer for measuring wind velocity. e) Pressure gauge for measuring hot water inlet pressure. 3.7 All the instruments supplied and used shall be calibrated by a National laboratory or by an independent laboratory approved by the Owner. Contractor shall furnish necessary test certificates for the same to the Owner. 4.0 <u>PERFORMANCE GUARANTEE</u> 4.1 The performance of the cooling tower shall be guaranteed over the following range, unless otherwise called for in Data Sheet-A. a) Cooling tower flow 90% to 110% of design flow. b) Wet bulb temperature (+) 1.7 deg C to (-) 3.9 deg C of design inlet wet bulb temperature. c) Cooling range 80% to 120% of design cooling range. d) Relative humidity 30% to 100% 4.2 The results of the above tests shall govern the acceptance or otherwise of the cooling tower commissioned. 4.3 The tests shall be carried out on all cooling towers. 4.4 The guarantee period shall be deemed to be 24 (twenty four) calendar months from the date of taking over of the complete cooling tower by the OWNER OR the stabilisation of the unit, whichever is later. If, within this guarantee period, any deficiency is detected in the performance of the tower, the CONTRACTOR shall rectify the same, at no extra cost to the OWNER.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER	SHEET 7 OF 7
5.0 LAYOUT AND MAINTENANCE REQUIREMENTS 5.1 Layout Requirements 5.1.1 The proposed location of the cooling tower is shown in the plot plan enclosed. BIDDER shall review the same and confirm the relative location of the cooling tower for satisfactory performance of the tower. BIDDER shall also note that the cooling tower shall be accommodated within the space indicated in the drawing. 5.2 Maintenance Requirements 5.2.1 Suitable staircase with handrails and inspection/access doors as required shall be provided for inspection/maintenance of fill, water distribution system, drift eliminators. 5.2.2 Suitable handling facilities shall be provided for handling and maintenance of mechanical equipment.. BIDDER shall demonstrate use of the handling equipment immediately after completion of the tower erection. 5.2.3 The BIDDER shall supply any special maintenance tools for attending to different equipment.		
		ISSUE R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
TCE.5750A-500-H-001	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D15
PART B	DATA SHEET A		SHEET 1 OF 2
	NATURAL DRAFT COOLING TOWER		
SL. NO.	ITEM	UNIT	

1	Type of Cooling Tower		RCC Natural Draft, Counter Flow
2	No. of Cooling Towers		Two(2)
3	Capacity per tower	m ³ /h	(CW flow through condenser + ACW flow through SG and TG auxiliaries + cooling water flow through other plant auxiliaries)x1.05
4	Hot Water Temperature	°C	43
5	Cold Water Temperature	°C	33
6	Relative Humidity		45 %
7	Ambient WBT	°C	28
8	Cycles of Concentration		5
9	TDS of make up water	mg/l	Refer water analysis
10	TSS of make up water	mg/l	< 2
11	Evaporation & Drift Losses per tower	m ³ /h	Not to exceed 1420
12	Codes & Standards		BS-4485 & ASME PTC-23
13	Type of fills		PVC splash V bars finished color : White
14	Static pump head (Hot water header – NWL in CT basin)		Bidder to indicate
15	Basin Storage Capacity b/w NWL to lowest water level		6 hours of make up water flow per tower
16	Basin Partitions		Basin of each NDCT shall be partitioned into two equal storage chambers. Each basin chamber shall have overflow arrangement and a sludge pit end with necessary dewatering arrangements.
17	Minimum permissible slope of basin floor towards sludge pit		1:150
18	Materials of construction :-		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	
CHD. BY					5750A		ISSUE R1
DATE							

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D15
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A NATURAL DRAFT COOLING TOWER		SHEET 2 OF 2
SL. NO.	ITEM	UNIT	

18.1	Basins, Walls, Structures, Roof, Staircase, Louvers		RCC
18.2	Hot Water Distribution Nozzles		Polypropylene
18.3	Fills & drift eliminators		PVC
18.4	Fill Supporting Members		RCC
18.5	Water distribution pipes		PVC
18.6	Valves		Body : Ni-CI Spindle & Trim : Bronze
19.0	Tower Draft Margin		Minimum, 3%

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
CHD. BY							
DATE							

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D15
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B NATURAL DRAFT COOLING TOWER		SHEET 1 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

1.0	DRAWINGS			
1.1	Cooling tower general arrangement drawing clearly indicating scope / terminal points, arrangements of basin, fill and hot water distribution system.			
1.2	Thermal performance curve			
2.0	DIMENSIONS			
2.1	Height of top of tower above sill	m		
2.2	Height of throat above sill	m		
2.3	Height of top of air inlet above sill	m		
2.4	Depth of Fill at periphery/centre above sill	m		
2.5	Internal diameter of tower:	m		
	a) at sill level	m		
	b) at throat	m		
	c) at top	m		
3.0	THERMAL PARTICULARS			
3.1	Cooling water flow per unit fill area	kg/m ² /h		
3.2	Dry air flow per unit fill area	kg/m ² /h		
3.3	Ratio of water to air weight			
3.4	Temperature of air at Fill outlet wet bulb / dry bulb	°C		
3.5	Total dry air flow per tower	x 10 ⁶ kg/h		
3.6	Inlet air enthalpy above 0° C	k.Cal/kg		
3.7	Exit air enthalpy above 0° C	k.Cal/kg		
3.8	Total heat exchange per hour	k.Cals		
3.9	Evaporation loss (maximum)	kg/h		
3.10	Drift loss (maximum)	kg/h		
3.11	Tower coefficient			
3.12	Total pumping head required at terminal point:			
	a) Frictional losses in inlet pipe upto distribution trough	mwc		
	b) Static height from normal water level in	mwc		

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

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D15
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B NATURAL DRAFT COOLING TOWER		SHEET 2 OF 2
ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	

	basin to water level in distribution trough			
	Total	mwc		
3.13	Performance coefficient (C)			
3.14	Duty coefficient (D)			
3.15	Fill			
	a) Type			
	b) Material of Fill			
	c) Material of Fill support			
	d) Total surface area per tower			
	e) Shape and thickness (enclose sketch)			
	f) Total volume per tower			
	g) Manner of support			
3.16	Water distribution system type and material			
	a) Riser pipe			
	b) Primary Distribution pipe			
	c) Secondary Distribution pipe			
4.0	MATERIALS OF CONSTRUCTION			
4.1	CEMENT REQUIREMENT			
	a) OPC conforming to IS 269	T		
	b) OPC conforming to IS 8112	T		
	c) Sulphate Resisting Portland Cement conforming to IS 12330	T		
4.2	REINFORCEMENT BAR		HYSD	Mild steel
	a) 10 mm	T		
	b) 12 mm	T		
	c) 16 mm	T		
	d) 20 mm	T		
	e) 22 mm	T		
	f) 25 mm	T		
	g) 28 mm	T		
	h) 32 mm	T		

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 – III SECTION: D15
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan NATURAL DRAFT COOLING TOWER –DATA SHEET C	SHEET 1 OF 1
DRAWINGS / DATA TO BE FURNISHED BY THE VENDOR AFTER THE AWARD OF CONTRACT 1.0 Dimensioned outline drawing of the tower showing plan/elevation along with terminal point details. 2.0 Detailed design calculations and construction drawings of the tower in its entirety as stipulated in clause 4 of the specification. 3.0 Drawing of basin clearly indicating outlet channel and drainage arrangement. 4.0 Drawing indicating Fill arrangement. 5.0 Drawing of hot water distribution system. 6.0 Drawing showing lightning protection system and aviation warning beacons. 7.0 Thermal performance curve covering the following ranges : a) 80% to 120% design flow. b) 80% to 120% cooling range. c) Relative humidity ranging from 30% to 100%. d) Wet bulb temperature - minimum to maximum as specified in Data Sheet-A 8.0 Consultant/Owner will review and approve the drawings listed above. Any other drawings, if submitted by Vendor or called for by Owner will be only for information and record.		
		ISSUE R1

D16

MILL REJECT HANDLING SYSTEM

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 1 OF 11

1.0 Scope

The scope of work includes complete mill reject handling system consisting of mill reject hoppers / chutes, conveyors and its accessories, transfer house's / junction towers, mill reject silo with remote operated discharge gates and remote operated gates for mill reject hoppers. The mill reject handling system shall be complete in all aspects with all mechanical, civil, structural, electrical and instrumentation.

2.0 System Description

Mill rejects discharged from the mills shall be fed to conveyors through auto operated gates provided at the outlet of mill reject hoppers. Mill rejects from these belt conveyors shall be conveyed to the Mill Reject storage silo through series of conveyors. The storage silo capacity shall be sized to store 12 hrs mill reject generation from the mills. Motor / pneumatically operated sector gates shall be provided at the outlet of silo. The rejects from silo will be discharged into truck / dumper for further disposal. Number of belt conveyors and routing shall be as per system requirement.

3.0 System capacity

Single stream conveyors shall be provided for handling mill rejects. The mill reject handling system equipment shall be designed to operate on continuous basis for 24 hours / day. Rated capacity of all belt conveyors shall be sized to conveyor rejects from all the mills with a margin of 10% on the rejects generated from all the mills at continuous MCR rating.

3.1 Mechanical Equipment / System

- 3.1.1 Rated capacity of all belt conveyors shall be sized to convey rejects from all the mills with a margin of 10% on the rejects generated from all the mills at continuous MCR rating.
- 3.1.2 For designing of structural, selection of belts, drives, etc., the design capacity shall be 25% more than the rated capacity of mill reject handling system.
- 3.1.3 Angle of surcharge of reject shall be considered as 20 deg. Maximum moisture content shall be considered for design of equipment as 5% including surface moisture. The inclination of conveyors above the ground level shall not exceed 14 degree. The conveyor shall be horizontal at the feed point.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 2 OF 11

3.1.4 Bulk density of Mill rejects

- a) For calculation of capacity 1200 kg/m³
- b) For design of structural and drive selection – 1000 kg/m³
- c) For structural design and drive equipment design – 1600 kg/m³

3.1.5 The motors, gearboxes, couplings and pulleys for conveyors shall be standardized and number of types shall be limited to minimum possible. These shall be of heavy duty type.

3.1.6 All equipment drives shall be capable of starting on full load.

3.1.7 The motor rating for all the equipment shall have a minimum margin of 10% over the BkW. The service factor for selection of gearboxes, flexible couplings, brakes, etc, shall be minimum 1.5 on the motor rating.

3.1.8 Speed reduction units for all equipment with drive motor rating of above 10 kW shall be hardened and ground helical / bevel helical type. The gears shall be hardened and ground type. The gear boxes shall be provided with fan cooling arrangement wherever required and water cooling arrangement shall not be provided.

3.1.9 The type of high speed coupling between motor and gearbox shall be as follows:

For motors of rating upto 30 Kw	Resilient type flexible coupling
For LT motors above 30 kW	Traction type fluid coupling
For HT motors	Actuator operated scoop type fluid coupling. These couplings shall be air cooled type. Water shall not be used for this purpose.

3.1.10 The design of belt conveyors shall be as per IS-11592. The artificial coefficient of friction shall be considered as 0.03 for calculating the power requirement for conveyors.

3.1.11 All conveyor drives shall be single snub pulley drive with minimum angle of wrap of 210 deg.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 3 OF 11
3.1.12 Safety guards shall be provided for drive pulleys and tail pulleys of all conveyors and feeders, couplings guards and brake drums of all conveyors. 3.1.13 All idler, rolls shall be manufactured from ERW tubes conforming to latest edition of IS: 9295 or from seamless tubes conforming to IS: 3601 /BS-1775. 3.1.14 The side brackets for all idlers shall be of pressed 'C' type. 3.1.15 Self-aligning carrying and return idlers shall be provided at an interval of 12M from the terminal pulley and 24 M thereafter. 3.1.16 Idler rollers shall be waterproof, dust proof and weather proof against a high velocity water jet. All idlers shall be provided with minimum double labyrinth seal. 3.1.17 For a particular size of belt each type of idlers and their components shall be identical to ensure interchangeability. All rollers of same size shall be fully interchangeable. 3.1.18 Shell thickness for pulleys shall be minimum 10 mm. The shafts of pulleys shall be of C-40 or better. Thickness of rubber lagging shall be 12 mm herring bone type for drive and 10 mm plain type for non drive pulleys with shore hardness of 55 ±5 on scale 'A'. Width of pulley shall be minimum 200 mm more than the belt width. 3.1.19 Pulleys shall be mounted on machined and ground surfaces. Suitable guards shall be provided for all tail pulleys and bend pulleys for safety of operating personnel. 3.1.20 The pulley shall be statically and dynamically balanced and all the components like hubs, end discs, etc shall be accurately machined to ensure concentricity. 3.1.21 Pulley shafts shall be designed considering the combined shear stress as 500kg/cm², deflection at hub limited to 8° and shaft deflection of 1 in 1200 whichever is higher. 3.1.22 Pulley shafts shall be supported on heavy duty, horizontal split type Plummer blocks. The bearings shall be self-aligning spherical roller type having a B-10 life of 50,000 working hours. 3.1.23 Snub pulleys of all conveyors at head end shall be covered in the main discharge chute.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 4 OF 11
3.1.24 The troughing angle of belt conveyor shall be 35 deg. The belting shall be of Nylon-Nylon / EP. Minimum Number of plies shall be 3. The belts shall be of fire retardant type conforming to Canadian Bureau of Mines. The minimum cover thickness shall be 5 mm at the top and 3 mm at the bottom. 3.1.25 All inclined conveyors shall be provided with hold back integral with the gearbox and electro-hydraulic thruster brakes. Electro-hydraulic thruster brakes shall also be provided for horizontal conveyors where the coasting time is required to be adjusted. 3.1.26 One sprung blade type and one torsion arm type belt scrapers at discharge pulleys and one number V-plough type internal scraper shall be provided for each conveyor. 3.1.27 Deck plate of minimum 3.15 mm thickness shall be provided for full length of all conveyors. 3.1.28 <u>Take up arrangement:</u> The belt conveyors shall be equipped with suitable tensioning devices. The devices shall have sufficient travel to allow the easy removal and replacement of the belt pulleys. If dead weight tensioning units are employed they shall have slide rails on each side. The total weight should be made up of individual weights of not more than 15 kg each. It shall be possible to raise the tensioning weights by means of hand winches so that the belt is fully un-tensioned. The drop of the tensioning weights shall be limited. Handling facilities shall be provided. Sand pit, safety guards etc. shall be provided as per relevant Indian standards. 3.1.29 For over ground conveyor, take-up shall not be provided in the pits. Sand pit shall be provided at the ground level. The gravity take up shall be provided with a minimum travel of 2.5% of length of conveyor plus 600mm. Wire mesh guard of 2.5m height above ground level / maintenance platform level around take up shall be provided. Lower end of gravity take up counter weight box shall not be less than 1500mm from ground level. 3.1.30 Conveyor skirt boards at loading points shall be equipped with rubber dust flaps. Skirt board sealing arrangement shall be of segmented type. Skirt board shall be of modular type. 3.1.31 Conveyor belt pieces shall not be used as skirt rubber. The discharge ends of all conveyors shall be equipped with rubber dust flaps only. The skirt boards shall end on an impact idler.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 5 OF 11
3.1.32 Continuous skirt boards shall be provided wherever feeds from multiple points on same conveyor are envisaged. Skirts boards shall be in segments so that adjustment can easily be done when rubber strip in any section wear out. 3.1.33 The chutes shall be constructed out of 10 mm MS mother plate with 6mm thick SS-304 liners conforming to AISI. The liner shall be for the full height of the chute on all faces. The size of the chute shall be bigger to avoid any build up of coal with high moisture. 3.1.34 The valley angle of chute shall be minimum 60 degree and side plate angle of hopper shall be minimum 65 degree. 3.1.35 All conveyors shall be provided with enclosed galleries. The clear width of walkway shall be 1000 mm on one side and 800 mm on the other side. 3.1.36 Stepped walkway with chequered plate shall be provided for conveyor inclination more than 10° 3.1.37 The coasting time of conveyors and feeders shall be adjusted such the material discharge and equipment shall have highest coasting time and the preceding equipment shall have equal or lower in descending order. 3.1.38 Level indicators shall be provided for continuous level monitoring in the storage silo. 3.1.39 In order to dispose off the dust on the walkway of conveyor galleries and different floors of JT / TH's dust hoppers with grill and discharge chutes up to ground level shall be provided so that dust accumulated will be swept and put into the hoppers. Dust hoppers at 20 metres intervals along the length of conveyor galleries and at least two hoppers in each floor of the JT/TH's shall also be provided. 3.1.40 Adequate number of hoists (manual / electrical) with trolleys and monorails shall be provided for handling the equipments / components, etc. in transfer houses / Junction tower and other places. The capacity, lift etc. of each hoist shall be decided by the Bidder depending on the heaviest part of the equipment to be handled. Manual hoists shall be provided for handling items of 300 kg to 1000 kg up to a lift of 10M. Electric hoist shall be provided for handling components of 1000 kg and above or lift more than 10M. 3.1.41 The bottom portion of galleries of conveyors which cross the buildings, roads, railway tracks, main plant area, etc. shall be provided with seal plate of minimum thickness 3.15 mm.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 6 OF 11
3.1.42	Remote operated sector gate of non-jamming type shall be provided for below silo. The gate surface shall be provided with SS-409M liners.	
3.1.43	Buffer Hopper shall be provided between Mill & Belt conveyors and material can be fed on to the belt conveyors. Suitable gates shall be provided for closing and opening with hoppers full. The liner on the gate plate shall be TISCRAI.	
3.1.44	Suitable motor operated gates shall be provided for mill reject hopper.	
3.1.45	Silo shall be suitable for storing 12 hrs of rejects generated from the mills. Silo shall be constructed out of 10 mm MS mother plate with 5 mm thick SS-304 liners conforming to AISI – 409 M for complete conical portion. Bottom of the operating floor shall be 5.0 m above ground level and column centers shall be 6.0 m to enable passage of trucks. Also suitable staircase to reach the operating floor and top of silo shall be provided.	
3.1.46	There should be one flexible transfer chute at the Bottom of Mill reject Silo, So that mill rejects can be loaded to trucks at a reduced spillage.	
3.1.47	2 Nos. (1 W + 1 S) of sump pumps with level indicator shall be provided in each Transfer House and near silo with complete piping up to nearest plant drain.	
3.1.48	Tunnel ventilation system provided shall be suitable for a minimum of 12 air changes per hour.	
3.1.49	For natural ventilation of galleries of above-ground conveyors, a gap of 300 mm shall be provided throughout the length of gallery between roof and side cladding at the top and 200 mm at the bottom. Chequered plate walkways shall be provided for galleries. For conveyor inclination more than 10° stepped walkway shall be provided.	
3.2.0	Instrumentation & Controls The control operation and monitoring of belt conveyors shall be through the plant DCS located in the central control room. However, silo unloading shall be through a relay based local control panel mounted on the silo columns. The status of unloading shall be provided on the plant DCS. Besides the above, local push button stations shall be located near each equipment for maintenance purpose. Also de-interlock switches shall be provided for de-Interlocking the conveyors from the sequence.	
4.0	Performance and Availability Requirements	
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 7 OF 11

4.1 **System Performance Requirements**

The mill reject handling system and equipment shall perform satisfactorily to meet the guarantee requirements specified in the following section and also those specified in this specification.

After the mill reject handling system is ready, the same shall be tested at rated capacity within three (3) months from the date of initial operation preferably during the monsoon season to prove the performance of the system and equipment. The capacity figures specified for the equipment shall have to be achieved with tolerance on the positive side. The guarantee requirements shall be met without undue vibrations in the conveyor supports & junction towers.

- 4.1.1 The capacities of conveyors shall be equal to or more than the specified.
- 4.1.2 All drive motors shall be suitable for direct-on-line starting and capable of starting fully loaded conveyors.
- 4.1.3 Noise level produced by any rotating equipment individually and collectively should not exceed 85 dBA at a distance of 1.85 meters from it in any direction under any load condition.
- 4.1.4 Vibration level of equipments at bearings shall not exceed the following limits for different equipment.

Vibration levels shall conform to the limits specified below and shall be measured as per VDI 2056 / BS 4675.

Equipment

Peak to peak limit

- a) At the bearing of drive pulley, motor and gear box for the following equipment:

- i) Conveyors : 75 microns

- b) Conveyor gallery walkways : 200 microns

- 4.1.5 The flow of reject in the transfer chutes and silo shall be smooth without any plugging / rat holing even with worst moisture.

4.1.6 **Illumination Levels**

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 8 OF 11
Minimum illumination levels specified for lighting shall be achieved during normal operation of the plant with dust-laden environment for about one month. 4.1.7 Earthing Resistance An earthing resistance of less than 1 ohm shall be achieved when measured after isolating mill reject handling earthing system. 4.1.8 Endurance Test The path shall be tested at rated capacity for 24 hours to prove that the system functions satisfactorily without any trip due to overload or system fault. 4.1.9 All necessary instruments including walkie-talkies etc. for carrying out performance testing of mill reject handling system shall be provided by the Contractor. 4.1.10 The CONTRACTOR during the performance tests shall prove the specified performance figures of the equipment. If the results of the tests show any variation from the specified values, the vendor shall modify the equipment as required to enable it to meet the requirements. 5.0 Layout and Maintenance Requirements 5.1 Minimum clearance between the bottom of the tail pulley and floor in Transfer House / Junction tower shall be 600 mm. 5.2 Centre lines of conveyors, transfer houses / Junction tower, silo and elevation of silo top shall be finalised by the vendor. The sizes of the transfer houses / junction tower and the floor elevations shall be finalised by the vendor considering a minimum clear walkway space of 1200 mm around the equipment in each floor. The clear distance between the floors shall be minimum 3000 mm and the headroom shall be suitable for handling / removing the equipment at the head end and tail end. The floor of silo top and operating floor shall be designed for keeping the heaviest part of the equipment anywhere on the floor for maintenance purpose. Adequate space for maintenance of equipment shall be provided. The length and elevation of the conveyors shall be finalised by the Vendor based on the limitations for the inclination furnished in the specification. 6.0 <u>PENALTY</u> 6.1 The BIDDER shall comply with the system specification. No credit will be given in tender evaluation if parameters better than those specified are		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 9 OF 11
offered by the BIDDER. In case the BIDDER's recommendation is different from the specification in regard to any aspect, the BIDDER shall quote basically in line with the specification indicating price change for adopting his recommendation, failing which his bid is liable for rejection. 6.2 The BIDDER shall ensure that there are no deviations from technical specifications. In case the BIDDER takes major deviations from the specifications, his Bid will be summarily rejected. No deviation after award of contract from the agreed technical specification will be permitted. Any such deviation noticed by the PURCHASER/ ENGINEER/ CONSULTANT at any stage after award of Contract will not be permitted and the VENDOR shall carry out necessary modifications to bring the system in line with agreed technical specification at no extra cost. 6.3 The BIDDER shall furnish all the data called for various equipments in data sheets in their offer. Offers which do not contain all the data will be treated as incomplete & are liable for rejection. The BIDDER shall also furnish the information called for in the 'schedule of Drive motors and other electrical requirement' giving ratings and number of all electrical equipment under scope of contract. 6.4 In case, the energy consumption by the drive of any equipment exceeds guaranteed energy consumption figures furnished by the CONTRACTOR, the CONTRACTOR will be penalised as specified in Volume – II Section C9 6.5 The prices quoted by the tenderers for the essential spares, start-up spares, maintenance and erection tools & tackles will be included for tender evaluation. Recommended spares quoted by Bidder will not be considered for evaluation. 6.6 Deviations from the specification, if acceptable to the PURCHASER, will be evaluated suitably to compensate for the deviations from the specification CALCULATIONS / TECHNICAL DATA AND DRAWINGS TO BE FURNISHED FOR APPROVAL / REFERENCE OF PURCHASER / CONSULTING ENGINEERS AFTER THE AWARD OF CONTRACT 1.0 CALCULATION / TECHNICAL DATA TO BE SUBMITTED FOR APPROVAL: 1.1 Design calculations for typical one belt conveyor to be identified by the purchaser /engineer. 1.2 Lighting design calculations.		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 10 OF 11

- 1.3 Typical cable sizing calculations and voltage drop calculation.
- 1.4 Technical data sheet of all equipment including characteristic curves, if any.
- 1.5 One typical design calculation each for conveyor gallery, tunnel, trestle, junction tower/ transfer tower, crusher house etc.
- 1.6 Write-up giving the permissive conditions for starting the mill reject handling equipment, annunciation conditions etc.
- 1.7 QAP for all manufactured and sub contracted items.
- 1.8 Procedure for conducting Performance guarantee test along with all the proforma.
- 2.0 **CALCULATIONS / TECHNICAL DATA TO BE SUBMITTED FOR REFERENCE**
- 2.1 The contractor shall furnish the power requirements of each conveyor and other equipment.
- 2.2 Motor data including curves, starting time with driven equipment coupled at 100% and 80% rated voltage, withstand time at 100% and 110% voltage and withstand characteristics.
- 3.0 **LIST OF DRAWINGS TO BE SUBMITTED FOR APPROVAL**
- 3.1 Flow diagram of mill reject handling system.
- 3.2 Layout plan of mill reject handling system showing the coordinates of different equipment and structures.
- 3.3 General arrangement drawings of all the conveyors and junction towers / Transfer houses.
- 3.4 General arrangement drawing of the following structures giving equipment layout in different floors both in plan and sections and location of openings, fixing details, loading data, location of monorails, location of staircases, handrails, details of side sheeting / cladding and roofing, etc.
- 3.5 General arrangement drawing of silos, Pyrite hoppers,.

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D16
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan MILL REJECT HANDLING SYSTEM	SHEET 11 OF 11

4.0

DRAWINGS TO BE SUBMITTED FOR REFERENCE / RECORDS

4.1

Component drawings, such as idlers, pulleys, skirt boards and etc.

4.2

GA drawings of hoists, telescopic chute, sector gates, sump pump etc and other miscellaneous equipments.

ISSUE

R1

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME : III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A MILL REJECT HANDLING SYSTEM			SECTION : D16 SHEET 1 OF 5		
SL.NO.	ITEM			UNITS			
	<u>BELT CONVEYORS</u>				By Bidder		
1.0	<u>Belt</u>				Belt shall be of Nylon-Nylon / EP. The cover shall be Fire resistant grade type (BS 490 Part-I grade N17 rubber). Fire resistant property shall conform to Canadian CAN/CSA/M422-M87.		
1.1	Minimum thickness of cover			mm	Top – 5 Bottom – 3		
1.2	Minimum no. plies				3		
1.3	Ratio of working tension to allowable tension				90 %(maximum)		
2.0	<u>Pulley</u>						
2.1	Type				Heavy duty type. Minimum shell thickness 10 mm		
2.2	Lagging				12mm thick herring bone grooved type rubber lagging for drive pulleys and 10 mm thick plain type for non-drive pulleys.		
2.3	Bearing life			Hrs.	50,000		
2.4	Pulley width			mm	As per IS:8531		
2.5	Bearings				Double row self aligning spherical roller bearing		
3.0	<u>Idlers</u>						
3.1	Carrying idlers				Carrying idlers shall be of 3 roll,		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	HBS					
CHD. BY	SMS	SMS					
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED			VOLUME : III		
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A MILL REJECT HANDLING SYSTEM			SECTION : D16 SHEET 2 OF 5		
SL.NO.	ITEM			UNITS			
					troughing. Roller dia and thickness shall be minimum 114.3 mm & 4.5 mm, Spacing– 1000 mm		
3.2	Return idlers				Return idlers shall be single roll type. Roller dia and thickness shall be minimum 114.3 & 4.5 mm. Spacing – 3000 mm.		
3.3	Impact Idlers				Shall be 3 roll type of 139 mm roll dia with 88.9 mm steel tube dia and 4.5 mm thickness. Minimum 6 nos. of impact idlers shall be provided per feed point.		
3.4	Self aligning carrying and return idlers				Shall be provided on thrust bearing for swiveling. Side guide rollers shall be provided. Spacing shall be 12 m from the terminal pulleys and bend pulleys and 24 m apart thereafter.		
3.5	Bearings				Single row deep groove ball bearing, - 25 mm dia minimum for carrying, return & impact idlers with double labyrinth seals		
3.6	Testing of rollers				Free rotation friction, Dust & water tests. Friction factor shall be less than 0.015.		
4.0	<u>Technological structures</u>						
4.1	Stringers/Short supports				Min. stringer size - ISMC 125 and short support - ISMC 100		
4.2	Deck plate				Min. 3.15 mm for full length of		
REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan	ISSUE R1
PPD. BY	HBS	HBS					
CHD. BY	SMS	SMS					
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan	SECTION : D16
	DATASHEET A MILL REJECT HANDLING SYSTEM	SHEET 3 OF 5

SL.NO.	ITEM	UNITS	
			conveyors
4.3	Sealing Plate		Min. 3.15 mm
4.4	Belt protection switches (Pull cord, belt sway & zero speed switches)		Dust ignition proof and flame proof enclosure as per IS – 1248
	A) Pull cord switches		At 30M interval on both sides of conveyor.
	B) Belt sway switches		At 50M interval on both sides of conveyor
	C) Zero Speed switches		Electronic non contact type.
4.5	Tensioning arrangement		Gravity type take-up for conveyor length more than 30M and screw take up for conveyor length up to 30M.
4.6	Discharge chutes		MS thick (min)-10mm, liner-SS409M, thick (min) - 6mm, Valley angle (min)-60°.
4.7	Skirt boards		Skirt boards shall be provided for 3m (min) at each feed point. If the feed points are close by, continuous skirt board shall be provided. Side plate shall be 12mm and top plate shall be 6 mm MS. 6mm SS409M liner shall be provided. Skirt board sealing shall be of segmented type.
4.8	Scrappers		
	a) External Scraper		One sprung blade type and one torsion arm type scrappers at discharge pulleys.

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	HBS					
CHD. BY	SMS	SMS				PROJECT: 2 x 660 MW, Super-Critical	
DATE	NOV'09	MAY'12				TPS, Stage- V Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A MILL REJECT HANDLING SYSTEM	SECTION : D16 SHEET 4 OF 5

SL.NO.	ITEM	UNITS	
	b) Internal scrapper		V – Plough type, mild steel flats with hard rubber strips.
5.0	<u>Galleries</u>		
5.1	Type of gallery		Enclosed Gallery
5.2	Roof & side cladding material		Pre-coated metal sheet.
5.3	Walkway width, clear	MM	1000mm one side, 850 mm on the other side
5.4	Walkway covering		6 thk. chequered plate.
5.5	Cross over		Shall be provided at 100m intervals.
5.6	Hand rail size		32 NB
5.7	Seal plate		3.15 mm thk (minimum) wherever conveyor crosses the buildings, rail tracks, roads, main plant area, etc.
	<u>SUMP PUMPS</u>		
1.0	Type of pump		Submersible pump
2.0	Liquid to be handled		Slurry
3.0	Location		Tunnels, transfer houses
4.0	Quantity		1 working + 1 standby at each place
	<u>SILO LEVEL INDICATOR</u>		

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	HBS					
CHD. BY	SMS	SMS				PROJECT: 2 x 660 MW, Super-Critical	
DATE	NOV'09	MAY'12				TPS, Stage- V Suratgarh, Rajasthan	

SPECIFICATION NO. TCE-5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOLUME : III
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET A MILL REJECT HANDLING SYSTEM	SECTION : D16 SHEET 5 OF 5

SL.NO.	ITEM	UNITS	

1.1	Quantity required		One
1.2	Type of Bunker level indicator		Radio frequency type for continuous level monitoring
1.3	Accessories		Digital display, timers and others if necessary to make the silo level indication system complete.
1.4	Level Switches		Low level and high level switches to be provided for giving alarm to control room

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	ISSUE R1
PPD. BY	HBS	HBS				PROJECT: 2 x 660 MW, Super-Critical	
CHD. BY	SMS	SMS				TPS, Stage- V Suratgarh, Rajasthan	
DATE	NOV'09	MAY'12					

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B MILL REJECT HANDLING SYSTEM		VOLUME : III SECTION:D16 SHEET 1 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
1.0	BELT CONVEYORS (Bidder to list the data for each conveyor)			
1.1	Belt Width	mm		
1.2	Capacity	TPH		
1.3	Max. Lump Size of mil rejects handled	mm		
1.4	Belt Speed	mps		
1.5	Belt Construction (No. of Plies, Rating, Cover Thickness)			
1.6	Idlers Roll Dia, Bearing Dia and Spacing	mm		
1.7	Pulley Dia, Shell thickness, Lagging thickness & Shaft dia	mm		
1.8	Motor Rating	Kw		
1.9	Gear box type, ratio & Rating			
1.10	Performance guarantee			
a)	Design capacity at specified belt speed			
b)	Power consumption at design capacity			
2.0	SILO			
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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B MILL REJECT HANDLING SYSTEM		VOLUME : III SECTION:D16 SHEET 2 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
2.1	Capacity	T		
2.2	Construction			
2.3	Side Plate angle	Deg.		
2.4	Material and Thickness of liner	mm		
2.5	Gates for silo and mill reject hoppers			
2.5.1	Type			
2.5.2	Method of Operation.			
2.5.3	Motor rating	Kw		
3.0	SUMP PUMPS			
3.1	Location			
3.2	Quantity			
3.3	Capacity	m ³ /hr		
3.4	Type			
<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 	

SPECIFICATION NO. TCE-5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B MILL REJECT HANDLING SYSTEM		VOLUME : III SECTION:D16 SHEET 3 OF 3
ENQUIRY/SPECIFICATION NO.:			BIDDER:	
SL. NO.	ITEM	UNIT		
4.0	LEVEL INDICATOR / SWITCHES			
4.1	Type			
4.2	Indication			
5.0	MANUAL / ELEC. HOISTS & MISC. CRANES			
5.1	Type			
5.2	Quantity			
5.3	Capacity			
5.4	Location			
<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 	

D18

HYDROGEN GENERATION PLANT

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 1 OF 7
1.0 A hydrogen gas generation plant shall be provided to meet the make up requirements for the generator cooling for 2x660MW units. 2.0 The complete hydrogen generation plant system, equipment, layout etc shall be designed as per the stipulations of Explosives Authority and the bidder shall obtain the approval from Chief Controller of Explosives, India; and other statutory authorities for the design and installation of the plant. 3.0 The systems to be supplied shall include but not be limited to the following: 3.1 <u>Electrolysis plant</u> a) Unipolar / bipolar electrolysis cells having two streams (2x50%) each of 10 Nm³/hr capacity of hydrogen gas generation. (The total generation capacity shall not be less than 20 Nm³/hr) b) Hydrogen & oxygen gas leads from the electrolysis cells to the corresponding alkali drums / gas headers. c) Electrolyte circulation pumps (if required), feed headers with connecting piping to each cell. d) Oxygen gas pressure compensator (if required) e) Hydrogen gas and Oxygen gas water seals f) Hydrogen gas scrubber / washer g) Two (2) nos., gas holders , each of 10 m³ water capacity [one for each stream]. h) Rectifier system suitable for 415 V, 3 phase, 3 wire, 50 Hz, AC input. i) Triple pole air circuit breaker j) Purity meters with necessary contacts/controls to ensure proper system operation. 3.2 <u>Gas compression plant</u> a) 3x100% hydrogen gas compressor of reciprocating type with water cooled jackets. b) Drive motor with belt drive and belt guard		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 2 OF 7
c) Automatic compressor loader and unloader arrangement d) Two (2) nos., full duty filters at compressor discharge. e) Two(2) nos., full duty oil absorption elements at compressor discharge f) Two (2) nos., full duty dual type gas driers with refrigerant cooling element, refrigerant compressor with drive motor and cooler filters, etc., mounted on common base frame. g) Two(2) nos., full duty dust filters after drier h) Hydrogen gas filling manifold with twenty (20) connectors suitable for fixing to cylinder with valves as per IS 3224 / BS 341 / Equiv. i) Back pressure valve j) Hydrogen gas manifold vacuum pump with drive motors, common bed frame, etc. k) Twenty (20) connecting copper tubing with connectors for connecting the manifold to the cylinders. l) Necessary pumping arrangements for the supply of cooling water from cooling water tank to the hydrogen generation plant. 3.3 <u>Electrolyte solution preparation and feed water make-up system</u> a) Feed water tank of suitable capacity with gravity feed system to cells. b) Electrolyte preparation tank of suitable capacity with motor operated agitator and hand operated feed pump with necessary piping to transfer electrolyte to each cell. c) Automatic feed water valve to supply feed water to the cells. 3.4 Necessary venting and draining arrangements with associated valves, fittings, instruments, etc. 3.5 <u>Instrumentation and Controls</u>		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 3 OF 7
3.5.1 A relay based control system shall be provided, consisting of measuring instruments, indicators, gas flow meters, integrators and recorders, control switches, annunciators along with safety interlock arrangement for proper operation of the hydrogen gas generation plant. All remote indicators, gas flow recorders, annunciators, relays, timers, contactors, shall be mounted on the local control panel. 3.5.2 Purity meters and Dew point meters shall be included in the scope. 3.5.3 The plant shall be designed to meet the following operational criteria for continuous duty or for parallel operation of both streams to be operated completely from the control panel:- i) Flexible to operate electrolyser in part load with disconnection and operation interruption from the control panel. ii) Flexibility of isolating any cell of a electrolyser & recommissioning rest of the streams. iii) To trip the plant in case of high hydrogen level inside the building for which suitable numbers of hydrogen gas detectors shall be provided iv) Set pressure to be maintained with help of back pressure regulation valve. v) Automatic operation of standby compressor as and when required. vi) To provide alarm & tripping of compressor at low & low-low level in gas holder. vii) Auto-changeover of gas holder through four-way motorized valves 3.6 <u>Electrical System</u> 3.6.1 AC power shall be supplied to a rectifier unit which shall provide DC power to operate a battery of cells. The electrical system shall comprise of a 415 V motor control centre (MCC). This MCC shall be located in the hydrogen generation plant switch gear room, which shall have two incomers and double front MCC panels aligned in one row. 3.6.2 The switchgear room shall have the following control panels		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 4 OF 7

a)

Control panel for hydrogen generation plant

b)

Dry control panel

c)

Burner panel

d)

Control cubicle for rectifier

3.6.3

The electricals like motors, PBs, lighting control gear in electrolysis plant and gas compression plant shall have flameproof enclosure. Certificates from CMRS, Dhanbad shall be furnished by the bidder.

3.6.4

The construction and specific requirements of MCC, earthing system, lighting system shall be as per the Electrical Specification

3.7

Civil Requirements

3.7.1

This shall be a single story RCC frame structure with brick cladding. The facilities housed in this building are rectifiers, electrolysis plant, air compressors, control room, gas bottling manifolds, gas cylinder storage area, site office, store, toilets, etc. Roof shall be of RCC with no beam projection inside the room to prevent accumulation of gas. All doors and windows shall be of shatterproof glass. All doors in the hazardous areas shall be swing types opening outwards. Hydrogen cylinder storage area shall be well ventilated without any glass windows. Acid/alkali resistant brick flooring shall be provided in areas where acid / alkali spillage is anticipated. Building shall have separate boundary wall with Gate approach road etc.

3.8

Essential Spares

<u>Description</u>	<u>Qty required</u>
Electrolyte cell	1 complete set
Electrodes	10% of total
PVC / HDPE tubing	20% of total for each size
Clips for tubes	20% for each size
Bolts, nuts & washers for Electrolysis cell	10% of total for each size
Rectifier diodes	20% of total

ISSUE

R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 5 OF 7
Rectifier fuses 20% of total Rectifier room cooling fan And motor bearings One(1) set each Bearings for compressor Motors Two(2) sets each Valves 10% of each type & size Vee belts Two(2) nos Agitators One(1) no. Filling manifold Cylinder liners One(1) no Portable Hydrogen gas leak detector (0-100%) : one (1) no. 4.0 <u>Design Requirements</u> 4.1 Generated Hydrogen gas purity: 99.9 % 4.2 Moisture content in Hydrogen gas: 0.05 gm/m3 4.3 Oxygen content: 0.001 % by volume 4.4 Carbon dioxide content: 10 ppm by volume 4.5 No. of cylinders to be filled at a time: 10 4.6 Cylinder filling pressure: 150 kg/cm2 (g) 4.7 No. of connections at H2 filling manifold: 24		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT	SHEET 6 OF 7

TECHNICAL PARTICULARS

SL.NO	DESCRIPTION	MATERIAL OF CONSTRUCTION
1	Anodes	High conductivity grade steel
2	Anode plating	Nickel
3	Cathode	High conductivity grade steel
4	Cathode plating	Nickel
5	Cell wall & cover	MS of thickness 10 SWG
6	Cell wall plating	Nickel – electroplated
7	Diaphragms	High grade asbestos
8	Cell frame material	Nickel plated steel
9	Alkali drums	Nickel plated steel
10	Feed water make up tank	HDPE / PVC / MSRL
13	Electrolyte piping	PVC / HDPE
14	Gas outlet piping from cells	Seamless carbon steel ASTM A 106 Gr B
15	Gas seal tank	MS coated with anti corrosive paint

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D18
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan HYDROGEN GENERATION PLANT		SHEET 7 OF 7

16	H2 gas piping	Carbon steel for low pressure , Seamless steel for high pressure
17	O2 gas piping	Carbon steel
18	Gas holder tanks	MS with anti corrosion paint

ISSUE
R1

D19

MISCELLANEOUS EQUIPMENT

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 1 OF 7

WORKSHOP EQUIPMENT

(a) The equipment covered in this section shall be installed in the workshop building common for two units.

(b) The following workshop equipment shall be supplied complete with all accessories. The Contractor shall furnish the machinery required for operation, maintenance and overhaul of the power plant equipment and for production of some spares of power plant equipment. The Contractor shall note that the machinery and equipment parameters specified hereunder are minimum requirements. However the Bidder can increase these capacities/ ranges depending on the equipment being offered for this specific project. All the work shop equipments listed below shall be supplied with necessary tools like drill bits, lathe tools, HSS tools, key, necessary accessories and attachment for the successful functioning of machine. Bidder shall furnish details of tools, accessories etc.

(c) Bidder shall note that all the motors required for misc equipments should be as per electrical specification.

1.0 TRACKS REQUIRED FOR MOVEMENT OF TRANSFORMERS

Transformer wheel tracks shall be provided in such a way that the transformers can be moved to the station building.

2.0 WORKSHOP EQUIPMENT

Following workshop equipment shall be supplied complete with all accessories to carry out the maintenance and / or for production of spare parts of power plant requirement.

2.1 Lathe Machines

2.1.1 Three (3) general purpose lathes

Two(1) no : (Height of centres : 300 mm; swing over bed : 600 mm (dia) Distance between centres : 3000 mm)

One (1) no: (Height of centres : 400 mm; swing over bed : 800 mm (dia) Distance between centres : 3000 mm)

One (1) no Heavy Duty: (Height of centres : 550 mm; swing over bed : 1100 mm (dia) Distance between centres : 5000 mm)

2.1.2 One (1) high speed precision lathe

One (1) no: (Height of centres : 250 mm; swing over bed : 500 mm (dia) Distance between

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 2 OF 7
centres : 3000 mm)		
2.2	<u>Drilling Machines</u>	
2.2.1	One (1) radial drilling machine	(Drilling capacity : 50 mm (steel), Drilling radius (max) : 1500 mm)
2.2.2	Two (2) bench drilling machine	(Drilling comm. Steel)
2.2.3	Two (2) portable drill gun	
2.2.4	One (1) No. Column Drilling Machine with all accessories.	
2.3	<u>Grinding Machines</u>	
2.3.1	One (1) cylindrical grinding machine	(Grinding wheel dia. 350 mm, Distance between centre : 1500 mm)
2.3.2	Two (2) double ended pedestal grinder	(Wheel size 350 mm)
2.3.3	One (1) tool and cutter grinder	(Grinding wheel dia : 250 mm)
2.3.4	Two (2) flexible shaft grinder wheel	
2.4	<u>Shaping Machines</u>	
	Two(2) nos.,	Medium stroke and suitable table size
2.5	<u>Bending and Shearing Machine</u>	
2.5.1	One (1) hydraulic pipe bender	(Bending capacity 10 – 80 mm pipe size, 10 mm thick)
2.5.2	One (1) plate shearing machine	(Capacity : width x thickness : 2500mm x 12 mm)
2.5.3	One (1) hand operated shear	
2.6	<u>Press</u>	
2.6.1	One (1) mechanical press	

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 3 OF 7
2.6.2	One (1) fly press	
2.7	Vertical turning machine and bore machine	Max. Turning diameter-1700mm, Table diameter - 1500mm, Max. working height - 1000mm, Max. vertical travel ram head - 550mm Horizontal travel of side ram head - 300mm Vertical travel of side ram head - 700mm , Swivel angle of ram head +30 o , No of table speed - AC variable frequency drive
2.8	Slotting machine	Stroke-500mm, rotary table - 510mm, Longitudinal movement - 400mm, Cross movement - 400mm, Cutting speed ram stroke per minutes) - 60-90
2.9	<u>Other Machinery</u>	
2.9.1	One (1) Hydraulic hacksaw	(Capacity : to cut square / round material upto 300 mm sq. / 300 mm dia.
2.9.2	One (1) pipe threading machine	
2.9.3	One (1) set of balancing equipment	
2.9.4	One (1) No. Universal milling machine with all accessories.	
2.10	<u>General Equipment for Machine Shop</u>	
2.10.1	Six (6) work benches with vices.	(Size 1800 x 1200 x 900 mm)
2.10.2	Five (5) nos portable drilling & grinding machines	
2.10.3	Two (2) set of snap on tools	
2.10.4	Two (2) lot of measuring tools like Scales, protractors, dial gauges, depth gauges, screw driver sets, dividers, V blocks, planer graphs, Tri squares.	

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 4 OF 7
2.10.5 Six (6) sets of general tools (such as screw drivers, spanners and cutting pliers) - Two surface plates, Two sets of precision micrometers (upto 500mm), 1 set crimping tools, 2 sets soldering irons, 1 set of Lockers, Almirahs etc. with all accessories. Mitutoyo make Vernier 0-150, 0-300, 0-600mm - 2set each Inside micrometer 0-50mm,0-150,0-300mm - 2set each. Outside micrometer 0-50, 0-100, 0-150, 0-300 - 2 sets each Dial guage with magnetic stand graduation - 0.01mm, measuring span 10mm- 5 no.s 2.10.6 One (1) set of pneumatically operated spanners 2.10.7 Three (3) sets of hand lamps 2.10.8 General Machines - One (1) static balancing m/c, One (1) hot air blower, One (1) incubation heater, One (1) hydraulic puller. 2.11 <u>Paint Shop</u> 2.11.1 One (1) portable compressor complete with 10 gallon capacity compressed air spraying equipment complete with spray gun, stirrer and accessories. 2.11.2 One (1) portable sanding machine 2.11.3 One (1) set of sign writing equipment and stencils 2.11.4 One (1) buffing and polishing machine 2.12 <u>Welding</u> 2.12.1 Two (2) A.C. welding transformer 2.12.2 Two (2) welding generator 2.12.3 Two (2) tig welding set 2.12.4 Four (4) oxy-acetylene gas welding/cutting sets 2.12.5 One (1) electrode drying oven (size 500 mm x 500 mm) 2.12.6 Four (4) welding tables 2.12.7 Four (4) soldering irons 2.12.8 Three (3) portable electrode driers		
		ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19															
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 5 OF 7															
2.12.9 Six (6) welder accessories sets <u>Note:</u> Location of workshop equipment: All the workshop equipment (except few) specified above shall be located in a separate workshop building, the construction of which is included in the scope of the CONTRACTOR. 3.0 <u>ROAD TRUCK WEIGH BRIDGE</u> 3.1 Electronic weigh bridge of suitable capacity (minimum 100 Ton) suitable for weighing loaded road trucks / trailers shall be provided. The system shall have an accuracy of $\pm 0.25\%$ of actual weight. The scope shall include supply of PC, printer, UPS with ½ hour backup, software capable of providing details like, net weight, tare weight, total weight etc. Stamping by relevant authorities is also included in Contractor's scope. 4.0 <u>MISCELLANEOUS EQUIPMENTS</u> 4.1 One (1) no. Forklift truck of 5 Ton Capacity. 4.2 One (1) no. Mobile Crane of 15 Ton Capacity. 4.3 Three (3) no.s portable centrifuge (mobile unit) of 4000 L/hr capacity. 4.4 Two (2) no.s portable pumping units & 1 no trolley mounted pumping unit. 4.5 Diesel tank of minimum capacity of 20KL. MOC of tank shall be FRP. 5.0 LIST OF SUBVENDORS <table> <tr> <th>SL.NO.</th><th>ITEM DESCRIPTION</th><th>SUB VENDOR</th></tr> <tr> <td colspan="3">I. Machine Tools:</td></tr> <tr> <td>5.1</td><td>Lathe</td><td>1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier 6. Sagar Machine Tools Pvt. Ltd. 7. Batliboi Ltd</td></tr> <tr> <td>5.2</td><td>Shaping Machine</td><td>1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier</td></tr> <tr> <td>5.3</td><td>Drilling Machine</td><td>1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT</td></tr> </table>			SL.NO.	ITEM DESCRIPTION	SUB VENDOR	I. Machine Tools:			5.1	Lathe	1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier 6. Sagar Machine Tools Pvt. Ltd. 7. Batliboi Ltd	5.2	Shaping Machine	1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier	5.3	Drilling Machine	1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT
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		ISSUE R1															

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 6 OF 7
4. Kirloskar 5. Premier 6. Sagar Machine Tools Pvt. Ltd. 7. Batliboi Ltd 5.4 Grinding Machine 1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier 6. Sagar Machine Tools Pvt. Ltd. 7. Batliboi Ltd 5.5 Universal Milling Machine 1. Beco Engineering 2. D.M. Kapoor & Sons 3. HMT 4. Kirloskar 5. Premier 6. Sagar Machine Tools Pvt. Ltd. 7. Batliboi Ltd 6 Static Balancing Machine 1. Advani Oerlikon 2. Abro Balancing Machines 3. Batliboi Ltd 4. Beco Engineering 7 LT Motors 1. ALSTOM LIMITED 2. BHARATH BIJILEE LIMITED 3. CROMPTON GREAVES LIMITED 4. KIRLOSKAR ELECTRIC CO.LTD. 5. SIEMENS 6. ABB 8 Power hacksaw 1.EIFCO 2.Chanana Brothers 3.Kapoor & Sons 4.HMT 5.Kirloskar 6.Khalsa 7.Premier 8.Sagar 9 Shearing M/C 1. Beco Engineering 2.Chanana Brothers 3.D.M 4.Kapoor & Sons ISSUE R1		

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D19
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan MISCELLANEOUS EQUIPMENT	SHEET 7 OF 7
II. Forklift Truck 5.HMT 6.Kirloskar 7.Khalsa 8.Premier 9.Sagar 1. Toyota 2. Clark 3. Mitsubishi 4. Komatsu ISSUE R1		

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.1
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT BENCH DRILLING MACHINE	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment Designation	: Bench drilling machine
1.2	Quantity	: Two (2)
1.3	Drilling capacity in Steel	: 20 - 40 mm
1.4	Column to centre spindle	: 250 mm
1.5	Spindle nose to work table	: 750 mm
1.6	Spindle travel	: 125 mm
1.7	Spindle nose to Base plate maximum	: 1000 mm
1.8	Work table size (with trough)	: 350 x 350 mm
1.9	Round work table (With trough)	: 430 dia
2.0	ACCESSORIES	
2.1	Starter, Start/Stop push buttons, Indicating Lamps, Motor, Control systems	
2.2	3 Jaw Drill chuck	
2.3	Machine vice	
2.2	Coolant equipment with fitting	
2.3	Round table elevating arrangement	
2.4	Machine lamp	
2.5	Set of maintenance tools	
2.6	Operation and Maintenance manual	

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.2
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT COLUMN DRILLING MACHINE	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Column Drilling Machine
1.2	Quantity	One (1)
1.3	Drilling Capacity in Steel / CI	40 / 50
1.4	No. of Range of Spindle feeds	*
2.0	ACCESSORIES	
2.1	Starter, Start / Stop Push Buttons, Indicating Lamps, Motor, Control Systems	
2.2	Universal Table	
2.3	Coolant Equipment with Fittings	
2.2	Machine Lamp	
2.3	Standard Box Table	
2.4	Electro-Hydraulic Locking Mechanism	
2.5	Magnetic clamp	
2.6	Foundation Bolts and Nuts	

Notes :

* As per Manufacturer Standards

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.3
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT CRIMPING TOOLS	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Crimping Tools
1.2	Quantity	One (1) Set
1.3	Application	For crimping of aluminium/tinned copper terminals, lugs, connectors etc.
1.4	Range	0.5 to 16 mm² 10 to 95 mm ² 10 to 185 mm ² 50 to 400 mm ²

ISSUE
R1

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME: III
TCE.5750A-500-H-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D1.4
PART B		DATA SHEET A		SHEET 1 OF 5
		WORKSHOP AND MISCELLANEOUS EQUIPMENT		
		GENERAL EQUIPEMENT		
SL. NO.	ITEM		UNIT	

	The following general equipment, tools, instruments shall be supplied. The applicable codes and standards shall include, but not be limited to the latest editions of the standards indicated against each item.		
1.0	Two (2) sets of spanners of DE open type, all sizes upto 2 inches.		
2.0	Two (2) sets of spanners of box type, all sizes upto 2 inches		
3.0	One (1) set of valve grinding and lapping tools for valve sizes upto 150 NB size		
4.0	GENERAL TOOLS KIT Three (3) sets of general tools kit (All sizes) shall be supplied each of which shall consist the following:		
4.1	Set of fitter's hammers	IS: 1841 HAND HAMMERS	
4.2	Set of soft hammers		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GENERAL EQUIPEMENT	VOLUME: III SECTION: D1.4
TCE.5750A-500-H-001 PART B		SHEET 2 OF 5
SL. NO.	ITEM	UNIT

4.3	Two (2) each of the following files	IS: 1931 ENGINEERING FILES
	a) Flat file	- do -
	b) Head file	- do -
	c) Square file	- do -
	d) Round file	- do -
	e) Half round file	- do -
	f) Three square file	- do -
	g) Warding file	- do -
	h) Pillar file	- do -
	i) Mile file	- do -
	j) Horse rasp file	- do -
4.4	Two (2) each of the following chisels:	IS: 402 ENGINEERING COLD CHISELS
	a) Flat chisel	- do -
	b) Cross chisel	- do -
	c) Half round chisel	- do -
	d) Diamond pointed chisel	- do -

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GENERAL EQUIPEMENT		VOLUME: III SECTION: D1.4
TCE.5750A-500-H-001 PART B			SHEET 3 OF 5
SL. NO.	ITEM	UNIT	

4.5	One (1) each of the following drifts	IS: 6935 DRIFTS
	a) Simple drift	- do -
	b) Key drift	- do -
	c) Toothed drift	- do -
	d) Pin drift	- do -
4.6	One (1) Arbor press	- ---
4.7	One (1) Flat scraper	---
4.8	One (1) Half round scraper	----
4.9	One (1) Hacksaw	IS: 5169 HACKSAW FRAME
4.10	Set of screw drivers	IS: 844 SCREW DRIVERS
4.11	Set of taps and dies	IS : 6175 Hand taps & short machine taps for isometric screw threads IS : 6172 Hand taps for pipe threads parallel IS : 7796 Hand taps pipe threads taper IS : 3239 Die holder for circular thread cutting IS : 5616 Thread cutting circular dies for conduit threads
4.12	One (1) centre punch	IS : 7177 CENTRE PUNCHES

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GENERAL EQUIPEMENT	VOLUME: III SECTION: D1.4
TCE.5750A-500-H-001 PART B		SHEET 4 OF 5
SL. NO.	ITEM	UNIT

4.13	One (1) diagonal wire cutter	---
4.14	Set of wrenches	IS : 6131 Technical requirements for hand operated wrenches and sockets
4.15	One (1) pliers	IS : 2615 General requirements for pliers, pincers and nippers
5.0	MEASUREMENT TOOLS KIT Two (2) Nos. measuring tools kit (All sizes) shall be supplied which shall consist of the following:	
5.1	Set of adjustable angle plates (cast iron slotted)	IS : 6973 Precision angle plates. IS : 6985 Precision box angle plates.
5.2	Set of Vee blocks	IS : 2949 Plain V block
5.3	Set of parallel bars	IS : 4241 Engineers parallels
5.4	One (1) No. tool maker's clamp	---
5.5	One (1) No. spirit level	IS : 5706 Spirit levels for use in precision engineering
5.6	One (1) dividers (spring and firm joint type)	IS : 4019 Firm joint dividers IS : 4083 Spring dividers
5.7	Set of callipers (spring and firm joint type comprising inside, outside, transfer and hermaphrodite types)	IS : 4189 Firm joint inside, outside callipers IS : 4052 Spring callipers
5.8	Set of trammels	---

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY							
DATE							

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GENERAL EQUIPEMENT		VOLUME: III SECTION: D1.4
TCE.5750A-500-H-001 PART B			SHEET 5 OF 5
SL. NO.	ITEM	UNIT	

5.9	Set of feeler gauges	IS : 3179 Feeler gauges
5.10	Set of engineer's scales	IS : 1480 Metric scales foe general purposes IS : 1481 Metric scales for engineers
5.11	Set of straight edges	IS : 2220 Steel straight edges
5.12	Combination set	---
5.13	One (1) No. universal surface gauge	---
5.14	Set of engineer's squares	IS : 2103 Engineer's squares
5.15	One (1) No. bevel protractor	IS : 4239 Mechanical bevel protractors
5.16	One (1) No. tri square	---
5.17	One set each of depth gauges, marking gauges and planer gauges	---

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

SPEC No: TCE.5750A-H-500-001	TCE Consulting Engineers Limited	VOLUME – III SECTION: D1.5
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT FLEXIBLE SHAFT GRINDER	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Flexible shaft grinder
1.2	Number required	Two (2)
1.3	Type	Electric
1.4	Type of Drive	Geared Motor
1.5	Mounting of Motor	Rotating, Straight swivelling and tilting mounting.
1.6	Speed range	Three speed
2.0	ACCESSORIES	
2.1	Grinding wheels and guards	
2.2	One set of maintenance tools	
2.3	Three (3) metres of flexible shaft	
2.4	Geared motor for different speeds	
2.5	Tools holders and collets	
2.6	Operation and maintenance manual	

ISSUE
R0

SPECIFICATION NO.	TCE Consulting Engineers Limited RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT DOUBLE ENDED PEDESTAL GRINDER		VOLUME: III SECTION: D1.6
TCE.5750A-500-H-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Pedestal grinder
1.2	Type		Double ended
1.3	Quantity		Two (2)
1.4	Wheel size	mm	350 dia
1.5	Speed of wheels	rpm	Single speed (As per manufacture standard)
1.6	Base to Centre Line Height Distance	mm	500 (min)
1.7	Distance between wheels	mm	MFU STD
2.0	ACCESSORIES		
2.1	Grinding Wheels		a) Coarse wheel b) Fine wheel
2.2	Starter, Start / Stop Push Buttons, Motor, Control Systems		
2.3	Adjustable work rest		
2.4	Wheel Guards with side covers		
2.5	Eye Shields		
2.6	Container for Coolant		
2.7	Set of Maintenance Tools		
2.8	Foundation Bolts & Nuts		
2.9	Wheels nut spanner		
2.10	Operation and Maintenance Manual		
	Notes :		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TCE Consulting Engineers Limited			VOLUME: III SECTION: D1.6
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT DOUBLE ENDED PEDESTAL GRINDER			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

	- One pedestal grinder shall have medium graded wheels on one end and fine grade on the other for finish grinding. - The second pedestal grinder shall be coarse wheels on both sides for rough grinding and shall be heavy duty.

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TCE Consulting Engineers Limited RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT HYDRAULIC HACKSAW			VOLUME: III SECTION: D1.7
TCE.5750A-H-500-001 PART B				SHEET 1 OF 1
SL. NO.	ITEM	UNIT		

1.0	DESIGN DATA		
1.1	Equipment Designation		Hydraulic Hacksaw
1.2	Number required		One (1)
1.3	To cut square material up to	mm	300
1.4	To cut round material up to	mm	300 mm or Nearest standard size
2.0	ACCESSORIES		
2.1	Coolant equipment and tank		
2.2	Machine light		
2.3	Vice		
2.4	Bar support stand		
2.5	Set of maintenance tools		
2.6	Operation and maintenance manual		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TCE Consulting Engineers Limited RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT HYDRAULIC PULLER		VOLUME: III SECTION: D1.8
TCE.5750A-H-500-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Hydraulic Puller
1.2	Quantity		One (1)
1.3	Application		For removing all pulleys, bearings, gears and couplings from shafts
1.4	Capacity	T	100
	Maximum outside diameter	mm	1000
	Vertical height from floor to ram	mm	Min 250 Max 1250
2.0	ACCESSORIES		
2.1	100 T capacity hydraulic power pack		
2.2	Control panel and other instruments		
2.3	Cutting attachment		
2.2	1 Set of torch for cutting, welding and brazing		
2.3	1 Set of cutting nozzle		
2.4	1 Set of welding nozzle		
2.5	Oxygen and acetylene single stage regulators		
2.6	10 meter oxygen and acetylene fitted hoses		
2.7	Rayflex goggles		
2.8	Acetylene and oxygen flash back arrester		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TCE Consulting Engineers Limited			VOLUME: III SECTION: D1.8
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT HYDRAULIC PULLER			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

2.9	Flint spark lighter		
2.10	Operating spanners, etc		
2.11	Cylinder trolley		

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPEC No: TCE.5750A-H-500-001	TCE Consulting Engineers Limited		VOLUME – III SECTION: D1.9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT GENERAL PURPOSE LATHE		SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment Designation	Centre Lathe General purpose
1.2	Quantity required	Two (2)
1.3	Height of Centre	300 - 400 MM
1.4	Swing over Bed	600 - 800 MM
1.5	Swing over cross slide	350 MM
1.6	Distance between Centres	3000 MM
1.7	Type of Bed	Straight bed
1.8	Swing in gap	500
1.9	Speed range	32 to 1200 rpm
2.0	ACCESSORIES	
2.1	Dog plate	
2.2	Thread Dial Indicator	
2.3	Dead Centre	
2.4	Live Centre	
2.5	Four-way change tool post with tool holders or quick change tool post	
2.6	Steady Rest	
2.7	Follow Rest	
2.8	Coolant Pump with Fittings	
2.9	3-Jaw Self Centering Chuck	
2.10	4-Jaw Independent Chuck	
2.11	Rapid Traverse of Saddle	
2.12	Machine Lamp	
2.13	Swarf Tray	
2.14	Splash Guard	
2.15	Set of Standard operating / cutting and maintenance Tools	
2.16	Set of Change Gears for Metric, whitworth and Fractional Threads	
2.17	Taper Turning Attachment	
2.18	Operation and maintenance manual	

ISSUE R0

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT CENTRAL LATHE		VOLUME: III SECTION: D1.10
TCE.5750A-H-500-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment Designation		Heavy duty centre Lathe
1.2	Quantity		One (1)
1.3	Height of centres	mm	550
1.4	Swing over Bed	mm	1100
1.5	Swing over cross slide	mm	700 or Nearest standard size
1.6	Distance between centres	mm	5000
1.7	Gap bed required		Open gap
1.8	Type of Bed		*
1.9	Swing in gap	mm	1150
1.10	Speed range	rpm	*
1.11	Cross slide travel	mm	575
2.0	ACCESSORIES		
2.1	Starter, Start/Stop push buttons, Indicating Lamps, Motor, Control systems		
2.2	Dog plate		
2.3	Thread dial indicator		
2.4	Dead centre, Live centre		
2.5	Quick change tool post		

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK			TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY	AKC	AKC					
DATE	NOV-09	MAY-12					

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT CENTRAL LATHE		VOLUME: III SECTION: D1.10
TCE.5750A-H-500-001 PART B			SHEET 2 OF 2
SL. NO.	ITEM	UNIT	

2.6	Steady Rest		
2.7	Follow stop		
2.8	Coolant pump with fittings		
2.9	3 – Jaw self centering chuck		
2.10	Taper turning attachment		
2.11	Rapid traverse of saddle (Motor Operated)		
2.12	Machine lamp		
2.13	Swarf tray		
2.14	Splash guard		
2.15	Set of Operating and Cutting tools		
2.16	Change gear for different threads		
2.17	4-Jaw independent chuck		
2.18	Foundation bolts and Nuts		
2.19	Set of Maintenance tools		
2.20	Operation and Maintenance manual		

Note : * to be indicated by Bidder

REV. NO.	R0	R1			JOB NO.	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC			TCE.		
DATE	NOV-09	MAY-12			5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED		VOLUME: III
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT LOCKERS, ALMIRAHS		SECTION: D1.11
				SHEET 1 OF 1
SL. NO.	ITEM		UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Steel Lockers
1.1.1	Quantity		One (1)
1.1.2	Overall size		1200X500X1800 (H)
1.1.3	Compartments		10 Nos.
1.1.4	Each compartment shall have individual locking provision.		
1.2	Equipment designation		Steel Almirahs
1.2.1	Size		1200X500X1800 (H)
1.2.2	Shall be manufactured from 0.7 mm thick steel sheet fitted with 7 lever lock with 5 Nos. of adjusted shelves.		

REV. NO.	R0	R1			JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY	MSN	RK					
CHD. BY	AKC	AKC				PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE	NOV-09	MAY-12					

FILE NAME: F330R2.DOC

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.12
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT HYDRAULIC PIPE BENDING MACHINE	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Hydraulic Pipe Bending Machine
1.2	Number required	One (1)
1.3	Type	Hydraulic
1.4	Bending Capacity	10 to 80 mm pipe size, upto 8 mm pipe thickness
2.0	ACCESSORIES	
2.1	Universal head plates	
2.2	Head formers for all pipe sizes	
2.3	Outer formers for all pipe sizes	
2.4	Extension for piston rod	
2.5	Set of maintenance tools	
2.6	Hydraulic pump motor	
2.7	Standard die blocks	
2.8	Stand	
2.9	Three wheel type pipe outer	
2.10	Operation and maintenance manual	

ISSUE
R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.13
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT PIPE THREADING MACHINE	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Pipe Threading machine
1.2	Quantity	One (1)
1.3	Maximum Pipe dia to thread	150 mm

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D1.14
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT PORTABLE DRILLING MACHINE	SHEET 1 OF 1

1.0	<u>DESIGN DATA</u>	
1.1	Equipment designation	Portable Drill
1.2	Number required	Two (2)
1.3	Drilling capacity	6 mm to 25 mm
1.4	Type of Drive	Geared Motor to obtain different spindle speeds
2.0	ACCESSORIES	
2.1	Complete set of drill bits and drill chucks	
2.2	Removable type of spade handle and side handle for heavy duty drilling.	
2.3	10 metres length of power cable with reeling drum.	
2.4	Portable work table with vice.	

ISSUE R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT PRECISION LATHE MACHINE		VOLUME: III SECTION: D1.15
TCE.5750A-H-500-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment Designation		High Speed Precision Lathe
1.2	Quantity		One (1)
1.3	Height of centres	mm	250
1.4	Swing over Bed	mm	500
1.5	Swing over cross slide	mm	300
1.6	Distance between centres	mm	3000
1.7	Type of Bed		Straight natural gap
1.8	Swing in gap	mm	550
1.9	Speed range	rpm	50 to 2000
2.0	ACCESSORIES		
2.1	3 –Jaw Self centering chuck		
2.2	3 – Jaw Precision Self-centering Chuck		
	4 – Jaw independent Chuck		
2.2	Universal face plate		
2.3	Collect Chuck and Collets		
2.4	Rear tool post		
2.5	Steady Rest		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOLUME: III SECTION: D1.15
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT PRECISION LATHE MACHINE		SHEET 2 OF 2
SL. NO.	ITEM	UNIT	

2.6	Follow stop		
2.7	Longitudinal stop		
2.8	Roll stop		
2.9	Taper turning attachment		
2.10	Set of change gears of non standard type		
2.10	Diametral and Circular pitches, Parrallel and Taper threads on bolt and pipes		
2.11	Coolant equipment		
2.12	Splash guard		
2.13	Machine lamp		
2.14	Quick change Tool post with 5 nos Tool Holders		
2.15	Set of operating / Cutting and maintenance tools		
2.16	Centre reduction sleeve		
2.17	Driving plate with Peg		
2.18	Operation and maintenance manual		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT RADIAL DRILLING MACHINE		VOLUME: III SECTION: D1.16
TCE.5750A-500-H-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Radial Drilling machine
1.2	Quantity		One (1)
1.3	Drilling Capacity in Steel / CI		50 / 60
1.4	Maximum Drilling Radius		1500
1.5	Maximum Distance between Base Plate and spindle		1000
1.6	Maximum Drilling Head Traverse		1000
1.7	Spindle Travel Drilling Depth		250
1.8	No. of Range of Spindle feeds		*
1.9	Swing of Arm		*
2.0	ACCESSORIES		
2.1	Starter, Start / Stop Push Buttons, Indicating Lamps, Motor, Control Systems		
2.2	Universal Table		
2.3	Coolant Equipment with Fittings		
2.2	Machine Lamp		
2.3	Standard Box Table		
2.4	Electro-Hydraulic Locking Mechanism		
2.5	Magnetic clamp		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME: III SECTION: D1.16
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT RADIAL DRILLING MACHINE			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

2.6	Foundation Bolts and Nuts		

Notes :

* As per Manufacturer Standards

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT SHAPING MACHINE		VOLUME: III SECTION: D1.17
TCE.5750A-H-500-001 PART B			SHEET 1 OF 1
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Shaping machine
1.2	Number		Two (2)
1.3	Maximum length of Stroke	mm	600
	Table Size		
1.4	Top Length	mm	600
1.5	Top Width	mm	550
1.6	Side height	mm	550
1.7	Horizontal Travel of the Table on slides	mm	750
1.8	Vertical Travel of the table	mm	350
1.9	Admit on Top table	mm	400
2.0	ACCESSORIES		
2.1	Swivelling Table		
2.2	Universal Table		
2.3	Quadrant Tool Box		
2.4	Set of operating and maintenance tools		
2.5	Cooling Pump with Fittings		
2.6	Operation and maintenance manual		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT UNIVERSAL MILLING MACHINE		VOLUME: III SECTION: D1.18
TCE.5750A-H-500-001 PART B			SHEET 1 OF 2
SL. NO.	ITEM	UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Universal Milling machine
1.2	Number		One
1.3	Length	mm	1500
1.4	Width	mm	300
1.5	Power Operating Long Traverse	mm	950
1.6	Power Operating Cross Traverse	mm	320
1.7	Power Operating Vertical Traverse	mm	400
1.7	Spindle Speed Range	rpm	35 to 2400
2.0	ACCESSORIES		
2.1	Machine Vice with Swivel Base		
2.2	Self Centering Vice		
2.3	Universal Dividing Head		
2.4	Height Adjustable Tail Stock		
2.5	Hand Operated Vertical Indexing Head		
2.6	Hand Operated Horizontal Indexing Head		
2.7	Slotting Attachment		
2.8	Hand Operated Circular Table		
2.9	Milling Arbors and Stub Arbors		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT UNIVERSAL MILLING MACHINE		VOLUME: III SECTION: D1.18
TCE.5750A-H-500-001 PART B			SHEET 2 OF 2
SL. NO.	ITEM	UNIT	

2.10	Collect Chuck with Collets		
2.11	Machine Lamp		
2.12	Climb Milling Attachment		
2.13	Coolant Equipment		
2.14	Over arm Brace		
2.15	Two Arbor Support Bearings		
2.16	Set of operating and maintenance tools		
2.17	Thread Milling Attachment		
2.18	Vertical and Universal Milling Attachment		
2.19	Operation and maintenance manual		
2.20	Back lash eliminator		
2.21	Magnetic chuck		
2.22	Rack milling attachment		
2.23	Set of cutters including gear cutter - One set		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY							
CHD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE					5750A		

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME: III SECTION: D1.19
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT WORK BENCHES			SHEET 1 OF 1
SL. NO.	ITEM		UNIT	

1.0	DESIGN DATA		
1.1	Equipment designation		Work bench with knee
1.2	Type		Wooden with metal frames
1.3	Quantity		Six (6)
1.4	Size		1800 (L) x 1200 (W) x 900 (H)
1.5	Material of wood		To be decided by bidder
1.6	Thickness of wood		To be decided by bidder
1.7	No. of vice on each work Bench		Four (4) Fitted on four corner
1.8	Vice Jaw width		150

Notes:-

The work benches should be essentially of wooden construction with M.S frame work and sheet metal top over wooden top and should be robust in design. Each work bench should have two sets of two drawers fitted with locks positioned at diagonally opposite sides. One drawer suitable for holding tools and the second for keeping miscellaneous things. The work benches should be capable of withstanding approximately 1 tonne load and should be sound enough for working like chipping, filling, hammering, assembly etc. Each bench should be fitted with bench vices on opposite sides. The bench vice should be generally as per IS 2686.

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY							
DATE							

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.1
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GAS CUTTING, WELDING, BRAZING SET			SHEET 1 OF 2
SL. NO.	ITEM	UNIT		

1.0	DESIGN DATA		
1.1	Equipment Designation		Gas Cutting, Welding & Brazing Set
1.2	Quantity		Four (4)
1.3	Capacity:		
	a) Welding(Mild steel)	mm	25 (Max)
	b) Cutting (Mild steel)	mm	150 (Max)
2.0	ACCESSORIES TO BE SUPPLIED		
2.1	Shank		
2.2	Mixer		
2.3	Cutting attachment		
2.4	1 Set of torch for cutting, welding and brazing		
2.5	1 Set of cutting nozzle		
2.6	1 Set of welding nozzle		
2.7	Oxygen and acetylene single stage regulators		
2.8	10 meter oxygen and acetylene fitted hoses		
2.9	Rayflex goggles		
2.10	Acetylene and oxygen flash back arrester		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.1
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT GAS CUTTING, WELDING, BRAZING SET			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

2.11	Flint spark lighter		
2.12	Operating spanners, etc		
2.13	Cylinder trolley		

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
TCE.5750A-H-500-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D2.2
PART B		DATA SHEET A		SHEET 1 OF 2
		WORKSHOP AND MISCELLANEOUS EQUIPMENT OXY ACETYLENE SETS		
SL. NO.	ITEM		UNIT	

1.0	DESIGN DATA		
1.1	Equipment Designation		OXY – ACETYLENE SET
1.2	Quantity		FOUR (4)
2.0	ACCESSORIES		
2.1	Spark Lighter		YES
2.2	Gas Welding / Gas Cutting Nozzles		YES
2.3	Gas Pressure Regulators (Oxygen / Acetylene)		YES
2.4	Red and Black Hose Pipes (10 metres each)		YES
2.5	Hose Clips		YES
2.6	Cylinder Key Spanners		YES
2.7	Two Cylinder Trolleys with Tool Box		YES
2.8	Gas Welding Gloves		YES
2.9	Pressure Gauges		YES
2.10	Chrome Leather Apron		YES
2.11	Chrome Leather Gloves		YES
2.12	Hose Protectors		YES
2.13	Regulator Spanners, Spindle Keys and Outfit Spanners		YES

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.2
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT OXY ACETYLENE SETS			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

2.14	Hose Connectors		YES
2.15	Hose Connections, Check valves and Nuts		YES
2.16	Standard Wire Brush		YES
2.17	Narrow Wire Brush		YES
2.18	Blow Pipe for Welding (Standard and Adaptable)		YES
2.19	Blow Pipe for Cutting (Standard and Adaptable)		YES
2.20	Welding Torch with Separable Tips and Mixing Head.		YES
2.21	Gas Cylinder	1 Nos	YES

Notes:

The above units should be of standard make. Each of the cutting / welding units should be complete with the various spare nozzles to facilitate cutting / welding of different thickness of metals.

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE.	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY					5750A		
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III SECTION: D2.3
		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING GEN SET		SHEET 1 OF 2
SL. NO.	ITEM		UNIT	

1.0	DESIGN DATA		
1.1	Equipment Designation		MOTOR GEN. WELD SET (DC)
1.2	Type		PORTABLE
1.3	Quantity		TWO (2)
1.4	Maximum Continuous Hand Welding Current (60% Duty cycle)	A	300
1.5	Range of Welding Current	A	50 – 400
1.6	Input Supply	V, Ph. Hz.	415V, 3PH, 50 Hz
1.7	Type of Enclosure :		DRIP PROOF
1.8	Insulation Class		By BIDDER
1.9	Tolerances for Rated Current and Normal Speed.		By BIDDER
1.10	Induction Motor for Running Generator Required (Motor to Conform to IS: 325)		YES
1.11	Max, Intermittent Hand Welding Current		400
1.12	Type of Current Settings.		STEPPED / STEPLESS
2.0	ACCESSORIES TO BE SUPPLIED		
2.1	Electrode Cable (5 m Length)		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY							
DATE							

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.3
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING GEN SET			SHEET 2 OF 2
SL. NO.	ITEM		UNIT	

2.2	Electrode Holder (Insulated)		
2.3	Protective Mask / Shield with Coloured Glass (2 nos.)		
2.4	Earthing Clamp and Cable (5 m Length)		
2.5	Chipping Hammers (2 nos)		
2.6	Wire Scratch Brush (2 nos Standard & Narrow)		
2.7	Leather Gloves (2 Pairs)		
2.8	Detachable Regulator for Remote Control of Welding Current		
2.9	Chrome Leather Apron		
2.10	Welders Goggles Protected by Clear Glass		

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED		VOLUME:III
TCE.5750A-H-500-001		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SECTION: D2.4
PART B		DATA SHEET A		SHEET 1 OF 3
		WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING RECTIFIER SET		
SL. NO.	ITEM		UNIT	

1.0	DESIGN DATA		
1.1	Equipment Designation		WELDING RECTIFIER
1.2	Quantity		TWO (2)
1.3	Input Supply	V, Ph, Hz.	415V, 3 Ph, 50Hz
1.4	Open Circuit Voltage		BY BIDDER
1.5	Welding Current Range	A	50 - 400
1.6	Maximum Continuous Hand Welding Current (60% Duty Cycle)	A	300
1.7	Maximum Intermittent Hand Welding Current	A	400
1.8	Type of Current Settings		STEPPED / STEPLESS
1.9	Insulation Class		BY BIDDER
1.10	Type of Cooling		BY BIDDER
1.11	Type of Enclosure		BY BIDDER
2.0	ACCESSORIES TO BE SUPPLIED		

REV. NO.					JOB NO.	CLIENT: RRVUNL	
PPD. BY					TCE. 5750A	PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY							
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING RECTIFIER SET			SHEET 2 OF 3
SL. NO.	ITEM		UNIT	

2.1	Electrode Cables		
2.2	Electrode Holder		
2.3	Earthing Clamp		
2.4	Pair of Hand Gloves		
2.5	Face Shield with Coloured Glasses and two numbers of clear glasses		
2.6	Chipping Hammer		
2.7	Wire Scratch Brush		
2.8	Chrome Leather Apron		
2.9	Welders Goggles Protected by Clear Glass		
3.0	TESTS AND TEST CERTIFICATES		
3.1	The following routine tests shall be conducted and test certificates for the same shall be furnished		
3.1.1	Short circuit test		
3.1.2	High voltage test		
3.1.3	Insulation resistance test		
3.1.4	Open circuit voltage test		
3.1.5	Type of Certificate for the following tests shall be furnished_		
3.2	Testing for maximum welding current		

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED			VOLUME:III SECTION: D2.4
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING RECTIFIER SET			SHEET 3 OF 3
SL. NO.	ITEM		UNIT	

3.2.1	Temperature rise test		

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
DATE							

FILE NAME: F330R2.DOC

SPEC No: TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D2.5
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING TRANSFORMER DATA SHEET - A		SHEET 1 OF 3

1.0	<u>DESIGN DATA</u>		
1.1	Equipment Designation		TRANSFORMER WELD SET
1.2	Type		Air / Oil cooled
1.3	Quantity		Two (2)
1.4	Maximum Continuous Hand Welding Current (60% Duty cycle)	A	300
1.5	Range of Welding Current	A	50 – 400
	Input Supply	V, Ph. Hz.	415V, 3ph, 50 Hz
2.0	Open Circuit		By Bidder
2.1	Insulation Class Voltage not to Exceed 80 V, RMS		By Bidder
2.2	Type of Enclosure		DRIP PROOF
2.3	Maximum Intermittent Hand Weld Current	A	400
2.4	Type of Current Settings		STEPPED / STEPLESS
2.5			
2.6	ACCESSORIES		
2.7	Electrode Cables		YES, 5 M Length
2.8	Electrode Holder		YES
2.9	Protective Mask / Shield with Coloured Glass		YES
2.10	Earthing Clamp and Cable		YES, 5 M Length per set

ISSUE R1

SPEC No: TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME – III SECTION: D2.5
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING TRANSFORMER DATA SHEET - A		SHEET 2 OF 3

2.11	Chipping Hammer		YES, 6 Nos
2.12	Wire Scratch Brush		YES
2.13	Pair of Leather Gloves		YES, Chrome Leather
2.14	Chrome Leather Apron		YES
2.15	Welders Goggles Protected by Clear Glass		YES
2.16	TESTS AND TEST CERTIFICATES		
2.17	<u>The following routine Tests shall be conducted and test certificates for the same shall be furnished</u>		
	Short circuit test		
2.18	High voltage test		
2.19	<i>Insulation resistance test</i>		
2.20	Open Circuit Voltage Test		
3.0	<i>Test certificate for the following tests shall be furnished</i>		
3.1	Testing for maximum welding current		
3..2	Temp rise test		
	Notes		
	The transformer shall be capable of operating continuously at maximum continuous hand welding current at the specified duty cycle without overheating.		

ISSUE R1

SPEC No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME – III SECTION: D2.5
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan WORKSHOP AND MISCELLANEOUS EQUIPMENT WELDING TRANSFORMER DATA SHEET - A	SHEET 3 OF 3
ISSUE R1		

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET A HEADING / PARTICULAR		VOLUME:III SECTION: D
TCE.5750A-500-H-001 PART B				SHEET 1 OF 1
SL. NO.	ITEM	UNIT		

[illegible]

REV. NO.					JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY							
CHD. BY							
DATE						PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	

FILE NAME: F330R2.DOC

D20

RIVER WATER SYSTEM

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D20
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RIVER WATER SYSTEM	SHEET 1 OF 4

1.0 RIVER/CANAL WATER SUPPLY SYSTEM

- 1.1 The source of raw water for the proposed station would be from Indira Gandhi Nahar Pariyojana (IGNP). Main canal which is situated 4 km away from the proposed site. The entire river/canal water supply system intake, Parshall flume, link canal, de-silting chambers, pumping station and conveying from the source to the power plant including route survey and Geotechnical investigation is included in the scope of this contract. Head regulator on the IGNP main canal shall be constructed by Irrigation Department Govt. Of Rajasthan but screen is to be provided and fixed by bidder.
- 1.2 The proposed canal intake system shall be located within 100m from the existing canal intake system on the IGNP canal. The intake system shall cover intake screen, Parshall flume, lined channel, stop log with handling and maintenance arrangement and onward conveying channel, RCC de-silting chambers with sludge pumps, forebay, RCC pump house with EOT crane and all required complete system as per existing river water scheme. Required interconnection between existing and proposed system if any shall be included in the scope. The link canal, Parshall flume and de-silting chambers are to be designed for 120 cusecs discharge. However pump house and conveying system shall be designed for 60 cusecs discharge keeping provision for future extension for additional 60 cusecs discharge. All required clearance/ approval shall be obtained by Contractor. Water required during construction period shall be arranged by Contractor. Bidder to visit the site to understand scope and to identify the exact location of the proposed system as per client requirement before submitting their bid. Please refer attached drawing no. TCE.5750A-562-SK-1016 P0 for details of river water flow scheme.
- 1.3 River water pump house shall be located adjacent to the existing pump house. It shall be sized to accommodate 5 x 50% (two pumps for each unit and 1 no. common standby) river water pumps each of 2150 cum/hour capacity (18 hours/day). Main supply pipeline to plant from river water pump house shall be designed for 5 nos. pumps operating at full load condition. Separate bays within the pump house shall be provided for equipment unloading, pump/motor maintenance, chlorination equipment, MCC and Control room. Stop logs & coarse screens shall be provided at the inlet of each pumping chamber. Provision shall be kept for installing future pumps of similar capacity.
- 1.4 Underground GRP pipeline shall be laid from river water pump house to raw water storage tank located inside proposed plant. Pump discharge piping shall be complete with required expansion joints, motorised & manually operated butterfly valves and other fittings. Refer section D7 of Vol. III for piping requirement details.
- 1.5 **CIVIL REQUIREMENTS**
Civil works for Raw water Intake system from IG Canal head regulator to De-silting chamber, Pump house etc. & Piping up to Reservoir including Parshall

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D20
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RIVER WATER SYSTEM	SHEET 2 OF 4

flume for flow measurement at intake. The link canal shall be lined with 150 mm clay layer, 100 mm thick sand cushion, 500 micron HDPE film and 600x600x50 mm M-20 grade precast concrete blocks placed over 20 mm thick 1:4 cement mortar. De-silting chambers shall be divided in two compartments of RCC construction, having RCC screen wall across the width, ramp, baffle walls, stop logs etc. Refer Vol. VI for design parameters of civil works.

1.6 ELECTRICAL SYSTEM

The scope of electrical system includes the following:-

- 2 Nos. 11kV distribution feeders starting from the 11 kV Station switchgear located in the power plant up to the 11kV Switchgear of the river water pump house which is located 4 KMs away. These feeder shall be partly by cable and partly by over head line as follows:
 - From the 11 kV Station switchgear of power plant up to the boundary of the power plant where the cables shall be terminated on to the 11 kV Lattice towers – By 11 kV unearthed armoured cable. – For specification of cable and laying refer Vol IV, Part-B, sections D16.
 - From 11 kV lattice towers located near the power plant up to the 11 kV lattice towers located near the River water pump house – By double circuit overhead lines on lattice towers. For detailed specification refer Vol IV, Part-B, Section D30.
- 11 kV River water pump house Switchgear with 2 incomers and bus coupler breakers – generally as per attached drawings and Vol IV, Part-B, sections D7.
- 2x100%, 11kV/433 V cast resin dry type Service Transformers of capacity as required. For detailed specification refer- Vol IV, Part-B, Section- D8.
- 415 V River water pump house MCC/ Switchgear DBs with 2 incomers and bus coupler breakers – generally as per attached drawings and Vol IV, Part-B, sections D9.
- Non- segregated bus ducts for connection between Service Transformers and Switchgear/MCC. For detailed specification refer- Vol IV, Part-B, Section- D6-1.
- Power, Control and instrumentation cables required for the river water system - For details of specifications of cables refer Vol IV, Part-B, section D16.
- Power, control and instrumentation Cable trays, trenches, over head racks, tray supporting members, GI pipes, duct banks etc for laying of cables for the river water system. For detailed specification refer- Vol IV, Part-B, Section- D16

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D20
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RIVER WATER SYSTEM	SHEET 3 OF 4

- h) Lighting system for illumination of River water pump house, MCC room, Control room and their periphery consisting of Lighting transformers, Lighting DB, single phase Lighting panels, 15 A and 5 A Receptacles, Light fittings, conduits, switches, JBS, cables etc as per Vol IV, Part-B, Section D17.
- i) Power, control and instrumentation Cable trays, trenches, over head racks, tray supporting members, GI pipes, duct banks etc for laying of cables for the river water system. For detailed specification refer- Vol IV, Part-B, Section- D16
- j) Formation of an earthing grid with Earthing conductor, earthing electrodes, earth pits (both treated and normal) and connection to various equipment / structures requiring earth connection. Neutral earthing of Transformers - For detailed specification refer- Vol IV, Part-B, Section- D12 and D18.
- k) Lightning protection of the River system buildings - For detailed specification refer- Vol IV, Part-B,Section- D18.
- l) Complete fire alarm, detection and portable fire extinguishers for the RW system equipment and within buildings. For detailed specification refer- Vol IV, Part-B,Section- D19
- m) UPS for the RW system PLC. For detailed specification refer- Vol IV, Part-B,Section- D11.
- n) Battery and Battery chargers – 2 X 100 % batteries and 2 X 100 % Float cum Boost Chargers with DCDB.- For detailed specification refer- Vol IV, Part-B,Section-D10.
- o) Motors as required for the system. For detailed specification refer- Vol IV, Part-B, Section- D13.
- p) Control panel for local operation of the system - For detailed specification refer- Vol IV, Part-B, Section- D15.
- q) Communication system for communicating within RW system and with the main plant and outside world. - For detailed specification refer- Vol IV, Part-B,Section- D22.
- r) Installation, testing and commissioning of all equipment. For detailed specification refer- Vol IV, Part-B, Section- D20 and D29.
- s) Spares and tools as per Vol IV, Part-B,Section- D27

1.7 INSTRUMENTATAION AND CONTROL

ISSUE
R1

SPEC. No: TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME: III SECTION: D20
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RIVER WATER SYSTEM	SHEET 4 OF 4
PLC based control system shall be provided for control and operation of River Water system equipment such as pumps, motorized valves etc. Both local and remote control and monitoring shall be envisaged for this system. For remote control and monitoring, the PLC system shall be linked to plant DCS through dual redundant Fibre Optic communication links with suitable EI/Optical converters/deconverters. For the specific requirements of Instrumentation and Control system design, control and operation philosophy etc. refer Volume-V of the tender specification. 2.0 GRP pipes shall be sourced from following vendors. 1.0 Graphite India Nashik 2.0 Amiantit Goa 3.0 Ankit Roof ISSUE R1		

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 20
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 1 OF 2
DATASHEET A RIVER WATER PUMPS			
SL. NO.	ITEM	UNIT	

1	Total No. of pumps	NOS.	5x50% for River water pumps
2	No. of pumps operating	NOS.	2W (each unit) + 1S (common standby)
3	Pump capacity	Cu.m/hr	2150
4	Pump Total Head excluding losses in the pump	m	By Bidder
5	Pump speed (max.)	RPM	By Bidder (to limit specific speed to 6000 & ensure adequate NPSH at all conditions)
6	Type of pump		Vertical Turbine
7	Type of internal element		Non pull out
8	Liquid handled		River water
9	Type of line bearing lubrication		Self
10	Liquid for lubrication		Pumped liquid
11	Type of pump motor coupling		By Bidder
12	Thrust bearing location		By Bidder
13	Pump operating range		Refer Note-1
14	Motor rating		Minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.
15	Materials of construction		
	(a) Pump column pipe, Discharge elbow		Fab steel to IS 2062 Gr. B with epoxy painting
	(b) Pump bowl and bell mouth		CI to IS 210 FG 260
	(c) Impeller		ASTM A351 A Gr. CF8
	(d) Shaft		ASTM A 276 Type 410

REV. NO.				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY					PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	
CHD. BY						
DATE						ISSUE R1

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED		VOL III SECTION: D 20
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan		SHEET 2 OF 2
DATASHEET A RIVER WATER PUMPS			
SL. NO.	ITEM	UNIT	

	(e) Line shaft coupling		ASTM A 276 Type 410
	(f) Line shaft bearing		Cutlass Nitrile rubber in SS shell
	(g) All hardware		ASTM A193 / 194 -B8M /8M
	(h) Sole plate		MS - IS 2062 Gr. B
	(i) Base plate		MS - IS 2062 Gr. B
	(j) Shaft sleeve		ASTM A 276 Type 410
	(k) Wear ring		ASTM A351 A Gr. CF8
	(l) Gland		SS 304
	(j) Gland packing		PTFE
1.6	Inspection Requirement		As per relevant section
1)	Note : Pumps shall be capable of operating from shut-off point to a maximum flow of 130%		
2)	Bidder shall establish the water levels in the reservoir and accordingly design the head of river water pumps		

REV. NO.				JOB NO. TCE. 5750A	CLIENT: RRVUNL	
PPD. BY						
CHD. BY					PROJECT: 2 x 660 MW, Super-Critical TPS, Stage- V, Suratgarh, Rajasthan	ISSUE R1
DATE						

SPECIFICATION NO. TCE.5750A-H-500-001 PART B	TATA CONSULTING ENGINEERS LIMITED	VOL III SECTION: D 20
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B RAW WATER PUMPS	SHEET 1 OF 1

ENQUIRY/SPECIFICATION NO.:	BIDDER:

SL. NO.	ITEM	UNIT	

1	Pump make and type /Model		River water pumps
2	Motor make & model		[[
3	Guaranteed performance		[[
	(a) Design capacity	(cu.m. /hr)	[[
			[[
	(b) Total head excluding losses in pumps	m	[[
			[[
	(c) Losses in pumps	m	[[
			[[
	(d) Shut off head	m	[[
			[[
	(e) Pump speed	RPM	[[
			[[
	(f) Bowl efficiency	%	[[
			[[
	(g) Pump overall efficiency	%	[[
			[[
	(h) Power input to pump at duty point	kW	[[
			[[
	(i) Noise level	dBA	[[
			[[
	(j) Vibration level	microns	[[
4	Pump materials of construction		[[
5	Pump set weight (a) Static weight including weight of rotating parts (b) Weight of rotating parts	kg. kg.	[[
6	Pump setting length	M	[[
7	Motor rating	kW	[[

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 – III SECTION: D 20
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan RAW WATER PUMPS : DATASHEET C	SHEET 1 OF 1
1.1 Final dimensional drawings for the pumpset with details of opening required in the floors for clearance of casing, details of pump plate and anchor bolts (size, location, embedment, projection etc.) grouting details, details of sealing the floor openings, grouting details for thrust pad arrangement weight of pump and motor including water column, forces acting at pump, base plate and other bends in the pump suction and delivery lines, necessary clearances for erection / maintenance and any other relevant data required for design of civil structures. 1.2 Cross Sectional drawing of the pump with complete bill of material for various components indicating recommended spare parts. 1.3 Loading data required for foundation design. 1.4 Layout drawings for pumps gland sealing and line bearing lubrication system. 1.5 Final list of motors including voltage phase, kilowatt, service and location etc. 1.6 Schedule of valves and fittings. 1.7 Write-up & recommended logic schemes for interlock, protection and sequential controls for pumps and its auxiliaries. 1.8 Characteristic of temperature elements. 1.9 List of alarm and trip settings. 1.10 Weights and sizes of major components / sub-assemblies to be handled at site as single lift during erection. 1.11 Inspection and Test procedure. 1.12 Recommended mode of erection, erection sequence and other relevant particulars in respect of erection of circulating water pumps and accessories. 1.13 Instructions Manual 1.14 Quality Plans 1.15 Pump performance curves 1.16 Details of handling equipment to carry out maintenance work on pumps 1.17 Calculations for establishing pump head. 1.18 System resistance curve		
		ISSUE R1