

RAJASTHAN RAJYA VIDYUT UTPADAN
NIGAM LTD.

2 X 660 MW, SUPER-CRITICAL TPS,
STAGE-V, UNIT # 7 & 8
AT
SURATGARH, RAJASTHAN

TECHNICAL SPECIFICATION
FOR
AUXILIARY STEAM PRESSURE REDUCING
AND DESUPERHEATING STATION
ALONGWITH ACCESSORIES

SPECIFICATION No: PE-TS -392-142-N101 (REV 00)



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

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TECHNICAL SPECIFICATION
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VOLUME - II B

SPECIFICATION No: PE-TS -392-142-N101 (REV 00)



BHARAT HEAVY ELECTRICALS LIMITED
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TITLE

PREAMBLE

SPECIFICATION NO **PE-SS-999-100-Q-001**

VOLUME **II B**

SECTION PREAMBLE

REV NO. **0** DATE 05.02.2008

SHEET 1 OF 1

1.0 Volume – II B :

This volume is sub- divided into following sections: -

Section – A : This section outlines the scope of enquiry

Section – B : This section provides : “ Project Information”.

Section- C : This section indicates tech. Requirements specific to the contract, not covered in Section – D.

Section – D : This section comprises of tech. Specifications of equipments complete with data sheet A,B&C.

Data Sheet – A specifics data and other requirements pertaining to the equipment.

Data sheet – B specifics data to be filled by the bidder (Data Sheet B is contained in Volume – III.

Data Sheet – C indicates data/ documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).



TITLE

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

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Data Sheet - A 1	Sizing Data For High Capacity Aux. Steam PRDS (Combined type ASV-22, CDV-262)		
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**RRVUNL - 2 x 660 MW, Super-Critical TPS,
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	Equipment Specification Steam Desuperheater	PES-148-01	3
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Quality Plan	Quality Plan for Control Valve		5
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Tender Drawings	Auxiliary Pr. Reducing and DeSuperHeating Station	PE-DG-392-142-N101	1

FILLED-UP QUALITY PLAN AS MINIMUM REQUIREMENTS IS INCLUDED
FOR CONTROL VALVE & STEAM DESUPERHEATER.



TITLE


SCOPE OF ENQUIRY**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION****FOR****RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

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VOLUME **IIB**SECTION **A**REV NO. **00** DATE 15.11.13

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SECTION – A**SCOPE OF ENQUIRY**

	TITLE SCOPE OF ENQUIRY AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION FOR RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan	SPEC. NO.: PE-TS-392-142-N101	
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1.1 This enquiry covers the Design, Manufacture, Assembly, Inspection and Testing at Vendor’s and/or his sub-vendors works, painting and delivery to site of Auxiliary Steam Pressure Reducing & Desuperheating Stations, as mentioned in different sections of this specification for RRVUNL – 2X660 MW SURATGARH UNIT-7/8.

The tenderer shall also quote separately for the following:-

a) Supervision of erection & commissioning of the equipment, if applicable.

b) Recommended spares for 3 years of post guarantee period operation.

1.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the Engineer/Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

1.3 The bidder may quote for his standard, proven design of equipment and shall indicate any deviations from this specification in the enclosed schedule. **In the absence of duly filled deviation schedule, it shall be presumed that the offer confirms exactly to this specification.** The bidder shall also furnish the performance feedback data of the equipment from similar installations. However, the acceptance of the deviations/options is not binding on the Engineer/Owner.

1.4 The bids shall be in English language and MKS Units.

1.5 Filled up quality Plans as minimum technical requirements, are included in this specification in Vol. IIB Sec D. Bidder is required to submit the enclosed Quality Plan, or bring out specific deviations on it, while submitting the bid.

1.6 Similar to Quality Plan, Bidder is required to furnish Field Quality Plan (FQP), if applicable. FQP shall indicate all inspection/test to be carried out at site covering the following:

i).

Receipt of material.

ii).

Storage or Conservation.


iii).

Pre-Erection & Erection

iv).

Pre-Commissioning, commissioning & post commissioning.

FQP shall furnish adequate instructions to be followed by erection & commissioning agency at site.

	TITLE SCOPE OF ENQUIRY AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION FOR RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan	SPEC. NO.: PE-TS-392-142-N101	
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Bidder is requested to refer standard no PES-100-918 on field quality plan enclosed in Volume III of this specification.

1.7 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

1.8 BHEL's / RRVUNL's representatives shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

1.9 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / RRVUNL.



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PROJECT INFORMATION

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

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SECTION – B

PROJECT INFORMATION



TITLE

PROJECT INFORMATION

AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
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PROJECT INFORMATION

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



TITLE

PROJECT INFORMATION

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



TITLE
SPECIFIC TECHNICAL REQUIREMENTS
AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION
FOR
RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan

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SECTION-C

SPECIFIC TECHNICAL REQUIREMENTS



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1.0.0 BRIEF SYSTEM DESCRIPTION

- 1.1.0 Auxiliary steam system is designed to provide steam for the turbine auxiliaries, boiler auxiliaries and fuel oil heating system during start-up, low loads and normal running of unit.
- 1.2.0 The system comprises of two auxiliary steam pressure reducing and desuperheating stations (PRDS). One "High capacity PRDS" with tapping off steam from main steam line to meet auxiliary steam requirements during unit start-up, low loads & for fuel oil system, and the other "Low Capacity PRDS" with tapping off steam from CRH line to meet auxiliary steam requirements during normal running. Spray water required for desuperheating will be tapped off from CEP discharge.
- 1.3.0 These two stations will reduce the pressure and temperature of the steam tapped off from CRH line and main steam line to 16 kg/cm² (abs) & 310°C at the high temperature auxiliary steam header and subsequently to 16 kg/cm² (abs) & 210°C at the low temperature auxiliary steam header through a suitable desuperheater between the high temperature and low temperature auxiliary steam headers.

2.0.0 EQUIPMENT TO BE PROVIDED BY TENDERER

2.1.0 AUXILIARY STEAM PRDS COMPRISING OF :

2.1.1 Control Valves & Accessories:

- 2.1.1.1 Combined Type High Capacity Pressure Reducing & Desuperheating Valve (On MS line) (ASV-22) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.1.2 Low Capacity PRV on CRH Line (ASV-26) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.1.3 Spray Control Valve for HC-PRDS (CDV-262) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.1.4 Spray Control Valve for LT-DESH (CDV-268) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.1.5 Spray Control valve to TGS DESH (CDV-93) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.1.6 Each control valve shall be supplied with the accessories specified in the relevant data sheets at Section-D.

2.1.2 Desuperheaters :

- 2.1.2.1 Direct mixing type LT desuperheater (DESH-2) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.2.2 Direct mixing type TGS desuperheater (DESH-3) : One No. / Unit (02 nos. for 02 Unit)
- 2.1.2.3 The desuperheater shall be complete with pipe, spray nozzle along with necessary attachment as specified in section-D. **Insertion type desuperheaters are not acceptable.**



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

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SPECIFIC TECHNICAL REQUIREMENTS.

1. In case of any clash between this SPECIFIC TECHNICAL REQUIREMENTS and customer SPECIFIC TECHNICAL REQUIREMENTS, attached further the customer specific technical requirements shall override
2. The Hook-up diagram for Control valve, is attached. the scope demarcation as indicated should be adhered. The connection details at Instrument Air valve shall be furnished to successful bidder after the award of contract.
3. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. **However Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.**
4. Bidder to note that, **wherever downstream side of the valve is subjected to the Vacuum service, bidder to offer double Gland packing, and in that case, flow direction of working fluid shall be to close the valve.** Separate indication for the same has not been made in the data sheets-A.
5. For valves subjected to cavitation service, anti-cavitation trim shall be provided.
6. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost
7. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.
8. SS nameplate to control valve shall include Tag no./ KKS no./ Sl. No./ Body material/ size/ Press Rating/ Trim material/ Trim type/ action on air failure/ diaphragm air press at full open and close condition
9. Hand wheel shall have open/ close direction.
10. Limit switch shall be designed for 1,00,000 operations.
11. JB shall be 24 ways as per enclosed hook-up diagram.
12. The material of filter for Air Filter Regulator shall be Sintered bronze.
13. Bidder to indicate pick-up & drop out voltage for all solenoid valves.
14. Protection class for Limit switches, I/P converter and Position transmitter shall be IP-65 only.
15. All JB's and valves shall be with double compression type Ni plated brass cable glands.



Technical specification for
Control Valves with Accessories
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16. Solenoid valve class of protection shall be IP-65.

17. All local cabling up to JB's shall be in Conduit (Flexible/Rigid). If JB is not mounted near valve

18 . All regulating type final control elements shall have actuator of pneumatic type.

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Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS	SHEET 19 OF 55 SHEET 5 OF 23

3.0.0 SPECIFIC TECHNICAL REQUIREMENTS FOR CONTROL VALVES & ACCESSORIES

The requirements in this section are specific for the project and **shall over-ride the specification under section-D** in case of any contradiction.

(clause nos. mentioned as below are as per customer specification, the same shall be considered as sub-clauses of 3.0.0)

14.15 Pneumatically Operated Control Valves

14.15.1 Pneumatically Operated Control Valves shall be provided for all control application. If the process demands any other control, then control valves shall be provided for those applications also. Where a single control valve can not meet the turn down ratio as dictated by the process, control valves with split range application shall be provided. All bypass valves of control valves shall be motor operated valves suitable for inching operation provided with position transmitters. All integrated bypass valves shall be motor operated. Electro-pneumatic positioners shall be used for all pneumatic control valves.
Pressure test points & drains shall be provided across each control valve .

14.15.2 ~~In case during detailed engineering, pneumatic control elements get converted to electrically operated items, thyristor reversing unit based electronic power positioner (EPP) are in Bidder's scope. In case, for these EPPs, power supply other than what is~~

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<p>available if required, the same shall be supplied, by the Bidder.</p> <p>14.15.3 The pneumatically operated control valves shall be provided with Smart Positioners, diagnostics and HART compatibility. Control Valve diagnostics shall be transmitted through this HART Protocol to DCS/PLC.</p> <p>14.16 Solenoid Valves shall be provided for all pneumatic control valves hooked up with process interlock requirements and where direct tripping is involved. All solenoid valves shall be uniformly rated for 24VDC. The number of ways for solenoid valve shall be provided as indicated below :</p> <p>(a) On line two (2) way solenoid valves shall be provided, where process line of less than 2 inch with low pressure & temperature application is involved.</p> <p>(b) Three (3) way solenoid valves shall be provided commonly, where the pressure is admitted or exhausted from a diaphragm valve or single acting cylinder. E.g.: Pneumatic operated spray water block valve.</p> <p>(c) Four (4) way solenoid valves shall be provided for operating double acting cylinders. If applicable. E.g.: Pneumatically operated on-off type dampers.</p> <p>(d) Dual coil, latch/unlatch type Solenoid valves shall be supplied for equipment trips/critical applications.</p> <p>(e) Five-way, dual coil solenoid valves shall be used for Oil guns.</p> <p>14.17 Position Transmitters shall be provided for all motorised inching valves .Position transmitters shall be 24 VDC, 2 wire, non-contact type.</p> <p>14.18 Electro-Pneumatic positioners shall be provided for all pneumatically operated control valves, power cylinders etc., for converting controller output of 4-20 mA to appropriate pneumatic signal.</p> <p>14.19 Air Filter Regulators along with gauges shall be provided in each of the:</p> <p>(a) Air supply line to valve positioners /power cylinders</p> <p>(b) Air supply line to pneumatic interlocked block valves</p> <p>(c) Transmitter Racks</p> <p>14.20 Interposing relay (To be mounted in Control room cabinet) for interface to the following:</p> <p>(a) Solenoid valve (two relays per valve) Relays with contact rating of 2 Amps.</p> <p>(b) DC Starter (two relays per drive) Relays with contact rating of 0.2Amps.</p>		
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29.12.1 All regulating type final control elements shall have actuators of pneumatic type excepting LP/HP bypass and Turbine governor valve, which shall be hydraulic type. Actuators shall be provided with air failure lock to obtain the required fail safe condition, control contacts as warranted, adjustable minimum / maximum stops, local position indication and two (2) wire electronic position transmitters with solenoid valves wherever necessary and air filter regulator. Fail safe action of the final actuator shall be as follows:

(a) Modulating control- Stay put

(b) ON/OFF control -Move to safe-end-position

29.12.2 All actuators shall be provided with hand wheel for local operation.

29.13 CONTROL VALVES:

29.13.1 The control valves shall be capable of handling at least 130 percent of required maximum flow at full open condition. Control valves shall be provided with manual isolating and bypass valves for facilitating maintenance wherever alternative flow paths are not available.

29.13.2 SMART Positioners shall be used for all regulating services. Two wire electronic position transmitters and limit switches shall be provided on the valve wherever required depending upon the system requirement. SMART Positioners shall be provided with HART protocol and Diagnostic features.

29.13.3 Bidder shall note that in case of Ash Control valves, if Spiess valve is offered, the Bidder shall confirm the following:

(a) If patented design of the OEM, Local spare/service support shall be confirmed.

(b) Adequate Technical details required for understanding the Trim internal functionality and maintaining Valve shall be provided.

(c) The Thyristor based Electronic Power Positioner electronics shall not be mounted in the hot Combustor zone because of the dusty and hot conditions.

29.13.4 Bidder's shall quote the Pneumatic operated valve which has been proven in the subject application for more than 2 years.

29.13.5 Also Bidder shall list out clearly the material considered for Trim with a proof that the material shall not be worn out under the severe hot Ash conditions it is subjected to. Bidder shall also give an Extended warranty of 5 years for this valve since the application is critical.

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<p>31.9 For all HT drives alarm and trip signals for bearing and winding temperatures shall be considered through soft LVM from temperature element signal only. No temperature transmitters are required for these signals.</p> <p>31.10 All Critical control valves shall be provided with anti-cavitation trim. Control valves / dampers shall be supplied with all accessories including non-contact type position transmitters and E/P Positioners. Combination of I/P + Pneumatic positioner is not acceptable. All inching valves shall be supplied with position transmitters integral with the valve positioner.</p> <p>31.11 All transmitters shall be SMART type with integral local LCD indication and HART protocol.</p> <p>31.12 All Temperature sensors shall be Duplex type and field mounted temperature transmitter shall be provided for all temperature measurement applications. Direct wiring of RTD or T/C to DCS or PLC is not preferred. (Except for Winding and bearing temperature sensors).</p> <p>31.13 Switches (pressure, temperature, level & flow etc.) shall be provided only for critical equipment trip such as BFP/ CEP trip etc. Wherever possible, transmitters shall be provided with required redundancies for all other purposes.</p> <p>31.14 Similar make and model shall be provided for same type of I&C system equipment. This shall specifically apply for field transmitters, control valves etc.</p> <p>31.15 Smart positioners shall be provided for all control valves/ dampers.</p> <p>31.16 Where multiple functions like monitoring /control/alarm etc. are sought to be performed based on a parameter value, in minimum dual sensor shall type be provided.</p> <p>31.17 All outdoor field equipment shall be provided with epoxy painting.</p> <p>31.18 Individual continuous purging shall be provided for all Air and Flue gas transmitters. The tap points for these services shall be "Y" shaped. The purging line shall be connected near the root valve only and not at the Transmitter end.</p> <p>31.19 All local cabinets / utility plant control panels with bottom cable entry shall be provided with suitable pedestals for easy cabling. The panels shall be designed for ease of operation of operating hardware and monitoring the indicators.</p> <p>31.20 All local panel indicating lamp/indicating type Push button should be of cluster LED type only. All local panels shall be of double door type instead of double leaf type to avoid ingress of dust in dust prone areas.</p> <p>31.21 All motorised bypass valves shall be inching type and shall be provided with position transmitters of non-contact type.</p>		
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<p>1.27.2 All the Terminal Blocks shall be rust proof and corrosive resistant for outdoor mounted panels. Terminal Blocks housing material shall be 6.6 polyamide and metallic portion shall be coated against rust/corrosion.</p> <p>1.27.3 In each Local Panel, a 24 V DC Voltmeter shall be provided to check the Field Interrogation voltage.</p> <p>1.28 Vibration Monitoring And Analysis System Refer TABLE 13.</p> <p>1.29 230 V AC Distribution Board The function of the 230V AC distribution is sub distribution of 230V AC power supply from UPS to all the utilities viz., system cabinets, HMI and peripherals. Redundant feeders shall be provided for each utility. The cabinets shall be free standing vertical cabinets, designed for indoor location. Material of construction shall be 2mm thick CRCA. Fluorescent lighting, fire detector and space heater shall be provided for each cabinet. Isolating switches and HRC cartridge fuses shall be provided for individual feeder isolation. Ammeter and voltmeter shall be provided for incoming feeders to the distribution boards. Each terminal shall have LED indication with fuses to indicate and isolate earth faults.</p> <p>1.30 Control Valves</p> <p>1.30.1 Multistage, anti-cavitation, balanced, modulating, globe type, cage guided, single ported, diaphragm type of actuator with hand wheel, SMART positioner, air filter regulator, air lock device, solenoid valve as applicable, limit switches and position transmitters completely tubed with junction box. Smart positioner shall be suitable for accepting 4-20mADC signal. Pneumatic (PVC coated copper) tubing complete with accessories, fittings, If any up-gradation of the offered system is envisaged before completion of the job to meet the specified requirements, the same shall be incorporated in the system, with the approval of the OWNER without any additional cost. Positioner shall be provided with input/output/bypass gauges. Local position indicator & Non-contact type position transmitter with 2 wire, 4-20mA DC output. All limit switches/position transmitters, E/P converter signals etc., shall be wired out to external block of actuator and respective junction boxes.</p> <p>1.30.2 Control valves shall be sized to have an opening of 15% at minimum flow condition and 85% at maximum flow condition. Noise level shall not exceed 85 dB at a distance of about 1.5 M from the valve. In case of predicted noise level above 85dBA, suitable low noise trim shall be provided. Noise reduction shall be achieved through an inherent Trim design and not through external means.</p>		
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SPEC.NO: TCE.5750A-11-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME-V SECTION : D5.4
Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 11 OF 42 SHEET 10 OF 23

1.30.3	All control valves shall have a leakage class of V and tight shut off application class VI shall be provided.
1.30.4	Either extended type bonnet or cooling fin type bonnet shall be provided for service above 200 Degree C and for other service the bonnet type shall be standard.
1.30.5	The end connections shall be socket welded for sizes below 50 NB and butt welded for sizes 50 NB and above. Flanged connection shall be provided for DM water services, with suitable rubber lined interfaces.
1.30.6	Water seal shall be provided for valves that could be subjected to below atmospheric conditions.
1.30.7	Generally stem and guide material(trim) shall be SS 316 stellited, and plug and seat material shall be 17-4 PH SS, except for specific applications like DM water, HP bypass services. Refer to mechanical section of this specification for selection of control valve body material and actuator type.. The trims supplied shall be suitable for quick changing. Actuator housing shall be of pressed steel construction.
1.30.8	Trim shall be designed such that trim exit velocity shall be limited to avoid cavitation.
1.30.9	The action of valves on failure of operating media shall be determined by the process requirements with regard to safe operation and emergency shut down requirements.
1.30.10	Control valve sizing shall be accompanied with data sheets. Following size calculation details shall be furnished for Control valves:
1.31	<p>Pneumatic block valves</p> <p>Balanced, on off, plug type, single ported, gate valve. End connection socket welded for sizes 50 NB and below & butt welded for sizes above 50 NB and flow direction shall be horizontal.</p> <p>For body and bonnet material refer mechanical section of this specification.</p> <p>Packing material GRAFOIL.</p> <p>Trim : Cage guided, metal seated with flow characteristic of quick opening with stem, plug, seat and guide material of SS 316.</p> <p>Actuator : Diaphragm (Nitrile) type with handwheel & travel indicator and adjustable stop. It shall be sized for shut off differential pressure.</p> <p>Accessories like air filter regulator, solenoid valve, limit switch with Nema4 enclosure, etc. shall be supplied. Actuators & accessories requiring tubing shall be mounted and tubed.</p>

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<p>1.32 Control Damper Drives</p> <p>Pneumatic actuator type, located in flue gas/air area with damper shaft bearings mounted externally. Bearings are grease lubricated. Blades(SS) shall be linked together. Accessories like position transmitters (2 wire) with 4-20mA DC output, Local Position indicator, position locks, limit/torque switches, etc. shall be supplied, after integrating, calibrating & testing at works. Smart Positioners with all required accessories, required for the positioning of control damper drives shall be provided. Spare cams for accommodating any change in characteristic to achieve better process control during commissioning shall be supplied as required.</p> <p>All the field mounted Damper accessories (position indicator, limit switches etc.,) shall comply to IP-65.</p> <p>1.33 SMART Positioners of Control Valves.</p> <p>1.33.1 Positioner shall be microprocessor based with digital communication by means of HART protocol. Positioner has to be 2-wire, 4-20 mA loop powered by the control system and capable of split ranging operation.</p> <p>1.33.2 The SMART positioner shall be suitable for both single acting and double acting actuators. The SMART positioner shall be fully modular in construction with Encapsulated printed wiring board and pressure gauges inside the positioner cover to protect from transit/site damage.</p> <p>1.33.3 SMART positioner shall preferably be of the same make as the Control Valve, to ensure repeatability in Calibration, serviceability and proper maintenance of the Control System.</p> <p>1.33.4 The SMART positioner shall have pressure sensors to measure the pneumatic outputs to the actuator.</p> <p>1.33.5 The control algorithm for the positioner shall use feedback signal from the motion of the pneumatic relay beam instead of pressure feedback to minimize pneumatic related effects and for stable and smooth response of the control valve. The SMART positioner shall have user adjustable tuning sets to identify the optimum tuning for the total valve assembly. SMART Positioner with HART Communication facility shall communicate all the valve diagnostics to DCS.</p> <p>1.33.6 The electrical housing shall be designed to meet NEMA 4X, IEC 60529 IP66.</p> <p>1.34 Void</p> <p>1.35 Void</p> <p>1.36 Void</p>		
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1.37 Air Filter Regulator (AFR)

Constant bleed type AFR with an accuracy of $\pm 0.1\%$, inlet pressure range of 5-8 kg /sq.cm and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P converters and shut off valves, transmitter purging lines etc; Filtering particles above five microns having phosphor bronze filter element. Material of accessories shall be SS. Built in blow down valve shall be provided. AFR shall have automatic drain feature. All accessories shall be supplied. Degree of protection shall be IP65.

1.38 Position Transmitters

24VDC operated Non contact LVDT type with 4-20 mA DC 2 wire system with an accuracy of $\pm 1\%$; range adjustment and zero adjustment to be provided; IP65 degree of protection for casing. The output shall be linear. All accessories shall be SS.

1.39 Solenoid Valves

Direct operated solenoid valves, pilot operated for higher sizes with shut off class (leakage) VI, body material of bronze, plunger material of 316 SS rated for continuous duty. IP 65 class for enclosure. Insulation class of 'F' for the solenoid. Body ratings shall suit the pressure and temperature conditions.

1.40 Void

1.41 Bunker level monitoring system:

Radar type shall be provided. 230V UPS shall be utilised for the instruments. The system shall provide 4-20mA for connecting to DCS and CHS PLC.

1.42 Furnace Temperature Probe

Duplex k-type thermocouple with mineral insulation & SS sheath located in furnace below SH panels; minimum of 2 nos. Probe housing shall be weather proof & corrosion resistant. Accuracy shall be $\pm 0.5\%$ of span. The junction shall be ungrounded with response time of 2 to 5 seconds. Starter box shall be provided with IP65 enclosure & 3 mm thick sheet. Electric motor with chain drive shall be provided for the lance. The traverse of the probes from opposite sidewalls shall cover the full cross section of the furnace. Automatically controlled cooling system shall be provided for the lance. Loss of cooling water shall be detected & provided as a contact. Accessories like limit/torque switches position transmitters, etc. shall be provided. All the field mounted accessories (limit switches etc.,) shall comply to NEMA-4.

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Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT CODES AND STANDARDS	SHEET 1 OF 1 SHEET 13 OF 23
<div> <div> Instrumentation Symbols and identification. Binary Logic Diagrams for Process Operation Graphic symbols for DCS, shared display inst. logic & Comp. System Annunciator sequences and spec. Environmental Conditions Control Valve Sizing Control Valve Procedure Capacity Test Uniform Face — Two Face Dimensions for Flanged Globe Style CV Bodies Diagrams, Charts, Tables Industrial Process Control Valves Graphical Symbols for Diagrams, Binary Logic Elements Operating Conditions for Industrial Process Meas. & Control Equipment. Electromagnetic Compatibility for Industrial Process Measurement Preparation of Function Chart for Control System Industrial Measurement & Control — Terms & definition Vibration, Axial Position & Bearing Temperature Monitoring Systems Plain End Steel Tubes, Welded & Seamless General Table — Dimensions & Masses / Length Measurement of Fluid Flow by Means of Orifice Plates & Nozzles Pipe Threads Quality Control Standard for Control Valves Seat Leakage Thermocouples Measurement & Control, Electrical sensors, Elec. Position sensors & Sig. Converters for IS two-wire DC systems. Industrial Platinum. RTD Air Purge System Measurement of Fluid Flow by Meter Run Temperature Measurement Degree of Protection by Enclosure Electrical Apparatus for Explosive Gas Standards for Cables Process control security requirements </div> <div> ISA S 5.1 ISA S 5.2 ISA S 5.3 ISA S 18.1 ISA S 71.04 ISA S 75.01 ISA S 75.02 ISA S 75.03 IEC 113 IEC 534 IEC 617-12 IEC 654 IEC 801 IEC 848 IEC 902 API 670 ISO 4200 ISO 5167 ANSI B 2.1 ANSI FCI 70.02 ANSI B 16.104 ISA MC 96.1 / ASTM E 230- 03/DIN 43710/IEC 60584 DIN 19243 DIN 43760/ IEC 751 ISA S 12.4 / NFPA 496 ISO 5167 ANSI MC 96.1 / IEC 751 IEC 529 IEC IEC IEC 62443 </div> </div>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME-V SECTION : TABLE 14
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT TESTS	SHEET 2 OF 13 SHEET 14 OF 23	
PART-A: TESTS FOR I&C EQUIPMENT			
SL. NO	INSTRUMENT / EQUIPMENT	TESTS TO BE CONDUCTED	
13.	Interposing relay	Functional test/temperature rise test/high voltage test/ limits of operation test/insulation test.	
14.	Level gauges	Hydrostatic test/Material test/Seat leakage test / Ball check test	
15.	Level switches (magnetic)	Material test/Contact rating test/Hydro test / Calibration test	
16.	Level gauges (Probe)	Material test /Contact rating test /Hydro test / Calibration test	
17.	Flow switch	Material test / Hydro test/ (1.5 time max. pr) / function test	
18.	Flow glasses	Material test /Hydro test/ (1.5 time max. pr) / function test	
19.	Variable area flow meters	Calibration test / Material test / Hydrostatic test (1.5 time max. pr)	
20.	Flow element	100% Radiography test / Hydro test / Calibration test / IBR certificate	
21.	Control valves	(a) IBR certificate Form III C (b) Hydrostatic test : IBR/MSS-SP-61/ANSI B 16.34 (Note 1) (c) Seat leakage test : As per ANSI B 16-104 (Note-1) (d) CV test : As per ISA procedure (Note 1) (e) Magnetic particle test : As per ANSI B 16.34 special class (applicable for pr.> 70 bar & tem < 400°C (f) Liquid penetration test : As per ANSI B 16.34 special class (applicable for pr > 70 bar & temp < 400°C (g) Calibration and Hysteresis test (Note-1) NOTE-1: These tests shall be witnessed by PURCHASER / CONSULTANT	
22.	Pneumatic Block Valves:	(a) IBR certificate Form III C (b) Hydrostatic test : ANSI B 16.34 (Note 1) (c) Seat leakage test : As per ANSI B 16-104 (Note-1) (d) CV test : As per ISA procedure (Note 1)	
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Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan INSTRUMENTATION AND CONTROL EQUIPMENT SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 7 OF 42 SHEET 16 OF 23
<p>coloured LCD or fluorescent tube with user selectable span; programmability (selection of input & scan/storage rate) shall be through Front panel keyboard; the recorder shall have the capability of being drawn out from the front side of the housing for maintenance and shall have electrical connection of plug-in type; material of casing shall be die-cast aluminium with epoxy coating and with a non-glare shatter proof Glass; enclosure shall be IP32 The quantity of Hybrid recorders shall be 4 nos.</p> <p>1.21 Pressure and Differential Pressure Transmitter Racks</p> <p>Open type transmitter racks to mount all pressure, differential pressure and flow transmitters with vibration dampener: air supply lines and header shall be provided with bulk head fittings to receive impulse lines; Also provided with blow down/drain header. The material of accessories shall be SS. Drains shall be connected upto suitable Owner / Project Manager's drain header. The quantity shall be as required for the specified Pressure and Diff. Pressure transmitter.</p> <p>1.22 Junction Boxes (JB)</p> <p>All JB's shall be Galvanised. Wall/column mounted junction boxes having 32 (2x16) terminals and cable entry only at the bottom and sealed with fireproof compound; Screwed terminal type; IP 65 or equivalent degree of protection for enclosure. Separate terminal blocks shall be used for analog and digital signal and also for signals with different voltages. Removable gland plate shall be supplied. JB shall have single lockable door with gasket, able to open side ways, with common keys. Painting inside shall be glossy white & outside - IS-5 shade 631. Shield bus for screw connection shall be provided. Terminal size shall be suitable for 0.5 sq.mm to 2.5 sq.mm wire. Terminal blocks shall be vertical. JB shall have provision to add 10% additional terminals. Accessories like metal tag (SS), clamps, fixtures, bolts (SS), nuts (SS), gaskets (neoprene), lock & key, fireproof compound for sealing, etc. shall be supplied. The grouping of instruments in JB's is subject to Owner / Project Manager's approval. All the field Junction boxes shall have single doors and provision for locking. The doors shall not have screwed type of locking, but turnable hinge based. The JB's are subject to approval prior to manufacturing All JB's shall be provided with individual canopies to avoid ingress of water. All the TB's used shall be 6.6polymide to withstand corrosion and the metallic portion shall be coated against rust / corrosion.</p> <p>1.23 Programmable Logic controller (PLC)-Refer Cl.no. 9.0 & Table-15</p> <p>1.24 Interposing Relays (IPR)</p> <p>Electro magnetic type IPRs with plug-in type connections, suitable for channel/rail mounting in cabinets; coil rating 24V D.C; 2 set of silver plated Change over contacts rated for 0.2A 220 V DC. Freewheeling diode across relay coil (copper) and self reset type status indicator flag (electronic) shall be provided. All relays</p>		
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4.0.0 SPARES, CONSUMABLE AND SPECIFIED TOOLS & TACKLES (For all Units):

4.1.1 Commissioning Spares & Consumables

The bidder shall supply spares and consumables for all the above valves & desuperheater required during start-up. A list of all spares and consumables to be supplied shall be submitted along with the bid.

4.1.2 Recommended Spares

The bidder shall submit a list of recommended spares for all the above valves and desuperheaters for three years of normal operation. These are to be quoted separately & unit prices to be indicated, to enable placement of a separate order later if required.

4.1.3 Special Tools & Tackles

The bidder shall supply one complete set of special tools & tackles required for the erection, assembly, disassembly & maintenance of the equipment. A list of such tools & tackles to be supplied shall be submitted along with the bid.

4.1.4 Bidder to indicate the service life expectancy period for the spare parts under normal working conditions. The spares shall be treated and packed for long storage under climatic conditions prevailing at site. Small items shall be packed in sealed transparent plastic bags with desiccators' packs as necessary.

5.0.0 SPARES: The following spares are required to be offered.

a) Stat-up & Commissioning spares:

- i) Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Control Valves. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III
- ii) The Start-up and commissioning spares indicated by the bidder shall be a part of the main Control valves supply. However bidder to indicate prices separately. The list of these spares required to be supplied shall be submitted along with the bid.

LIST OF COMMISSIONING SPARES

S.No.	ITEM DESCRIPTION	QUANTITY REQUIRED (per unit)
1	Gaskets	One (1) set with each control valve Tag
2	Gland Packings	One (1) set with each control valve Tag



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3	Cu Tubing	25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for each CV
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5.1.0 LIST OF MANDATORY SPARES

Auxiliary Steam Pressure Reducing & Desuperheating System		
For Control Valve & Pneumatic Block Valve (for each type/model of valve)		
(a)	Plug with Stem Assembly	2 no. for each type
(b)	Seat Ring	2 no. for each type
(c)	Packing and Gasket	2 no. for each type
(d)	Pilot Relay	2 no. for each type
(e)	Actuator Diaphragm	2 no. for each type
(f)	O-ring	4 nos. for each size of positioner
(g)	Feed Back Linkage	2 no. for each type
(h)	Control Valve (Electrical operated –if supplied)- Interfacing modules	10% or 1 no. of total quantity whichever is higher

6.0.0 INFORMATION TO BE FURNISHED ALONGWITH THE OFFER BY THE BIDDER.

The bidder shall submit four (04) sets of the following drawings and data along with the bid without which the offer will be deemed incomplete.

- 6.1.0. Un-prices Bill of Quantities (BOQ) for main package & mandatory Spares.
- 6.2.0. Calculations for valve sizing, actuator sizing, valve velocities and noise level.
- 6.3.0. Dimensioned outline drawing giving overall dimensions, material.
- 6.4.0. **Duly filled BHEL technical data sheets 'B'** for each control valve & desuperheater in the format as enclosed in volume III of this specification.
- 6.5.0. Hook-up diagram of control valves with actuator & accessories.
- 6.6.0. Reference list, Catalogue & Technical bulletins for various items being offered.



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- 6.7.0. Any deviations from the specification / data sheet & reasons thereof.
- 6.8.0. Schedules as in Vol. III.
- 6.9.0. Quality Plan for the equipment offered in the format enclosed with this specification.
- 6.10.0. Field quality plan, if applicable
- 6.11.0. List of commissioning and recommended spares.
- 6.12.0. List of tools & tackles, if applicable
- 6.13.0. List of consumables / lubricants, if applicable

7.0.0 DRAWING

For general arrangement and terminal point details refer enclosed drawings nos. PE-DG-392-142-N101 in Volume II B Sec. D.

8.0.0 QUALITY PLAN

The bidder shall furnish quality plan along with the offer and the same shall be finalized before the issue of LOI.

Detailed quality plan shall be submitted by the successful tenderer after the placement of order for each project during contract execution for final approval by BHEL / its customer. BHEL / its customer shall indicate Customer Hold Points (CHP) in the approved quality plan beyond which work shall not proceed without the approval of BHEL / its customer for any particular project during final execution.

The quality plans enclosed in volume-II-B 'D' of the specification are for bidder's guidance only and are not exhaustive. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in BHEL/Customer formats in the event of order based on the guidance given as above for BHEL/Customer's approval.



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DATA SHEET- A-1
SIZING DATA FOR AUXILIARY STEAM PRDS

<u>SL. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>CASE-VII</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS TO COMBINED PRDS (ASV-22)						
1.1	PRESSURE (Kg/Cm ² a)	63	109	247	94	108	271
1.2	TEMP. (°C)	375	490	565	385	425	573
1.3	FLOW (T/HR)	Bidder to calculate					
2.0	OUTLET PARAMETERS AT COMBINED PRDS (ASV-22)						
2.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	16	21
2.2	TEMP. (°C)	310	310	310	310	310	360
2.3	FLOW (T/HR)	109.6	63.1	197.3	126	147	-
3.0	INLET OF SPRAY CONTROL VALVE (CDV-262)						
3.1	PRESSURE (Kg/Cm ² a)	37	37	34.7	37	37	46
3.2	TEMP. (°C)	39.6	39.6	45.9	39.6	39.6	55
3.3	FLOW (T/HR)	Bidder to calculate					

NOTE:

- Case-1 is the capability check point for PRV ASV-22. Case-V is the capability check point for Spray Water control valves.
- High capacity steam pressure reducing valve min. flow at 10% valve lift shall correspond to the passing capability of low capacity steam pressure reducing valve at 95% valve list (refer datasheet A-2).
- Outlet pressure of HT-DESH is indicative only. Bidder shall calculate outlet pressure of Combined PRDS considering pressure drop across DESH-2



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DATA SHEET- ~~A~~-2
SIZING DATA FOR AUXILIARY STEAM PRDS (PRV (ASV-26))

<u>S.NO</u>	<u>PARAMETERS</u>	<u>CASE-III</u>	<u>CASE-IV (A)</u>	<u>CASE-IV (B)</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS OF PRV (ASV-65)				
1.1	PRESSURE (Kg/Cm ² a)	22.66	22.66	55.95	74.1
1.2	TEMP. (°C)	343.5	343.5	333.3	360
1.3	FLOW (T/HR)	14.41	7.22	7.44	-
2.0	OUTLET PARAMETERS OF PRV (ASV-65)				
2.1	PRESSURE (Kg/Cm ² a)	16	16	16	21
2.2	FLOW (T/HR)	14.41	7.22	7.44	-

NOTE:

1. High capacity steam pressure reducing valve min. flow at 10% valve lift shall correspond to the passing capability of low capacity steam pressure reducing valve at 95% valve list (refer datasheet A-1).
2. Outlet pressure of ASV-26 is indicative only. Bidder shall calculate outlet pressure of PRV (ASV-26) considering pressure drop across DESH-2.
3. Valve shall be suitable for passing **30T/Hr** at rated parameters.



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DATA SHEET- A-3
SIZING DATA FOR AUXILIARY STEAM PRDS ((DESH-2) & SPRAY CONTROL
VALVE (CDV-268)

Sl. No.	PARAMETERS	CASE-I	CASE-II	CASE-III	CASE-IV	CASE-V	CASE-VI	CASE-VII	CASE-VIII	MECH. DESIGN
1.0	PARAMETERS AT DESUPERHEATER INLET (DESH-2)									
1.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	16	16	16	16	21
1.2	TEMP. (°C)	310	310	337.2	337.2 / 288.7	310	310	310	310	350
1.3	FLOW (T/HR)	Bidder to calculate								
2.0	PARAMETERS AT DESUPERHEATER OUTLET (DESH-2)									
2.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	16	16	16	16	21
2.2	TEMP. (°C)	210	210	210	210	210	210	210	210	250
2.2	FLOW (T/HR)	83.7	53.7	12.2	7.4	134.5	97.7	112.4	160.1	-
3.0	INLET OF SPRAY CONTROL VALVE CDV-268									
3.1	PRESSURE (Kg/Cm ² a)	37	37	35.7	35.7 / 34.7	34.7	37	37	35.7	46
3.2	TEMP. (°C)	39.6	39.6	39.6	39.6 / 45.9	45.9	39.6	39.6	39.6	55
3.3	FLOW (T/HR)	Bidder to calculate								

NOTE:

- Vendor to ensure the D/S pressure of DESH-2 shall be 16 Kg/ Cm² (a)



TITLE
SPECIFIC TECHNICAL REQUIREMENTS
**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**
FOR
RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. PE-TS-392-142-N101

VOLUME **II-B**

SECTION **C**

REV NO. **00** DATE 15.11.2013

Sheet 23 of 23

DATA SHEET- ~~A-4~~
SIZING DATA FOR TGS DESUPERHEATER (DESH-3) & SPRAY CONTROL
VALVE (CDV-93)

S.NO	PARAMETERS	Condition-1	Condition-2	Condition-3	Condition-4	MECH. DESIGN
1.0	PARAMETERS AT TGS DESUPERHEATER INLET (DESH-3)					
1.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	21
1.2	TEMP. (°C)	310	310	337.2	337.2	350
1.3	FLOW (T/HR)	Bidder to calculate				
2.0	PARAMETERS AT TGS DESUPERHEATER OUTLET (DESH-3)					
2.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	21
2.2	TEMP. (°C)	270	300	300	270	350
2.3	FLOW (T/HR)	2.7	2.7	2.7	2.7	-
	INLET OF SPRAY CONTROL VALVE (CDV-93)					
3.1	PRESSURE (Kg/Cm ² a)	37	37	37	37	46
3.2	TEMP. (°C)	39.6	39.6	39.6	39.6	55
3.3	FLOW (T/HR)	Bidder to calculate				



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**

SECTION **D**

REV NO. **00** DATE 15.11.2013

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EQUIPMENT SPECIFICATIONS



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

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SECTION **D**

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SECTION – D

EQUIPMENT SPECIFICATIONS

FOR

CONTROL VALVE WITH PNEUMATIC ACTUATOR



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PES – 145 - 06

VOLUME II B

SECTION D

REV. NO. 05

DATE : 15-05-2007

SHEET 1 OF 12

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Control valve (with Pneumatic/Electric Actuator) for use in Utility/Captive Power Station/Combined Cycle Station.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 The Design and Materials used for the components shall also comply with the relevant National and International standards.

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

Indian Boiler Regulation (IBR)	:	
Allowable Seat leakage	:	ANSI-B16.104 / FCI-70.2
Pressure & Temperature ratings	:	ANSI-B16.34
Enclosure class	:	IEC-144 / NEMA / IS-13947
Control Valves	:	ISA S-75
Electric Motor operated Actuators	:	IS-9334

3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-55°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C.

3.1 Control Valve

The control valve shall be suitably designed for the operating conditions and system characteristics as specified in the Data Sheet-A.

3.1.1 The control valve shall be of globe body design with single port. The valve trim, shall be suitable for quick removal without any cutting or welding.

3.1.2 The material of body, internals and packing shall be as specified in the data sheets. Alternatives, considered more suitable for service specified may be given as alternative offer, along with adequate justification. However main offer shall totally meet specification requirements. Asbestos shall not be used for the packing or any other component.

3.1.3 The valve bonnet and packing shall be suitable for the service conditions as in Data Sheet-A. Gland sealed type bonnets are not acceptable. Double packing is mandatory for applications involving vacuum service. Bonnets having teflon packing shall have valve stem finished to 2-4 microns. Packing material requiring lubrication will not be acceptable. Justification for proper selection of bonnet & packing shall be furnished in the bid.

3.1.4 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection and ANSI B16.5 for flanged ends. End to end dimension shall be as per ANSI 16.10.

3.1.5 The valve seat leakage shall be as per ANSI B16.104 / FCI-70.2. The leakage class shall be as per Data Sheet-A.



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- 3.1.6 The valve body shall have the direction of flow embossed on all valves.
- 3.1.7 The sizing shall conform to the requirements of ANSI/ISA(S75- 01), and the valve capacity shall be selected so as to meet the following:
- | | | | | |
|--|---|---|---|--------------------|
| Valve with Linear characteristic. | - | Normal Flow (Design Point) | : | 70-75% valve lift. |
| | - | Max. Flow | : | 90% valve lift. |
| | - | Min. Flow | : | >10% valve lift. |
| Valve with Equipercentage Characteristic | - | Normal Flow (Design Point) | : | 75-85% valve lift. |
| | - | Max. Flow | : | 90% valve lift. |
| | - | Min. Flow | : | >10% valve lift. |
| ON/OFF Quick open Characteristic | - | 1.1 times the CV calculated on the basis of maximum flow condition. | | |
- 3.1.8 Calculation for valve sizing, velocity and noise shall be subject to purchaser's approval during contract stage. However responsibility of proper selection and design for the duties specified lies with the vendor. Any modifications required to be done on the valves or actuators & accessories to achieve satisfactory performance of the control system shall be done without any commercial implication.
- 3.1.9 Suitable justification and evidence shall be furnished regarding proper selection of the valve.
- 3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.
- | | | | |
|-----|----------------|----|--|
| i) | Liquid service | <= | 7 Metres/Sec. |
| ii) | Steam service | <= | 1/3 Sonic velocity in the flow medium. |
- 3.1.11 For flashing duty, the trim design shall be such that the vapour bubbles are kept away from valve body.
- 3.1.12 For cavitation service, the trim design shall be of multistage pressure drop type, so as to avoid cavitation altogether, instead of keeping cavitation away from valve parts.
- 3.1.13 In case of predicted noise level above 85 dBA, suitable low noise trim or inbuilt diffusers shall be provided to bring down the noise level below 85dBA.
- 3.1.14 The equivalent weighted sound level measured at 1.5M. above floor level in elevation and one metre horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA (without pipe insulation). The offer shall include noise prediction calculations for each valve.
- 3.1.15 In case of wrong selection/mal operation of valve and for associated actuator during guarantee period, the vendor shall replace the valve suitably with a modified/new valve of design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be at vendor's expenses.



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3.2 Pneumatic Actuator

The pneumatic actuators shall be employed for modulating or open/close duty, as specified in Data Sheet-A. The bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drops and shut off pressure.

3.2.1 The pneumatic spring opposed diaphragm actuator for modulating duty shall be capable of positioning the associated valve at desired opening for all the operating conditions specified.

3.2.2 The pneumatic actuator for open/close duty shall be suitable for fast opening/closing of the associated valve.

3.2.3 The actuator design shall allow valve assembly to be mounted at 45° inclination on either side in the vertical plane.

3.2.4 The actuators shall be suitably sized to ensure that the associated valve travel time from full open to full closed position and vice versa is less than 20 seconds under the most stringent service conditions.

3.2.5 The actuator shall be painted with epoxy based paint.

3.3 Accessories for Control valve with Pneumatic Actuator

The bidder shall offer all the accessories as specified in the Data Sheet - A for the Pneumatic Actuators under modulating or OPEN/CLOSE duty. The accessories specified shall be supplied duly mounted on the valve actuator and piped with PVC covered copper tube and flareless brass fittings (Refer typical hook up diagram in sheet 12 of 12).

3.3.1 Handwheel

Handwheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve. The handwheel shall have a circular stainless steel plate with Tag number and service.

3.3.2 Local Position Indicator

Each actuator shall be provided with a mechanical pointer attached to stem, moving over a graduated scale with markings, for OPEN, 25%, 50%, 75%, CLOSE positions.

3.3.3 Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20 mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0-100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have accuracy and enclosure class. Necessary cable glands shall be supplied.



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3.3.4 Air Filter Regulator

Instrument quality air at suitable pressure of 5.5 Kg/Cm²(g) to 7 Kg/Cm²(g) shall be supplied to each valve through air filter regulator. The filter regulator shall include an inbuilt blow-down valve, 5 micron size filter. The design pressure for regulator shall be 7 Kg/cm²g. The Air filter regulator shall be selected to meet the requirements of positioner/actuator, E/P convertor and air-lock. The flow capacity of the Air filter regulator shall be variable with a knob. Output gauge shall be provided wherever pneumatic positioner is not specified for the valve.

3.3.5 Air Lock Relay

Air lock relay shall retain the valve position stayput, in case of air supply failure and shall reset automatically on resumption of air supply. Air lock shall have a threaded plug for evacuating diaphragm air if required for local manual operation.

3.3.6 Solenoid Valves

Solenoid valves are meant for interlock & protection purposes overriding the controller signal, and/or to result stayput action on controller signal failure. The Solenoid valve shall be 3-way **Universal** type and the valve internals shall be of stainless steel. The coil shall have class-H insulation and rated for continuous AC/DC duty as specified in Data sheet-A. The enclosure shall be to IP-55. Cable gland shall be provided for cable entry. The solenoid shall in general conform to IS-8935. The solenoid operation shall be universal type. The solenoid shall be suitable for 24V DC supply, unless specified otherwise in Data Sheet-A.

3.3.7 Limit Switches

Limit switches are required as specified in the data sheet-A. Each limit switch shall have 2NO+2NC contacts with contact rating of 5A at 240V AC/0.2A at 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.

3.3.8 I/P Converter

I/P Converters shall preferably be of force balance type and shall produce pneumatic output signal corresponding to input current signal, also specified in Data Sheet. Converter electronics shall be protected against reverse connection of signal polarities and a separate external connection shall be provided to facilitate grounding of instrument casing. Cable glands with neoprene gromets suitable for PVC cables shall be provided. I/P convertor shall have span adjustment facility. I/P convertor enclosure shall conform to IP-55 enclosure class.

3.3.9 Positioner

Positioner shall be suitable for accepting controller output signal 0.2-1.0 Kg/cm², 0.2-0.6 Kg/cm² or 0.6-1.0 Kg/cm² as specified and give an output suitable for the actuator. Pneumatic positioner shall have 3 gauges. All gauges shall have metric scales. The positioner input signal range shall be adjustable. Wherever applicable, it shall be possible to bypass the positioner by means of a switch. **Linearity and Hysteresis shall be as indicated in Data sheet-A**

3.3.10 Electro pneumatic Positioner

In place of separate E/P Converter and pneumatic positioner a combined electro pneumatic positioner can also be supplied. The electro pneumatic positioner shall have 2 gauges.



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3.3.11 Junction Box

Wherever specified, an integral junction box with all electrical accessories conduited up to JB shall be supplied. The junction box shall have two (2) cable glands for outgoing cables. Junction box shall have enclosure class of IP-55.

3.4 Guarantee & Performance

3.4.1 The overall performance of the control valve with pneumatic actuator assembly shall be as follows:-

i)	Hysteresis	:	$\pm 1\%$ of span
ii)	Linearity	:	$\pm 2\%$ of span
iii)	Sensitivity	:	$\pm 0.5\%$ of span.
iv)	Repeatability	:	$\pm 1\%$ of span
v)	Accuracy (Overall)	:	$\pm 2\%$ of span

3.4.2 The guarantee for the control valve, pneumatic actuator & accessories shall be for 12 months continuous operation from the date of commissioning, unless specified otherwise in VOL-IIB Section-B or Section-C.

3.5 Electric Actuator

The electric actuator shall be employed for modulating duty.

3.5.1 The actuator assembly shall be complete with drive motors, gears, hand wheel, signaling & switching units, associated control, integral starter, (when specified) and other accessories as required.

3.5.2 The Electric Actuator shall be capable of positioning the associated valve at the desired opening for all the operating conditions.

3.5.3 The motor shall meet the requirements of Current, torque, Axial thrust, Accelerating & stall time as imposed by the driven equipment.

3.5.4 The motor shall be suitable for direct on line starting.

3.5.5 Motors shall be suitable for inching & plugging duty operations.

3.5.6 The motors shall be capable of starting and accelerating to rated speed at 85% of rated voltage.

3.5.7 The motors shall be rated for continuous operations for modulating duty.

3.5.8 The motor shall operate satisfactorily under the following conditions:

- i) $\pm 10\%$ supply voltage variation at rated frequency.
- ii) -5% to $+ 3\%$ variation in frequency at rated supply voltage.

iii) Simultaneous variation in voltage and frequency, the sum of absolute percentage not exceeding 10%.
3.5.9 The Actuator shall be suitable for mounting directly on the valve and shall be suitable for mounting in any position. Supports required for inclined mounting shall form part of supply of valve assembly.

3.5.10 The actuator shall be capable of producing the required torque and thrust at the output shaft for satisfactory operation of the associated valve.



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- 3.5.11 Each actuator shall have a hand wheel for emergency operation. The hand wheel shall be designed such that it is declutched automatically when the power supply to the motor is restarted.
- 3.5.12 The hand wheel shall be so arranged that when looking from hand wheel, the valve is closed by rotating the hand wheel in clockwise direction.
- 3.5.13 Motor shall be totally enclosed conforming to IP-65 or better as per data sheet. The enclosure shall be suitable to protect the motor from leakage steam, water or oil from valve joints and glands.
- 3.5.14 Where flameproof enclosures are specified, it shall meet the specification IS-2148.
- 3.5.15 Insulation shall be at least class-B or better and shall be tropicalised to withstand the atmospheric condition.
- 3.5.16 The actuator shall be provided with antifriction bearing in grease filled cartridge.
- 3.5.17 Each actuator shall be provided with a mechanical position indicator to indicate accurately the valve position.
- 3.5.18 The integral starter, if specified in data sheet-A, shall be provided in weatherproof enclosure with protection class not less than IP-65 or better as per data sheet.

The integral starter shall consist of:

- i) Mechanical & Electrically interlocked reversing contractors suitable for class AC4 duty or Thyristor as per data sheet.
- ii) Thermal overload relay.
- iii) Step down control transformer with fuses.
- iv) Interposing relay.
- v) Monitoring relay..
- vi) Open, Close & Stop push buttons.
- vii) Indicating lamps.
- viii) Local-Remote lockable selector switch with spare potential free contacts, wired for remote interface.
- ix) A potential free contact shall be provided for remote annunciation of power failure/overload condition. The contact shall be SPDT, rated for at 5A 240V AC or 0.2A at 220V DC.



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- 3.5.19 The actuator shall be suitably time rated for the duty cycle involved with the necessary number of starts per hour, but in no case, less than 1200 starts per hour.
- 3.5.20 The actuator shall be provided with a suitable control unit for receiving 4-20 mA signal from remote controller.
- 3.5.21 The servomotor gear should have self locking or suitable brake so as to maintain it's last position as and when the motor power is switched off.
- 3.5.22 Thermostat/Thermistor as specified in the data sheet shall be provided for sensing the winding temperature and giving trip command. The trip contact shall be change over type. The contact shall be wired up to the actuator terminal box.
- 3.6 Accessories for Control Valve with Electric Actuator
- 3.6.1 Torque Switches
- i) Each actuator shall be provided with at least one open and one close torque switches each with 2 NO+2 NC contacts. The contacts shall be rated for 5A at 240V AC or 0.2A at 220V DC.
 - ii) The torque switches shall have a minimum accuracy $\pm 3\%$ of set value.
 - iii) The torque switches shall be provided with calibrated knobs for setting desired torque. Separate knobs shall be provided for close and open torque switches.
 - iv) The torque switches shall be provided with mechanical latching device to prevent operation when unsealing from the positions. The latching device shall unlatch as soon as the valve leaves the end position. If such provision is not possible, the torque switches shall be bypassed by end position limit switches, which open on valve leaving end position. These limit switches are additional to the number of limit switches specified elsewhere.
 - v) The torque switches or worm gear shall be self-locking type so that when torque switch operates it remains operated until the actuator is operated in the reverse.
 - vi) The torque switch enclosure shall conform to IP-55.
- 3.6.2 Limit Switches
- Each limit switch shall have 2NO+2NC contact with contacts rated for 5A 240V AC/0.2A 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.
- 3.6.3 Space Heater
- A space heater shall be provided in limit switch and starter compartments to prevent condensation. This shall be suitable for the power supply specified in the data sheet. Where integral starters are provided the space heaters shall be wired to control supply within the actuator.



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3.6.4 Remote Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0- 100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have $\pm 1\%$ accuracy. The enclosure shall conform to IP-55. Necessary cable glands shall be supplied.

3.6.5 Wiring

- i) The actuator and the accessories will be neatly wired up to the terminal boxes.
- ii) The internal wiring shall be minimum of 1 mm² stranded PVC insulated copper conductor.
- iii) The wiring shall be identified by means of numbered ferrules on both ends of all wires.

3.7 Terminal and Terminal boxes

3.7.1 Motor Terminal Box

- i) The terminals, terminal boards, terminal boxes, winding tails and associated equipment shall be suitable for connection to supply system having short circuit capacity specified in data sheet and clearance time determined by the associated fuses.
- ii) The terminals shall be stud type insulated from the frame. The insulation shall not be porcelain. The studs shall be of brass or stainless steel or phosphor bronze of adequate size.
- iii) The terminal box shall be totally enclosed conforming to degree of protection IP-65.

3.7.2 Actuator Terminal Box

- i) All terminals of limit and torque switches, space heater, position transmitters, thermostat/thermister shall be brought to a common terminal box. The enclosure shall be to degree of protection IP-65.
- ii) Terminal board with plug in connector shall be provided. Alternatively stud type or insertion type may be considered. Pinch screw type however will not be accepted. All terminals shall be shrouded to prevent accidental contact. Where stud type terminals are offered, it shall be as per clause 3.7.1 (ii).
- iii) There shall be at least five terminals spare to terminate spare cores of cable.

3.7.3 Cable Glands

The motor terminal box and actuator terminal box shall be provided with required number of double compression nickel plated brass cable glands to suit cable type and associated size.

3.7.4 Earthing Terminal

Two earthing terminal shall be provided on either side of motor and actuator terminal box.

3.7.5 Painting

The Actuator shall be painted with epoxy-based paint.



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4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.

4.2 The bidder shall furnish the Quality Plan in the format enclosed in volume-III. In case the Quality Plan(s) is/are included in volume-II B, the bidder shall furnish his Quality Plan strictly in line with the same. The Quality Plan shall be discussed and finalised with the technically accepted bidders before opening the price bid. The stages where purchaser would like to be associated for witnessing or verification of tests would be indicated by the purchaser in the Quality Plan before approval.

4.3 The following test shall be conducted as a minimum requirement.

4.3.1 Control Valve

- i) Radiographic tests on castings.
- ii) Dye penetrant tests on machined surface.
- iii) Ultrasonic tests for the forgings & bars of all valves with 60 Kg/cm² & higher ratings.
- iv) Hydrostatic tests as per ANSI B 16.34 prior to seat leakage tests.
- v) Valve closure and seat leakage tests as per ANSI B 16.104 / FCI-70.2.

4.3.2 Pneumatic Actuators

Functional test of actuator and each accessory.

4.3.3 Electric Actuator

- i) Routine tests on motors as per IS: 325.
- ii) Functional test on actuator and each accessory.
- iii) Insulation resistance and high voltage test.
- iv) Stall current & Stall torque test.
- v) Output shaft speed and torque of actuator and corresponding current tests.

4.3.4 Control valve with Actuator & Accessories fully assembled

- i) Functional tests of control valve operation along with actuator & accessories.
- ii) Dimension checks.

4.3.5 Type tests or Test Reports

- i) Valve lift vs. Flow test (**Cv Test**)
- ii) Degree of protection tests for the enclosures
- ii) Temperature rise test (**applicable for Electrical Actuator only**).
- iii) Type test for motor as per IS: 325.

4.4 Inspection will be conducted by BHEL and/or their authorised representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder, for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests covered under 4.3.5 above, "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorised representatives or in independent Test House/Laboratory approved by BHEL.

4.5 **The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the agreed QP, taking care of customer requirements mentioned in Sec-C and submit QP for final approval by BHEL / Customer.**



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5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

5.2 Mandatory Spares

The bidder shall offer along with main offer, the Mandatory Spares as specified in Volume IIB Section-C of the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL / BHEL's Customer to place a separate order later, if required.

5.4 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid:

6.1.1 Data sheet-B, completely filled-up along with all enclosures.

6.1.2 Wiring diagrams for Electrical Actuators.

6.1.3 Hook up diagrams of Control Valve with Actuator & accessories.

6.1.4 Valve & actuator assembly dimensional drawings with weights.

6.1.5 Quality Plan

6.1.6 All relevant Catalogs with detailed technical information.

6.1.7 Bar-chart to indicate the time schedule for procurement, manufacture, testing and despatch.

6.2 The successful bidder shall furnish the following documents in required number of copies to BHEL during the contract stage:

6.2.1 For approval

- i) Dimensional drawings.
- ii) Installation drawings with overall dimensions of the completed equipment and clearances for operation and maintenance.
- iii) Data sheet-C, completely filled-up along with all the enclosures including the sizing calculations & noise calculations.
- iv) Quality Plan.
- v) Test Certificates.



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6.2.2 Final / As-built Drawings

Final / As-built drawings / CDs in required number of copies shall be submitted.

6.3 Operation & Maintenance Manuals

O&M Manuals in required number of copies shall be submitted. O&M manuals shall also contain storage and commissioning instructions.

7.0 MARKING AND PACKING

7.1 Marking

A stainless steel metal nameplate should be permanently fixed on each equipment giving its tag number and technical specifications.

7.2 Packing

All equipment / materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea water spray (where applicable) as well as rough handling and delays in transit and storage in open.

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8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- Data sheet A&B for Control Valve with Pneumatic Actuator
- Data sheet C for Control Valve with Pneumatic Actuator
- Data sheet A&B for Control Valve with Electric Actuator
- Data sheet C for Control Valve with Electric Actuator



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PES – 145 - 06

VOLUME II B

SECTION D

REV. NO.

05

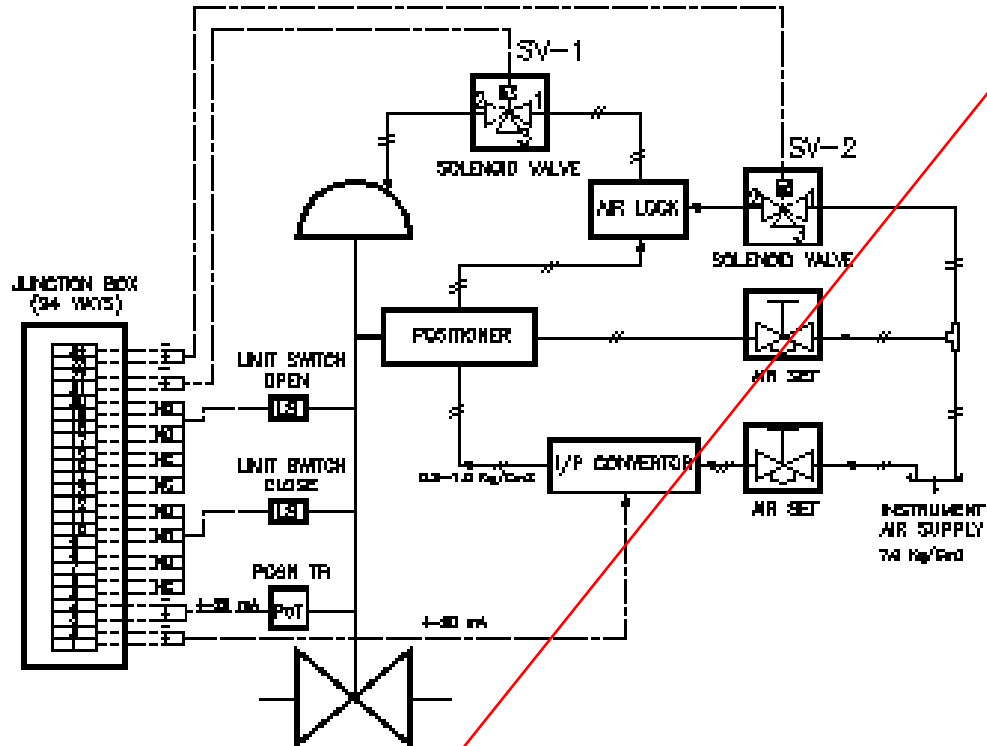
DATE : 15-05-2007

SHEET

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OF 12

THIS HOOK UP IS NOT APPLICABLE



NOTES:-

1. SOLENOID VALVE SV-1 WILL BE PROVIDED, IF SPECIFIED IN DATA SHEETS, FOR OVER-RIDING THE CONTROLLER SIGNAL.
2. SOLENOID VALVE SV-2 WILL BE PROVIDED, IF SPECIFIED IN DATA SHEET, FOR VALVE STOP/PUT POSITION REQUIREMENT ON CONTROLLER SIGNAL FAILURE.
3. SOLENOID VALVES PORT CONNECTION
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGIZED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGIZED CONDITION.
4. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVE THE FOLLOWING ACCESSORIES SHALL NOT BE APPLICABLE:-
 1. POSITIONER
 2. POSITION TRANSMITTER
 3. I/P CONVERTER
 4. AIR LOCK



SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

SPECIFICATION NO.: PES – 145 – 06A

VOLUME

SECTION

REV. NO.

01

DATE : 30.09.2009

SHEET

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1.0 Electrical :

Input Signal	4-20mA
Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
Hart Protocol	Compatibility for Remote Calibration & Diagnostic (Super-Imposed HART Signal on Input Signal to positioner (4-20mA)
Valve Position Feedback	4-20mA output signal for Position Feedback is to be provided to control system.

2.0 Environment :

Operating Temperature	(-) 30 To 80 Deg.C
Humidity	0-95%
Protection Class	IP-65 (Minimum)

3.0 Diagnostic Features :

Diagnostic / Test Features (to be available in Smart Positioner and shall be accessible through any HMS software)	Minimum Diagnostic Features Like <ul style="list-style-type: none"> • Measurement of Valve positioning timing, • Detection of actuator leakage, • Display of fault alarm. • Logging of alarms and history. • Valve friction/jamming detection. • Detection of valve wear & tear, • Valve stroke length and timing.
	Advanced Diagnostic Features Like (OPTIONAL, if specified in customer's specification) <ul style="list-style-type: none"> • On line partial closure test. • Valve signature analysis (online graphical/tabular representation of input signal Vs valve travel). • Step response test.

4.0 Software :

Software (to be supplied alongwith smart positioner)	<ul style="list-style-type: none"> • Windows based software to meet the requirement for configuration, diagnostics, calibration and testing of Valve and actuator. • Easily up-gradable with same hardware and compatible with any Hart Management Systems (HMS). • Shall be capable to cater to all the tags in the specification at the same time.
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SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

SPECIFICATION NO.: PES – 145 – 06A

VOLUME

SECTION

REV. NO.

01

DATE : 30.09.2009

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5.0 Hardware :

Hardware (As required)	1. PC with software for configuring and accessing diagnostic features of the positioners.
	2. Multiplexers for interfacing smart positioner with PC.
	3. Communication cable for interconnecting multiplexers with PC.
	4. RS232/RS485 converter (if required)

Note : Power supply for Multiplexer shall be arranged by the owner.

6.0 Valve Action :

Valve Action	Direct & Reverse. (Same positioner for Single Acting or Double Acting And no separate relays required for changing from Single acting to double).
	During Failure of input Electrical signal (4-20 mA), valve to attain fail Freeze position without any external hardware. (Sol valve, Power Supply etc.)

7.0 Flow Characterization :

Flow Characterization	Possible to fit valve characteristic curve linear & Equal percentage
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8.0 Performance:

Characteristic Deviation	$\leq 0.75\%$ of span
Ambient temp effect	$\leq 0.01\%$ / Deg C or better.
Dead Band	Adjustable 0.1 to 10%.
Scan Time	10ms
Resolution	$\leq 0.05\%$
Sensitivity/Linearity	0.3-0.4% of FS
Repeatability	0.32% of FS

9.0 Test Certificates:

Test Certificates/Test Reports for degree of protection, Accuracy and calibration test (as a minimum) to be submitted as per Manufacture Standard / Relevant Standard.

10.0 EMC & CE compliance

International Standard Like EN/IEC.

To EN 50081-2 & EN 50082 or equivalent



SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

SPECIFICATION NO.: PES – 145 – 06A

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11.0 Accessories

In Built Operator Panel	Display with push buttons for Configuration and display on the positioner itself
Hand Held Hart Calibrator (Optional)	Universal Hart Calibrator To Be Provided, One Per Unit.
Press Gauge Block	For Supply & Output Pr., Filter Regulator Other Accessories Shall Be Provided As per Control valve hook-up diagram.
Electrical cable entry	½ - NPT, side or bottom entry to avoid water Ingress.



**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101	
VOLUME	II - B
SECTION	D
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DATE :	20.06.2013
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**DATA SHEETS- A&B
FOR CONTROL VALVES**



**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

SPECIFICATION NO.: PE-TS-392-142-N101			
VOLUME	II - B		
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Control Valve datasheets for

Sl. No.	TAG No.	SERVICE	SHEET
1.	ASV-22	MAIN STEAM TO AUXILIARY STEAM PRESSURE REDUCING & DEUPERHEATING VALVE (COMBINED TYPE HC PRDS)	3-4
2.	ASV-26	COLD REHEAT STEAM TO AUXILIARY STEAM PRESSURE REDUCING VALVE (LC PRV)	5-6
3.	CDV-262	SPRAY CONTROL VALVE TO COMBINED TYPE HC PRDS	7-8
4.	CDV-268	SPRAY CONTROL VALVE TO LOW TEMP. DESUPERHEATER (DESH-2)	9-10
5.	CVD-93	SPRAY CONTROL VALVE TO TGS DESUPERHEATER	11-12
6.	----	DATASHEET FOR ACCESSORIES	13

**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

SHEET 3 OF 13

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

[illegible]

SPECIFICATION NO.: PE-TS-392-142-N101		
VOLUME	II - B	
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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – B
(TO BE FILLED UP BY
BIDDER)

	SL. No.	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU- LATED CV	% VALVE LIFT	VALVE O/L VELOCITY	
SERVICE CONDITION*		Refer Sizing Data Sheet A-1 for Aux. Steam PRDS (Case-1 is the capability point for control valve ASV-22)								
	VALVE TYPE							<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 271 * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 271 | 573 * IBR FORM III-C [•] REQUIRED <input type="checkbox"/> NOT REQUIRED							..... .....|..... .....	

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg

1. DESIGN C_v SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION



**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

SPECIFICATION NO.: PE-TS-392-142-N101

VOLUME II - B

SECTION D

REV. NO. 0

DATE : 15.11.2013

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Tag No.: **ASV-26**Qty.: **ONE PER UNIT**
DATA SHEET – A & B

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL *	PROJECT SERVICE	RRVUNL - 2 x 660 MW Suratgarh COLD REHEAT STEAM TO AUXILIARY STEAM PR. REDUCING VALVE (LC PRV)	.....
	LOCATION	<input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR	.....
BODY *	DUTY	<input type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING	.....
	PIPE SIZE (inlet / outlet)	Ø 114.3x6.02 | Ø 219.1 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 Gr. B | SA 106 Gr. B	.....
	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input type="checkbox"/> CAGE <input type="checkbox"/> ONE	.....
	BODY SIZE: PORT SIZE: DESIGN CV		.....
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED	.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCC <input type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 C5 <input type="checkbox"/> A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE	.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED	.....
TRIM FORM	<input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE	.....
TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....
: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST)	.....
FLOW	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT	.....
OUTLET VELOCITY	<input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3 (STM)	.....
REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI	.....
NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 Dba (AT ONE METER DISTANCE)	.....
VACUUM SERVICE	<input type="checkbox"/> YES <input type="checkbox"/> NO	.....
ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input type="checkbox"/> NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....
	CLOSE AT : OPEN AT (KG/CM ² g)	1.0 | 0.2	.....
ACCESSORIES	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input type="checkbox"/> STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	AIR FILTER REGULATOR	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	AIR LOCK RELAY	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	<input type="checkbox"/> REQUIRED	
	LOCAL POSITION INDICATOR	<input type="checkbox"/> REQUIRED	

SPECIFICATION NO.: PE-TS-392-142-N101		
VOLUME	II - B	
SECTION	D	
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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 2% ± 1% ± 0.5% ± 2%				
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		Refer Sizing Data Sheet A-2 for Aux. Steam PRDS Low Capacity Pressure Reducing Valve ASV-26							
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 74.1 BODY DESIGN : PRESS (KG/CM2(A) TEMP (DEG C) 74.1 360 * IBR FORM III-C [•] REQUIRED <input type="checkbox"/> NOT REQUIRED							
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							

1. DESIGN C_v SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – B
(TO BE FILLED UP BY
BIDDER)

GENERAL*	PROJECT SERVICE	RRVUNL - 2 x 660 MW Suratgarh	
	LOCATION	SPRAY TO COMBINED PRDS CONTROL VALVE	
BODY*	DUTY	[•] INDOOR [] OUTDOOR	
	PIPE SIZE (inlet / outlet)	[] ON/OFF [•] MODULATING	
PNEUMATIC ACTUATOR	PIPE MATERIAL (inlet / outlet)	Ø 60.3 x5.54 | Ø 60.3 x5.54	
		SA 106 Gr. B | SA 106 Gr. B	
ACCESSORIES	MODEL NO.	BIDDER TO SPECIFY	
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE [] TOP [•] CAGE |ONE	
BODY*	BODY SIZE: PORT SIZE: DESIGN CV		
	END CONNECTION & RATING (ANSI)	[•] BWE [] SWE [] FLANGED	
PNEUMATIC ACTUATOR	BODY MATERIAL	[] A216 WCB [•] A217 WC6 [] SS [] A217 C5	
	PACKING: MATERIAL SINGLE / DOUBLE	[] A351 CF8M	
BODY*	BONNET TYPE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	
	TRIM FORM	[] STD [] EXTENDED [] FINNED	
PNEUMATIC ACTUATOR	TRIM MATERIAL: SEAT | PLUG	[] LINEAR [•] EQ. PERCENTAGE	
	: CAGE | GUIDE BUSH	[] QUICK OPEN (ON/OFF)	
ACCESSORIES	FLOW	17-4 PH SS | 17-4 PH SS	
	OUTLET VELOCITY	17-4 PH SS | 17-4 PH SS	
BODY*	REQUIRED LEAKAGE CLASS	[] BELOW SEAT [] ABOVE SEAT	
		[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3 (STM)	
PNEUMATIC ACTUATOR	NOISE LEVEL (dBA) (spec. 3.1.14)	[] II [] III [] IV [•] V [] VI	
	VACUUM SERVICE	LESS THAN 85 dBA (AT ONE METER DESTANCE)	
ACCESSORIES	ANTI CAVITATION TRIM	[] YES [•] NO	
		[] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	
ACCESSORIES	*TRAVEL TIME FOR OPEN TO CLOSE		
	AND CLOSE TO OPEN	LESS THAN 10 SECS.	
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
PNEUMATIC ACTUATOR	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
PNEUMATIC ACTUATOR	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

SPECIFICATION NO.: PE-TS-392-142-N101			
VOLUME		II - B	
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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 2% ± 1% ± 0.5% ± 2%				
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		Refer Sizing Data Sheet A-1 for High Capacity PRDS							
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 46 * BODY DESIGN : PRESS (KG/CM2(A) TEMP (DEG C) 46 60 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED							
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg								

NOTES:

1. DESIGN C_v SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – B
(TO BE FILLED UP BY
BIDDER)

GENERAL*	PROJECT SERVICE	RRVUNL - 2 x 660 MW Suratgarh
	LOCATION	SPRAY TO LT DESH CONTROL VALVE	.....
BODY*	DUTY	[•] INDOOR [] OUTDOOR	.....
	PIPE SIZE (inlet / outlet)	[] ON/OFF [•] MODULATING	.....
PNEUMATIC ACTUATOR	PIPE MATERIAL (inlet / outlet)	Ø 48.3 x5.08 | Ø 48.3 x5.08	.....
		SA 106 Gr. B | SA 106 Gr. B	.....|.....
ACCESSORIES	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE [] TOP [•] CAGE |ONE	.....|.....|.....|.....
BODY*	BODY SIZE: PORT SIZE: DESIGN CV		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	[] BWE [•] SWE [] FLANGED	.....
PNEUMATIC ACTUATOR	BODY MATERIAL	[] A216 WCB [•] A217 WC6 [] SS [] A217 C5	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] A351 CF8M	.....
BODY*	BONNET TYPE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	TRIM FORM	[] STD [] EXTENDED [] FINNED	.....
PNEUMATIC ACTUATOR	TRIM MATERIAL: SEAT | PLUG	[] LINEAR [•] EQ. PERCENTAGE	.....
	: CAGE | GUIDE BUSH	[] QUICK OPEN (ON/OFF)	.....
ACCESSORIES	FLOW	17-4 PH SS | 17-4 PH SS	.....|.....
	OUTLET VELOCITY	17-4 PH SS | 17-4 PH SS	.....|.....
PNEUMATIC ACTUATOR	REQUIRED LEAKAGE CLASS	[] BELOW SEAT [] ABOVE SEAT	.....
		[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3 (STM)	.....|.....
ACCESSORIES	NOISE LEVEL (dBA) (spec. 3.1.14)	[] II [] III [] IV [•] V [] VI	.....
	VACUUM SERVICE	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
PNEUMATIC ACTUATOR	ANTI CAVITATION TRIM	[] YES [•] NO	.....
		[] YES [•] NO	.....
ACCESSORIES	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
PNEUMATIC ACTUATOR	*TRAVEL TIME FOR OPEN TO CLOSE		.....
	AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
ACCESSORIES	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
ACCESSORIES	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

SPECIFICATION NO.: PE-TS-392-142-N101			
VOLUME	II - B		
SECTION	D		
REV. NO.	0	DATE : 15.11.2013	
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Data Sheet No. PES-145-06-DS1-0

DATA SHEET – B
(TO BE FILLED UP BY
BIDDER)

PERFORMANCE OF VALVE	LINEARITY	$\pm 2\%$
	HYSTERESIS	$\pm 1\%$	.....
	SENSITIVITY	$\pm 0.5\%$	.....
	ACCURACY (OVERALL)	$\pm 2\%$	.....
		

NOTES:

1. DESIGN C_v SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
For
RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V,
Unit # 7 & 8 at Suratgarh, Rajasthan**

SHEET 11 OF 13

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – B
(TO BE FILLED UP BY
BIDDER)

GENERAL*

PROJECT
SERVICE
LOCATION
DUTY
PIPE SIZE (inlet / outlet)
PIPE MATERIAL (inlet / outlet)

RRVUNL - 2 x 660 MW Suratgarh SPRAY TO TGS DESUPERHEATER (DESH-3)	
<input checked="" type="checkbox"/> INDOOR	<input type="checkbox"/> OUTDOOR
<input type="checkbox"/> ON/OFF	<input checked="" type="checkbox"/> MODULATING
Ø 33.4 x4.55	Ø 33.4 x4.55
SA 106 Gr. B	SA 106 Gr. B

BODY*

MODEL NO.

TYPE OF BODY: GUIDING : NO. OF PORTS

BODY SIZE: PORT SIZE: DESIGN CV

END CONNECTION & RATING (ANSI)

BODY MATERIAL

PACKING: MATERIAL SINGLE / DOUBLE

BONNET TYPE

TRIM FORM

TRIM MATERIAL: SEAT | PLUG
: CAGE | GUIDE BUSH

FLOW

OUTLET VELOCITY

REQUIRED LEAKAGE CLASS

NOISE LEVEL (dBA) (spec. 3.1.14)

VACUUM SERVICE

ANTI CAVITATION TRIM

BIDDER TO SPECIFY

[•] GLOBE [] ANGLE [] TOP [•] CAGE | ONE

[] BWE [•] SWE [] FLANGED

[] A216 WCB [•] A217 WC6 [] SS [] A217 C5

[] A351 CF8M

[] PTFE [•] GRAFOIL [] DOUBLE [•] SINGLE

[] STD [] EXTENDED [] FINNED

[] LINEAR [•] EQ. PERCENTAGE

[] QUICK OPEN (ON/OFF)

17-4 PH SS | 17-4 PH SS

17-4 PH SS | 17-4 PH SS

[] BELOW SEAT [] ABOVE SEAT

[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3 (STM)

[] II [] III [] IV [•] V [] VI

LESS THAN 85 dBA (AT ONE METER DISTANCE)

[] YES [•] NO

[] YES [•] NO

PNEUMATIC ACTUATOR

MODEL NO. & SIZE

CLOSE AT : OPEN AT (KG/CM²g)

*TRAVEL TIME FOR OPEN TO CLOSE }
AND CLOSE TO OPEN }

*VALVE POSN. ON SIGNAL AIR FAILURE

*VALVE POSN. ON SUPPLY AIR FAILURE

BIDDER TO SPECIFY

0.2	|	1.0
-----	--	-----

LESS THAN 10 SECS.

[] TO OPEN [] STAYPUT [•] TO CLOSE
[•] STAYPUT

ACCESSORIES

POSITIONER (SMART)
AIR FILTER REGULATOR
AIR LOCK RELAY
POSITION LIMIT SWITCH
POSITION TRANSMITTER
SOLENOID VALVE
E/P CONVERTOR
JUNCTION BOX
HAND WHEEL (SIDE MOUNTED)
LOCAL POSITION INDICATOR

☒ REQUIRED ☐ NOT REQUIRED
☒ REQUIRED ☐ NOT REQUIRED
☒ REQUIRED ☐ NOT REQUIRED
☒ REQUIRED ☐ NOT REQUIRED
 PART OF SMART POSITIONER
☒ REQUIRED ☐ NOT REQUIRED
 PART OF SMART POSITIONER
☒ REQUIRED ☐ NOT REQUIRED
☒ REQUIRED
☒ REQUIRED

SPECIFICATION NO.: PE-TS-392-142-N101			
VOLUME	II - B		
SECTION	D		
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SHEET	12	OF	13

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 2% ± 1% ± 0.5% ± 2%					
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU- LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		Refer Sizing Data Sheet A-4 for TGS DESUPERHEATER							
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 46 * BODY DESIGN : PRESS (KG/CM2(A) TEMP (DEG C) 46 60 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED							
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							

1. DESIGN C_v SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION



Technical specification for Control Valves with Accessories (Pneumatically Operated)

Tag No..... Quantity.....

APPLICABLE FOR TAG Nos.WHEREVER STATEMENT "REQUIRED" INDICATED IN THE INDIVIDUAL CV DATA SHEETS

DATA SHEET – A & B for ACCESSORIES

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED-UP BY BIDDER)	
POSITIONER	MFR. & MODEL NUMBER				
	BYPASS	GAUGES	ENCL. CLASS	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> THREE <input type="checkbox"/> TWO <input checked="" type="checkbox"/> IP-55	
	INPUT SIGNAL (Kg / Cm ²)			<input checked="" type="checkbox"/> 0.2 – 1.0 <input type="checkbox"/> 0.2 – 0.6 <input type="checkbox"/> 0.6 – 1.0	
	OUTPUT SIGNAL (Kg / Cm ²)			TO SUIT ACTUATOR	
AIR FILTER REGULATOR TWO (2) Nos. PER CV	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm ² g)			<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
	OUTPUT PRESS (Kg / Cm ² g)			TO SUIT ACTUATOR	
	FILTER SIZE OUTPUT GAUGE			5 MICRON <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
AIR LOCK	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm ²)				
	SUPPLY PRESS (Kg / Cm ²)			<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
	RESET TYPE			AUTO	
	VENT PLUG			REQUIRED	
LIMIT SWITCH	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn	1 NO. <input type="checkbox"/> --- <input type="checkbox"/> 1 NO.	
	CONTACT TYPE			SPDT 2 NO + 2 NC	
	RATING (AC / DC)			5A 240V AC AND 0.2A 220V DC	
	ENCLOSURE CLASS			<input checked="" type="checkbox"/> IP-65 <input type="checkbox"/>	
POSITION TRANSMITTER	MFR. & MODEL NUMBER			<input checked="" type="checkbox"/> Electronic (2-Wire) Contactless <input type="checkbox"/> OTHER	
	TYPE			PART OF SMART POSITIONER	
	SUPPLY				
	OUTPUT RATING				
	ACCURACY				
	ENCLOSURE CLASS				
SOLENOID VALVE	MFR. & MODEL NUMBER				
	RATING			<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>	
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)	
	OPERATION	QUANTITY		<input type="checkbox"/> Stayput <input type="checkbox"/> Interlock <input type="checkbox"/> 1 <input type="checkbox"/> 2	
	COIL INSULATION CLASS			CLASS - F	
	ENCLOSURE CLASS			<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/> NEMA 4 <input type="checkbox"/>	
HANDWHEEL	ORIENTATION			<input type="checkbox"/> TOP MOUNTED <input checked="" type="checkbox"/> SIDE MOUNTED	
JUNCTION BOX	NO. OF WAYS			<input type="checkbox"/> 24-WAYS <input type="checkbox"/> AS REQUIRED <input checked="" type="checkbox"/> 36-Ways	
	SIZE			AS REQUIRED	
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).	
	ENCLOSURE CLASS			<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>	
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY		PART OF SMART POSITIONER	
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERISIS				
Cu. Tubing & Fittings / per CV	This is in addition to cu. Tubing and fittings which are integral part of CV			25 Meters of ¼" PVC coated Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.	
					COMPANY SEAL
					NAME
					SIGNATURE
					DATE



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101


VOLUME **II-B**

SECTION **D**

REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

SECTION – D
EQUIPMENT SPECIFICATIONS
FOR
STEAM DESUPERHEATER

	TITLE EQUIPMENT SPECIFICATION STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
		SECTION D	
		REV NO. 0	DATE 05.02.2008
		SHEET 1 OF 3	

1.0.0 GENERAL

This standard specification covers the design, materials, construction features, manufacturing process, assembly, inspection and testing requirements, painting and packing requirements of Steam Desuperheater along with spray nozzle.

2.0.0 CODES AND STANDARDS

2.1.0 The design, manufacture, inspection and testing of the equipment shall comply with the requirements of the latest national and international codes and standards wherever applicable. Wherever the specific code requirements are specified herein,. the same shall be adhered to.

In particular, the equipment shall be designed to comply with latest editions of the following standards

(i) Indian Boiler Regulations (IBR).

(ii) ASME Section - VIII / Div. - 1.

(iii) Material specifications as per ASTM, AISI.


3.0.0 DESIGN AND CONSTRUCTIONAL FEATURES

3.1.0 The desuperheater shall be of direct mixing mechanical spray type. The assembly shall consist of desuperheater pipe with steam inlet and outlet & spray water connection along with spray nozzle. The spray nozzle shall direct the spray in the direction of steam flow for proper mixing and arranged in such position that direct impingement of spray water on desuperheater walls is avoided.

3.2.0 The spray nozzle shall be accurately sized for best results in total range as stipulated in the data sheet.

3.3.0 The desuperheater shall be complete with matching counter flanges including bolts, nuts, gaskets, necessary reducers / expanders to suit purchaser's pipe line and supporting legs / pads & holding down bolts as required.

3.4.0 The material of construction shall be as indicated in Data Sheet – A.

	TITLE EQUIPMENT SPECIFICATION STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
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		REV NO. 0	DATE 05.02.2008
		SHEET 2 OF 3	

4.0.0 SHOP INSPECTION AND TEST

4.1.0 The bidder shall submit along with the offer the Quality Plans in the enclosed format together with all reference documents/standards etc. as applicable.

4.2.0 Indicative Quality Plans, specifying minimum checks and tests as considered necessary are enclosed along with this specification for compliance. These however are not intended to exhibit the total comprehensive testing programmes, which are the responsibility of the bidder.

4.3.0 Detailed Quality Plans to be submitted by the bidders should also include all the checks/tests carried out by the suppliers as part of their normal practice. The Quality Plans submitted by the bidders shall be subject to approval of BHEL/their Customer who reserves the right to ask for further checks during finalization of Quality Plans. BHEL/their Customer shall indicate customer hold points in the approved Quality Plans beyond which the work shall not proceed without their approval.

4.4.0 The supplier shall furnish their production program along with scheduled dates of testing at least three months in advance to enable BHEL/their customer to plan for witnessing the tests identified as hold points.

4.5.0 Material identification and co-relation with test certificates for all major components shall be essentially required. In absence of these, the material of each component shall be tested as per relevant specification for Chemical Composition and Mechanical properties i.e. Yield Stress, Ultimate Tensile Stress, Impact test, % Elongation, % Reduction in Area, Hardness etc. In addition, to ensure freedom from surface and sub-surface defects, suitable Non Destructive Testing shall also be carried out.

4.6.0 Following tests shall be done at Manufacturers' works during various stages as minimum requirement :


4.6.1 Visual examination of all components.

4.6.2 Check for weld joints for proper fit up, Dye Penetration Test after root run and final welding. 100% Radiographic test as per ASTM E 165 for all butt welds.

4.6.3 Verification of stress relieving chart if post-weld heat treatment is called for.

4.6.4 Check / test for pressure retaining bolts and nuts as per relevant Codes/Standards.

4.6.5 Dimension check for all components including surface finish.

	TITLE EQUIPMENT SPECIFICATION STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
		SECTION D	
		REV NO. 0	DATE 05.02.2008
		SHEET 3 OF 3	
4.6.6	Hydraulic Test to two times the rated design pressure for desuperheater body and other pressure retaining parts.		
4.6.7	Check for final completeness, cleaning, surface finish, appearance, identification, surface preparation, painting, marking and packing including spares.		
4.6.8	The equipment comes under the purview of IBR (Indian Boiler Regulations). All tests certificates duly signed by Chief Inspector (IBR) / authorized representative shall be furnished in IBR from III-C.		
4.6.9	The particulars of proposed shop tests and process of test shall be submitted to BHEL/their Customer along with Quality Plan for approval.		
5.0.0	<u>PERFORMANCE REQUIREMENTS</u>		
	Bidder shall guarantee that equipment offered shall meet the rating and performance requirements as stipulated in this specification. In case it is not as per guarantee furnished by the bidder, the deficiency shall be made good by the bidder by rectification / replacement of defective parts within reasonable time at their own cost inclusive of cost of transportation both ways if required. The Purchaser is entitled to reject the equipment in case of repeated failures to meet the guaranteed performance.		
6.0.0	<u>PAINTING</u>		
6.1.0	All foundry sand and loose material shall be removed and surface should be made thoroughly clean for further protection as required.		
6.2.0	A shop coat of paint, removable after installation at site, shall be applied to all steel surfaces and other exposed surfaces requiring corrosion protection during transit and storage at site.		
7.0..0	<u>PRESERVATION, MARKING AND PACKING</u>		
7.1.0	A Stainless Steel metal nameplate should be permanently fixed on each equipment giving its Tag. No. and technical specifications i.e. Service, Size, Pressure Rating etc.		
7.2.0	All equipments / materials shall be packed suitably and protected from impact, abrasion, corrosion, incidental damage due to vermin, Sun-light, high temperature, rain, moisture, humidity, dust, sea water (where applicable) as well as rough handling during entire period of dispatch, storage and erection including delays in transit and storage in open.		
7.3.0	Spares shall be packed separately and marked clearly for identification. These shall be specially packed for long storage without damage.		



TIT I F

EQUIPMENT SPECIFICATION

STEAM DESUPERHEATER

For

RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO.: PE-TS-392-142-N101

VOLUME II-B

SECTION D

REV NO. 0 DATE 15.11.2013

SHEET 1 OF 2

DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR LOW TEMP. DESUPERHEATER DESH-2

S.NO	DESCRIPTION	UNITS	DATA FOR HIGH CAP. PRDS DESUPERHEATER
1.0	TAG NO.		DESH-2
2.0	TYPE	VARIABLE ORIFICE / VENTURI TYPE	
3.0	STEAM PARAMETERS	(INLET OF DESUPERHEATER)	
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-3
3.2	PRESSURE	Kg/cm ² (a)	BIDDER TO DECIDE BASED ON SIZING DATA
3.3	TEMPERATURE	°C	BIDDER TO DECIDE BASED ON SIZING DATA
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)	REFER SIZING DATA SHEET A-3	
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-3
5.2	PRESSURE	Kg/cm ² (a)	BIDDER TO DECIDE BASED ON SIZING DATA
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-3
6.0	END DETAILS	(STEAM INLET / OUTLET)	
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 457.2 x 9.53
7.0	END DETAILS	(SPRAY WATER INLET)	
7.1	TYPE / MATCHING PIPE		SW/ 48.3 x 5.08
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A216 WCB
8.2	PIPE		SA 106GRB
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316 (Spray Nozzle design pressure shall be equal to Design Spray Water Pressure)
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (a)	21
9.2	DESIGN TEMPERATURE	°C	350



TIT I F

EQUIPMENT SPECIFICATION**STEAM DESUPERHEATER****For****RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**SECTION **D**REV NO. **0** DATE 15.11.2013SHEET **2** OF **2****DESUPERHEATER DATA SHEET A-2****DATA SHEET FOR 'TGS DESUPERHEATER' DESH-3**

S.NO	DESCRIPTION	UNITS	DATA FOR HIGH CAP. PRDS DESUPERHEATER
1.0	TAG NO.		DESH-3
2.0	TYPE		VARIABLE ORIFICE / VENTURI TYPE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-4
3.2	PRESSURE	Kg/cm ² (a)	BIDDER TO DECIDE BASED ON SIZING DATA
3.3	TEMPERATURE	°C	BIDDER TO DECIDE BASED ON SIZING DATA
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-4
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-4
5.2	PRESSURE	Kg/cm ² (a)	BIDDER TO DECIDE BASED ON SIZING DATA
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-4
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 88.9 x 5.49
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		SW/ 33.4 x 4.55
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A216 WCB
8.2	PIPE		SA 106GRB
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316 (Spray Nozzle design pressure shall be equal to Design Spray Water Pressure)
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (a)	21
9.2	DESIGN TEMPERATURE	°C	350



TITLE

EQUIPMENT SPECIFICATIONS**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION****RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**SECTION **D**REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

DATA SHEET-C**LIST OF DOCUMENTS AND DATA TO BE SUBMITTED
AFTER AWARD OF CONTRACT**

The list of documents and data to be submitted by the successful bidder after the award of the contract are specified in Data Sheet - C.

The supplier shall after award of contract submit FIFTEEN (15) sets of the following documents for purchaser's approval / vetting.

- (i) Certified final drawings & data sheets as per cl. 4.0.0 of section-C.
- (ii) Quality Plans, Inspection/Test Reports as agreed with the Purchaser.
- (iii) Material and Hydraulic Test Certificates along with IBR form III C.
- (iv) Performance Test Procedures and Reports.
- (v) Field Quality Plan as agreed.
- (vi) Storage Instructions.
- (vii) List of Commissioning, Mandatory and Recommended Spares.
- (viii) List of Tools and Tackles required.
- (ix) List of lubricants.
- (x) Operation and Maintenance Instruction Manual.

NOTE: Above list is only tentative. Successful bidder shall prepare detailed schedule of Drawings/ Documents, which shall be mutually agreed and included in the contract document/ordering Specification.



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**

SECTION **D**

REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

FINAL DOCUMENTATION

S.NO.	DESCRIPTION	INITIAL SUBMISSION FOR APPROVAL TO BHEL	COPIES FOR NLC/TCE APPROVAL AFTER BHEL CLEARANCE
1.	Vendor drawing / document for approval Note : <ul style="list-style-type: none"> Initial submissions with Rev. No. P0, P1, P2 etc. After BHEL clearance, submission to MAHAGENCO with Rev. No. R0, R1, R2 etc. 	05+Soft Copy	18+Soft Copy
2.	Issue of action A/B/C Civil / Erection Drawings / documents for construction at site (for civil packages only)	8	
3.	Release of finally approved drawings / documents (action A/E) i.e. distribution prints	22 + Soft Copy	
4.	O&M Manuals	2	24
5.	“As-Built” drawings	12	



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**

SECTION **D**

REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

QUALITY PLAN



STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-999-145-I 006**

VOLUME IIB


SECTION D


REV. NO. DATE

SHEET 1 OF 6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	

1.0 MATERIAL

1.1	Body & Bonnet casting / forgings, plug, stem.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3	---	2,1,4	
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3/2	2	1,4	IBR Certification (if applicable)
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet(NDT)	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1,4	Only for rating ANSI 600 and above. 
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1,4	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1,4	After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1,4	For Body & Bonnet after machining

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test ^{\$} P - Agency Performing the Test. 1 - BHEL 4.RRVUNL/RRVUNL NOMINATED agency
MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor
MI - Minor characteristics  V - Agency Verifying the Test. 3 - Sub-vendor



PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: PE-QP-999-145-I 006

VOLUME IIB


SECTION D

REV. NO. DATE

SHEET 2 OF 6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1,4	
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1,4	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2		2,1,4	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Appd Drg	Record	3	---	2,1,4	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Rele. Standards	Rele. Standards	Test Certificate	3	---	2,1,4	In case TC is not available, Actual test shall be conducted
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1,4	Type test certificate to be provided.

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT - Dye penetrant Test ^{\$} P - Agency Performing the Test. 1 - BHEL 4.RRVUNL/RRVUNL NOMINATED agency
MA - Major characteristics UT - Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor
MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor

<div></div> <div>PEM :: C&I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO. _____ DATE _____				
								SHEET 3 OF 6				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2,1,4	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1,4	
2.0	IN PROCESS INSPECTION											
2.1	Body & Bonnet after machining, Plug with actuator stem	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1,4	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1,4	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1,4	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	Test Records	2			
3.0	TESTS ON COMPLETED VALVE											01
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1,4	1,4	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	No Leakage	Test Certificate	2	1,4	1,4	Refer Note-4
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1,4	1,4	Refer Note-4
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test ^{\$} P - Agency Performing the Test. 1 - BHEL 4.RRVUNL/RRVUNL NOMINATED agency
 MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor
 MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor



STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-999-145-I 006**

VOLUME IIB

SECTION D

REV. NO. DATE

SHEET 4 OF 6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	1,4	1,4	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note1,4
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Report	2	1,4	1,4	On assembled valve Refer Note-4
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Records	2	1,4	1,4	Refer Note-4
		11. Pre defined valve position in case of air failure	MA	Visual	100%	As per spec & Appd drg	As per spec & Appd drg	Test Certificate	2	1,4	1,4	
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	1,4	1,4	

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4.RRVUNL/RRVUNL NOMINATED agency
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MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor



STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-999-145-I 006**

VOLUME IIB


SECTION D

REV. NO. DATE

SHEET 5 OF 6

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
5.0	AUXILIARY ITEMS											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	Overall leakage including tubing
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1,4	On completed valve
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1,4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1,4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	

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<div><div>04/05/2024</div><div></div><div>PEM :: C&I</div></div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO.		DATE		
								SHEET 6		OF 6		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1,4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1,4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2	1	1,4	
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1,4	Refer Note-2
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

NOTES:

01

- Cv test will be conducted ONE PER TYPE PER SIZE, CV VALUE. Cv test conducted at IIT/FCRI/any govt. approved laboratory shall not be witnessed by BHEL.
- In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Sea worthy packing, if applicable.
- "Inspection call shall be raised to Customer / Customer representative for the scheduled inspection/ testing. In absence of Customer / Customer representative BHEL/BHEL representative will do inspection and necessary approval." The notice period shall be as per contract specification. 02
- IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
- Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests (Leak/Operation) shall be submitted to BHEL for verification and acceptance.
- HT report/chart verified by BHEL shall be submitted for RRVUNL review and records. 01

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT - Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4. RRVUNL/RRVUNL NOMINATED agency
 MA - Major characteristics UT - Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor
 MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor

02



TITLE

EQUIPMENT SPECIFICATIONS

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **II-B**

SECTION **D**

REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

TENDER DRAWINGS

NOTE

1. EQUIPMENTS IN BIDDER'S SCOPE HAVE BEEN MARKED AS []^{BS}

[illegible]

KARNATAKA POWER CORPORATION
LIMITED

1X700 MW BELLARY TPS
STAGE-III

TECHNICAL SPECIFICATION
FOR
AUXILIARY STEAM PRESSURE REDUCING
AND DESUPERHEATING STATION
ALONGWITH ACCESSORIES

VOLUME - III

SPECIFICATION No: PE-TS -367-142-N101 (REV 00)



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




TITLE

PREAMBLESPECIFICATION NO **PE-SS-999-100-Q-001**VOLUME **III**SECTION **PREAMBLE**REV NO. **0** | DATESHEET **1 OF 1****VOLUME – III TECHNICAL SCHEDULES**

1.0 This volume contains technical schedules and Data Sheets – B , which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No. PES-100-901 in Volume-III.

2.0 The requirements mentioned in Section – C / Data Sheets – A of Section – D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section – D.

	TITLE AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION	SPEC. NO.: PE-TS-392-142-N101	
		VOLUME III	
		SECTION	CONTENTS
		REV NO. 0	DATE 15.11..2013
		SHEET 1 OF 3	
1.0	Volume III comprises of following: -		
1.1	Data Sheet : Data Sheet(s) 'B' Section 'D'.		
1.2	Schedules :		
	PART – A : Technical Schedules		
	PART – B : Price Schedules		
	(See clause 2 (b) below for unpriced schedules)		
	The Schedule and Data Sheets enclosed/indexed shall be completely filled up by the bidder and furnished with the bid duly signed and stamped by the bidder. Purchaser reserves the right to ask the bidder to fill additional schedules, which are not listed in the contents.		
2.0	Form No. PEM-6020 is a 'Checklist', which is enclosed to facilitate the bidder to make sure that the necessary data/information is furnished by him in his bid. The remarks column of this schedule shall be filled up by the bidder as per the instructions given below:-		
	a) The bidder shall write 'Not Applicable' against those schedules / documents which are not listed in the contents.		
	b) The bidder shall write 'Enclosed' for the listed schedules / documents which are filled and furnished by the bidder with the bid. Otherwise 'Not Enclosed' shall be written.		
	c) Duly filled Part-A schedules as well as Data Sheet-B shall be furnished with the technical offer while Part-B (Price Schedules) shall be submitted with price offer in separate covers.		
	d) Wherever unpriced schedules are to be furnished with Part-A schedules in tech. bids. the same is indicated in the filling space of price schedule formats.		
	e) Other documents / information as required in the checklist shall also be furnished by the bidder.		
3.0	The Data Sheet(s)-B shall be filled-up completely and typed written and shall be duly signed with Rev. No. and date. One copy of the same shall be furnished with the bid. The items, which deviate from the specification, shall be marked with an asterisk (*) in the data sheets and details shall also be given in the 'Schedule of deviations' from technical specification (Form No. PEM-6036).		
4.0	Bidder shall fill specification No. in all schedules .		
5.0	Schedules PEM – 6020 & PEM 6040 duly filled in shall be enclosed by bidder both in Technical and price offers.		



TITLE

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **III**

SECTION **CONTENTS**

REV NO. **0** DATE 15.11..2013

SHEET 2 OF 3

CONTENTS

PART-A

<u>SL.NO.</u>	<u>FORM NO.</u>	<u>FORM DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.		Data Sheet-C for Control Valves	3
2.		Data Sheet-C for Steam Desuperheater	2
3.	PE-6020	Check List - List of Schedules	1
4.	PE-6024	Schedule of Drawings / Catalogues submitted with bid	1
5.	PE-6026*	Schedule of Equipment, Manufacture, Dispatch & Shipment to Site	1
6.	PE-6027*	Schedule of Weights & Dimensions	1
7.	PE-6030*	Inspection Schedule	1
8.	PE-6036	Schedule of Deviations	1
9.	PE-6040	Schedule of Declaration	1
10.	PE-6041*	Quality Plan	1
11.	PE-6042-00	Instructions for filling up the Quality Plan	1
12.	PE-6042*	Vendor's Drawings / Document Schedule	1
13.	PE-6046*	Inspection Request	1

* To be filled up by successful bidder after LOI.



TITLE

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **III**

SECTION **CONTENTS**

REV NO. **0** DATE 15.11..2013

SHEET 3 OF 3

CONTENTS

PART-B

<u>SL.NO.</u>	<u>FORM NO.</u>	<u>FORM DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.	PE-6051	Schedule of Prices	1
2.	PE-6052	Schedule of Unit Prices	1
3.	PE-6053	Schedules of Prices for Commissioning & Mandatory Spares	1
4.	PE-6054	Schedule of Prices for Recommended Spares	1
5.	PE-6055	Schedule of Prices for Erection & Maintenance Tools & Tackles	1
6.	PE-6056*	Schedule of Bidder's Man-power for Supervision of E & C and their Charges	1

* to be filled up by successful bidder after LOI.



TITLE

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **III**

SECTION **PART-A**

REV NO. **00** DATE 15.11.2013

SHEET 1 OF 1

**VOLUME-III
PART-A**

SCHEDULES AND DATA SHEETS



TITLE


EQUIPMENT SPECIFICATIONS**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101

VOLUME **III**SECTION **D**REV NO. **0** DATE 15.11.2013

SHEET 1 OF 1

DATA SHEETS - C
**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION****(TO BE FILLED BY SUCCESSFUL VENDOR AFTER THE AWARD OF CONTRACT)**

	Technical specification for APRDS CONTROL VALVES (Pneumatically Operated) RRVUNL-2X660MW, Super-Critical TPS, Stage-V, Unit -7 & 8 at Suratagarh	SPECIFICATION NO. PE-TS-375-142-N101	
		VOLUME III	
		SECTION D	
		REV. NO. 00	DATE: 15.11.2013
		SHEET 1 of 3	

		NAME
		SIGNATURE
		DATE
Tag No..... Quantity.....		Data Sheet No. PES-145-06-DS2-0
DATA SHEET C		
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)		
GENERAL*	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN DV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA) (Spec. 3.1.14)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm ² g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
ACCESSORIES	POSITIONER	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	E / P CONVERTER	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	
	ELECTRO PNEUMATIC POSITIONER	



**Technical specification for
APRDS CONTROL VALVES**
(Pneumatically Operated)
RRVUNL-2X660MW, Super-Critical TPS,
Stage-V, Unit -7 & 8 at Suratagarh

SPECIFICATION NO. **PE-TS-375-142-N101**VOLUME **III**SECTION **D**

REV. NO. 00

DATE: 15.11.2013

SHEET 2 of 3

Tag No..... Quantity.....

Data Sheet No. PES-145-06-DS2-0

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

**PERFORMANCE
OF VALVE**

LINEARITY

HYTERSIS

SENSITIVITY

ACCURACY


**SERVICE
CONDITION*****SL.+
NO.****LOAD****FLOW
(T/HR)****INLET PR.
(KG/CM² (A))****OUTLET PR.
(KG/CM² (A))****TEMP
DEG. C****CALCULA
TED CV****%
VALVE
LIFT****VALVE O/L
VELOCITY**


VALVE TYPE


* MAX SHUT OFF PRESS ((KG/CM²g)* BODY DESIGN : PRESS ((KG/CM²g) | TEMP (DEG. C)

* IBR FORM III-C

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.


	Technical specification for Control Valves with Accessories (Pneumatically Operated)		SPECIFICATION NO.	
			VOLUME II-B	
			SECTION D	
			REV. NO.	DATE:
			SHEET OF	
Tag No..... Quantity..... Data Sheet No. PES-145-06-DS2-1				
DATA SHEET C				
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)				
POSITIONER	MFR. & MODEL NUMBER			
	BYPASS	GAUGES	ENCL. CLASS	
	INPUT SIGNAL (Kg / Cm ²)			
	OUTPUT SIGNAL (Kg / Cm ²)			
AIR FILTER REGULATOR	MFR. & MODEL NUMBER			
	AIR SUPPLY PRESS (Kg / Cm ² g)			
	OUTPUT PRESS (Kg / Cm ² g)			
	OUTPUT GAUGE			
	FILTER SIZE			
AIR LOCK	MFR. & MODEL NUMBER			
	SET PRESS (Kg / Cm ²)			
	SUPPLY PRESS (Kg / Cm ²)			
	RESET TYPE			
	VENT PLUG			
LIMIT SWITCH	MFR. & MODEL NUMBER			
	OPEN posn	INT posn	CLOSE posn	
	CONTACT TYPE			
	RATING (AC / DC)			
	ENCLOSURE CLASS			
POSITION TRANSMITTER	MFR. & MODEL NUMBER		PART OF POSITIONER.	
	TYPE			
	SUPPLY			
	OUTPUT RATING			
	ACCURACY			
	ENCLOSURE CLASS			
SOLENOID VALVE	MFR. & MODEL NUMBER			
	RATING			
	OPERATION	QUANTITY		
	COIL INSULATION CLASS			
	ENCLOSURE CLASS			
HANDWHEEL	ORIENTATION			
JUNCTION BOX	NO. OF WAYS			
	SIZE			
	CABLE GLANDS (Size / Quantity)			
	ENCLOSURE CLASS			
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY	PART OF POSITIONER.	
	SPLIT RANGE			
	ENCLOSURE CLASS			
	LINEARITY			
	HYSTERESIS			
Cu. Tubing & Fittings / per CV	25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for connection to IA Header on one end and accessories on another end of CV			
			COMPANY SEAL	
			NAME	
			SIGNATURE	
			DATE	


	TITLE DATASHEET - C STEAM DESUPERHEATER				SPEC. NO.: PE-TS-392-142-N101	
					VOLUME III PART -A	
	SHEET 1 OF 2					
INSTRUCTIONS TO BIDDER 1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B. 2. Items which deviate from specification shall be marked with an asterisk (*) 3. This data sheet shall be submitted alongwith bid.						
SL.NO.	ITEM	UNIT	PARTICULARS			
1.0	TYPE OF DESUPERHEATER	-				
2.0	MODEL NO.	-				
3.0	NUMBER OFFERED NOS.					
4.0	FLOW CAPACITY (OUTLET OF DESUPERHEATER)	T/HR				
5.0	STEAM PARAMETERS AT INLET					
5.1	PRESSURE	KG/CM ² A				
5.2	TEMPERATURE	°C				
5.3	FLOW T/HR					
6.0	STEAM PARAMETERS AT OUTLET					
6.1	PRESSURE	KG/CM ² A				
6.2	TEMPERATURE	°C				
7.0	SPRAY WATER PARAMETERS					
7.1	PRESSURE	KG/CM ² A				
7.2	QUANTITY	T/HR				
8.0	DESIGN PARAMETERS OF DESUPERHEATER BODY					
8.1	PRESSURE	KG/CM ² G				
8.2	TEMPERATURE	°C				
9.0	DESIGN PRESSURE OF SPRAY NOZZLE	KG/CM ² G				
10.0	TYPE OF SPRAY NOZZLE					
10.1	FIXED / VARIABLE AREA ORIFICE					
10.2	SINGLE HOLE / MULTI HOLE					
Name of Bidder / Vendor					Project	
Revision Number	0	1	2	3	BIDDER'S SEAL	
Signature of Bidder / Vendor / Authorised Representative						
Date						


	TITLE DATASHEET - C STEAM DESUPERHEATER				SPECIFICATION NO. PE-TS-392-142-N101	
					VOLUME III PART -A	
	SHEET 2 OF 2					
INSTRUCTIONS TO BIDDER 1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B. 2. Items which deviate from specification shall be marked with an asterisk (*) 3. This data sheet shall be submitted alongwith bid.						
SL.NO.	ITEM	UNIT	PARTICULARS			
11.0	NUMBER OF SPRAY NOZZLE / TURNDOWN RATIO					
12.0	SPRAY WATER NOZZLE CHARACTERISTICS					
13.0	SIZE OF ORIFICE	MM				
14.0	MIN. VELOCITY ACCEPTABLE IN THE DESUPERHEATER PIPE	M/SEC				
15.0	END CONNECTIONS TYPE & SIZE					
15.1	DESUPERHEATER INLET / OUTLET					
15.2	SPRAY WATER INLET					
16.0	MATERIAL OF CONSTRUCTION					
16.1	BODY					
16.2	SPRAY NOZZLE					
17.0	OVERALL DIMENSIONS	MM				
18.0	WEIGHT OF DESUPERHEATER	KG				
19.0	MOUNTING RECOMMENDATIONS (IF ANY)					
20.0	DESIGN CODE					
21.0	HYDRAULIC TEST PRESSURE	KG/CM ² G				
Name of Bidder / Vendor					Project	
Revision Number		0	1	2	3	BIDDER'S SEAL
Signature of Bidder / Vendor / Authorised Representative						
Date						

CHECKLIST — LIST OF SCHEDULES

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings / Catalogues submitted with Bid	✓
2.	PEM-6025@	Schedule of Occurance of Key Events of Delivery,Erection& Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture, Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions	✓
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction / Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings / Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurance of Key Events for Civil / Structural Works	
16.	PEM-6046	Inspection Request	✓
17.	PEM-6051	Schedule of Prices	✓
18.	PEM-6052@	Schedule of Unit Prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles	✓
22.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges.	✓
23.	PEM-6057	Schedule of Daily & Overtime Rates	
24.	PEM-6058	Schedule of Hire-charges for Construction / Site Fabrication Facilities	
For Forms marked with @ certain information to be filled by DEs - before issuing to bidder.			

	TITLE SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID		SPECIFICATION NUMBER PE-TS-392-142-N101	
			VOLUME III PART - A	
			SHEET OF	
Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.				
DRAWING./ CATALOGUE NUMBER	DESCRIPTION			NUMBER OF SHEETS
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	

	TITLE SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE			SPECIFICATION NUMBER PE-TS-392-142-N101	
				VOLUME III PART - A	
				SHEET OF	
Equipment / Major Bought-out Items	Time for Manufacture/ Procurement from Date of Issue of Letter of Intent (Weeks)	Time for Test, Dismantling Packing & Ready for Despatch (Weeks)	Time required for Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of Intent to Shipment to Site (Weeks)	
We, the undersigned hereby undertake to meet the above time schedule in weeks for manufacture, despatch and shipment of each equipment and procurement of major boughtout items as listed above.					
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE		

	TITLE <h2 style="text-align: center;">SCHEDULE OF WEIGHTS & DIMENSIONS</h2>		SPECIFICATION NUMBER PE-TS-392-142-N101			
			VOLUME III PART - A			
			SHEET OF			
The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.						
Description of Package(s)		Dimensions (in meters)		Weight (in tonnes)		
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE						
NAME	DESIGNATION				SIGNATURE	DATE
COMPANY SEAL						



INSPECTION SCHEDULE

SPECIFICATION NUMBER PE-TS-392-142-N101

P.O.
NUMBER


VOLUME - III PART-A

SHEET OF

S. No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	Scheduled Date of Inspection	Duration of Test / Inspection (in days)

This schedule shall be in line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI / PO.

PARTICULARS OF VENDOR's / AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	COMPANY SEAL

	TITLE * SCHEDULE OF DEVIATIONS () From Conditions of Contract (Volume - I) () From General Technical Conditions (Volume - II A) () From Technical Specifications (Volume - II B)				SPECIFICATION NUMBER PE-TS-392-142-N101	
					VOLUME III PART - A	
					SHEET OF	
We the undersigned hereby certify that the above mentioned are the only deviations.						
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					COMPANY SEAL	
NAME	DESIGNATION	SIGNATURE	DATE			



TITLE

SPECIFICATION NUMBER PE-TS-392-142-N101

VOLUME III PART - A

SHEET OF

* SCHEDULE OF DECLARATION

DECLARATION

I,.....certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our formal proposal number Dated..... and there is no deviation to the specification.

I hereby certify that I am duly authorised representative of the Bidder's company whose name appears above my signature.

Bidders Company Name

Authorised representative's
Signature

Name

Bidder's Intent The bidder hereby agrees to fully comply with the requirements and intent of this specifications for the price indicated.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

INSTRUCTIONS FOR FILLING QUALITY PLAN

(Form No. PEM-6042-0)

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- Column 1- Serial Number
- Column 2- Component/Operation- The component and/or operation being checked shall be given here.
- Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
- Column 4- Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel
'MA' stands for major Characteristic - affecting safety of equipment and personnel
'MI' stands for minor characteristic - affecting appearance etc.
- Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
- Column 6- Extent of check, such as, 100, 10, 1 per heat etc.
- Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
- Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
- Column 9- Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
- Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'
The agencies are codified '1' stands for (BHEL)
as 1,2 & 3 '1' * means the operation shall be cleared by BHEL before the start of the next operation.
'2' Stands for Vendor
'3' stands for sub-Vendor of the Vendor and so on.

Example :

- Entry '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC
- Entry '2' in column 'W' means test./inspection to be witnessed by Vendor's QC
- Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
- Column II- Remarks - Any special remarks shall be given here.

NOTES :

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be complied with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).

INSPECTION REQUEST

(From Vendor to BHEL Inspection Agency)

1 PROJECT TITLE:**2 NAME OF VENDOR:****3 BHEL'S LOI / PO NO:****DATE :****4 SYSTEM / ITEM DESCRIPTION****5 ITEMS BEING OFFERED FOR INSPECTION WITH SL. NO. AS PER LOI / PO / BILLING SCHEDULE****6 DESCRIPTION AND SL. NO. OF INSPECTION AS PER QUALITY PLAN****7 QUANTITY OFFERED FOR INSPECTION****8 PLACE OF INSPECTION (FULL ADDRESS AND NAME OF SUB-VENDOR, IF ANY)**

PLACE

ADDRESS

.....
.....**9 CONTACT PERSON (FOR SL. NO. 8 ABOVE).**

NAME DESIGNATION

TELEPHONE

FAX TELEGRAM

TELEX

10 THE FOLLOWING DOCUMENTS ARE APPROVED BY BHEL AND AVAILABLE AT PLACE OF INSPECTION

(A) QUALITY PLAN (B) DRAWINGS (C) DATA SHEETS, CHARACTERISTIC CURVES ETC. (D) PLANT STANDARDS

11 REQUIRED DATE OF INSPECTION LIKELY DURATION (No of Working days).....

WEEKLY OFF DAY WORKING HOURS

(At least 15 days prior notice shall be given by the Vendor to Inspection Agency)

We hereby certify that the above items are complete in all respects and have been fully inspected/tested by us and are found to be as per technical specification/approved drawings/data sheets/characteristic curves and are acceptable to our QC department. The detailed inspection and test reports of our QC department are enclosed.

VENDOR'S PARTICULARS

NAME	DESIGNATION	SIGNATURE	PLACE	DATE	COMPANY SEAL



TITLE

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101


VOLUME **III**

SECTION **PART-B**

REV NO. **0** DATE 15.11..2013

SHEET **1** OF **1**

**VOLUME-III
PART-B
PRICE SCHEDULES**

	TITLE SCHEDULE OF PRICES AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION	SPEC. NO.: PE-TS-392-142-N101	
		VOLUME	III
		SECTION	PART-B
		REV NO. 0	DATE 15.11.2013
		SHEET 1 OF 1	

S.No.	Description of Works or Equipment/System	Price (in Lakhs of Rs.)
1.0	Total price for design, manufacture, assembly, inspection, testing, packing and dispatch to site of auxiliary steam pressure reducing and desuperheating stations complete with desuperheaters, controls valves and all accessories including commissioning spares and special tools & tackles as specified and necessary as per technical specification PE-TS-392-142-N101	
2.0	Recommended spares, item-wise break up with item-wise price to be given as per “Schedule of Recommended Spares” enclosed under Vol. III of technical specification- price not to be included in clause 1.0 above, Bidder to indicate the break up.	
3.0	Mandatory Spares price – prices not to be included in clause 1.0 above	
4.0	Optional price of supervision of erection and commissioning of equipments – prices not to be included in clause 1.0 above.	
	Indicate all duties, taxes etc. Stating whether included/excluded in above price.	

-Bidder shall furnish this price schedule in his price offer only.

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PARTICULARS OF VENDOR’S/AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	COMPANY SEAL



TITLE

SCHEDULE OF UNIT PRICES

**AUXILIARY STEAM PRESSURE REDUCING
& DESUPERHEATING STATION**

SPEC. NO.: PE-TS-392-142-N101


VOLUME **III**


SECTION **PART-B**


REV NO. **0** DATE 15.09.2013


SHEET OF

S.No.	Item Description	Unit Price (in Lakhs of Rs.)																								
1.0	Design, manufacture, inspection & testing, packing and delivery for site for following as specified in Technical specification PE-TS-392-142-N101:																									
1.1	Unit Price of Control valves (2X660 MW, RRVUNL SURATGARH) <ul style="list-style-type: none"> a) Combined Type Aux. Steam High Capacity Pr. Reducing Valve (ASV-22) b) Low Capacity Pressure Reducing Valve (from CRH line) (ASV-26) c) HC PRDS Control Spray Valve (CDV-262) d) DESH-2 Control Spray Valve, (CDV-268) e) Low Temperature desuperheater (DESH-2) f) TGS Desuperheater (DESH-3) g) Spray control valve to DESH-3, (CDV-93) 																									
1.2	Unit Price of Mandatory Spares (2X660 MW, RRVUNL SURATGARH) <div> <p>For Control Valve and Pneumatic Block valves (for each type/ model of valve)</p> <table> <tr> <td>(a)</td><td>Plug with Stem Assembly</td><td>2 no. for each type</td></tr> <tr> <td>(b)</td><td>Seat Ring</td><td>2 no. for each type</td></tr> <tr> <td>(c)</td><td>Packing and Gasket</td><td>2 no. for each type</td></tr> <tr> <td>(d)</td><td>Pilot Relay</td><td>2 no. for each type</td></tr> <tr> <td>(e)</td><td>Actuator Diaphragm</td><td>2 no. for each type</td></tr> <tr> <td>(f)</td><td>O-ring</td><td>4 nos. for each size of positioner</td></tr> <tr> <td>(g)</td><td>Feed Back Linkage</td><td>2 no. for each type</td></tr> <tr> <td>(h)</td><td>Control Valve (Electrical operated –if supplied)- Interfacing modules</td><td>10% or 1 no. of total quantity whichever is higher</td></tr> </table> </div>	(a)	Plug with Stem Assembly	2 no. for each type	(b)	Seat Ring	2 no. for each type	(c)	Packing and Gasket	2 no. for each type	(d)	Pilot Relay	2 no. for each type	(e)	Actuator Diaphragm	2 no. for each type	(f)	O-ring	4 nos. for each size of positioner	(g)	Feed Back Linkage	2 no. for each type	(h)	Control Valve (Electrical operated –if supplied)- Interfacing modules	10% or 1 no. of total quantity whichever is higher	
(a)	Plug with Stem Assembly	2 no. for each type																								
(b)	Seat Ring	2 no. for each type																								
(c)	Packing and Gasket	2 no. for each type																								
(d)	Pilot Relay	2 no. for each type																								
(e)	Actuator Diaphragm	2 no. for each type																								
(f)	O-ring	4 nos. for each size of positioner																								
(g)	Feed Back Linkage	2 no. for each type																								
(h)	Control Valve (Electrical operated –if supplied)- Interfacing modules	10% or 1 no. of total quantity whichever is higher																								

		TITLE * SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES				SPECIFICATION NUMBER PE-TS-392-142-N101			
						VOLUME III			
						SHEET OF			
The bidder shall indicate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section-C / Section - D. If the listed spares are not adequate, then the bidder shall indicate those and additional spares considered necessary by him.									
Type	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Required	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection and Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE									
NAME	DESIGNATION	SIGNATURE	DATE						

		TITLE * SCHEDULE OF PRICES FOR RECOMMENDED SPARES				SPECIFICATION NUMBER PE-TS-392-142-N101			
						VOLUME III			
						SHEET OF			
The bidder shall give below a list of spares recommended for three years (or as otherwise specified in section - C) for trouble free performance of the equipment / system offered.									
S. No.	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity recommended	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE									
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL					

	TITLE SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES		SPECIFICATION NUMBER PE-TS-392-142-N101	
			VOLUME III	
			SHEET OF	
The bidder shall be give below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section - C / Section - D.				
S. No.	Description of Tools & Tackles	Quantity offered	Unit Price (Rs.)	Total Price (Rs.)
NOTE : The hire charges for vendor's equipment called for in this schedule shall include the cost of consumables, operation services, depreciation, wear and tear as well as vendor's over head and profit. (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract.)				
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	

	TITLE			SPECIFICATION NUMBER PE-TS-392-142-N101	
	SCHEDULE OF BIDDER'S MAN POWER FOR SUPERVISION OF E & C AND THEIR CHARGES			VOLUME III	
				SHEET OF	
The bidder shall indicate below, designation-wise, the personnel required for supervision of erection and commissioning and their charges.					
SUPERVISION OF ERECTION					
S. No.	Designation	Normal rate per day of 8 hours		Overtime rate per hour	
SUPERVISION OF COMMISSIONING					
Sl. No.	Designation	Normal rate per day of 8 hours		Overtime rate per hour	
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE		