

**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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**VOLUME - II B**

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



BHARAT HEAVY ELECTRICALS LIMITED  
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PPEI, NOIDA, INDIA



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).

	<b>TITLE</b>  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>  <b>RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b>	SPEC. NO.: PE-TS-392-142-N101	
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FILLED-UP QUALITY PLAN AS MINIMUM REQUIREMENTS IS INCLUDED  
FOR CONTROL VALVE & STEAM DESUPERHEATER.

	<b>TITLE</b> <b>SCOPE OF ENQUIRY</b>  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>  <b>FOR</b> <b>RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b>	SPEC. NO.: PE-TS-392-142-N101	
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SECTION – A

SCOPE OF ENQUIRY

	<b>TITLE</b>  <b>SCOPE OF ENQUIRY</b>  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>  <b>FOR</b> <b>RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b>	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.

	<b>TITLE</b> <b>SCOPE OF ENQUIRY</b>  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>  <b>FOR</b> <b>RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b>	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.





TITLE

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

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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,  
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan

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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	<b>Climatic conditions</b>	
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 & DESUPERHEATING STATION

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

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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**

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

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## SECTION-C

### SPECIFIC TECHNICAL REQUIREMENTS



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**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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**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/cm<sup>2</sup> (abs) & 310°C at the high temperature auxiliary steam header and subsequently to 16 kg/cm<sup>2</sup> (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.**

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Package: <del>EPC</del>	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan  <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b>  DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS	SHEET 3 of 20

### 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 &amp; 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 <del>Interposing relay (To be mounted in Control room cabinet) for interface to the following:</del></p> <p><del>(a) Solenoid valve (two relays per valve) Relays with contact rating of 2 Amps.</del></p> <p><del>(b) DC Starter (two relays per drive) Relays with contact rating of 0.2Amps.</del></p>		
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<p>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:</p> <p>(a) Modulating control- Stay put</p> <p>(b) ON/OFF control -Move to safe-end-position</p> <p>29.12.2 All actuators shall be provided with hand wheel for local operation.</p> <p><b>29.13 CONTROL VALVES:</b></p> <p>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.</p> <p>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.</p> <p>29.13.3 Bidder shall note that in case of Ash Control valves, if Spiess valve is offered, the Bidder shall confirm the following:</p> <p>(a) If patented design of the OEM, Local spare/service support shall be confirmed.</p> <p>(b) Adequate Technical details required for understanding the Trim internal functionality and maintaining Valve shall be provided.</p> <p>(c) The Thyristor based Electronic Power Positioner electronics shall not be mounted in the hot Combustor zone because of the dusty and hot conditions.</p> <p>29.13.4 Bidder's shall quote the Pneumatic operated valve which has been proven in the subject application for more than 2 years.</p> <p>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.</p>		
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<p>31.9 <del>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.</del></p> <p>31.10 <del>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.</del></p> <p>31.11 <del>All transmitters shall be SMART type with integral local LCD indication and HART protocol.</del></p> <p>31.12 <del>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 ).</del></p> <p>31.13 <del>Switches (pressure, temperature, level &amp; 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.</del></p> <p>31.14 <del>Similar make and model shall be provided for same type of I&amp;C system equipment. This shall specifically apply for field transmitters, control valves etc.</del></p> <p>31.15 <del>Smart positioners shall be provided for all control valves/ dampers.</del></p> <p>31.16 <del>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.</del></p> <p>31.17 <del>All outdoor field equipment shall be provided with epoxy painting.</del></p> <p>31.18 <del>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.</del></p> <p>31.19 <del>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.</del></p> <p>31.20 <del>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.</del></p> <p>31.21 <del>All motorised bypass valves shall be inching type and shall be provided with position transmitters of non-contact type.</del></p>		
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SPEC.NO. <del>TCE.5750A-H-500-001</del>	<del><b>TATA CONSULTING ENGINEERS LIMITED</b></del>	VOLUME-V <del>SECTION - D5.4</del>
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 7 of 20
<p>1.27.2 <del>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.</del></p> <p>1.27.3 <del>In each Local Panel, a 24 V DC Voltmeter shall be provided to check the Field Interrogation voltage.</del></p> <p>1.28 <del>Vibration Monitoring And Analysis System</del>  <del>Refer TABLE-13.</del></p> <p>1.29 <del>230 V AC Distribution Board</del>  <del>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.</del>  <del>Each terminal shall have LED indication with fuses to indicate and isolate earth faults.</del></p> <p>1.30 <del>Control Valves</del></p> <p>1.30.1 <del>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 &amp; 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.</del></p> <p>1.30.2 <del>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.</del></p>		
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Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 8 of 20
<p>1.30.3 All control valves shall have a leakage class of V and tight shut off application class VI shall be provided.</p> <p>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.</p> <p>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.</p> <p>1.30.6 Water seal shall be provided for valves that could be subjected to below atmospheric conditions.</p> <p>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.</p> <p>1.30.8 Trim shall be designed such that trim exit velocity shall be limited to avoid cavitation.</p> <p>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.</p> <p>1.30.10 Control valve sizing shall be accompanied with data sheets. Following size calculation details shall be furnished for Control valves:</p> <p>1.31 <del>Pneumatic block valves</del></p> <p><del>Balanced, on-off, plug type, single ported, gate valve. End connection socket welded for sizes 50 NB and below &amp; butt welded for sizes above 50 NB and flow direction shall be horizontal.</del></p> <p><del>For body and bonnet material refer mechanical section of this specification.</del></p> <p><del>Packing material GRAFOIL.</del></p> <p><del>Trim : Cage guided, metal seated with flow characteristic of quick opening with stem, plug, seat and guide material of SS 316.</del></p> <p><del>Actuator : Diaphragm (Nitrile) type with handwheel &amp; travel indicator and adjustable stop. It shall be sized for shut off differential pressure.</del></p> <p><del>Accessories like air filter regulator, solenoid valve, limit switch with Nema4 enclosure, etc. shall be supplied. Actuators &amp; accessories requiring tubing shall be mounted and tubed.</del></p>		
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SPEC.NO. <del>TCE-5750A-H-500-001</del>	<del><b>TATA CONSULTING ENGINEERS LIMITED</b></del>	VOLUME V <del>SECTION - D5.4</del>
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 9 of 20
<p>1.32 Control Damper Drives</p> <p><del>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 &amp; 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.</del></p> <p><del>All the field mounted Damper accessories ( position indicator, limit switches etc.,) shall comply to IP-65.</del></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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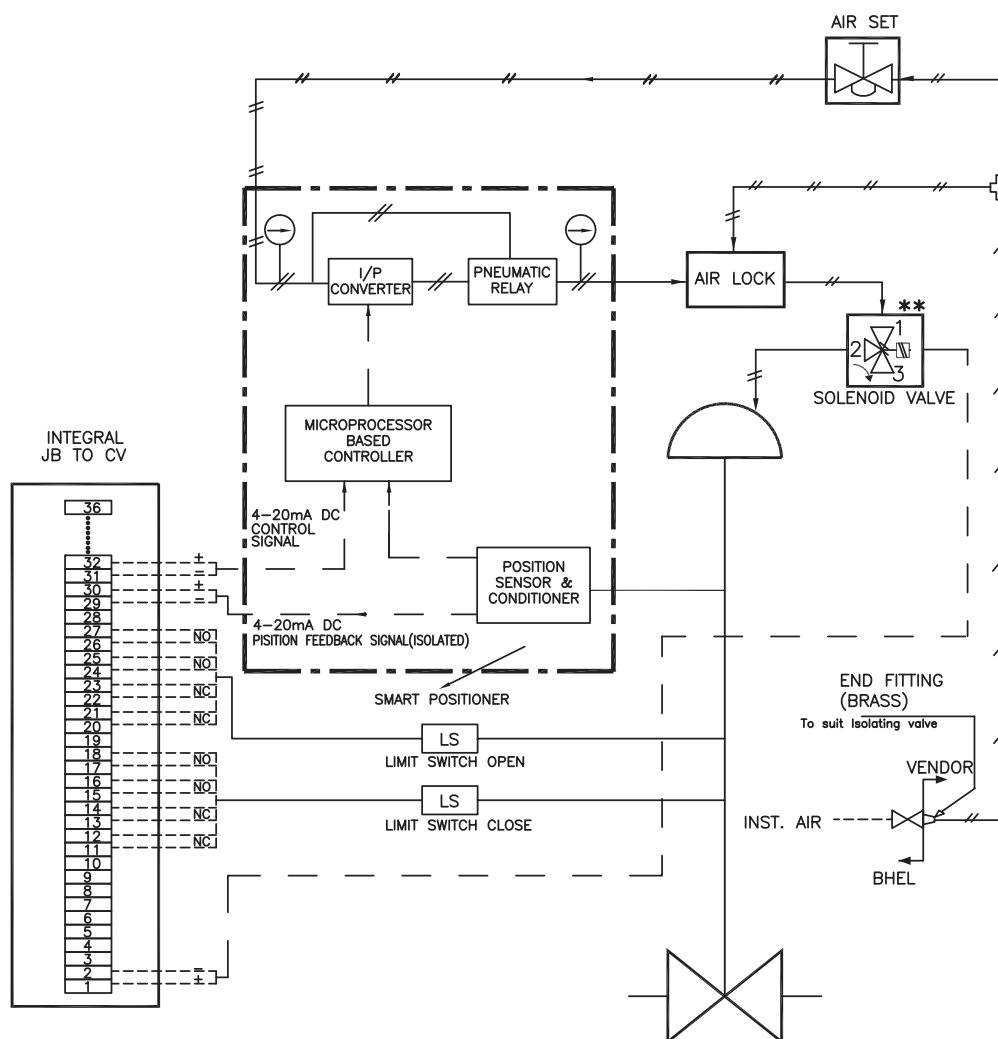
<p><del>SPEC.NO.</del> <del>TCE.5750A-H-500-001</del></p>	<p><del><b>TATA CONSULTING ENGINEERS LIMITED</b></del></p>	<p><del>VOLUME-V</del> <del>SECTION : D5.4</del></p>
<p>Package: EPC</p>	<p><b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b></p> <p><b>INSTRUMENTATION AND CONTROL EQUIPMENT</b></p> <p>SPECIFICATION FOR INSTRUMENTATION &amp; CONTROL EQUIPMENT</p>	<p>SHEET 10 of 20</p>
<p>1.37      Air Filter Regulator (AFR)</p> <p>Constant bleed type AFR with an accuracy of +/-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.</p> <p>1.38      Position Transmitters</p> <p>24VDC operated Non contact LVDT type with 4-20 mA DC 2 wire system with an accuracy of ±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.</p> <p>1.39      Solenoid Valves</p> <p>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.</p> <p><del>1.40      Void</del></p> <p>1.41      Bunker level monitoring system:</p> <p><del>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.</del></p> <p>1.42      Furnace Temperature Probe</p> <p><del>Duplex k-type thermocouple with mineral insulation &amp; SS sheath located in furnace below SH panels; minimum of 2 nos. Probe housing shall be weather proof &amp; corrosion resistant. Accuracy shall be +/-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 &amp; 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 &amp; 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.</del></p>		
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Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> CODES AND STANDARDS	SHEET 11 of 20
<div> <div> Instrumentation Symbols and identification.  Binary Logic Diagrams for Process Operation  Graphic symbols for DCS, shared display inst. logic &amp; 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. &amp; Control Equipment.  Electromagnetic Compatibility for Industrial Process Measurement  Preparation of Function Chart for Control System  Industrial Measurement &amp; Control—Terms &amp; definition  Vibration, Axial Position &amp; Bearing Temperature Monitoring Systems  Plain End Steel Tubes, Welded &amp; Seamless General Table—Dimensions  &amp; Masses / Length  Measurement of Fluid Flow by Means of Orifice Plates &amp; Nozzles  Pipe Threads  Quality Control Standard for Control  Valves Seat Leakage  Thermocouples    Measurement &amp; Control, Electrical sensors, Elec. Position sensors &amp; 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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Package: EPC	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan <b>INSTRUMENTATION AND CONTROL EQUIPMENT TESTS</b>	SHEET 12 of 20
<b>PART-A: TESTS FOR I&amp;C EQUIPMENT</b>		
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) <b>NOTE-1: These tests shall be witnessed by PURCHASER / CONSULTANT</b>
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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### TYPICAL HOOK-UP DIAGRAM



NOTE:—

1. SOLENOID VALVE WILL BE PROVIDED FOR ON/OFF DUTY VALVES AND FOR CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND INDICATED IN RESPECTIVE DATA SHEETS
- SOLENOID VALVES PORT CONDITION:
  2. PORT 1 & 2 SHAL BE CONNECTED UNDER DE-ENERGISED CONDITION.
  - PORT 2 & 3 SHAL BE CONNECTED UNDER ENERGISED CONDITION.
3. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVES SMART POSITIONER SHALL NOT BE APPLICABLE.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
5. 25 METERS 1/4 " PVC COATED COPPER TUBING AND 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END.
6. VOLUME BOOSTER IF REQUIRED SHALL BE PROVIDED

\*\* APPLICABLE TO VALVES WHERE OPEN/CLOSE ACTION REQUIRED ON INTERLOCK CONDITION.





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**Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

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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**

<b>S.No.</b>	<b>ITEM DESCRIPTION</b>	<b>QUANTITY REQUIRED (per unit)</b>
1	Gaskets	One (1) set with each control valve Tag
2	Gland Packings	One (1) set with each control valve Tag
3	Cu Tubing	25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for each CV



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#### **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.
- 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.



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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**

SL. NO	PARAMETERS	CASE-I	CASE-II	CASE-V	CASE-VI	CASE-VII	CASE-IX	MECH. DESIGN
1.0	INLET PARAMETERS TO COMBINED PRDS (ASV-22)							
1.1	PRESSURE (Kg/Cm <sup>2</sup> a)	63	109	247	94	108	247	271
1.2	TEMP. (°C)	375	490	565	385	425	565	573
1.3	FLOW (T/HR)	Bidder to calculate						
2.0	OUTLET PARAMETERS AT COMBINED PRDS (ASV-22)							
2.1	PRESSURE (Kg/Cm <sup>2</sup> a)	16	16	16	16	16	16	21
2.2	TEMP. (°C)	310	310	310	310	310	310	360
2.3	FLOW (T/HR)	106.4	61.2	192.5	122.5	143.0	128.3	-
3.0	INLET OF SPRAY CONTROL VALVE (CDV-262)							
3.1	PRESSURE (Kg/Cm <sup>2</sup> a)	37	37	34.7	37	37	35.7	46
3.2	TEMP. (°C)	39.6	39.6	45.9	39.6	39.6	39.5	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-5).
- 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-65))**

<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>
<b>1.0</b>	<b>INLET PARAMETERS OF PRV (ASV-65)</b>				
1.1	PRESSURE (Kg/Cm <sup>2</sup> 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)	10.99	6.66	6.90	-
<b>2.0</b>	<b>OUTLET PARAMETERS OF PRV (ASV-65)</b>				
2.1	PRESSURE (Kg/Cm <sup>2</sup> a)	16	16	16	21
2.2	FLOW (T/HR)	10.99	6.66	6.90	-

**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 <sup>2</sup> a)	16	16	16	16	16	16	16	16	21
1.2	TEMP. (°C)	310	310	333	333 / 288	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 <sup>2</sup> 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	136.7	-
3.0	INLET OF SPRAY CONTROL VALVE CDV-268									
3.1	PRESSURE (Kg/Cm <sup>2</sup> 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/ Cm<sup>2</sup> (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 20.06.2013

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**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 <sup>2</sup> a)	16	16	16	16	21
1.2	TEMP. (°C)	310	310	333	333	350
1.3	FLOW (T/HR)	Bidder to calculate				
2.0	PARAMETERS AT TGS DESUPERHEATER OUTLET (DESH-3)					
2.1	PRESSURE (Kg/Cm <sup>2</sup> 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 <sup>2</sup> 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

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**EQUIPMENT SPECIFICATIONS**





TITLE

**EQUIPMENT SPECIFICATIONS**

**AUXILIARY STEAM PRESSURE REDUCING  
& DESUPERHEATING STATION**

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

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DATE : 15-05-2007

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### 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 Equipercantage 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/Cm<sup>2</sup>(g) to 7 Kg/Cm<sup>2</sup>(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/cm<sup>2</sup>g. 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. Convertor 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/cm<sup>2</sup>, 0.2-0.6 Kg/cm<sup>2</sup> or 0.6-1.0 Kg/cm<sup>2</sup> 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-II B 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 mm<sup>2</sup> 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-IIB, 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/cm<sup>2</sup> & 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~~

OF 12

- 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 STROKING POSITION REQUIREMENT ON CONTROLLER SIGNAL FAILURE.
- 3 SOLENOID VALVES PORT CONNECTION  
  
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.  
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED 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

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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 :

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

### 4.0 Software :

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

SPECIFICATION NO.: PES – 145 – 06A

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### 5.0 Hardware :

<b>Hardware</b> (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 :

<b>Valve Action</b>	<b>Direct &amp; Reverse.</b> (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 :

<b>Flow Characterization</b>	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 &amp; 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

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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

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### INDEX

#### Control Valve datasheets for

Sl. No.	TAG No.	SERVICE	SHEET
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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
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## DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
<b>GENERAL*</b>	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	<b>RRVUNL - 2 x 660 MW Suratgarh COMBINED TYPE MAIN STEAM TO AUX. STEAM PRDS (HC PRDS)</b> [•] INDOOR      [] OUTDOOR [] ON/OFF        [•] MODULATING <b>Ø 219.1x 34         Ø 508 x 9.53</b> <b>SA 335 P91           SA 335 P22</b>	..... ..... ..... ..... ..... .....
<b>BODY*</b>	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 [•] SA182 F91 [] SS [] A217 C5    [] A351 CF8M [] PTFE [•] GRAFOIL [] DOUBLE [•] SINGLE [] STD [] EXTENDED [•] FINNED [] LINEAR [•] EQ. PERCENTAGE [] QUICK OPEN (ON/OFF) SS316 (ST)         SS316 (ST) SS316 (ST)         SS316 (ST) [] 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 DESTANCE) [] YES [•] NO [] YES [•] NO	..... ..... ..... ..... ... .....
<b>PNEUMATIC ACTUATOR</b>	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	PNEUMATIC PISTON TYPE 0.2                                 1.0  LESS THAN 10 SECS. [] TO OPEN [] STAYPUT [•] TO CLOSE [•] STAYPUT	..... ..... ..... ..... ..... ..... ..... .....
<b>ACCESSORIES</b>	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	

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

$\pm 2\%$
$\pm 1\%$
$\pm 0.5\%$
$+ 2\%$

VALVE  
O/L  
VELOCITY

☐ CAVITATION    ☐ FLASHING  
☒ HIGH DP

* MAX SHUT OFF PRESS ( KG/CM2(A)	<b>271</b>
* BODY DESIGN : PRESS (KG/CM2(A)   TEMP (DEG C)	271   <b>573</b>
* IBR FORM III-C	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg

1. DESIGN C<sub>v</sub> 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

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[illegible]

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

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

$\pm 2\%$
$\pm 1\%$
$\pm 0.5\%$
$\pm 2\%$

VALVE  
O/L  
VELOCITY

BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 74.1 | **360**  
 \* IBR FORM III-C [•] REQUIRED [ ] NOT REQUIRED

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg

1. DESIGN C<sub>V</sub> 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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Tag No.: **CDV-262**Qty.: **ONE EACH PER UNIT**

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

**DATA SHEET – A & B**

**DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)  
(TO BE FILLED BY PURCHASER)**

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

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

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

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

$\pm 2\%$
$\pm 1\%$
$\pm 0.5\%$
$+ 2\%$

VALVE  
O/L  
VELOCITY

**Refer Sizing Data Sheet A-1 for High Capacity PRDS**

☐ CAVITATION    ☐ FLASHING  
☐ 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<sub>v</sub> 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

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Tag No.: **CDV-268**Qty.: **ONE EACH PER UNIT**

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

**DATA SHEET – A & B**

**DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)  
(TO BE FILLED BY PURCHASER)**

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

<b>GENERAL*</b>	PROJECT	<b>RRVUNL - 2 x 660 MW Suratgarh</b>	.....
	SERVICE	<b>SPRAY TO LT DESH CONTROL VALVE</b>	.....
	LOCATION	<input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR	.....
	DUTY	<input type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING	.....
	PIPE SIZE (inlet / outlet)	<b>Ø 48.3 x5.08             Ø 48.3 x5.08</b>	.....
	PIPE MATERIAL (inlet / outlet)	<b>SA 106 Gr. B             SA 106 Gr. B</b>	.....
<b>BODY*</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	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED	.....
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 C5	.....
	BODY MATERIAL	<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	<input type="checkbox"/> QUICK OPEN (ON/OFF)	.....
	: CAGE   GUIDE BUSH	17-4 PH SS   17-4 PH SS	.....
	FLOW	17-4 PH SS   17-4 PH SS	.....
	OUTLET VELOCITY	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT	.....
REQUIRED LEAKAGE CLASS	<input type="checkbox"/> < 7 M/SEC (WATER)   <input type="checkbox"/> MAC NO < 1/3 (STM)	.....	
NOISE LEVEL (dBA) (spec. 3.1.14)	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI	.....	
VACUUM SERVICE	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....	
ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input type="checkbox"/> NO	.....	
	<input type="checkbox"/> YES <input type="checkbox"/> NO	.....	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2             1.0	.....
	*TRAVEL TIME FOR OPEN TO CLOSE } AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input type="checkbox"/> STAYPUT	.....
<b>ACCESSORIES</b>	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	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	SOLENOID VALVE	PART OF SMART POSITIONER	
	E/P CONVERTOR	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	JUNCTION BOX	PART OF SMART POSITIONER	
	HAND WHEEL (SIDE MOUNTED)	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	LOCAL POSITION INDICATOR	<input type="checkbox"/> REQUIRED	

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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)	$\pm 2\%$	.....

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
		<div> <div>Refer Sizing Data Sheet A-3 for Low Capacity PRDS</div> </div>							
	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<sub>v</sub> 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

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Tag No.: **CDV-93**Qty.: **ONE PER UNIT**

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

**DATA SHEET – A & B**

**DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)  
(TO BE FILLED BY PURCHASER)**

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

<b>GENERAL*</b>	PROJECT	<b>RRVUNL - 2 x 660 MW Suratgarh SPRAY TO TGS DESUPERHEATER (DESH-3)</b>	.....
	SERVICE		.....
<b>BODY*</b>	LOCATION	<input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR	.....
	DUTY	<input type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING	.....
	PIPE SIZE (inlet / outlet)	Ø 33.4 x4.55             Ø 33.4 x4.55	.....
	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	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED	..... ..... .....
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 C5	..... ..... .....
	BODY MATERIAL	<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	<input type="checkbox"/> QUICK OPEN (ON/OFF)	.....	
: CAGE   GUIDE BUSH	17-4 PH SS   17-4 PH SS	..... .....	
FLOW	17-4 PH SS   17-4 PH SS	..... .....	
OUTLET VELOCITY	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT	.....	
REQUIRED LEAKAGE CLASS	<input type="checkbox"/> < 7 M/SEC (WATER)   <input type="checkbox"/> MAC NO < 1/3	..... .....	
NOISE LEVEL (dBA) (spec. 3.1.14)	(STM)	.....	
VACUUM SERVICE	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI	.....	
ANTI CAVITATION TRIM	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	BIDDER TO SPECIFY	..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2             1.0	..... .....
	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input type="checkbox"/> STAYPUT	.....
<b>ACCESSORIES</b>	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	



**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		
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Tag No.: **CDV-93**Qty.: **ONE PER UNIT**

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

**DATA SHEET – A & B**

**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		$\pm 2\%$		..... ..... ..... .....				
	HYSTERESIS		$\pm 1\%$						
	SENSITIVITY		$\pm 0.5\%$						
	ACCURACY (OVERALL)		$\pm 2\%$						
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
		<b>Refer Sizing Data Sheet A-4 for TGS DESUPERHEATER</b>							
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS ( KG/CM2(A) <b>46</b> * BODY DESIGN : PRESS (KG/CM2(A)   TEMP (DEG C) <b>46   60</b> * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... ..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			

**NOTES:**

1. DESIGN C<sub>v</sub> 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)

<b>POSITIONER</b>	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 <sup>2</sup> )	<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 <sup>2</sup> )	TO SUIT ACTUATOR	
<b>AIR FILTER</b>	MFR. & MODEL NUMBER		
<b>REGULATOR</b>	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)	<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
TWO (2) Nos. PER CV	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)	TO SUIT ACTUATOR	
	<b>FILTER SIZE</b>	5 MICRON	
	OUTPUT GAUGE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
<b>AIR LOCK</b>	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm <sup>2</sup> )		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )	<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
	RESET TYPE	AUTO	
	VENT PLUG	REQUIRED	
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER		
	OPEN posn    INT posn    CLOSE posn	<input checked="" type="checkbox"/> 1 NO. <input type="checkbox"/> --- <input checked="" 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-64 <input type="checkbox"/>	
<b>POSITION TRANSMITTER</b>	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		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER		
	RATING	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>	
	<b>TYPE</b>	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"/>	
<b>HANDWHEEL</b>	ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input checked="" type="checkbox"/> SIDE MOUNTED	
<b>JUNCTION BOX</b>	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"/>	
<b>I/P CONVERTER</b>	INPUT SIGNAL    POWER SUPPLY	PART OF SMART POSITIONER	
	SPLIT RANGE		
	ENCLOSURE CLASS		
	<b>LINEARITY</b>		
	<b>HYSTERESIS</b>		
<b>Cu. Tubing &amp; Fittings / per CV</b>	This is in addition to cu. Tubing and fittings which are integral part of CV	25 Meters of 1/4" 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 20.06.2013

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	
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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  <b>EQUIPMENT SPECIFICATION</b>  <b>STEAM DESUPERHEATER</b>	SPECIFICATION NO <b>PES-148-01</b>	
		VOLUME <b>II-B</b>	
		SECTION <b>D</b>	
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		SHEET <b>3 OF 3</b>	
<p>4.6.6 Hydraulic Test to two times the rated design pressure for desuperheater body and other pressure retaining parts.</p> <p>4.6.7 Check for final completeness, cleaning, surface finish, appearance, identification, surface preparation, painting, marking and packing including spares.</p> <p>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.</p> <p>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.</p> <p><b>5.0.0 <u>PERFORMANCE REQUIREMENTS</u></b></p> <p>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.</p> <p><b>6.0.0 <u>PAINTING</u></b></p> <p>6.1.0 All foundry sand and loose material shall be removed and surface should be made thoroughly clean for further protection as required.</p> <p>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.</p> <p><b>7.0..0 <u>PRESERVATION, MARKING AND PACKING</u></b></p> <p>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.</p> <p>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.</p> <p>7.3.0 Spares shall be packed separately and marked clearly for identification. These shall be specially packed for long storage without damage.</p>			



TITLE  
**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

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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 <sup>2</sup> (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 <sup>2</sup> (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 <sup>2</sup> (a)	21
9.2	DESIGN TEMPERATURE	°C	350



TITLE

## 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

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### 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 <sup>2</sup> (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 <sup>2</sup> (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 <sup>2</sup> (a)	21
9.2	DESIGN TEMPERATURE	°C	350

	<b>TITLE</b>  <b>EQUIPMENT SPECIFICATIONS</b>  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>  <b>RRVUNL - 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b>	SPEC. NO.: PE-TS-392-142-N101	
		VOLUME <b>II-B</b>	
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### **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

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### 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"> <li>Initial submissions with Rev. No. P0, P1, P2 etc.</li> <li>After BHEL clearance, submission to MAHAGENCO with Rev. No. R0, R1, R2 etc.</li> </ul>	05+Soft Copy	18+Soft Copy
2.	<del>Issue of action A/B/C Civil / Erection Drawings / documents for construction at site (for civil packages only)</del>	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

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**QUALITY PLAN**

<div><div><div></div><div></div><div></div></div><div>PEM :: C&amp;I</div></div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)							QUALITY PLAN NO.: PE-QP-999-145-I 006				
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks	
									P	W	V		
SHEET 1 OF 6													
REV. NO. 05 DATE: 24.07.2010													
SECTION D													
VOLUME IIB													
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		
		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	IBR Certification (if applicable) to be verified by BHEL	
		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	Only for rating ANSI 900 and above. Applicable for Body and Bonnet only. For Lower rating only if called for in specification.	
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1		
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	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	For Body & Bonnet after machining	
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics													
P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.													
1 - BHEL/CUSTOMER 2 - Vendor 3 - Sub-vendor													

<div> PEM :: C&amp;I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006			
												VOLUME IIB			
												SECTION D			
												REV. NO. 05      DATE: 24.07.2010			
												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				
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1				
		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				
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1				
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1				
		3. Performance	MA	1. Stiffness ratio 2. Scrapping 3. Cyclic test (Endurance) 4. Dimension (Measurement)	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1				
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	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				
LEGEND: *		CR - Critical characteristics	RT- Radiographic Test	PT – Dye penetrant Test	P - Agency Performing the Test.			1 - BHEL/CUSTOMER							
		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&amp;I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006										
												Acceptance Norms		Format of Records		Agency <sup>s</sup>			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	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1	

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	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	Test Records	2			


3.0	TESTS ON COMPLETED VALVE											
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	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	1	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	1	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	1	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4

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

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)												QUALITY PLAN NO.: PE-QP-999-145-I 006																	
 PEM :: C&I																		VOLUME	IIB										
																		SECTION	D										
																		REV. NO.	05	DATE: 24.07.2010									
																		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	1	Refer Note-4																	
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																	
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																	
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																	
		7. Accuracy (Overall)	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4																	
		8. Control Valve characteristics / CV Test	MA	♦Measurement (Press. vs. discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet / ISA 75.01	As per specs/ Approved drg. / data sheet / ISA 75.01	Test Certificate	2	1	1	♦Size = Body & port size Or Body size & CV for non std port. Refer Note 1.																	
		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	1	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	1	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	1																		
		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	1																		
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics																		\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.						1 - BHEL/CUSTOMER 2 - Vendor 3 - Sub-vendor					






		<b>STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>										QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b>			
PEM :: C&I												VOLUME IIB			
												SECTION D			
												REV. NO. 05 DATE: 24.07.2010			
												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				
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1				
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1				
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1				
		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				
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1				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:**

1. Cv test will be conducted as per ISA 75.01 procedure for one valve per batch of each type of valve
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. See worthy packing, if applicable.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. 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.

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

<div><div><div>भारतीय विद्युत निगम</div><div></div></div></div>		STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS				CUSTOMER : KPCL		PROJECT: 2x660 MW RRVUNL SURATGARH		SPECIFICATION NUMBR <b>PE-TS-392-142-N995</b>		
						BIDDER/ : AS PER APPROVED VENDOR LIST		SPECIFICATION TITLE : <b>AUXILIARY STEAM P.R.D.S</b>				
		SHEET 1 of 2		SYSTEM ITEM : <b>STEAM DESUPERHEATER</b>			QUALITY PLAN NUMBR		SECTION		VOLUME	
SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY		REMARKS	
									P	W	V	
1	2	3	4	5	6	7	8	9	10		11	

1.0	Raw Materials											
1.1	Pipes	Mechanical & Chemical Prop.		Mechanical & Chemical	100%	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Leakproofness		Hydraulic test	100%	-do-	-do-	TC	3/2	-	1	
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
1.2	Forging	Physical & Chemical Prop.		Physical & Chemical Prop.	1/heat	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
		Heat Treatment		Scrutiny	100%	-do-	-do-	HT/SR Chart	3/2	-	1	Correlation required
2.0	In Process											
2.1	Forgings	Internal defects		U.T	100%	ASTMA 435	ASTMA 435	IR	3/2	-	1	
2.2	Machining Body Internals	Dimensions		Measurement	100%	Appd.Drg.	Appd.Drg.	IR	3/2	-	1	Correlation required
2.3	Body	Surface Defects		D.P. Check	100%	ASTME165	ASME-B 16.34 ,Appendix-III	TC	3/2	-	1	

PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR
NAME			
SIGNATURE			
DATE			
			BIDDER'S/ VENDOR'S COMPANY SEALS

<div><div><div>बि.प्र.स.प्रा.</div><div>BHEL</div></div></div>				<div>STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS</div>				CUSTOMER : KPCL		PROJECT: 2x660 MW RRVUNL SURATGARH		SPECIFICATION NUMBR <b>PE-TS-392-142-N995</b>	
				BIDDER/ : AS PER APPROVED VENDOR LIST				SPECIFICATION TITLE : <b>AUXILIARY STEAM P.R.D.S</b>					
SHEET 2 of 2				SYSTEM ITEM : <b>STEAM DESUPERHEATER</b>				QUALITY PLAN NUMBR		SECTION VOLUME			
SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY		REMARKS		
									P	W	V		
1	2	3	4	5	6	7	8	9	10		11		

2.4	WPS,PQR,WPQ	WPS,PQR,WPQ		Physical	100%	ASME Sec-IX/IBR	ASME Sec-IX/IBR	Format	3/2	-	1	Records to be shown
3.0	Final Inspection											
3.1	Assembly	Completeness and Marking		Visual	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
		Dimensional		Measurement	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
3.2	Pressure Test	Leak Proofness		Hydraulic Test	100%	-do-	-do-	IR	3/2	1	-	
4.0	Painting	Surface Prepn., Uniformity, Shade & Thick.		Visual, Measurement	100%	-do-	-do-	IR	3/2	-	1	
5.0	Packing	Soundness of Packing, Marking		Visual	100%	Appd Specn./Mfr. Standard	Appd Specn./Mfr. Standard	IR	3/2	-	1	
Note:: IBR –Certificate in Form III C shall be submitted.												

LEGEND P – PERFORM W – WITNESS V – VERIFICATION  
1 – BHEL, CUSTOMER/CONSULTANT 2 – VENDOR 3 – SUB VENDOR

PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR
NAME			
SIGNATURE			
DATE			BIDDER'S/ VENDOR'S COMPANY SEALS



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 20.06.2013

SHEET 1 OF 1

**TENDER DRAWINGS**

[illegible]

**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


**VOLUME - III**

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



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




	TITLE  <b>PREAMBLE</b>	SPECIFICATION NO <b>PE-SS-999-100-Q-001</b>	
		VOLUME <b>III</b>	
		SECTION <b>PREAMBLE</b>	
		REV NO. <b>0</b>	DATE
		SHEET <b>1 OF 1</b>	

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  <b>AUXILIARY STEAM PRESSURE REDUCING &amp; DESUPERHEATING STATION</b>	SPEC. NO.: PE-TS-392-142-N101	
		VOLUME <b>III</b>	
		SECTION <b>CONTENTS</b>	
		REV NO. <b>0</b>	DATE   20.06.2013
		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 20.06.2013

SHEET 2 OF 3

## **CONTENTS**

### **PART-A**

<u><b>SL.NO.</b></u>	<u><b>FORM NO.</b></u>	<u><b>FORM DESCRIPTION</b></u>	<u><b>NO. OF SHEETS</b></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 20.06.2013

SHEET 3 OF 3

## **CONTENTS**

### **PART-B**

<u><b>SL.NO.</b></u>	<u><b>FORM NO.</b></u>	<u><b>FORM DESCRIPTION</b></u>	<u><b>NO. OF SHEETS</b></u>
<b>1.</b>	PE-6051	Schedule of Prices	1
<b>2.</b>	PE-6052	Schedule of Unit Prices	1
<b>3.</b>	PE-6053	Schedules of Prices for Commissioning & Mandatory Spares	1
<b>4.</b>	PE-6054	Schedule of Prices for Recommended Spares	1
<b>5.</b>	PE-6055	Schedule of Prices for Erection & Maintenance Tools & Tackles	1
<b>6.</b>	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 20.06.2013

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 20.06.2013

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

SPECIFICATION NO. **PE-TS-392-142-N101**VOLUME **III**SECTION **D**

REV. NO. 00

DATE: 20.06.2013

SHEET 1 of 3

		NAME
		SIGNATURE
		DATE
Tag No..... Quantity.....		Data Sheet No. PES-145-06-DS2-0
<b>DATA SHEET C</b>		
<b>DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)</b> (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)		
<b>GENERAL*</b>	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
<b>BODY</b>	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	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm <sup>2</sup> g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
<b>ACCESSORIES</b>	POSITIONER (SMART)	
	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 - 2 x 660 MW, Super-Critical TPS,  
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPECIFICATION NO. **PE-TS-392-142-N101**VOLUME **III**SECTION **D**

REV. NO. 00

DATE: 20.06.2013

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

HYSTERSIS

SENSITIVITY

ACCURACY

**SERVICE  
CONDITION\*****SL.+  
NO.****LOAD****FLOW  
(T/HR)****INLET PR.  
(KG/CM<sup>2</sup> (A))****OUTLET PR.  
(KG/CM<sup>2</sup> (A))****TEMP  
DEG. C****CALCULA  
TED CV****%  
VALVE  
LIFT****VALVE O/L  
VELOCITY**

VALVE TYPE

\* MAX SHUT OFF PRESS ((KG/CM<sup>2</sup>g)\* BODY DESIGN : PRESS ((KG/CM<sup>2</sup>g) | 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)**


<b>POSITIONER</b>	MFR. & MODEL NUMBER			
	BYPASS	GAUGES	ENCL. CLASS	
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )			
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )			
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER			
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)			
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)			
	OUTPUT GAUGE			
	FILTER SIZE			
<b>AIR LOCK</b>	MFR. & MODEL NUMBER			
	SET PRESS (Kg / Cm <sup>2</sup> )			
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )			
	RESET TYPE			
	VENT PLUG			
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER			
	OPEN posn	INT posn	CLOSE posn	
	CONTACT TYPE			
	RATING (AC / DC)			
	ENCLOSURE CLASS			
<b>POSITION TRANSMITTER</b>	Part of positioner			
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER			
	RATING			
	OPERATION	QUANTITY		
	COIL INSULATION CLASS			
	ENCLOSURE CLASS			
<b>HANDWHEEL</b>	ORIENTATION			
<b>JUNCTION BOX</b>	NO. OF WAYS			
	SIZE			
	CABLE GLANDS (Size / Quantity)			
	ENCLOSURE CLASS			
<b>I/P CONVERTER</b>	Part of positioner			
<b>Cu. Tubing &amp; Fittings / per CV</b>	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

	<b>TITLE</b>  <b>DATASHEET - C</b>  <b>STEAM DESUPERHEATER</b>				SPEC. NO.: PE-TS-392-142-N101	
					VOLUME III PART -A	
	SHEET 1 OF 2					
<b>INSTRUCTIONS TO BIDDER</b> 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 <sup>2</sup> A				
5.2	TEMPERATURE	°C				
5.3	FLOW T/HR					
6.0	STEAM PARAMETERS AT OUTLET					
6.1	PRESSURE	KG/CM <sup>2</sup> A				
6.2	TEMPERATURE	°C				
7.0	SPRAY WATER PARAMETERS					
7.1	PRESSURE	KG/CM <sup>2</sup> A				
7.2	QUANTITY	T/HR				
8.0	DESIGN PARAMETERS OF DESUPERHEATER BODY					
8.1	PRESSURE	KG/CM <sup>2</sup> G				
8.2	TEMPERATURE	°C				
9.0	DESIGN PRESSURE OF SPRAY NOZZLE	KG/CM <sup>2</sup> 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						


	<b>TITLE</b>  <b>DATASHEET - C</b>  <b>STEAM DESUPERHEATER</b>				<b>SPECIFICATION NO. PE-TS-392-142-N101</b>	
					<b>VOLUME III</b> <b>PART -A</b>	
	<b>SHEET 2 OF 2</b>					
<b>INSTRUCTIONS TO BIDDER</b>						
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.						
<b>SL.NO.</b>	<b>ITEM</b>	<b>UNIT</b>	<b>PARTICULARS</b>			
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 <sup>2</sup> 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  <b>SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID</b>		SPECIFICATION NUMBER <b>PE-TS-392-142-N101</b>	
			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				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL



	TITLE <b>SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE</b>			SPECIFICATION NUMBER <b>PE-TS-392-142-N101</b>	
				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					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	

	TITLE  <h2 style="text-align: center;">SCHEDULE OF WEIGHTS &amp; DIMENSIONS</h2>		SPECIFICATION NUMBER <b>PE-TS-392-142-N101</b>			
			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



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



TITLE

SPECIFICATION NUMBER PE-TS-392-142-N101

## \* SCHEDULE OF DECLARATION

VOLUME III PART - A

SHEET ..... OF .....

## 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 compiled 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 20.06.2013

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

**VOLUME-III  
PART-B**

**PRICE SCHEDULES**

	<b>TITLE</b>  <b>SCHEDULE OF PRICES</b> <b>AUXILIARY STEAM PRESSURE REDUCING</b> <b>&amp; DESUPERHEATING STATION</b>	SPEC. NO.: PE-TS-392-142-N101	
		VOLUME <b>III</b>	
		SECTION <b>PART-B</b>	
		REV NO. <b>0</b>	DATE 20.06.2013
		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	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.	<b>0</b>	DATE 20.06.2013
---------	----------	-----------------

SHEET OF

[illegible]

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)
-----	---

- 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)


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1.2


### Note

a)


b)

		TITLE  <b>* SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES</b>					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	COMPANY SEAL						

		TITLE  <b>* SCHEDULE OF PRICES FOR RECOMMENDED SPARES</b>				SPECIFICATION NUMBER <b>PE-TS-392-142-N101</b>			
						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		SPECIFICATION NUMBER PE-TS-392-142-N101	
	<b>SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS &amp; TACKLES</b>		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.)
<b>NOTE :</b> 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				
NAME	DESIGNATION	SIGNATURE	DATE	
				<b>COMPANY SEAL</b>



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