NTPC LTD.

3X660MW NORTH KARANPURA STPP (EPC) WITH ACC

TECHNICAL SPECIFICATION
FOR

AUXILIARY STEAM PRESSURE REDUCING AND DESUPERHEATING STATION ALONGWITH ACCESSORIES

VOLUME - II B & III

SPECIFICATION No: **PE–TS –405-142–N101 (REV 00)**

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

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	TITLE **PREAMBLE**	SPECIFICATION NO **PE-SS-999-100-Q-001** VOLUME **II B** SECTION PREAMBLE REV NO. **0** DATE 05.02.2008 SHEET 1 OF 1

1.0 Volume – II B :

This volume is sub- divided into following sections: -

Section – A : This section outlines the scope of enquiry

Section – B : This section provides : " Project Information".

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

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

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

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

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

TITLE **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION** **NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPEC. NO.: PE-TS-405-142-N101	
	VOLUME **II-B**	
	SECTION **CONTENTS**	
	REV NO. **0**	DATE 04.09.2014
	SHEET 1 OF 2	

CONTENTS

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

SECTION – A

SCOPE OF ENQUIRY

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 NTPC – 3X660 MW NORTH KARANPURA.

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.

Bidder is requested to refer standard no PE S-100-918 on field quality plan enclosed in Volume III of this specification.

1.7 The omission of specific reference to any co mponent / accessory necessary for the proper performance of the equipm ents shall not re lieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

1.8 BHEL's / NTPC'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 / NTPC.

SECTION – B

PROJECT INFORMATION

1.00.00 **BACKGROUND**

North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand.

The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.

1.01.00 **Location and Approach**

The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.
Major rail/road distances from the project site are as under:

City		**Distance Approx. (kms)**
Ranchi	:	150
Khalari	:	40

The site is located near Tandwa town having latitude and longitude of about 23^0 50' N to 23º 52' N and 84^0 59' E to 85º 2' E respectively.

SECTION-C

SPECIFIC TECHNICAL REQUIREMENTS

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 One “High capacity PRDS” with tapping from Main steam line to meet auxiliary steam requirements during unit start-up, low loads 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 The HCPRDS will reduce the pressure and temperature of the steam tapped off from main steam line to 16 kg/cm^2 (abs) & 290^{o}C. The LCPRDS shall reduce the pressure of steam tapped from CRH line to 16 kg/cm^2 (abs) and temperature in the range of 285^{o}C to 322^{o}C, depending upon the CRH parameters at corresponding load.

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 (03 nos. for 03 Unit)

2.1.1.2 Low Capacity PRV on CRH Line (ASV-26) : One No. / Unit (03 nos. for 03 Unit)

2.1.1.3 Spray Control Valve for HC-PRDS (CDV-262 & CD-265) : One No. each (Total 2 Nos) / Unit (06 nos. for 03 Unit)

2.1.1.4 Block Valve in spray line (CDV-84) : One No. / Unit (03 nos. for 03 Unit)

2.1.1.5 (**OPTIONAL)**Spray Control valve to TGS DESH (CDV-93) : One No. / Unit (03 nos. for 03 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: (OPTIONAL)

2.1.2.1 Direct mixing type TGS desuperheater (DESH-3) : One No. / Unit (03 nos. for 03 Unit)

2.1.2.2 The desuperheater shall be complete with pipe, spray nozzle along with necessary attachment as specified in section-D. Insertion type desuperheaters are not acceptable.

3.0.0 SPECIFIC TECHNICAL REQUIREMENTS

The technical requirement details in this section are applicable for the project and shall override the standard specification enclosed under section D in case of any contradiction.

1. The Hook-up diagram for Control valve, is attached. The scope demarcation as indicated should be adhered. The connection details at Instrument Air valve shall be furnished to successful bidder after the award of contract.

2. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. However Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.

3. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost.

4. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.

5. SS nameplate to control valve shall include Tag no./ KKS no./ Sl. No./ Body material/ size/ Press Rating/ Trim material/ Trim type/ action on air failure/ diaphragm air press at full open and close condition.

6. Hand wheel shall have open/ close direction.

7. Limit switch shall be designed for 1,00,000 operations.

8. The material of filter for Air Filter Regulator shall be Sintered bronze.

9. Bidder to indicate pick-up & drop out voltage for all solenoid valves.

10. All JBs and valves shall be with double compression type Ni plated brass cable glands.

11. The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to approval during detailed engineering.

12. The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.

13. Valves with high lift cage guided plugs & quick-change trims shall be supplied

14. Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280°C.

15. Valve Trim Material:

VALVE MATERIALS

Sr. No.	Service	Body material	Trim Material
1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC9 for fluid temperature above 275 Deg. C	316SS stellited with stellited faced guide posts and bushings.
2.	Severe flashing/cavitation services	Alloy steel ASTM-A217 Gr. WC9	440 C
3.	Low flashing/cavitation service	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS
4.	DM water service	316 SS	316 SS

NOTE Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.

16. Guidelines for Packing

- ✓ After inspection of control valves assembly. Smart Positioner along with Pressure Gauge shall be disassembled & packed separately.
- ✓ Threaded connection of Smart Positioner & Pressure Gauge shall be shipped with the end caps fitted to avoid any damage.
- ✓ Instructions with sketch for mounting the Smart Positioner & Pressure Gauge shall be sent along with the aforesaid accessories.
- ✓ Packing of the control valves and Smart Positioner along with Pressure Gauge shall be done in separate wooden boxes/cases in order to avoid damage during transit and also during storage at site in tropical climatic conditions for a period of 18-24 months.
- ✓ All valves & smart positioner along with pressure gauges shall be packed properly with quality wooden planks with proper wooden frame support. Moreover the valves are internally covered with polythene sheets to protect from the water and moisture entry.
- ✓ Stronger shock absorbing cover material like expanded Polyurethane which can take any direct impact on it shall be used for packing
- ✓ Proper reaper support to be provided in the packing and Valve assembly to be aligned properly to avoid the damage of accessories during transit due to vibration effect.
- ✓ Marking for Fragile & Condensing environment shall be done on the packing box.

<u>The Following Details are to be marked on the Packing Cases</u>

- ✓ Address of consignee
- ✓ Purchase order no.
- ✓ Description of items or title of packing list
- ✓ Weight
- ✓ Dimension of the Box
- ✓ Marking showing upright position
- ✓ Marking showing sling position
- ✓ Marking showing umbrella
  (i.e. for machines/components to be stored under covered storage)

4.0.0 SPARES, CONSUMABLE AND SPECIFIED TOOLS & TACKLES (For all Units):

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

4.1.2 Recommended Spares

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

4.1.3 Special Tools & Tackles

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

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

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

a) Stat-up & Commissioning spares:

i) Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Control Valves. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

ii) The Start-up and commissioning spares indicated by the bidder shall be a part of the main Control valves supply. However bidder to indicate prices separately. The list of these spares required to be supplied shall be submitted along with the bid.

LIST OF COMMISSIONING SPARES

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

5.1.0 LIST OF MANDATORY SPARES

Auxiliary Steam Pressure Reducing & Desuperheating System		
High Capacity PRDS System (i.e for ASV-22)		
a)	Desuperheater Liners(If applicable)	1 set
b)	Steam	1 no.
c)	Disc	1 no.
d)	Body seat rings	2 nos. for each type, size and rating of valves
e)	Gland packings	2 nos. for each type, size and rating of valves
f)	Pressure Seal Ring	2 nos.
g)	Gasket	2 nos.

For Spray Water Line Control Valve (i.e. for CDV-262,CDV-265)		
a)	Valve trim including cage, plug, stem, seat rings, guide bushings, stem packing	1 no. for each size, type & rating of valves

Low Capacity PRDS System (i.e for ASV-26)		
a)	Steam	1 no.
b)	Disc	1 no.
c)	Body seat rings	2 nos. for each type/size
d)	Gland packings	2 nos. for each type, size and rating of valves
e)	Pressure Seal Ring	3 nos.
f)	Gasket	2 nos.

Actuator Internals for each control Valve		
a)	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
b)	Diaphragms, O' rings, seals etc. of all types make etc.	100%
c)	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more
d)	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more
e)	Positioner units (complete unit)	10% or 1 no. of each type whichever is more
f)	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
g)	Air lock relays	10% or 2 nos. of each type whichever is more

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-TS-405-142-N102 in Volume II B Sec. D.

8.0.0 QUALITY PLAN

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

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

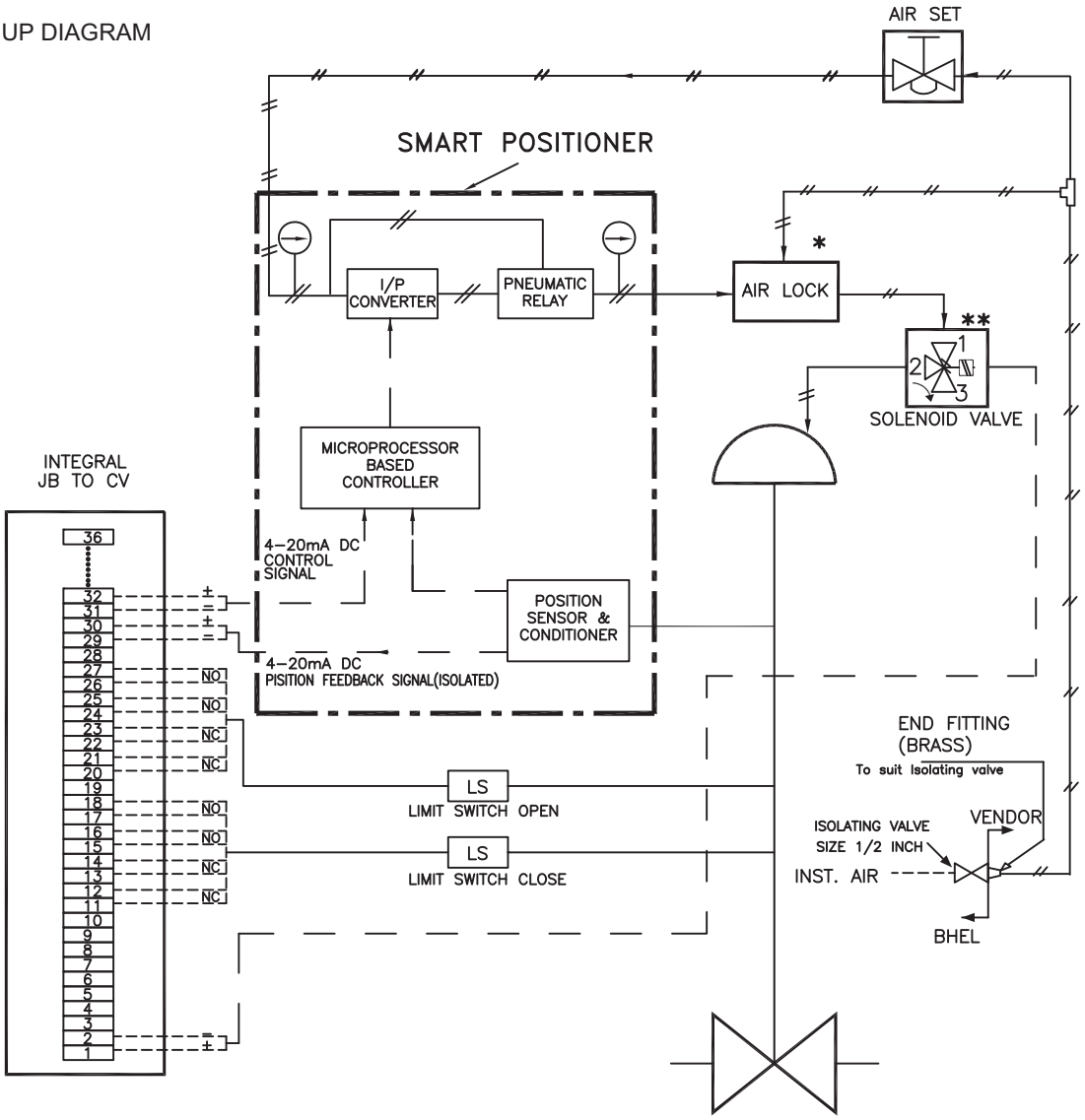
The quality plans enclosed in volume-II-B 'D' of the specification are for bidder's guidance only and are not exhaustive. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in BHEL/Customer formats in the event of order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

TITLE

CONTROL VALVE HOOK–UP DIAGRAM WITH SMART POSITIONER

3X660MW NORTH KARANPURA STPP (EPC) WITH ACC

9.0.0 HOOK UP DIAGRAM



NOTE:–

1. SOLENOID VALVE WILL BE PROVIDED ONLY FOR ON/OFF DUTY VAVLVES & FOR CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND INDICATED IN RESPECTIVE DATA SHEETS.
2. SOLENOID VALVES PORT CONDITION:
   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 VALVE,SMART POSITIONER SHALL NOT BE APPLICABLE.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
5. 15 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

* APPLICABLE AS PER REQUIRED VALVE POSITION IN DATA SHEETS ON SIGNAL AIR FAILURE & Valve Position Electric Signal Failure (4–20mA).

DATA SHEET- A-1

SIZING DATA FOR COMBINED AUXILIARY STEAM PRDS (ASV-22), SPRAY CONTROL VALVE (CDV-262/CDV-265) & SPRAY BLOCK VALVE (CDV-84)

SL.NO.	PARAMETERS	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	MECH. DESIGN
1.0	INLET OF COMBINED AUX. PRDS (ASV-22)										
1.1	PRESSURE (kg/cm^2 (a))	43	80	110	110	260	260	137	80	260	286.8
1.2	TEMP. (^oC)	360	380	400	530	593	593	513	380	593	601
1.3	FLOW (T/Hr)	BIDDER TO CALCULATE									
2.0	OUTLET OF COMBINED AUX. PRDS (ASV-22)										
2.1	PRESSURE (kg/cm^2 (a))	16	16	16	16	16	16	16	16	16	21
2.2	TEMP. (^oC)	290	290	290	290	290	290	290	290	290	350
2.3	FLOW (T/Hr)	111.1	128.4	69.6	69.6	140.6	158.9	66.6	133.6	240.0	
3.0	INLET OF SPRAY BLOCK VALVE (CDV-84)										
3.1	PRESSURE (kg/cm^2 (a))	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	50
3.2	TEMP. (^oC)	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	75
3.3	FLOW (T/Hr)	BIDDER TO CALCULATE									
4.0	INLET OF SPRAY CONTROL VALVE (CDV-262/265)										
4.1	PRESSURE (kg/cm^2 (a))	BIDDER TO DECIDE									50
4.2	TEMP.(^oC)	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	75
4.3	FLOW (T/Hr)	BIDDER TO CALCULATE									

NOTE:

1. Case-1 is the capability check point for PRV ASV-22. Case-9 is the capability check point for Spray Water control valves.
2. 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 lift (refer datasheet A-2).

DATA SHEET- A-2

SIZING DATA FOR AUXILIARY STEAM PRDS (PRV (ASV-26))

SL.NO.	PARAMETERS	CASE-1	CASE-2	# CASE-3	MECH. DESIGN
1.0	INLET OF PRV (ASV-26)				
1.1	PRESSURE (kg/cm^2 (a))	26.2	62.2	62.2	74.1
1.2	TEMPERATURE (^{O}C)	298.5	365.9	365.9	380.0
1.3	FLOW (T/Hr)	0.55	0.55	15.00	
2.0	OUTLET OF PRV (ASV-26)				
2.1	PRESSURE (kg/cm^2 (a))	16	16	16	21
2.2	TEMPERATURE (^{O}C)	286	322	322	350
2.3	FLOW (T/Hr)	0.55	0.55	15.00	-

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 lift (refer datasheet A-1).
2. # Valve shall be suitable for passing 15T/Hr at rated parameters.

DATA SHEET- A-3 (OPTIONAL)

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

S.NO	PARAMETERS	CASE-1	CASE-2	MECH. DESIGN
1.0	PARAMETERS AT TGS DESUPERHEATER INLET (DESH-2)			
1.1	PRESSURE (Kg/Cm^{2}a)	16	16	21
1.2	TEMP. (^{0}C)	285	325	350
1.3	FLOW (T/HR)	BIDDER TO CALCULATE		
2.0	PARAMETERS AT TGS DESUPERHEATER OUTLET (DESH-2)			
2.1	PRESSURE (Kg/Cm^{2}a)	16	16	21
2.2	TEMP. (^{0}C)	270	270	310
2.3	FLOW (T/HR)	4.0	4.0	-
	INLET OF SPRAY CONTROL VALVE (CDV-93)			
3.1	PRESSURE (Kg/Cm^{2}a)	30.1	30.1	50
3.2	TEMP. (^{0}C)	65.0	65.0	75
3.3	FLOW (T/HR)	BIDDER TO CALCULATE		

SECTION – D

EQUIPMENT SPECIFICATIONS

SECTION – D

EQUIPMENT SPECIFICATIONS

FOR

CONTROL VALVE WITH PNEUMATIC ACTUATOR

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.

3.1.6 The valve body shall have the direction of flow embossed on all valves.

3.1.7 The sizing shall conform to the requirements of ANSI/ISA(S75- 01), and the valve capacity shall be selected so as to meet the following:

Valve with Linear characteristic.	-	Normal Flow (Design Point)	:	70-75% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
Valve with Equipercentage Characteristic	-	Normal Flow (Design Point)	:	75-85% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
ON/OFF Quick open Characteristic	-	1.1 times the CV calculated on the basis of maximum flow condition.		

3.1.8 Calculation for valve sizing, velocity and noise shall be subject to purchaser's approval during contract stage. However responsibility of proper selection and design for the duties specified lies with the vendor. Any modifications required to be done on the valves or actuators & accessories to achieve satisfactory performance of the control system shall be done without any commercial implication.

3.1.9 Suitable justification and evidence shall be furnished regarding proper selection of the valve.

3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.

i)	Liquid service	<=	7 Metres/Sec.
ii)	Steam service	<=	1/3 Sonic velocity in the flow medium.

3.1.11 For flashing duty, the trim design shall be such that the vapour bubbles are kept away from valve body.

3.1.12 For cavitation service, the trim design shall be of multistage pressure drop type, so as to avoid cavitation altogether, instead of keeping cavitation away from valve parts.

3.1.13 In case of predicted noise level above 85 dBA, suitable low noise trim or inbuilt diffusers shall be provided to bring down the noise level below 85dBA.

3.1.14 The equivalent weighted sound level measured at 1.5M. above floor level in elevation and one metre horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA (without pipe insulation). The offer shall include noise prediction calculations for each valve.

3.1.15 In case of wrong selection/mal operation of valve and for associated actuator during guarantee period, the vendor shall replace the valve suitably with a modified/new valve of design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be at vendor's expenses.

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 flare less brass fittings (Refer typical hook up diagram in sheet 12 of 12).

3.3.1 Hand wheel

Hand wheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve. The hand wheel 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.

3.3.4 Air Filter Regulator

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

3.3.5 Air Lock Relay

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

3.3.6 Solenoid Valves

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

3.3.7 Limit Switches

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

3.3.8 I/P Converter

I/P Converters shall preferably be of force balance type and shall produce pneumatic output signal corresponding to input current signal, also specified in Data Sheet. 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/cm2, 0.2-0.6 Kg/cm2 or 0.6-1.0 Kg/cm2 as specified and give an output suitable for the actuator. Pneumatic positioner shall have 3 gauges. All gauges shall have metric scales. The positioner input signal range shall be adjustable. Wherever applicable, it shall be possible to bypass the positioner by means of a switch. Linearity and Hysterisis 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.

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	:	± 1% of span
ii)	Linearity	:	± 2% of span
iii)	Sensitivity	:	± 0.5% of span.
iv)	Repeatability	:	± 1% of span
v)	Accuracy (Overall)	:	± 2% of span

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

3.5 Electric Actuator

The electric actuator shall be employed for modulating duty.

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

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

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

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

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

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

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

3.5.8 The motor shall operate satisfactorily under the following conditions:

i) ±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.

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 pet 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.

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.

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 ± 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^2 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.

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^2 & 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.

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.

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.

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 no. PES-145-06-DS1-1
- Data sheet C for Control Valve with Pneumatic Actuator : Data sheet no. PES-145-06-DS2-1
- Data sheet A&B for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS3-1
- Data sheet C for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS4-1

1.0 Electrical :

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

2.0 Environment :

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

3.0 Diagnostic Features :

Diagnostic / Test Features (to be available in Smart Positioner and shall be accessible through any HMS software)	**Minimum Diagnostic Features Like** • Measurement of Valve positioning timing, • Detection of actuator leakage, • Display of fault alarm. • Logging of alarms and history. • Valve friction/jamming detection. • Detection of valve wear & tear, • Valve stroke length and timing.
	Advanced Diagnostic Features Like (OPTIONAL, if specified in customer's specification) • On line partial closure test. • Valve signature analysis (online graphical/tabular representation of input signal Vs valve travel). • Step response test.

4.0 Software :

Software (to be supplied alongwith smart positioner)	• Windows based software to meet the requirement for configuration, diagnostics, calibration and testing of Valve and actuator. • Easily up-gradable with same hardware and compatible with any Hart Management Systems (HMS). • Shall be capable to cater to all the tags in the specification at the same time.

5.0 Hardware :

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

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

6.0 Valve Action :

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

7.0 Flow Characterization :

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

8.0 Performance:

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

9.0 Test Certificates:

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

10.0 EMC & CE compliance

International Standard Like EN/IEC. To EN 50081-2 & EN 50082 or equivalent

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 SHEETS- A&B
FOR CONTROL VALVES

INDEX

Control Valve datasheets for

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 3 OF 13

Tag No.: **ASV-22** 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)
GENERAL*	PROJECT	**NTPC-3X660MW NORTH KARANPURA STPP**	……
	SERVICE	**COMBINED TYPE MAIN STEAM TO AUX. STEAM PRDS (HC PRDS)**	……
	LOCATION		……
	DUTY	[•] INDOOR [] OUTDOOR	……
	PIPE SIZE (inlet / outlet)	[] ON/OFF [•] MODULATING	……
	PIPE MATERIAL (inlet / outlet)	**Ø 219.1x 45 | Ø 457 x 9.53** **SA 335 P91 | SA 335 P22**	……|……
BODY*	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 [•] SA182 F91 [] SS	……
		[] A217 C5 [] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•] GRAFOIL [] DOUBLE [•] SINGLE	……
	BONNET TYPE	[] STD [] EXTENDED [•] FINNED	……
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	……|……
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST)	……|……
	FLOW	[] BELOW SEAT [] ABOVE SEAT	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [•] <150M/SEC (STEAM)	……|……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	……
	VACUUM SERVICE	[] YES [•] NO	……
	ANTI CAVITATION TRIM	[] YES [•] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	PNEUMATIC PISTON TYPE	……|……
	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	[] TO OPEN [] STAYPUT [•] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	……
ACCESSORIES	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	

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 4 OF 13

Tag No.: **ASV-22** 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-1 for Aux. Steam PRDS (Case-1 is the capability point for control valve ASV-22)							

VALVE TYPE	[] CAVITATION [] FLASHING [•] HIGH DP
* MAX SHUT OFF PRESS (KG/CM2(A) **286.8** * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 286.8 | **601** * IBR FORM III-C [•] REQUIRED [] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

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

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 5 OF 13

Tag No.: **ASV-26** 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)
GENERAL*	PROJECT	**NTPC-3X660MW NORTH KARANPURA STPP**	.....
	SERVICE	**COLD REHEAT STEAM TO AUXILIARY STEAM PR. REDUCING VALVE (LC PRV)**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 114.3x6.02 | Ø 219.1 x 12.7**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. C | SA 106 Gr. C**	.....
BODY*	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 WCC [•] A217 WC9 [] SS [] A217 C5 [] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•] GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [•] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE [] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST)	.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [•]<150M/SEC (STEAM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 Dba (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	.....
	*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	.....
ACCESSORIES	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	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC	SPECIFICATION NO.: PE-TS-405-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 04.09.2014
		SHEET 6 OF 13	

Tag No.: **ASV-26** 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		Refer Sizing Data Sheet A-2 for Aux. Steam PRDS Low Capacity Pressure Reducing Valve ASV-26							
	VALVE TYPE						[] CAVITATION [] FLASHING [•] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 74.1 BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 74.1 | **380** * IBR FORM III-C [•] REQUIRED [] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

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

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC	SPECIFICATION NO.: PE-TS-405-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 04.09.2014
		SHEET 7 OF 13	

Tag No.: **CDV-262 & CDV-265** Qty.: **TWO PER UNIT (One against each Tag)** 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)
GENERAL*	PROJECT	**NTPC-3X660MW NORTH KARANPURA STPP**	.....
	SERVICE	**SPRAY TO COMBINED PRDS CONTROL VALVE**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 60.3 x5.54 | Ø 60.3 x5.54**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	.....|.....
BODY*	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	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....|.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | []<150M/SEC (STEAM)	.....|.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	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	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	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	

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 8 OF 13

Tag No.: **CDV-262 & CDV-265** Qty.: **TWO PER UNIT (One against each Tag)** 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-1 for High Capacity PRDS							
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 50 * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 50 | **75** * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

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

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 9 OF 13

Tag No.: **CDV-84** 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)
GENERAL*	PROJECT	**NTPC-3X660MW NORTH KARANPURA STPP**	.....
	SERVICE	**BLOCK VALVE FOR APRDS SPRAY LINE**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[•] ON/OFF [] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**∅ 60.3 x 5.54 | ∅ 60.3 x 5.54**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	.....|.....
BODY*	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	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [] EQ. PERCENTAGE	.....
		[•] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....|.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | []<150M/SEC (STEAM)	.....|.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	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	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	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	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC	SPECIFICATION NO.: PE-TS-405-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 04.09.2014
		SHEET 10 OF 13	

Tag No.: **CDV-84** 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)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-1 for High Capacity PRDS							

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
* MAX SHUT OFF PRESS (KG/CM2 (A) 50 * BODY DESIGN : PRESS (KG/CM2 (A) | TEMP (DEG C) 50 | **75** * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

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

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 11 OF 13

Tag No.: **CDV-93 (OPTIONAL)** Qty.: **ONE PER UNIT** **D**ata 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)
GENERAL*	PROJECT	**NTPC-3X660MW NORTH KARANPURA STPP**	.....
	SERVICE	**SPRAY TO COMBINED PRDS CONTROL VALVE**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 33.4 x 4.55 | Ø 33.4 x 4.55**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	.....|.....
BODY*	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	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....|.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | []<150M/SEC (STEAM)	.....|.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	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	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	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	

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO.: PE-TS-405-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 04.09.2014 SHEET 12 OF 13

Tag No.: **CDV-93 (OPTIONAL)** Qty.: **ONE PER UNIT** **D**ata 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)		± 2% ± 1% ± 0.5% ± 2%						…… …… …… ……
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		Refer Sizing Data Sheet A-3 for TG Sealing Desuperheater							
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 50 * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 50 | **75** * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED						…… ……|…… ……		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							……		

NOTES:

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

FORM NO. PEM-6666-0

BHEL	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) 3X660MW NORTH KARANPURA STPP	SPEC NO.: PE-TS-405-142-N101 VOLUME **II-B** SECTION **D** REV. NO. 00 DATE: SHEET 13 OF 13

Tag No…… Quantity…….. Data Sheet No. PES-145-06-DS1-1

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

DATA SHEET – A& B for ACCESSORIES

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)							DATA SHEET – B (TO BE FILLED-UP BY BIDDER)
POSITIONER (SMART) WITH HART PROTOCOL	MFR. & MODEL NUMBER			Bidder To Specify			
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ■ NO	☐ THREE ■ TWO	■ IP-65	
	INPUT SIGNAL (Kg / Cm^2)			■ 0.2 – 1.0	☐ 0.2 – 0.6	☐ 0.6 – 1.0	
	OUTPUT SIGNAL (Kg / Cm^2)			TO SUIT ACTUATOR			
AIR FILTER REGULATOR TWO (2) Nos. PER CV	MFR. & MODEL NUMBER			Bidder To Specify			
	AIR SUPPLY PRESS (Kg / Cm^2 g)			■ 7.0			
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR			
	FILTER SIZE			5 MICRON			
	OUTPUT GAUGE			■ REQUIRED	☐ NOT REQUIRED		
AIR LOCK	MFR. & MODEL NUMBER			Bidder To Specify			
	SET PRESS (Kg / Cm^2)			Bidder To Specify			
	SUPPLY PRESS (Kg / Cm^2)			■ 7.0			
	RESET TYPE			AUTO			
	VENT PLUG			REQUIRED			
	ENCLOSURE CLASS			■ IP 65			
LIMIT SWITCH	MFR. & MODEL NUMBER			Bidder To Specify			
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**	**1 NO.**	
	CONTACT TYPE			SPDT 2 NO + 2 NC			
	RATING (AC / DC)			5A 240V AC AND 0.2A 220V DC			
	ENCLOSURE CLASS			■ IP 55 ☐			
POSITION TRANSMITTER (PART OF POSITIONER)	MFR. & MODEL NUMBER			**PART OF POSITIONER**			
	TYPE						
	SUPPLY						
	OUTPUT RATING						
	ACCURACY						
	ENCLOSURE CLASS						
SOLENOID VALVE	MFR. & MODEL NUMBER			Bidder To Specify			
	RATING			■ 24V DC ☐ 220V DC ☐ 240V AC ☐			
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)			
	OPERATION	QUANTITY		☐ Stayput ■ Interlock	■ 1 ☐ 2		
	COIL INSULATION CLASS			CLASS - H			
	ENCLOSURE CLASS			■ IP 65			
HANDWHEEL	ORIENTATION			☐ TOP MOUNTED ■ SIDE MOUNTED			
JUNCTION BOX	NO. OF WAYS			☐ 24-WAYS ☐ AS REQUIRED ■ 36-Ways			
	SIZE			AS REQUIRED			
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).			
	ENCLOSURE CLASS			■ IP 65			
I/P CONVERTER (PART OF POSITIONER)	INPUT SIGNAL	POWER SUPPLY		**PART OF POSITIONER**			
	SPLIT RANGE						
	ENCLOSURE CLASS						
	LINEARITY						
	HYSTERISIS						
Cu. Tubing & Fittings / per CV	**This is in addition to cu. Tubing and fittings which are integral part of CV**			15 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.			

COMPANY SEAL

NAME

SIGNATURE

DATE

SECTION – D

EQUIPMENT SPECIFICATIONS

FOR

STEAM DESUPERHEATER

1.0.0 GENERAL

This standard specification covers th e design, m aterials, construction features, manufacturing process, assem bly, inspecti on and testing requirem ents, painting and packing requirements of Steam Desuperheater along with spray nozzle.

2.0.0 CODES AND STANDARDS

2.1.0 The design, m anufacture, inspection and testi ng of the equipm ent shall com ply with the requirements of the latest national and in ternational cod es and stan dards wherever applicable. Wherever the specific code requirements are specified herein,. the same shall be adhered to.

In particular, the equipm ent shall be design ed to com ply with late st 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 m ixing mechanical spray type. The assem bly shall consist of desuperheater pipe with steam inlet and outlet & spray water connection along with spray n ozzle. The spray nozzle shall direct the spray in the direction of steam flow for proper m ixing and arranged in such positio n that direct impingement of spray water on desuperheater walls is avoided.

3.2.0 The spray n ozzle shall be accurately sized for be st results in total rang e 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.

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.

4.6.6 Hydraulic Test to two times the rated design pressure for desuperheater body and other pressure retaining parts.

4.6.7 Check for final completeness, cleaning, surface finish, appearance, identification, surface preparation, painting, marking and packing including spares.

4.6.8 The equipment comes under the purview of IBR (Indian Boiler Regulations). All tests certificates duly signed by Chief Inspector (IBR) / authorized representative shall be furnished in IBR from III-C.

4.6.9 The particulars of proposed shop tests and process of test shall be submitted to BHEL/their Customer along with Quality Plan for approval.

5.0.0 PERFORMANCE REQUIREMENTS

Bidder shall guarantee that equipment offered shall meet the rating and performance requirements as stipulated in this specification. In case it is not as per guarantee furnished by the bidder, the deficiency shall be made good by the bidder by rectification / replacement of defective parts within reasonable time at their own cost inclusive of cost of transportation both ways if required. The Purchaser is entitled to reject the equipment in case of repeated failures to meet the guaranteed performance.

6.0.0 PAINTING

6.1.0 All foundry sand and loose material shall be removed and surface should be made thoroughly clean for further protection as required.

6.2.0 A shop coat of paint, removable after installation at site, shall be applied to all steel surfaces and other exposed surfaces requiring corrosion protection during transit and storage at site.

7.0..0 PRESERVATION, MARKING AND PACKING

7.1.0 A Stainless Steel metal nameplate should be permanently fixed on each equipment giving its Tag. No. and technical specifications i.e. Service, Size, Pressure Rating etc.

7.2.0 All equipments / materials shall be packed suitably and protected from impact, abrasion, corrosion, incidental damage due to vermin, Sun-light, high temperature, rain, moisture, humidity, dust, sea water (where applicable) as well as rough handling during entire period of dispatch, storage and erection including delays in transit and storage in open.

7.3.0 Spares shall be packed separately and marked clearly for identification. These shall be specially packed for long storage without damage.

TITI F **EQUIPMENT SPECIFICATION** **STEAM DESUPERHEATER** **For** **NTPC-3X660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPEC. NO.: PE-TS-405-142-N101	
	VOLUME **II-B**	
	SECTION **D**	
	REV NO. **0**	DATE 04.09.2014
	SHEET 1 OF 1	

DESUPERHEATER DATA SHEET- A

DATA SHEET FOR 'TGS DESUPERHEATER' DESH-3

S.NO.	DESCRIPTION	UNITS	DATA FOR TG SEALING 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-3
3.2	PRESSURE	$Kg/cm^2(a)$	BIDDER TO DECIDE BASED ON SIZING DATA
3.3	TEMPERATURE	^0C	BIDDER TO DECIDE BASED ON SIZING DATA
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-3
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-3
5.2	PRESSURE	Kg/cm^2 (a)	BIDDER TO DECIIDE BASED ON SIZING DATA
5.3	TEMPERATURE	^0C	REFER SIZING DATA SHEET A-3
6.0	END DETAILS	(STEAM INLET / OUTLET)	
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 88.9 x 5.49
7.0	END DETAILS	(SPRAY WATER INLET)	
7.1	TYPE / MATCHING PIPE		SW/ 33.4 x 4.55
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A216 WCB
8.2	PIPE		SA 106GRB
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316 (Spray Nozzle design pressure shall be equal to Design Spray Water Pressure)
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	$Kg/cm^2(a)$	21
9.2	DESIGN TEMPERATURE	^0C	350

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.

FINAL DOCUMENTATION

S.NO.	DESCRIPTION	INITIAL SUBMISSION FOR APPROVAL TO BHEL	COPIES FOR NTPC APPROVAL AFTER BHEL CLEARANCE
1.	Vendor drawing / document for approval Note : ▪ Initial submissions with Rev. No. P0, P1, P2 etc. ▪ After BHEL clearance, submission to **NTPC** with Rev. No. R0, R1, R2 etc.	05+Soft Copy	18+Soft Copy
~~2.~~	~~Issue of action A/B/C Civil / Erection Drawings / documents for construction at site (for civil packages only)~~	~~8~~	
3.	Release of finally approved drawings / documents (action A/E) i.e. distribution prints	22 + Soft Copy	
4.	O&M Manuals	2	24
5.	"As-Built" drawings	12	

	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION** **NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **II-B** SECTION **D** REV NO. **00** DATE 04.09.2014 SHEET 1 OF 1

QUALITY PLAN

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	06 DATE: 05.09.2013
SHEET	1 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.0	**MATERIAL**											
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	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

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; 2 - Vendor; 3 - Sub-vendor

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. 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
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	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Appd Drg	Record	3	---	2,1	

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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	
1.4	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	
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	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	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	---	2	---	---	
3.0	**TESTS ON COMPLETED VALVE**											

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	06 DATE: 05.09.2013
SHEET	4 OF 7

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	
3.1	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
		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 and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	--	1	♦Size = Body & port size Or Body size & CV for non std port. Refer Note 1.

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics

RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test

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1 - BHEL; 2 - Vendor; 3 - Sub-vendor

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	
		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	
5.0	**AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)**											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	Overall leakage including tubing
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1	

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	06 DATE: 05.09.2013
SHEET	6 OF 7

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	
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1	
		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. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
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. Hysterisis	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	---	---	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

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PEM :: C&I	STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)	QUALITY PLAN NO.: **PE-QP-999-145-I 006**			
		VOLUME	IIB		
		SECTION	D		
		REV. NO.	06	DATE:	05.09.2013
		SHEET	7	OF	7

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	

NOTES:

1. In case valid CV test certificate for a similar control valve(Same type, Same size, Same CV) is not submitted to BHEL by the vendor, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, 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:

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

STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS	CUSTOMER : NTPC	PROJECT: NTPC-3X660MW NORTH KARANPURA (EPC) WITH ACC	SPECIFICATION NUMBR **PE-TS-405-142-N101**
	BIDDER/ VENDOR : AS PER APPROVED LIST	SPECIFICATION TITLE : **AUXILIARY STEAM P.R.D.S**	
SHEET 1 of 2	SYSTEM ITEM : **STEAM DESUPERHEATER**	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

STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS	CUSTOMER : NTPC	PROJECT: NTPC-3X660MW NORTH KARANPURA (EPC) WITH ACC	SPECIFICATION NUMBR **PE-TS-405-142-N101**
	BIDDER/ VENDOR : AS PER APPROVED LIST	SPECIFICATION TITLE : **AUXILIARY STEAM P.R.D.S**	
SHEET 2 of 2	SYSTEM ITEM : **STEAM DESUPERHEATER**	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	ASMESec-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

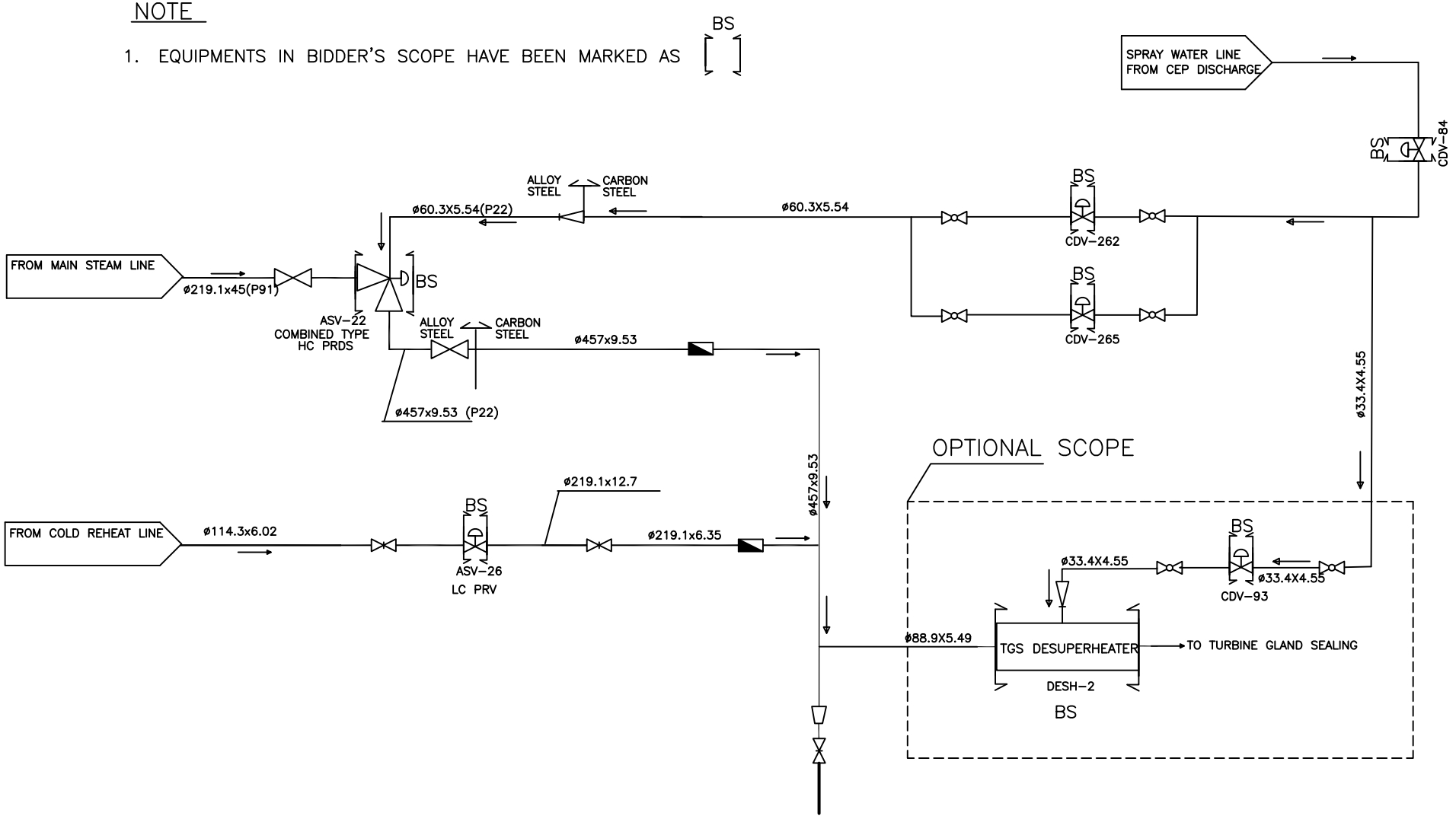
PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR	
NAME				
SIGNATURE				
DATE				BIDDER'S/ VENDOR'S COMPANY SEALS

	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION** **NTPC - 3x660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **II-B** SECTION **D** REV NO. **00** DATE 04.09.2014 SHEET 1 OF 1

TENDER DRAWINGS

NOTE

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



DRAWING NO. PE-TS-405-142-N102

CUSTOMER'S DRAWING NO.

JOB NO.	405

CUSTOMER: NTPC LTD.

3X660MW NTPC NORTH KARANPURA STPP (EPC) WITH ACC

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
H	DRN			04.09.2014
	DESN	VK		04.09.2014
	CHD	SSV		04.09.2014
	APPD	LJS		04.09.2014

TITLE: TECHNICAL SPEC. for AUXILIARY PRDS

C&I | DEPT. | SCALE NTS | DRAWING NO. PE-TS-405-142-N102
SIGN
DATE
SHEET 01 OF 01 | REV. 00

NTPC LTD.

3X660MW NORTH KARANPURA STPP (EPC) WITH ACC

TECHNICAL SPECIFICATION
FOR

AUXILIARY STEAM PRESSURE REDUCING AND DESUPERHEATING STATION ALONGWITH ACCESSORIES

VOLUME - III

SPECIFICATION No: **PE–TS –405-142–N101 (REV 00)**

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

PREAMBLE

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.

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.

CONTENTS

PART-A

* To be filled up by successful bidder after LOI.

CONTENTS

PART-B

* to be filled up by successful bidder after LOI.

	TITLE **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **PART-A** REV NO. **00** DATE 03.09.2014 SHEET 1 OF 1

VOLUME-III
PART-A

SCHEDULES AND DATA SHEETS

BHEL	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **D** REV NO. **0** DATE 04.09.2014 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) **NTPC-3X660MW NORTH KARANPURA STPP(EPC) WITH ACC**	SPECIFICATION NO. **PE-TS-405-142-N101** VOLUME **III** SECTION **D** REV. NO. 00 DATE: 04.09.2014 SHEET 1 of 3

	NAME
	SIGNATURE
	DATE

Tag No…….. Quantity…….. Data Sheet No. PES-145-06-DS2-0

DATA SHEET C

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

GENERAL*	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN DV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA) (Spec. 3.1.14)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
ACCESSORIES	POSITIONER	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	E / P CONVERTER	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	
	ELECTRO PNEUMATIC POSITIONER	

	Technical specification for **APRDS CONTROL VALVES** (Pneumatically Operated) **NTPC-3X660MW NORTH KARANPURA STPP (EPC) WITH ACC**	SPECIFICATION NO. **PE-TS-405-142-N101**
		VOLUME **III**
		SECTION **D**
		REV. NO. 00 / DATE: 04.09.2014
		SHEET 2 of 3

Tag No…….. Quantity…….. Data Sheet No. PES-145-06-DS2-0

DATA SHEET C

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

PERFORMANCE OF VALVE	LINEARITY	
	HYTERSIS	
	SENSITIVITY	
	ACCURACY	

SERVICE CONDITION*	**SL.+ NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCULATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**

	VALVE TYPE
	* MAX SHUT OFF PRESS ((**KG/CM^{2}g)**
	* BODY DESIGN : PRESS ((**KG/CM^{2}g)** **| TEMP (DEG. C)**
	* IBR FORM III-C

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.

FORM NO. PEM-6666-0

BHEL	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) NTPC- 3X660MW NORTH KARANPURA STPP (EPC) WITH ACC	SPEC NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **D** REV. NO. 00 DATE: SHEET OF

Tag No……. Quantity……. Data Sheet No. PES-145-06-DS2-1

DATA SHEET C

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

POSITIONER (SMART) WITH HART PROTOCOL	MFR. & MODEL NUMBER			
	BYPASS	GAUGES	ENCL. CLASS	
	INPUT SIGNAL (Kg / Cm^2)			
	OUTPUT SIGNAL (Kg / Cm^2)			
AIR FILTER REGULATOR TWO (2) Nos. PER CV	MFR. & MODEL NUMBER			
	AIR SUPPLY PRESS (Kg / Cm^2 g)			
	OUTPUT PRESS (Kg / Cm^2 g)			
	OUTPUT GAUGE			
	FILTER SIZE			
AIR LOCK	MFR. & MODEL NUMBER			
	SET PRESS (Kg / Cm^2)			
	SUPPLY PRESS (Kg / Cm^2)			
	RESET TYPE			
	VENT PLUG			
LIMIT SWITCH	MFR. & MODEL NUMBER			
	OPEN posn	INT posn	CLOSE posn	
	CONTACT TYPE			
	RATING (AC / DC)			
	ENCLOSURE CLASS			
POSITION TRANSMITTER **(PART OF POSITIONER)**	MFR. & MODEL NUMBER			
	TYPE			
	SUPPLY			
	OUTPUT RATING			
	ACCURACY			
	ENCLOSURE CLASS			
SOLENOID VALVE	MFR. & MODEL NUMBER			
	RATING			
	OPERATION	QUANTITY		
	COIL INSULATION CLASS			
	ENCLOSURE CLASS			
HANDWHEEL	ORIENTATION			
JUNCTION BOX	NO. OF WAYS			
	SIZE			
	CABLE GLANDS (Size / Quantity)			
	ENCLOSURE CLASS			
I/P CONVERTER **(PART OF POSITIONER)**	INPUT SIGNAL	POWER SUPPLY		
	SPLIT RANGE			
	ENCLOSURE CLASS			
	LINEARITY			
	HYSTERISIS			
Cu. Tubing & Fittings / per CV	15 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

FORM No. PEM - 6019 A-0

	TITLE	SPEC. NO.: PE-TS-405-142-N101
	DATA SHEET - C	VOLUME III PART -A
	STEAM DESUPERHEATER	SHEET 1 OF 2

INSTRUCTIONS TO BIDDER
1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B.
2. Items which deviate from specification shall be marked with an asterisk (*)
3. This data sheet shall be submitted alongwith bid.

SL.NO.	ITEM	UNIT	PARTICULARS
1.0	TYPE OF DESUPERHEATER	-	
2.0	MODEL NO.	-	
3.0	NUMBER OFFERED	NOS.	
4.0	FLOW CAPACITY (OUTLET OF DESUPERHEATER)	T/HR	
5.0	STEAM PARAMETERS AT INLET		
5.1	PRESSURE	KG/CM^2A	
5.2	TEMPERATURE	^0C	
5.3	FLOW	T/HR	
6.0	STEAM PARAMETERS AT OUTLET		
6.1	PRESSURE	KG/CM^2A	
6.2	TEMPERATURE	^0C	
7.0	SPRAY WATER PARAMETERS		
7.1	PRESSURE	KG/CM^2A	
7.2	QUANTITY	T/HR	
8.0	DESIGN PARAMETERS OF DESUPERHEATER BODY		
8.1	PRESSURE	KG/CM^2G	
8.2	TEMPERATURE	^0C	
9.0	DESIGN PRESSURE OF SPRAY NOZZLE	KG/CM^2G	
10.0	TYPE OF SPRAY NOZZLE		
10.1	FIXED / VARIABLE AREA ORIFICE		
10.2	SINGLE HOLE / MULTI HOLE		

INSTRUCTIONS FOR BHEL
1. In the column "SPECIFICATION NO." the specification number for the project shall be entered by DE before issue for an enquiry. The standard specification number shall not be entered.

Name of Bidder / Vendor				Project	
Revision Number	0	1	2	3	
Signature of Bidder / Vendor / Authorised Representative					
Date					BIDDER'S SEAL

FORM No. PEM - 6019 A-0

	TITLE	SPECIFICATION NO. PE-TS-405-142-N101
BHEL	**DATA SHEET - C** **STEAM DESUPERHEATER**	VOLUME III PART -A SHEET 2 OF 2

INSTRUCTIONS TO BIDDER
1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B.
2. Items which deviate from specification shall be marked with an asterisk (*)
3. This data sheet shall be submitted alongwith bid.

SL.NO.	ITEM	UNIT	PARTICULARS
11.0	NUMBER OF SPRAY NOZZLE / TURNDOWN RATIO		
12.0	SPRAY WATER NOZZLE CHARACTERISTICS		
13.0	SIZE OF ORIFICE	MM	
14.0	MIN. VELOCITY ACCEPTABLE IN THE DESUPERHEATER PIPE	M/SEC	
15.0	END CONNECTIONS TYPE & SIZE		
15.1	DESUPERHEATER INLET / OUTLET		
15.2	SPRAY WATER INLET		
16.0	MATERIAL OF CONSTRUCTION		
16.1	BODY		
16.2	SPRAY NOZZLE		
17.0	OVERALL DIMENSIONS	MM	
18.0	WEIGHT OF DESUPERHEATER	KG	
19.0	MOUNTING RECOMMENDATIONS (IF ANY)		
20.0	DESIGN CODE		
21.0	HYDRAULIC TEST PRESSURE	$KG/CM^2 G$	

INSTRUCTIONS FOR BHEL
1. In the column "SPECIFICATION NO." the specification number for the project shall be entered by DE before issue for an enquiry. The standard specification number shall not be entered.

Name of Bidder / Vendor				Project	
Revision Number	0	1	2	3	
Signature of Bidder / Vendor / Authorised Representative					
Date					BIDDER'S SEAL

FORM No. PEM - 6020-2

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.			

FORM No. PEM - 6024-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID	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**

FORM No. PEM - 6026-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE	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**

FORM No. PEM - 6027-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	SCHEDULE OF WEIGHTS & DIMENSIONS	VOLUME III PART - A
		SHEET ..... OF .....

The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.

Description of Package(s)	Dimensions (in meters)	Weight (in tonnes)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	**COMPANY SEAL**

FORM No. PEM - 6030-0

INSPECTION SCHEDULE

SPECIFICATION NUMBER PE-TS-405-142-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**

FORM No. PEM - 6036-0

	TITLE	SPECIFICATION NUMBER
	*** SCHEDULE OF DEVIATIONS** ( ) From Conditions of Contract (Volume - I) ( ) From General Technical Conditions (Volume - II A) ( ) From Technical Specifications (Volume - II B)	PE-TS-405-142-N101 VOLUME III PART - A SHEET ..... OF .....

* Each type of deviation shall be listed on a seperate sheet. Tick the applicable ☒

We the undersigned hereby certify that the above mentioned are the only deviations.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	**COMPANY SEAL**

FORM No. PEM - 6040-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	* SCHEDULE OF DECLARATION	VOLUME III PART - A
		SHEET ..... OF .....

DECLARATION

I,.....certify tha t 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.

Biders 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**

* Bidder shall include this schedule both in technical and Price offers.

BHEL	**QUALITY PLAN**	CUSTOMER: NTPC	PROJECT: **NTPC-3X660MW NORTH KARANPURA (EPC) WITH ACC**	SPECIFICATION: **PE-TS-405-142-N101** NUMBR
		BIDDER/: VENDOR	QUALITY PLAN MUMBER	SPECIFICATION TITLE: **AUXILIARY STEAM P.R.D.S**
	SHEET OF	SYSTEM:	ITEM:	SECTION VOLUME III

SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT. T	YPE 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

PARTICULARS BH	EL	BIDDER / VENDOR	
NAME			
SIGNATURE			
DATE			BIDDER'S/ VENDOR'S COMPANY SEALS

INSTRUCTIONS FOR FILLING QUALITY PLAN

(Form No. PEM-6041-0)

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 shets, 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 as 1,2 & 3

'1' stands for (BHEL)

'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 bgy BHEL and all tests as per relevent 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 presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise 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 approproate 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).

	VENDOR's DRAWINGS/DOCUMENTS SCHEDULE (Information in this form is to be furnished only after receipt of LOI/IPO)	SPEC. NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **PART-A** REV NO. **0** DATE SHEET 1 OF 1

TITLE OF SPECIFICATION

.S. NO.	Vendor's Drawing/Document No. (VDN)	PEM's Drawing/Document No. (PDN)	First Submission Date
	TITLE Final		Approval Date
	VDN PDN		
	TITLE		
	VDN PDN		
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PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	COMPANY SEAL

FORM NO PEM 6046-1

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 FOOLOWING DOCUMENTS ARE APPROVED BY BHEL AND AVAILABLE AT PLACT 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 here by 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 te chnical s pecification/approved drawings /data s heets/characteristic curves a nd are a cceptable to our QC departm ent. 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-405-142-N101 VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 03.09.2014 SHEET 1 OF 1

VOLUME-III
PART-B

PRICE SCHEDULES

BHEL	TITLE **SCHEDULE OF PRICES** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 03.09.2014 SHEET 1 OF 1

S.No.	Description of Works or Equipment/System	Price (in Lakhs of Rs.)
1.0	A.) Total price for design, manufacture, assembly, inspection, testing, packing and dispatch to site of auxiliary steam pressure reducing and desuperheating stations complete with combined type HC desuperheater (ASV-22), LC PRV (ASV-26), Spray control valves (CDV-262 & CDV-265) & Block Valve (CDV-84) and all accessories including commissioning spares and special tools & tackles as specified and necessary as per technical specification PE-TS-405-142-N101. B.) Total price for design, manufacture, assembly, inspection, testing, packing and dispatch to site of Turbine Gland Sealing Desuperheater (DESH-3) & Spray Control Valve (CDV-93) and all accessories including commissioning spares and special tools & tackles as specified and necessary as per technical specification PE-TS-405-142-N101 **(OPTIONAL SCOPE).**	
2.0	Recommended spares, item-wise break up with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of technical specification- price not to be included in clause 1.0 above, Bidder to indicate the break up.	
3.0	Mandatory Spares price – prices not to be included in clause 1.0 above	
4.0	Optional price of supervision of erection and commissioning of equipments – prices not to be included in clause 1.0 above.	

BHEL	TITLE **SCHEDULE OF UNIT PRICES** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-405-142-N101 VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 04.09.2014 SHEET 1 of 2

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-405-142-N101:	
1.1	Unit Price of Control valves (NTPC-3X660 MW NORTH KARANPURA STPP (EPC) WITH ACC) 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) HC PRDS Control Spray Valve BYPASS, (CDV-265) e) BLOCK Valve , (CDV-84)	
1.2	**OPTIONAL** a) TGS Desuperheater (DESH-3) b) Spray control valve to DESH-3, (CDV-93)	

S.No.	Item Description	Unit Price (in Lakhs of Rs.)
1.3	Unit Price of Mandatory Spares [NTPC-3X660MW NORTH KARANPURA STPP (EPC) WITH ACC]	

1.3.1

High Capacity PRDS System (i.e for ASV-22)		
a)	Desuperheater Liners(If applicable)	1 set
b)	Steam	1 no.
c)	Disc	1 no.
d)	Body seat rings	2 nos. for each type, size and rating of valves
e)	Gland packings	2 nos. for each type, size and rating of valves
f)	Pressure Seal Ring	2 nos.
g)	Gasket	2 nos.

1.3.2

For Spray Water Line Control Valve (i.e. for CDV-262,CDV-265)		
a)	Valve trim including cage, plug, stem, seat rings, guide bushings, stem packing	1 no. for each size, type & rating of valves

1.3.3

Low Capacity PRDS System (i.e for ASV-26)		
a)	Steam	1 no.
b)	Disc	1 no.
c)	Body seat rings	2 nos. for each type/size
d)	Gland packings	2 nos. for each type, size and rating of valves
e)	Pressure Seal Ring	3 nos.
f)	Gasket	2 nos.

1.3.4

Actuator Internals for each control Valve		
a)	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
b)	Diaphragms, O' rings, seals etc. of all types make etc.	100%
c)	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more
d)	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more
e)	Positioner units (complete unit)	10% or 1 no. of each type whichever is more
f)	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
g)	Air lock relays	10% or 2 nos. of each type whichever is more

FORM No. PEM - 6053-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	*** SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES**	VOLUME III
		SHEET ..... OF .....

The bidder shall incidate 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**

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.

FORM No. PEM - 6054-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	*** SCHEDULE OF PRICES FOR RECOMMENDED SPARES**	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 reco-mmended	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**

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.

FORM No. PEM - 6055-0

	TITLE	SPECIFICATION NUMBER PE-TS-405-142-N101
	SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES	VOLUME III
		SHEET ..... OF .....

The bidder shall be give below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section - C / Section - D.

S. No.	Description of Tools & Tackles	Quantity offered	Unit Price (Rs.)	Total Price (Rs.)

NOTE : The hire charges for vendor's equipment called for in this schedule shall include the cost of consumables, operation services, depreciation, wear and tear as well as vendor's over head and profit. (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract.)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	**COMPANY SEAL**

FORM No. PEM - 6056-0

	TITLE	SPECIFICATION NUMBER
	SCHEDULE OF BIDDER's MAN POWER FOR SUPERVISION OF E & C AND THEIR CHARGES	PE-TS-405-142-N101
		VOLUME III
		SHEET ..... OF .....

The bidder shal indicate below, designation-wise, the personnel required for superivsion of erection and commissioning and their charges.

SUPERVISION OF ERECTION

S. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

SUPERVISION OF COMMISSIONING

Sl. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	**COMPANY SEAL**