

TANGEDCO

&

2X660 MW ENNORE

TECHNICAL SPECIFICATION
FOR

**AUXILIARY STEAM PRESSURE REDUCING
AND DESUPERHEATING STATION
ALONGWITH ACCESSORIES**

SPECIFICATION No: **PE-TS -412-142-N101**



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

	TECHNICAL SPECIFICATION FOR AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION	SPEC. NO.: PE-TS-412-142-N101	
		SECTION	CONTENTS (I & II)
		REV. NO.	00 DATE 07.03.17
		SHEET	0 OF 17

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SCOPE OF ENQUIRY



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- 1.1 This enquiry covers the Design, Manufacture, Assembly, Inspection and Testing at Vendor's and/or his sub-vendors works, painting and delivery to site of Auxiliary Steam Pressure Reducing & Desuperheating Stations, as mentioned in different sections of this specification.
- 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 submit stamped compliance certificate (enclosed in Section II) conforming all the specification requirements.
- 1.4 The bids shall be in English language and MKS Units.
- 1.5 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 1.6 BHEL's / CUSTOMER'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.
- 1.7 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 / CUSTOMER.



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PROJECT

**SPECIFICATION
FOR
EPC CUM DEBT FINANCING CONTRACT
VOLUME II – GENERAL & SCHEDULES**

CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 Type of Plant

The proposed 2x660 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**



2 x 660 MW Ennore SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
Spec. No. CE/C/P&E/EE/E/OT.No.03 /2013-14

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Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude : 13⁰17' N to 13⁰18' N

Longitude : 80⁰18' E to 80⁰19' E

Distance from Chennai City : 35 km

Nearest Airport is at Chennai at a

Distance of : 60 km

Nearest Seaport is : Ennore

Nearest Railway Station is : Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data : Ambient temp. (°C)
Annual Maximum Mean Temp 41.5(°C)
Annual Minimum Mean Temp 24(°C)
Design Ambient temperature 35(°C)

Relative Humidity

Maximum 100%

Minimum 36%

Design 75%

Annual Rainfall

Maximum 2540 mm

Average 1600 mm

Minimum 1175 mm

Prevailing Wind Direction

Nov to Jan – From NW & NE



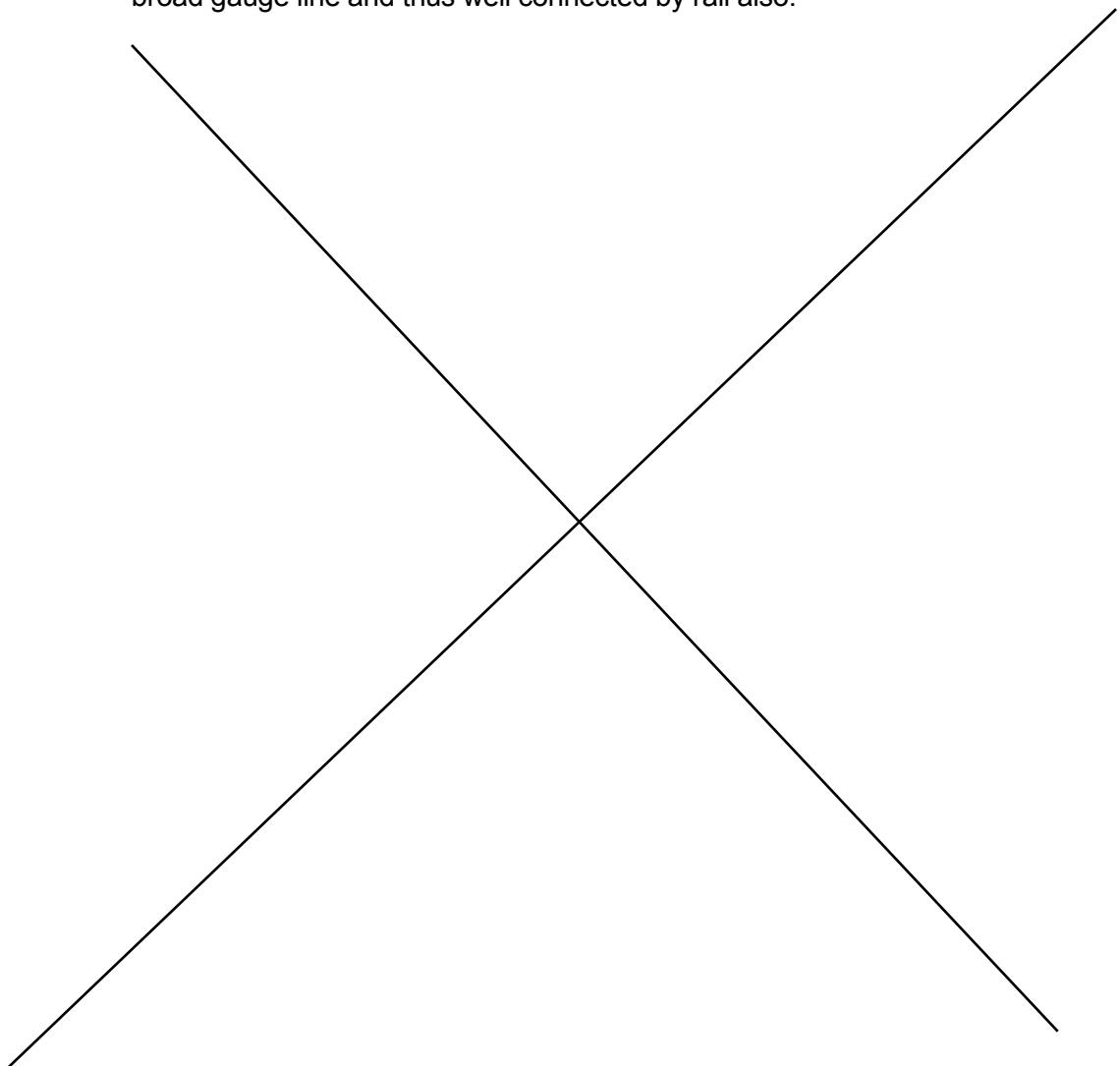
2 x 660 MW Ennore SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
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Feb to Mar – From East & SE
Apr to May – From South & SE
June – From SW
July to Aug – From NW
Sept to Oct – From SE & SW
Wind Speed 11.8 kmph (avg)
50 kmph (max)
Seismic Zone III as per
IS:1893-2002

1.5 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.



2 x 660 MW Ennore SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
Spec. No. CE/C/P&E/EE/E/OT.No.03 /2013-14

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SPECIFIC TECHNICAL REQUIREMENTS



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BRIEF SYSTEM DESCRIPTION

- 1.1 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 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 PRV" 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 The HCPRDS will reduce the pressure and temperature of the steam tapped off from main steam line to 16 kg/cm² (abs) & 290°C. The LCPRV shall reduce the pressure of steam tapped from CRH line to 16 kg/cm² (abs) and temperature in the range of 285°C to 350°C, depending upon the CRH parameters at corresponding load.
- 1.4 APRDS system Comprises of:

S No	Description	Quantity
1	Combined Type High Capacity Pressure Reducing & De-superheating Valve (On MS line)	1/unit (02 nos. for 02 Unit)
2	Low Capacity PRV (on CRH Line)	1/unit (02 nos. for 02 Unit)
3	Spray Control Valve for HC-PRDS	1/unit (02 nos. for 02 Unit)

- 1.5 Spares, consumable and specified tools & tackles:

- i) Start-up, Commissioning spares and consumables shall be part of main package supply; however bidder to indicate prices separately. All such items shall be strictly interchangeable with the parts for which they are intended for replacements.
- ii) The bidder shall supply one complete set of special tools & tackles (if any) 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.
- iii) 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.



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iv) **Mandatory Spares List:**

Auxiliary Steam Pressure Reducing & Desuperheating System

High Capacity PRDS System (i.e for ASV-22)

a)	Metal Seat	1 no. of each type
b)	Seat Ring	1 no. of each type
c)	Spindle	1 no. of each type
d)	Soft good kit valve	1 no. of each type
e)	Soft good kit actuator	1 no. of each type
f)	Complete actuator	1 no. of each type

Spray Control Valve (i.e for CDV-262)

a)	Metal Seat	1 no. of each type
b)	Seat Ring	1 no. of each type
c)	Spindle	1 no. of each type
d)	Soft good kit valve	1 no. of each type
e)	Soft good kit actuator	1 no. of each type
f)	Complete actuator	1 no. of each type

Low Capacity PRDS System (i.e for ASV-26)

a)	Metal Seat	1 no. of each type
b)	Seat Ring	1 no. of each type
c)	Spindle	1 no. of each type
d)	Soft good kit valve	1 no. of each type
e)	Soft good kit actuator	1 no. of each type
f)	Complete actuator	1 no. of each type

Other Accessories

a)	Solenoid valve	2 nos. of each type
b)	Feed back transmitter unit	2 nos. of each type
c)	Electronic Positioner Transmitter	2 nos. of each type
d)	Air filter regulator	2 nos. of each type
e)	Air Lock relay	2 nos. of each type



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- v) Commissioning Spares: As applicable for the project
(For Minimum requirement refer section II)

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.
- 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.



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SIZING DATA SHEET- A-1

COMBINED AUXILIARY STEAM PRDS & SPRAY CONTROL VALVE (ASV-22)

S.No.	Parameters	Cond.-1	Cond.-2	Cond.-3	Cond.-4	Cond.-5	Cond.-6	Mech. Design
1.0	Inlet of Combined APRDS							
1.1	Pressure (kg/cm ² (a))	63.94		108	109	247	247	271
1.2	Temp. (°C) 375		385	425	490	565	565	573
1.3	Flow (T/Hr)	Bidder To Calculate						
2.0	Outlet of combined APRDS							
2.1	Pressure (kg/cm ² (a))	16.16		16	16	16	16	21
2.2	Temp. (°C) 290		290	290	290	290	290	350
2.3	Flow (T/Hr)	103.85	120.65	70.25	70.25	181.70	217.95	-
3.0	Inlet of Spray Control Valve							
3.1	Pressure (kg/cm ² (a))	37.0 37.0		37.0	37.0	34.7	34.7	43
3.2	Temp. (°C) 47.0		47.0	47.0	46.6	46.6	46.6	60
3.3	Flow (T/Hr)	BIDDER TO CALCULATE						



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SIZING DATA SHEET- A-2

AUXILIARY STEAM PRV (ASV-26)

S.No.	Parameters	Cond.-1	Cond.-2	Cond.-3	Cond.-4	Mech. Design
1.0	Inlet of PRV					
1.1	Pressure (kg/cm ² (a)) 22.6	0	55.95	55.95	55.95	74.1
1.2	Temp. (°C) 343.	5	333.3	333.3	333.3	360
1.3	Flow (T/Hr)	7.95	7.95	8.55	30.00	-
2.0	Outlet of PRV					
2.1	Pressure (kg/cm ² (a)) 16		16	16	16	21
2.2	Temp. (°C)	Bidder To Calculate				
2.3	Flow (T/Hr)	7.95	7.95	8.55	30.00	-



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DATA SHEETS- A

AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION



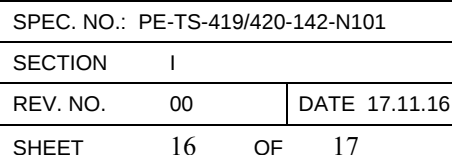
- (1) Valve actuators shall be capable of operating at 70 Degree C ambient continuously.
- (2) The design of all valve bodies shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.
- (3) Separate moisture separator unit for ensuring dryness of air entering I/P is to be supplied with each control valve.
- (4) SS name plate shall be fixed on the control valve and it will have all details like KKS Tag no. / SI. No. / Body material size / Press. Rating / Trim material / Trim type / action on air failure / diaphragm air pressure at full open and closed condition



DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	TANGEDCO - 2x660 MW ENNORE STPP COLD REHEAT STEAM TO AUXILIARY STEAM PR. REDUCING VALVE (LC PRV) [•] INDOOR [] OUTDOOR [] ON/OFF [•] MODULATING Ø 114.3x6.02 Ø 219.1 x 12.7 SA 106 Gr. C SA 106 Gr. C	
BODY*	MODEL NO. TYPE OF BODY: GUIDING : NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM(MULTITURN, MULTISTAGE, MULTIPATH RADIAL TRIM) TRIM MATERIAL: SEAT PLUG : CAGE GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) VACUUM SERVICE ANTI CAVITATION TRIM	BIDDER TO SPECIFY [•]GLOBE [] ANGLE [] TOP [•]CAGE ONE [•] BWE [] SWE [] FLANGED [] A216 WCC [•] A217 WC9 [] SS [] A217 C5 [] A351 CF8M [] PTFE [•] GRAFOIL []DOUBLE [•]SINGLE [] STD [•] EXTENDED [] FINNED [] LINEAR [•] EQ. PERCENTAGE [] QUICK OPEN (ON/OFF) SS316 (ST) SS316 (ST) SS316 (ST) SS316 (ST) [] BELOW SEAT [] ABOVE SEAT [] < 7 M/SEC (WATER) [] MAC NO. < 1/3 (FLASHING) [•] < 150 M/SEC (STM) [] II [] III [] IV [•] V [] VI LESS THAN 85 dBA (AT ONE METER DISTANCE) [] YES [•] NO [] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN } *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	PNEUMATIC DOUBLE ACTING PISTON TYPE 1.0 0.2 LESS THAN 10 SECS. [•] TO OPEN [] STAYPUT [] TO CLOSE [•] STAYPUT	
ACCESSORIES	POSITIONER (SMART) AIR FILTER REGULATOR AIR LOCK RELAY POSITION LIMIT SWITCH POSITION TRANSMITTER SOLENOID VALVE E/P CONVERTOR JUNCTION BOX HAND WHEEL (SIDE MOUNTED) LOCAL POSITION INDICATOR	[•] REQUIRED [] NOT REQUIRED [•] REQUIRED [] NOT REQUIRED [•] REQUIRED [] NOT REQUIRED [•] REQUIRED [] NOT REQUIRED PART OF SMART POSITIONER [•] REQUIRED [] NOT REQUIRED PART OF SMART POSITIONER [•] REQUIRED [] NOT REQUIRED [•] REQUIRED [•] REQUIRED	



- (1) Valve actuators shall be capable of operating at 70 Degree C ambient continuously.
- (2) The design of all valve bodies shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.
- (3) Separate moisture separator unit for ensuring dryness of air entering I/P is to be supplied with each control valve.
- (4) SS name plate shall be fixed on the control valve and it will have all details like KKS Tag no. / SI. No. / Body material size / Press. Rating / Trim material / Trim type / action on air failure / diaphragm air pressure at full open and closed condition



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

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	TANGEDCO - 2x660 MW ENNORE STPP SPRAY TO COMBINED PRDS CONTROL VALVE ☐ INDOOR ☐ OUTDOOR ☐ ON/OFF ☒ MODULATING Ø 60.3 x5.54 Ø 60.3 x5.54 SA 106 Gr. B SA 106 Gr. B	
BODY*	MODEL NO. TYPE OF BODY: GUIDING: NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM(MULTITURN, MULTISTAGE, MULTIPATH RADIAL TRIM) TRIM MATERIAL: SEAT PLUG : CAGE GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) VACUUM SERVICE ANTI CAVITATION TRIM	BIDDER TO SPECIFY ☒ GLOBE ☐ ANGLE ☐ TOP ☒ CAGE ONE ☒ BWE ☐ SWE ☐ FLANGED ☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 C5 ☐ A351 CF8M ☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE ☐ STD ☐ EXTENDED ☐ FINNED ☐ LINEAR ☒ EQ. PERCENTAGE ☐ QUICK OPEN (ON/OFF) 17-4PH-SS 17-4PH-SS 17-4PH-SS 17-4PH-SS ☐ BELOW SEAT ☐ ABOVE SEAT ☐ < 7 M/SEC (WATER) ☐ MAC NO. < 1/3 (FLASHING) ☒ < 150 M/SEC (STM) ☐ II ☐ III ☐ IV ☒ V ☐ VI LESS THAN 85 dBA (AT ONE METER DISTANCE) ☐ YES ☒ NO ☐ YES ☒ NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE } AND CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	PNEUMATIC DOUBLE ACTING PISTON TYPE 0.2 1.0 LESS THAN 10 SECS. ☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE ☒ STAYPUT	
ACCESSORIES	POSITIONER (SMART) AIR FILTER REGULATOR AIR LOCK RELAY POSITION LIMIT SWITCH POSITION TRANSMITTER SOLENOID VALVE E/P CONVERTOR JUNCTION BOX HAND WHEEL (SIDE MOUNTED) LOCAL POSITION INDICATOR	☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED PART OF SMART POSITIONER ☒ REQUIRED ☐ NOT REQUIRED PART OF SMART POSITIONER ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☒ REQUIRED	

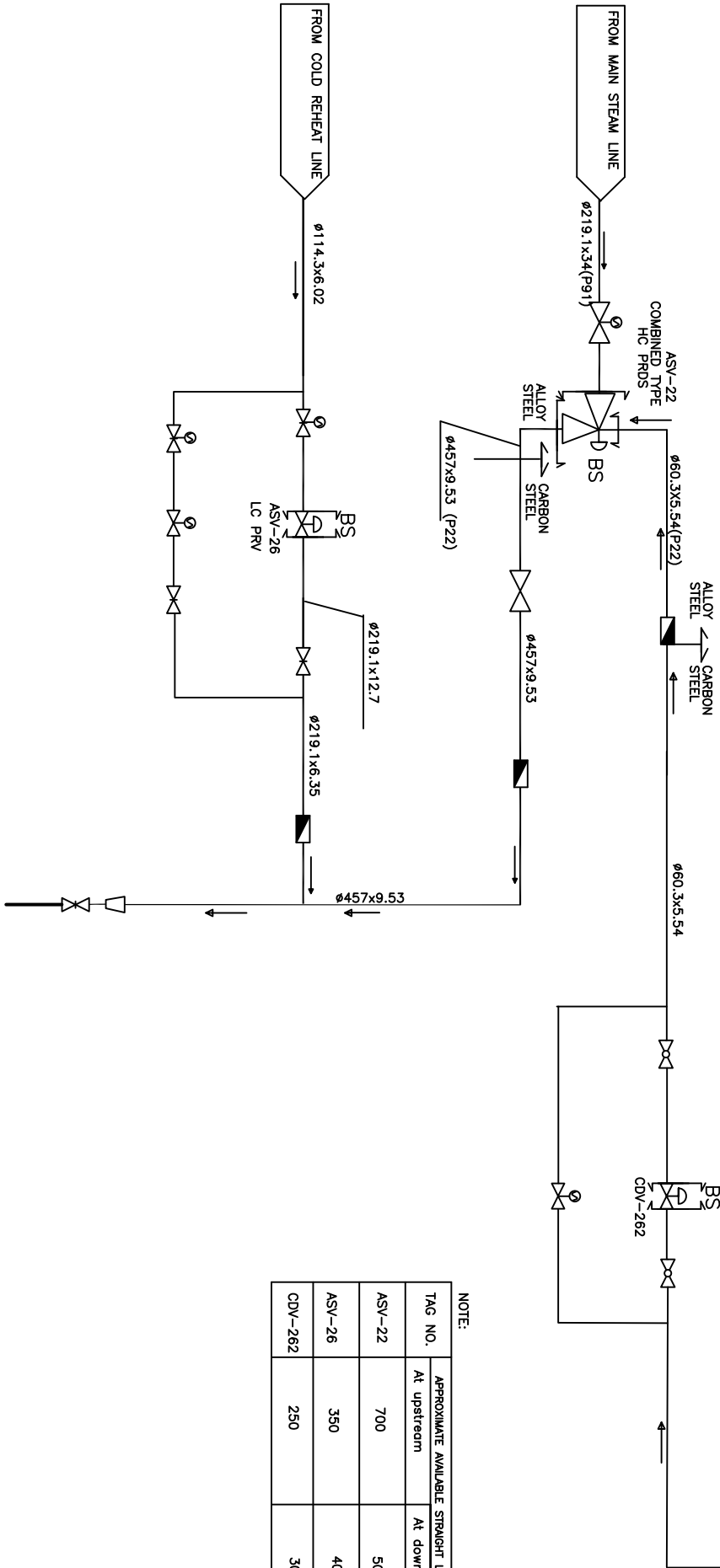
- (1) Valve actuators shall be capable of operating at 70 Degree C ambient continuously.
- (2) The design of all valve bodies shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.
- (3) Separate moisture separator unit for ensuring dryness of air entering I/P is to be supplied with each control valve.
- (4) SS name plate shall be fixed on the control valve and it will have all details like KKS Tag no. / SI. No. / Body material size / Press. Rating / Trim material / Trim type / action on air failure / diaphragm air pressure at full open and closed condition

		DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) 2 X 660 MW ENNORE STPP		SPECIFICATION NO. PE-TS-412-145-1104	
				VOLUME	
				SECTION	
				REV. NO. 02	DATE: 11.08.15
				SHEET 54	OF 56
Tag No..... Quantity..... Data Sheet No. PES-145-06-DS1-0					
ITEMS SHALL BE 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) ##	MFR. & MODEL NUMBER		TO BE INDICATED IN VENDOR'S DOCUMENT		
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ☒ NO	☐ THREE ☒ TWO ☒ IP-65
	INPUT SIGNAL (ELECTRICAL)		4-20 mA DC, HART COMPATIBLE		
	OUTPUT SIGNAL (PNEUMATIC)(Kg / Cm ²)		TO SUIT ACTUATOR		
	DI FOR FAULT SIGNAL		☒ YES ☐ NO		
AIR FILTER REGULATOR ##	MFR. & MODEL NUMBER		TO BE INDICATED IN VENDOR'S DOCUMENT		
	AIR SUPPLY PRESS (Kg / Cm ² g)		☒ UPTO 10		
	FILTER SIZE		5 MICRONS		
	OUTPUT PRESS (Kg / Cm ² g)		TO SUIT SMART POSITIONER		
	OUTPUT GAUGE		☒ REQUIRED ☐ NOT REQUIRED		
AIR LOCK ##	MFR. & MODEL NUMBER		TO BE INDICATED IN VENDOR'S DOCUMENT		
	SET PRESS (Kg / Cm ²)		TO BE INDICATED IN VENDOR'S DOCUMENT		
	SUPPLY PRESS (Kg / Cm ²)		☒ 5.0 - 8.0		
	RESET TYPE		AUTO		
	VENT PLUG		REQUIRED		
LIMIT SWITCH ##	MFR. & MODEL NUMBER		TO BE INDICATED IN VENDOR'S DOCUMENT		
	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 65		
POSITION TRANSMITTER ## (IN BUILT IN SMART POSITIONER)	MFR. & MODEL NUMBER		NOT APPLICABLE		
	TYPE		☒ Electronic (2-Wire Type), Non-Contact Type ☐ OTHER		
	SUPPLY		☒ 24V DC ☐ 220V DC ☐ 110V AC ☐ 240V AC		
	OUTPUT RATING		☒ 4-20mA ☐ 0-100 ohms		
	ACCURACY		± 1% FS		
SOLENOID VALVE ##	MFR. & MODEL NUMBER		TO BE INDICATED IN VENDOR'S DOCUMENT		
	RATING		☒ 24V DC ☐ 220V DC ☐ 240V AC ☐		
	OPERATION QU	ANTITY	☐ Stayput ☒ Interlock	AS PER DATASHEET & HOOK UP	
	COIL INSULATION CLASS		CLASS - H		
	ENCLOSURE CLASS		☒ IP 65		
HANDWHEEL ##	ORIENTATION		☐ TOP MOUNTED ☒ SIDE MOUNTED		
JUNCTION BOX ##	NO. OF WAYS		☐ 24-WAYS ☒ 36-Ways ☐ AS REQUIRED		
	SIZE A		S REQUIRED		
	CABLE GLANDS (Size / Quantity)		AS REQUIRED (Double Compression Type).		
	ENCLOSURE CLASS		☒ IP 65		
I/P CONVERTER ##	MFR. & MODEL NUMBER		IN BUILT IN SMART POSITIONER		
	INPUT SIGNAL	POWER SUPPLY			
	SPLIT RANGE				
	ENCLOSURE CLASS				
SS 316 Tubing & Fittings / per CV ##	This is in addition to SS316 Tubing and fittings which are integral part of CV		12 Meters of 1/4" SS316 Tubing, with 1 set of SS316 Fittings for each CV for connection to IA Header on one end and accessories on another end of CV and same shall be as per hook-up.		
## For further details refer "Annexure- 1".					COMPANY SEAL
					NAME
					SIGNATURE
					DATE

NOTE

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

SPRAY WATER LINE
FROM CEP DISCHARGE



NOTE:

TAG NO.	APPROXIMATE AVAILABLE STRAIGHT LENGTH (in mm)	
	At upstream	At downstream
ASV-22	700	5000
ASV-26	350	400
CDV-262	250	300

JOB NO. 412

CUSTOMER: TANDECO
2X660MW ENNORE

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTION
PROJECTS DISCONTINUED
NEW DELHI

TECH SPEC FOR AUXILIARY PRDS

PE-TS-412-142-N101



**TECHNICAL SPECIFICATION FOR
AUXILIARY STEAM PRESSURE REDUCING &
DESUPERHEATING STATION**

SPECIFICATION NO.: PE-TS-412-142-N101

SECTION I

REV. NO. 00

DATE : 07.03.17

CUSTOMER SPECIFICATION

CHAPTER-11**CONTROL VALVES WITH ACTUATORS****11.00.00 CONTROL VALVES, ACTUATORS AND ACCESSORIES****11.01.00 GENERAL REQUIREMENTS**

- 11.01.01 This section covers the design and construction requirements of Control Valves, their Actuators and Accessories. Except as otherwise specified herein, the Control Valves and accessory equipment furnished under this specification shall be designed, constructed and tested in accordance with the latest applicable requirements of code for Pressure Piping ANSI B31.1, the ASME Boiler and pressure vessel code, Indian Boiler Regulation (IBR) and other standards referenced herein as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA", or acceptable equal standards.
- 11.01.02 The design of Control Valves shall comply with relevant codes and standards, account for relevant design criteria viz. environmental conditions, power and air supply, established reliability (reliability target and life expectancy), design of enclosures as specified in Sections earlier.
- 11.01.03 All Control Valves and accessories furnished under the Section shall be of Owner approved make, fully meeting the qualifying requirements.

11.02.00 CONTROL VALVE CONSTRUCTION AND SIZING**11.02.01 General**

1. Valve Construction shall be in accordance with the requirements specified herein. (Bidder to also refer NIT drawing # 114-18-0100).
2. The design of all valve bodies shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.
3. The valve sizing shall be suitable for obtaining maximum operating conditions with valve opening at approximately 80% of total travel. Valves shall be open not less than 15 % of full opening for minimum flow condition and shall be capable of handling at least 120% of the required maximum flow at full open condition. Actual pressure drop is indicated in the specification sheets. Permissible pressure drop shall be calculated and



used by the Bidder for sizing calculations. Valve sizing shall be in compliance with the latest edition of ISA Handbook on control valves, ISA standards "ANSI/ISA-75.01.01, Flow Equations for Sizing of Control Valves" with due consideration for the measures to avoid choked flow.

4. a. The Bidder shall provide valves designed to prevent cavitations, wire drawing, flashing on the downstream side of valve and in downstream piping, when operating through full range under the specified conditions.

Bidder shall furnish detailed catalogue, calculations, write ups to establish compliance to these stipulations with the selection of each valve. No price implications during engineering stage would be admissible to comply with these stipulations and intents of specification.

- b. The Liquid pressure recovery factor (FL) shall be 0.995 or better for severe flashing/cavitation services.
- c. The Liquid pressure recovery factor (FL) shall be 0.985 or better for low flashing/cavitation services.



6. The valve design shall take into account noise abatement considerations. The design objective will be to limit the generation of valve induced noise to 85 dBA at 1 Meter from the valve surface under actual operating conditions. The noise abatement shall be obtained by valve body and trim design and piping arrangement and not by the use of silencers.
7. The Bidder shall be responsible for proper sizing of the valve and selection of appropriate model and materials of constructions for meeting the operating requirements specified herein and details subsequently furnished during the detailed engineering stage.
8. The valve travel time shall be less than 10 second for non critical services valves.
9. Rangeability should be 50 to 1 (min.) for non critical services valves.
10. Control Valve's Linearity, Hysteresis, Accuracy shall be $\leq \pm 1\%$ and Sensitivity shall be $\leq \pm 0.5\%$.

Bidder shall furnish the Control Valve data sheets and sizing calculations with the proposal which will be subjected to owner approval during detailed engineering. The bidder shall furnish all valves as per Owner approved data sheets and drawings.

11.02.02 Valve Construction

1. All valves shall be of globe body design and straightway pattern. Straightway pattern valves shall be either single or double ported as specified. Double ported and single ported valves shall have high lift cage guided plugs, unless otherwise specified.
2. Where specified, valves with cage guided plugs and quick change trim shall be supplied. The quick change trim shall consist of a cage and seat ring clamped in the valve body by the valve bonnet and sealed with a spiral wound stainless steel asbestos gasket. The trim shall be removable through the top after bonnet removal without any cutting or welding of the valve. Where applicable, plugs shall be designed to include pressure balancing for cage guided valves.
3. Direct acting and self-contained pilot type valves may have low lift plugs.
4. Cast iron valves are not acceptable.
5. Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Owner. Bonnet joints shall be designed for easy disassembly and for assurance of correct valve stem alignment. Bonnet joints of the internal threaded or union type will not be acceptable.
6. Plugs shall be of one-piece construction either cast, forged, or machined from solid bar stock. Plugs shall be screwed and pinned to valve stems or shall be integral with the valve stems.



7. When Teflon packing is used, the lower valve stem which passes through the stuffing box shall be polished to at least 2×10^{-4} millimeters r.m.s.
8. Valves gland packing shall normally be Teflon on liquid and gas services up to 100 kg/cm^2 and 230°C . Teflon impregnated asbestos shall be used above 230°C and graphite impregnated asbestos with lubrication shall be used for steam services.
9. All valves shall be arranged so that the plugs may be removed from the valve bodies from the bonnet side.
10. Each valve shall have an arrow permanently fixed on the valve body to indicate the correct direction of flow.
11. Each valve shall have a stainless steel name plate permanently fastened to the yoke which shall be visible when the valve is in service. The name plate shall include
 - a. Tag No. and Valve Serial No.
 - b. Body material, size and pressure rating
 - c. Trim material, size characteristics
 - d. Action on air failure
 - e. Spring range
 - f. Stem travel
 - g. Valve action, etc.

11.02.03

Valve Materials

1. Valve material shall be as specified in Supplier's approved Control Valve Specification sheets. The following table defines abbreviations used for valve materials:

S.No.	Abbreviations	Description
a	BR	Bronze ASTM B 61
b	CS	Carbon Steel Forged - ASTM A 105 Cast - ASTM A 216 Grade WCC
c	1- ¼ CR	1-1/4 % Chromium Alloy Steel Forged – ASTM A 182 Grade F11 Cast – ASTM A 217 Grade WC6
d	2- ¼ CR	2-1/4 % Chromium Alloy Steel Forged – ASTM A 182 Grade F22 Cast – ASTM A 217 Grade WC9
e	5 CR	5% Chromium Alloy Steel Forged – ASTM A 182 Grade



		F5 Cast – ASTM A 217 Grade C5
f.	SS	Stainless Steel AISI Type 316 ASTMA 351 Grade CF8M

3. Unless otherwise specified, all control valves shall have stems, guide bushings, plugs, seat rings, stem lock pins, stuffing box parts, and other trim, all made of stainless steel. Valve guide posts and bushings shall be stellite faced for valves where specified. Stellite faced guide posts and bushings shall be differential hardened. For applications involving high pressure drop as also for flashing and cavitation services, trim material shall be properly chosen to ensure required degree of hard facing (such as 17-4 PH SS) so as to avoid erosion.



4. Where stellite facing is not specified, hardened stainless steel shall be furnished for all surfaces subject to wear.
5. Manufacturer recommended materials for cage guided valves may be substituted for materials specified provided they satisfy the specified service conditions. Also where substitutions are made, the manufacturer shall guarantee performance of recommended materials to be equal to or better than the specified materials for conditions specified.

Bidder may offer valve with body and trim material better than the specified material and in such case, bidder shall furnish the comparisons of properties including cavitations resistance, corrosion resistance, temp. resistance, erosion resistance, hardness etc. of the offered material vis a vis specified material for owner approval.

11.02.04 **End Preparation**

1. Valve body ends shall be butt-welded type.
2. Flanged ends shall be of a pressure class equal or greater in pressure-temperature rating to the body design pressure and temperature indicated on the control valve. Unless otherwise specified, steel flanges shall be raised face type. Flanged ends for valves shall be in accordance with ANSI B 16.5.
3. Welded end for control valves where specified shall be socket-weld per ANSI B 16.11 for control valves of sizes 50 mm (2") and below and Butt welded connections per ANSI B16.25 for control valves 65 mm (2-1/2") and above. The end preparation for butt welded control valves shall be matched to the corresponding details for the piping on which the valve is installed.
4. All end preparations shall be as per Owners requirements indicated during Contract stage.

11.02.05 **Miscellaneous Parts**

1. Extension bonnets shall be used on all valves when the maximum temperature of the flowing fluid is greater than 275 deg. C or when specifically required in the control valve.
2. Stem travel indicators shall be provided on all valves.



11.03.00 VALVE OPERATIONS

- 11.03.01 All control valves shall be furnished with pneumatic spring opposed diaphragm, spring less diaphragm, or piston operators as specified herein.
- 11.03.02 The bidder shall be responsible for proper selection and sizing of valve operators in accordance with the pressure drop and maximum shut-off pressures.
- 11.03.03 Valve operators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance of stem force, at least 0.15 kg/sq. cm per linear millimeter of seating surface, shall be provided in the selection of the operator to assure tight seating unless otherwise specified. The operators shall be designed to produce the required stem force with supply air pressure of 3.5 kg/sq. cm maximum unless otherwise specified.
- 11.03.04 Diaphragms shall be moulded synthetic rubber and diaphragm housing shall be of pressed steel construction. Diaphragms shall not be fabricated of natural rubber.
- 11.03.05 Piston operators shall use cast pistons and cylinders with O-ring seals. Operators shall be supplied with name plates which indicate the diaphragm air pressure at full open and full closed positions. for single seated valves the pressures shall be listed for maximum differential and for zero differential across the valve.
- 11.03.06 Pistons and cylinders shall be cast aluminum. Piston rod and extension shall be chrome plated stainless steel. Cylinder seal bushings shall be brass and seal rings shall be nitrile. Yoke shall be cast iron.
- 11.03.07 Valve operators shall be capable of operating at 60 °C continuously.

11.04.00 CONTROL VALVE ACCESSORIES & DEVICES

The following accessory equipment shall be provided for control valves:

- 11.04.01 **Air Locks:** Air locks shall be designed to shut off the diaphragm loading air line if the supply air pressure to the associated pilot or Positioner fails. Air locks shall be of the automatic reset type and shall be furnished with alarms.
- 11.04.02 **Hand Wheels:** Hand Wheels shall be provided. Hand wheels shall be side mounted unless specified to be top mounted. However the mounting shall be as decided during engineering to offer maximum accessibility.
- 11.04.03 **Limit Switches:** Each control Valves shall be provided with limit switches for monitoring of end position in DDCMIS/DCS/PLC. Switches shall have not less than two normally open and two normally closed contacts in both open and close directions. Electrical rating of the limit switch contacts shall be 240V AC, 5 amp or 220V DC, 0.5 amp. Limit switches should be National Acme Co., or Honeywell micro switch type or Owner approved equal. The enclosures of the limit switches



shall be as per NEMA-4 Standard. Limit switches shall be constructed to withstand the temperatures encountered in the actual service. Explosion proof construction shall be furnished where required by applicable code or these specifications. Limit switches shall be factory mounted on the valves with provisions for adjusting the mounting. The Bidder shall stroke the valves to check limit switch operation prior to shipment.

Limit/micro switches can be offered as an integral part of Smart valve positioner.

- 11.04.04 **Smart Valve Positioner:** Control valve actuators for modulating and throttling services shall be provided with HART protocol based smart electro pneumatic valve Positioner to ensure accuracy & repeatability of response. The valve Positioner shall be designed suitable for vibration and service conditions of a steam electric power station.

The Positioner shall have the following features:

- a) Shall provide a pneumatic output signal of range 0.2 to 1.0 kg/cm² or as desired for the actuator.
- b) Shall have integral type position transmitter, input & output gauges, local keypad, display, 4-20 mA input and 4-20 mA output for position indication in DDCMIS/CCR/PLC.
- c) Shall be suitable for direct mounting on control valve assembly both for rotary & linear valves.
- d) Shall be capable of functioning under hot, humid & vibrating conditions.
- e) Shall have dust tight, corrosion resistant & weather proof IP 65 metal casing.
- f) Shall be operated at signal range of 4-20 mA for full travel of the valve. Split range operation in few case may be required. This facility shall also be available in positioner.
- g) Shall have in built mechanical position indicator.
- h) Shall have fail safe & fail freeze function as per loop process requirement.
- i) Shall have in built auto tune facility.

- 11.04.05 **Solenoid Valves:** Solenoid Valve will be provided for the following

- i. **ON / OFF Duty type Control Valve**
- ii. For over-riding the controller signal with Modulating type Control valves.
- iii. For control valve stay put position requirement on controller signal failure with Modulating type Control valves.
- iv. For construction and detailed specification of Solenoid valve, Chapter 3, Vol. V shall be referred by bidder.

- 11.04.06 **Diffusers :** Diffusers shall be provided as per service application requirements. The diffuser shall be designed to reduce the pressure drop across the control valve below the critical value and reduce the sound pressure level. Details of the diffusers shall be submitted.



- 11.04.07 **External Volume Chambers:** External volume chambers with adjustable bleed valves shall be provided for Control Valve. Volume chambers shall be furnished, mounted on the control valve yoke assembly.
- 11.04.08 **Position Transmitters:** Position transmitters shall be provided for control valves as a part of smart positioner. The signal shall be 4-20 mA DC range, 24 V DC. For non smart positioners applications and power cylinders, contact less position transmitter shall be provided by bidder.
- 11.04.09 **Tubing and Air Sets:** All pneumatic tubing required to interconnect devices assembled together shall be furnished complete with each control valve. The tubing shall be fully annealed soft temper copper tubing conforming to ASTM B68 to B75 (USA). Swage lock flare less tubing fittings shall be used for tubing connections (Swage lock or approved equal).
- Each device requiring an air supply shall be equipped with a combination filter-regulator. Devices mounted together on a valve yoke may be served by a single regulator, provided the supply pressure is satisfactory and the regulator capacity is not exceeded. Filter-regulators shall be mounted on the device served.
- Filter-regulators shall be suitable for a 10 kg/sq. cm maximum inlet pressure. Filter-regulators shall have built-in housing blow down valves and a 2 inch pressure gauge. The filter shall be of size not more than 5 microns and shall be made of sintered bronze.
- 11.04.10 **Pressure Switch**
- Pressure switch suitable for the above the pneumatic system shall be provided. The contact rating shall be 2 A for 240 AC, 2 A, 220 VDC 2 SPDT Contact. Enclosure IP 65.
- 11.04.11 **I/P Converter**
- For non smart positioners applications and power cylinders i/p converters shall be required and owner approval shall be obtained for the use of i/p converter for such applications.
- Electro-pneumatic, outdoor type, field mounted Linear. 4-20 MA DC input and 0.2 – 1.0 kg/Cm² output. Die cast aluminum casing with IP65 or equivalent enclosure class. Accuracy of $\pm 0.5\%$ of span or better and repeatability of $\pm 0.5\%$ of span or better will be provided. Easily accessible span and zero adjustment will be provided I/P converter shall be provided with all accessories and erection hardware. The I to P converters shall retain the pneumatic signal (last value) even in failure of control signal and shall have self volume boosters.
- 11.04.12 **Separate moisture separator unit** for ensuring dryness of air entering I/P as well as the power cylinder is to be supplied **with each control valve and control damper.**
- 11.05.00 **FOR FOLLOWING CRITICAL APPLICATION SPECIAL CONTROL VALVES ARE REQUIRED.:**



1. HP & LP Bypass Valves and Control System
2. BFP – Minimum Re-circulation Valve
3. Feed Water Control Valve
4. SH & RH spray Control Valves
5. APRDS System
6. Soot Blower control valve

11.05.01 **General Requirements for Critical Application Control Valves for -.**

- i) The valve accessories shall include hand wheels, limit switches, smart valve positioner (4-20mA DC type), electro pneumatic converter, Air lock relay, Solenoid valve and all other items required for the completeness and the accessories shall be explosion proof type as per hazardous area classification wherever applicable.
- ii) Control valves shall be furnished with IBR certification wherever required.
 1. **Noise:** The maximum allowable noise level shall be 85 dba or less at 1 m. distance from the downstream bare pipe surface. The specified noise level shall be attained without the use of orifices, mufflers, diffusers. No credit for thermal or acoustical insulations shall be taken.
 2. **Valve Trim:** Valve shall have quick change type trim utilizing top entry. No components shall be screwed or welded into the body. The valve shall have equal pressure distribution around the plug to avoid chattering / vibration.

Trim of severe/critical service valve shall be of multi stage & multi path design with sufficient no. of discrete pressure drop stage to eliminate the chance of erosion, cavitations, noise, vibration through out the control range of valve.
 3. **Leakage Class:** The valve shall have minimum class-V leakage for all steam applications including APRDS, HP/LP bypass spray control valves & Low Load feed water control valve.

In case of minimum boiler feed pump re-circulation applications, RH/SH spray control valves and HP/LP Bypass control valve application, the leakage class should be MSS-SP 61 (block valve leakage).
 4. **Actuator:** Actuator type should be pneumatic double acting piston/Hydraulic.

11.06.00 **Specific Requirements / Specifications for Different Valves:**

11. 06.01 Design Criteria for selection of Feed Water Control Valve :

The valve trim should be multi – stage, multi – path, multi – disk design having sufficient no.'s of discrete pressure reductions (turns / stages) to ensure elimination



of vibration, cavitations, erosion and noise effects. Pressure reduction / drop achieved by valve designs incorporating single or multistage orificed cage, diffusers are not acceptable. Bidder should work out no. of pressure drop turns in the trim of the valve and should provide calculations of trim exit velocity. Seat ring and trim fitment should not have any part screwed or welded. It should be easily replaceable type.

Flow vs. valve opening characteristic: The trim is to be so designed that the min. flow indicated in the bid specifications of the valve is achieved with min. lift of 20mm of valve plug from "Close" position. Subsequent characteristic should be "equal percentage" i.e. corresponding to the parabolic characteristics. Characterizing the cam of the positioner to minimise the required flow char is not acceptable.

Rangeability should be 50 to 1 (min.). Each pressure - reducing element should have a uniform pressure distribution around the plug to avoid mechanical vibrations (pressure equalizing rings / grooves). To prevent flow induced vibrations and the line trash damage to seat, the flow direction should be over the plug. During throttle opening of the control valve, flow should be diverted away from the body seat.

Required leakage should be better than ANSI – B - 16 – 104 Class – V with metal to metal seating. Soft seat is not acceptable. Requisite calculations in support of above leakage class to be submitted with the offer. The bidder should indicate how this will be achieved in their valves and actuators. Actuators should be pneumatic double acting piston type. Diaphragm type actuators are not acceptable.

The seating force on the valve seats to achieve the required leakage class (better than ANSI – B - 16 – 104 Class – V) should be about 180 kg / cm on seat ring. PI. indicates the closing force on the seat in Kgf / cm of seat circumference applied for actuator. Trim exit velocity should be less than 22.5 M / sec. Calculation sheet should be attached demonstrating satisfactory compliance of this requirement.

Noise level at 1 meter distance from the valve should be less than 85 dB without insulation, orifices, silencers, mufflers etc. Calculation sheet to be attached for each valve offered. Critical cavitation index (Kc) for all control valves should be 1 (one). This is specific requirement to avoid even remote possibility of cavitation damage to valve internals. Material of the valve internals should be as under:

Guide	:	400 series SS
Plug / Seat ring	:	400 series SS
Stem	:	17 – 4 PH

11.06.02 Control Valve Specifications For Turbine By Pass System

11.06.02.01 **Turbine Bypass Control System:** Standalone turbine bypass control system for each unit shall be provided. The control system shall include operator selectable manual or automatic modes with bump less transfer between modes. The turbine bypass system shall be included in the plant automation sequence for unit start-up and bypass operation.



Complete operational design for the control system, including logic, modulating controls, schematics and wiring shall be provided. The design shall integrate the operation of both the HP & LP bypass stations into a single coordinated operation. The bypass system shall be operationally tested to assure acceptable functional performance of the bypass control system.

Hardware, instrumentation, wiring interconnections and accessory devices necessary to be interfaced and will be implemented in the DDCMIS for control.

The turbine bypass system shall be utilized to warm up the boiler and main steam lines after an appropriate vacuum is established.

The HP/LP bypass system shall cut in operation automatically in case of (a) generator breaker opening, (b) Turbine trip (i.e.) ESV/CV close, and (c) sudden reduction in load.



11.06.05 **SPECIFICATION FOR APRDS System:****Brief System Description**

Auxiliary steam system is to be designed to provide steam for turbine auxiliaries, Boiler auxiliaries and fuel oil heating system during start-up, low loads and normal running of units.

The system comprises of one auxiliary steam stations capable of meeting 'High capacity' and 'Low capacity requirements' by a single system to meet auxiliary steam requirements during unit start-up, Low loads and for fuel oil system and during normal running. Spray water required for desuperheating will be tapped off from boiler feed pump discharge.

The above stations will reduce the pressure and temperature of the steam tapped off from main steam line. A suitable desuperheater should be considered for reducing the temperature.

Equipment To Be Provided by Bidder:

Combined high capacity and low capacity Auxiliary PRDS comprising of:

a) Control Valves and accessories:

- | | |
|-----------------------------|---|
| a) Pressure reducing valve: | Having multiturn, multistage, multipath radial trim valve as per specification. |
| b) Spray control station: | Dedicated to Desuper-heater. The spray water control station should have multiturn, multistage, and flow trim & the same should be a combination of pressure and temperature control valve and a high rangeability desuperheater. |

Each control valve shall be supplied with the accessories as specified in the approved data sheets.

Desuperheater:

1. Direct mixing type desuperheater :

The desuperheater shall be completed with spray nozzle along with necessary attachments.

Spares, Consumables and Special Tools and Tackles:

Commissioning spares and consumables:

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

Specific Technical Requirements for Control Valves, Actuators and Accessories:

Seat ring and trim fitment should not have any part screwed or welded. It should be easily replacable type.

The valve trim should be multistage, multipath design having sufficient numbers of discrete pressure reductions (turns/stages) to ensure elimination of vibration, cavitations, erosion and noise effects.

Pressure reduction/drop achieved by valve designs incorporating single or multistage orificed cage, diffusers are not acceptable.

Bidder should work out number of pressure drop turns in the trim of the valve and should provide calculations of trim exit velocity.

Flow Vs. valve opening characteristics: the trim is to be so designed that the minimum flow indicated in the bid specifications of the valve is achieved with minimum lift of 8mm. of valve plug from 'close' position. Subsequent characteristics should be 'Equal Percentage' i.e. corresponding to the parabolic characteristics. Characterising the cam of the positioner to mimic the required flow characteristics is not acceptable.

Rangeability should be 50 to 1(minimum). Valve should be able to throttle even below 5% opening without trim erosion.

Each pressure reducing element should have a uniform pressure distribution around the plug to avoid mechanical vibrations(pressure equalizing rings/ grooves).

To prevent flow induced vibrations and the line trace damage to seat, the flow direction should be over the plug for water and under the plug for steam.

During throttle opening of the control valve, flow should be diverted away from the body seat.

The valves shall have minimum ANSI B-16-104 class-V leakage class in metal to metal seating for all applications with minimum seating force of 125kgf per linear mm of seat ring circumference. Soft seat is not acceptable. Vendor shall confirm that the proposed valve shall maintain tight shutoff leakage class even after 3 years of field service.

The bidder should indicate how this will be achieved in their valves and actuators. Actuators should be pneumatic double acting piston type. Diaphragm type actuators are not acceptable.



Bidder to indicate the closing force on the seat in kgf/mm of seat circumference applied for actuator.

Trim exit velocity in both minimum and maximum flow conditions should be less than 30M/Sec. in case of water and 22.5M/sec in case of flashing water conditions. Calculation sheet should be attached demonstrating satisfactory compliance of this requirement.

Noise level at 1 meter distance from the valve should be less than 85dB without insulation, Orifices, silencers mufflers etc. Calculation sheet to be attached for each valve offered.

Critical cavitations index (Kc) for all control valves should be 1 (one). This is specific requirement to avoid even remote possibility of cavitational damage to valve internals.

To avoid problems associated with the piston rings provided in valves of balanced design, unbalanced design for port size upto 25mm. is required. Bidder to indicate the compliance clearly.

Material of the valve internals should be as under:

Guide	:	Inconel 718
Plug/stem	:	Inconel 718
Seat ring	:	SS 316 stellited

Valve actuators:

- i) Piston actuators shall be used for all valves.
- ii) Valve actuators shall be capable of operating at 70 Degree C ambient continuously.
- iii) Castings shall be of the type to suite individual area environments.
- iv) All fix connection size shall be 1/4" NPT (Female)
- v) Bidder shall guarantee that the size of the actuator is adequate to meet the operating thrust requirement for the control valve under extreme condition. Bidder shall indicate the stroking time of the valve assemblies with positioner.

Accessories:

Control valve actuators shall be equipped with air supply filter regulator, gauges and valve positioners alongwith boosters for typical applications wherever required, local poison indicator with scale and pointer, position transmitter, limit switch and hand wheel, air lock relay, solenoid valve etc.

Performance:

All control valves shall confirm to MSS-SP-61 leakage class.



11.07.00 TESTING AND COMMISSIONING:

11. 07.01 All valves shall be tested in accordance with the quality assurance programme agreed between the owner and the bidder as specified in chapter 14 which shall meet the requirements of IBR and other applicable codes mentioned in chapter 1 clause-1.09.00. The tests shall include but not be limited to the following.



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Valves for high pressure high temperature applications shall be subjected to 100% radiography examination test. Results shall be owner approved prior to dispatch. All castings and forging shall be visually inspected. The casting shall be radio graphically examined. Ultrasonic examination, liquid penetration examination, magnetic particle examination etc. as applicable shall be performed as per applicable standards and codes. The mechanical and chemical testing shall also Be performed in accordance with applicable ASTM material specification.

11.07.02 Non-destructive examinations shall be performed as required by ANSI B81.1 (Power Piping) and ANSI B16.34 (Steel Valves).

11. 07.03 Hydrostatic Test:

- ii) Valve shall be subjected to hydrostatic shell test in accordance with ANSI-B16.34 prior to seat leakage test. If the valves are reworked on the pressure parts for any reason after hydrostatic test, they must be retested.
- iii) Valves shall be hydrostatically tested in manufacturers works in accordance with code requirements. All hydrostatic testing and inspection shall be completed before any paint is applied to valve body. Certificates of inspection shall be executed in accordance with the latest codes and required codes shall be forwarded to the engineer.

All gaskets used for test shall be of the same material and design as specified for the finished product. Where mechanical gasket joints are broken following tests, new gaskets shall be furnished with the equipment, and the joints shall be retested.

11. 07.04 Leakage Test:

- i) Unless otherwise noted in the specification sheets, valve closure test and seat leakage tests shall be performed in accordance with ANSI B16.104, Leakage Class II/class IV as the case may be.
- ii) The leakage from packing shall be zero or bubble tight. For valve designs which are not covered by ANSI B16.104, the bidder shall submit the expected leakage rate with his proposal for review by Owner / Technical Specialist.
- iii) If valves are disassembled after the completion of the valve closure and seat leakage tests, these tests shall be repeated.

11. 07.05 Hysteresis Test :

The hysteresis test shall be run on completely assembled valves. The stuffing box shall be fully packed and made up hand tight. The allowable value of hysteresis specified by the bidder shall be achieved.

11.07.06 Tests for special class valves:

All valves supplied with the special class ratings per ANSI B16.34 "Steel Valves" (except flanged valves) shall be subject to the required examinations as per paragraph 8.3 of ANSI B16.34. the acceptance criteria shall be same as these given in Annexure B,C,D and E of ANSI B16.34 for the applicable examinations expect for the following.



Magnetic particle examination of castings, the linear indication shall not exceed 3/16 inch in length.

11.07.07 Functional Tests:

The fully assembled or completed valves including the operators control devices and accessories shall be functionally tested to demonstrate the operability of the valve and the operation. This may be done by cycling the valves 3 or 4 times from open to close position. The same controller can be used to test each valve. Control valve FI (Liquid pressure recovery factor) in operation test on completed valve (final inspection).



3.03.29 Instrument Air System

The instrument Air Supply System for various pneumatic Control & Instrumentation devices like pneumatic actuators, power cylinders, I/P converters, pneumatically operated valves etc. shall be complete in all respect with necessary Air Filter Regulators, valves, piping/tubing etc.. Each pneumatic instrument shall have an individual air shut off valve. The pressure-regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built in filter-housing blow down valve.

Filter shall be of minimum 5-micron size & sintered bronze material.

On collection of water in the drains of instrument air lines, mechanical automatic drains and periodically solenoid operated drains (with electronic timer - 15m, 30m, 60m and 2 Hours & Timing adjustable) are to be provided.

For mechanical type & Electrical type, the locations to be provided in the instrument air lines of boiler area, Chimney area, turbine area etc., shall be decided during detailed Engineering.

Bulk header nearby the crowded applications shall be provided and from this bulk header individual air lines with necessary isolation valves are laid to the application.

These bulk header are to be provided with **mechanical / electronic based automatic Drains.**

Individual moisture separator for O₂ analyzer or vital application shall be provided nearby the instrument so as to enhance the cell life or the performance of vital final control elements.

3.03.30 Air Filter Regulator (AFR)

Constant bleed type AFR with an accuracy of ± 1.0 % inlet pressure range of 5-8 kg/ cm² and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P converters and shut off valves for phosphor bronze filter element; Filtering particles above five microns. Weather and water proof enclosure. Material of accessories will be SS316.

Air filter regulators shall be provided in the :

- (a) Air supply line to valve positioners / power cylinders
- (b) Air supply line to electric to pneumatic converters.



- (c) Air supply line to pneumatic interlocked block valves.
- (d) For each instrument rack, field instruments enclosure for purging.

3.03.31 Electro-Pneumatic Convertors (E/P)

Two wire type E/P convertors with an accuracy of $\pm 0.25\%$ accepting 4-20 mA dc signals from control system and converting to 0.2 to 1 kg/cm² air pressure to operate valve positioner of all final control elements; Housed in cast aluminum casing (with polyurethane paint); NEMA 4 or equivalent degree of protection for enclosure. Material of accessories will be SS. E/P convertors shall have fail freeze (stay put) feature also. Process connection shall be 1/4" NPT (F) and Electrical connection shall be 1/2" NPT (F). Zero/span adjustment facility shall be provided. The E to P converters shall **retain the pneumatic signal (last value) even in failure of control signal** and shall have **self volume boosters**. Necessary air lock devices and pressure switches for air pressure low alarming shall be provided.

3.03.32 Solenoid Valves

Solenoid valves shall be provided with control valves / pneumatic control valves hooked up with process interlock requirements and where direct tripping is involved. The number of ways for solenoid valve shall be provided as indicated below:

- (a) Two (2) way solenoid valves shall be provided, where process line of less than 50 mm with low pressure and temperature application.
- (b) Three (3) way solenoid valve shall be provided commonly, where the pressure is admitted or exhausted from a diaphragm valve or single acting cylinder, e.g, Pneumatic operated spray water block valve.
- (c) Four (4) way solenoid valve shall be provided for operating double acting cylinders, e.g, Pneumatically operated on-off type dampers.
- (d) For operation of the fuel oil corner nozzle valves, fuel oil trip valves etc., **double coil solenoid valve** (latch coil & relatch coil) shall be adopted.
Single coil usage requires always power and loss of power leads to closure of above valves resulting the unit trip or loss of generation.
- (e) Solenoid Valve coils shall be Class-H high-temperature or Class-F construction as applicable and shall be designed for continuous duty. Three-way solenoid valves shall be designed for universal operation so that the supply air may be connected to any port. Solenoid enclosures shall be NEMA-4)/ (Explosion proof for NEC Class-1, Division 1 area)/ flame proof (IEC-79.1, Part I) As applicable). Body material of solenoid valve shall be Die Cast Aluminum or SS316.
- (f) All solenoid shall be with varister, LED indication, surge suppress diode and circuits.

3.03.33 Power Cylinders (Pneumatic)

Mounting Type	:	a) Fixed position mounting (End mounting).
	:	b) Trunnion mounting
Control Signal	:	0.2 to 1 Kg/Sq. cm. from I/P converter for modulating purposes. 24V/48VDC operated solenoid valve operating on pneumatic line.





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SPECIFICATION FOR APRDS

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1.0 SCOPE

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION (with Pneumatic Actuator) for use in Utility/Captive Power Station.
- 1.2 Expander/Reducer between valve body & pipe shall be in BHEL's scope of supply. However, any other expander/reducer required shall be in bidder's scope of supply.

2.0 CODES AND STANDARDS

- 2.1 As a minimum requirement, the latest revision/version of the following or equivalent standards shall be complied as a minimum requirement :-

Indian Boiler Regulation	:	IBR
ASME	:	B31.1/BPVC
Allowable Seat leakage	:	FCI-70.2
Pressure & Temperature ratings	:	ANSI-B16.34
Enclosure class	:	IEC-144 / NEMA / IS-13947
Control Valves Sizing	:	ISA S-75

3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-60°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 process operating conditions and system characteristics as specified in the Data Sheet-A.

- 3.1.1 The control valve shall be of globe/angle body design, as per datasheet, with single port. Valve trim shall be cage guided balanced type for valve sizes $\geq 3''$ and above. The valve trim shall be suitable for quick replacement without any cutting or welding. Anti-cavitation trims shall be provided for valves with cavitation service and hardened trims for flashing services.
- 3.1.2 Bidder to note that High Capacity PRDS is a combined type steam conditioning valve with single valve body design. Bidder to offer body and trim materials as per the datasheet-A. Wherever there is a deviation from the datasheets, bidder to furnish the documentary proof for confirming superior trim material/body material selection along with their offer. BHEL/ Customer reserves the right to accept/reject any variation in the specification.
- 3.1.3 Asbestos shall not be used for the packing or any other component.
- 3.1.4 The valve bonnet and packing shall be suitable for the service conditions as in Data Sheet-A. Gland sealed type bonnets are not acceptable. Bonnets having Teflon packing shall have valve stem finished to

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2-4 micro inches RMS. Packing material requiring lubrication will not be acceptable.

Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 or unless otherwise specified.

- 3.1.5 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection and ANSI B16.11 for socket weld connection. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10. The end connections shall be Socket Welded for sizes below 50NB and Butt Welded for sizes 50NB and above.
- 3.1.6 The valve seat leakage shall be as per FCI-70.2. The leakage class shall be as per Data Sheet-A.
- 3.1.7 The valve body shall have the direction of flow embossed on all valves.
- 3.1.8 The sizing shall conform to the requirements of ISA S75.01. Valve shall be capable of handling 120% of required maximum flow with meeting below mentioned requirements:
- | | | | | |
|--|---|---|---|--------------------|
| 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 | - | 1.2 times the CV calculated on the basis of maximum flow condition. | | |
- 3.1.9 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 & delivery implication.
- 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 | <= | 8 Meters/Sec. |
| ii) Steam service | <= | 150 Meters/Sec. |
- 3.1.11 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
- 3.1.12 The equivalent weighted sound level measured at 1.5 metre above floor level in elevation and 1 metre horizontally from the control valve expressed in decibels to a reference of 0.00 02 microbar shall not

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exceed 85 dBA (without pipe insulation). The offer shall include noise prediction calculations for each valve.

3.1.13 In case of predicted noise level above 85 dBA, same shall be brought down to acceptable noise level i.e. below 85dBA through Source treatment (proper valve trim & valve body selection). Path treatment (LNP/ Diffuser/ Cartridge/ Silencer etc.), if any shall be subject to Customer's/Owner's approval.

3.1.14 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 **ACTUATORS-** The control valves shall be operated with pneumatic actuator

3.2.1 **Pneumatic Actuator**

The actuator shall be designed for a thrust of 120% of valve's shut-off pressure at an air line supply pressure of 5-8 Kg/Sq. cm.

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, shut off pressure and valve travel.

The pneumatic spring opposed diaphragm actuator or piston actuator as the case may be 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 10 seconds or as specified in the datasheet under the most stringent service conditions.

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/ SS tube and flare less brass/ SS fittings etc. as per the hook up diagram (Refer drawing no. PES-145-06B).

3.3.1 **Handwheel**

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



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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 integral part of the smart positioner.

3.3.4 Air Filter Regulator

Instrument quality air at suitable pressure of 5 Kg /Cm²(g) to 8 Kg/Cm²(g) shall be supplied to each valve through air filter regulator. The filter regulator shall include an inbuilt blow-down valve (auto drain feature), 5 micron size filter. The bowl material for the AFR shall be sintered bronze. The Air filter regulator shall be selected to meet the requirements of positioner/actuator, E/P converter 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 stay put, 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 and valve body 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-65. Cable gland shall be provided for cable entry. The solenoid shall in general conform to IS-8935. The solenoid shall be provided with manual overriding facility. The solenoid shall be suitable for 24 V DC supply, unless specified otherwise in Data Sheet-A.

3.3.7 Limit Switch Assembly

Limit switch assembly 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-65. Each limit switch shall be supplied with cable glands.

3.3.8 I/P Converter

I/P Converter shall be integral part of the smart positioner.



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3.3.9 Smart positioner

Microprocessor based Electronic (Smart)Positioner

1	Electrical	a) Input Demand Signal	4-20 mA
		b) Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
		c) HART Protocol	Compatibility for Remote Calibration & Diagnostics (Superimposed HART signal on input Signal (4-20 mA))
		d. Valve position sensing	Position sensing, 4-20 mA output signal to be provided for control system.
2	Environment	a) Operating temp.	(-)30 To 80 Deg. C
		b) Humidity	0-95 %
		c) Protection class	IP-65 Minimum
3	Software for Configuration and Diagnostics	Software	Windows based software. Software shall meet the requirements for Configuration, Diagnostics, Calibration and Testing of the actuator. It shall be easily upgradable with some hardware and compatible with any HART management system/AMS. Valve positioning timing, actuator leakage, and valve wear and tear, fault alarm to be offered as a minimum.
		Diagnostic/Test features	Advanced diagnostic features like Stroke counter or Travel counter, Leakage in actuators, Valve Signature analysis, Step Response test, Valve friction /Jamming detection etc. to be provided.
4	Test reports/ Certificates	Factory Valve Signature Tests Reports (Pressure versus Valve travel and Travel versus I/P signal) are to be provided.	
		Test certificates as per manufacture standard/Relevant standard are to be submitted.	
5	Configuration/ Calibration	Remote & Local Calibration, Auto & Manual Calibration shall be possible.	
6	Operating Range	Full range/ Split range.	
7	Modes	Valve Action	Direct / Reverse Valve Action
		Flow Characterization	Possible to fit Valve Characteristic Curves- Linear , Equal percentage etc.
8	Fail Safe/Fail Freeze	Fail Safe/Fail Freeze feature is to be provided as per datasheet. (In case the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the	

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		same externally through solenoid valve Connected in the pneumatic circuit).	
9	Pneumatic	Air capacity	Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.
		Air pressure	To suit the air supply pressure/quality available.
		Process connection	1/4" NPT
10	Performance	characteristic deviation	<=0.5 % of span. (<0.75%)
		ambient temp effect	<=0.01 %/ deg c or better.
		dead band	adjustable to 0.1to 10%
		scan time	10ms
		resolution <=0.05	%
		sensitivity/linearity	0.3-0.4% of FS
		repeatability	0.32% of FS
		auto tune	yes
11	EMC & CE compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
12	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
		Pressure Gauge Block & Position Indicators.	For supply & output pressures, Air Filter Regulator, integral type position transmitter, in built mechanical position indicator and other accessories shall be provided on as required basis for making system complete.
		Electrical Cable Entry	1/2" NPT, side or bottom entry to avoid water ingress.
		Valves Mounting Assembly	For Sliding Stem/Rotary/Single acting/Double acting actuators on as required basis.

3.3.10 Junction Box

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-65.

3.4 **Painting** of the control valve assembly shall be as per the Painting Specification attached elsewhere in this technical specification. In the absence of specification for painting, vendor to submit their standard painting procedure for painting for BHEL's approval. Epoxy based paint (corrosion-resistant) to be provided for control valves for coastal environment.

3.5 **Sub-vendors** shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.

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4.0 TESTING AND INSPECTION

- 4.1 The testing and inspection of the equipment/items shall be in line with the approved QAP
- 4.2 The cost of all tests as per the approved QAP will be deemed to have been included in the bid.
- 4.3 In case, the bidder is supplying the valve from outside India, the third party inspection shall be arranged and considered by the bidder in their offer.

5.0 SPARES AND CONSUMABLES

5.1 Start-up/Commissioning Spares

The bidder shall supply all the start-up/commissioning spares as per the BOQ given in the technical specification.

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	SS Tubing (as applicable)	12 Meters of 1/4 " SS Tubing, with 1 set of Fittings for each CV

5.2 Mandatory Spares

The bidder shall supply all the mandatory spares as per the BOQ given in the technical specification.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents (4sets) along with the bid

- Compliance certificate as enclosed in Section II.
- Schedule of deviations if any.
- Sizing Calculations.
- General Assembly (GA) drawings indicating all important details for layout.
- Quality Plan duly signed & stamped.
- Relevant Catalogs with detailed technical information.
- Un-price schedule of prices & unit prices as per NIT.

6.2 The successful bidder shall furnish the following documents to BHEL during the contract stage viz. after the award of contract:



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6.2.1 2 sets of the following CONTROL VALVE DOCUMENTS for approval + 1 sets of CD/soft copy:

- a) All Sizing Calculations (CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.)
- b) General Assembly (GA) drawings indicating all important details (edge preparation details, dimensions, weight etc) for layout.
- c) Data sheet-B completely filled-up.
- d) Hook-up diagram of Control Valve with Actuator & Accessories.
- e) Quality Plan duly signed & stamped.
- f) Relevant Catalogs with detailed technical information.

6.3 Final documentation:

Final Documents / drawings to be furnished by the successful bidder shall be as follows:
12 sets with 5 CD-ROMS/Soft Copy of:-

- a) Category I & IV approved CONTROL VALVE DOCUMENTS
- b) Test certificates
- c) Operation & maintenance manuals for Control Valve, Actuator and all accessories

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. The Following Details are to be marked on the Packing Cases

- ✓ 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)





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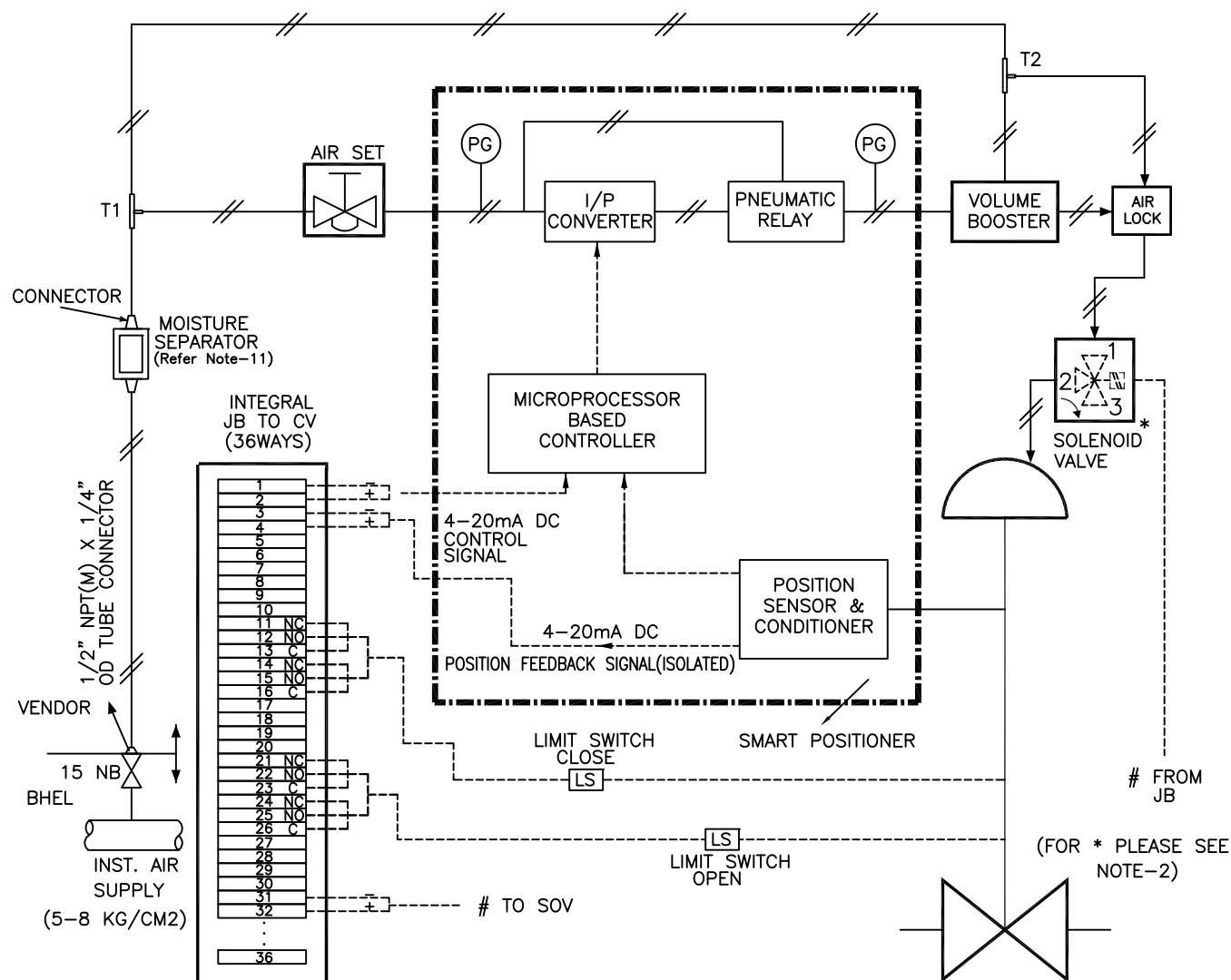
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Packing

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. Guidelines for packing are as follows:

- ✓ 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.

CONTROL VALVE HOOK-UP DIAGRAM (WITH SMART POSITIONER)



NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVE WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET.
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS 1/4" SS316 TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF SS316 FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE SS316 FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 SHALL BE PROVIDED.
11. SEPARATE MOISTURE SEPARATOR TO BE PROVIDED WITH EACH CONTROL VALVE. NECESSARY HARDWARE & SUITABLE CONNECTOR FOR MOUNTING THE MOISTURE SEPARATOR TO BE PROVIDED BY THE BIDDER.
12. ALL REQUIRED ACCESSORIES i.e. SOLENOID OR ANY OTHER HARDWARE REQUIRED TO ACHIEVE STAYPUT AT CONTROLLER SIGNAL FAILURE SHALL BE PROVIDED.
13. DI FOR FAULT SIGNAL OF THE SMART POSITIONER SHALL BE PROVIDED.
14. SS NAME PLATE SHALL BE FIXED ON THE CONTROL VALVE AND IT WILL HAVE ALL DETAILS LIKE KKS TAG NO. / SI. NO. / BODY MATERIAL SIZE / PRESS. RATING / TRIM MATERIAL / TRIM TYPE / ACTION ON AIR FAILURE / DIAPHRAGM AIR PRESSURE AT FULL OPEN AND CLOSED CONDITION



2 X 660 MW ENNORE STPP

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

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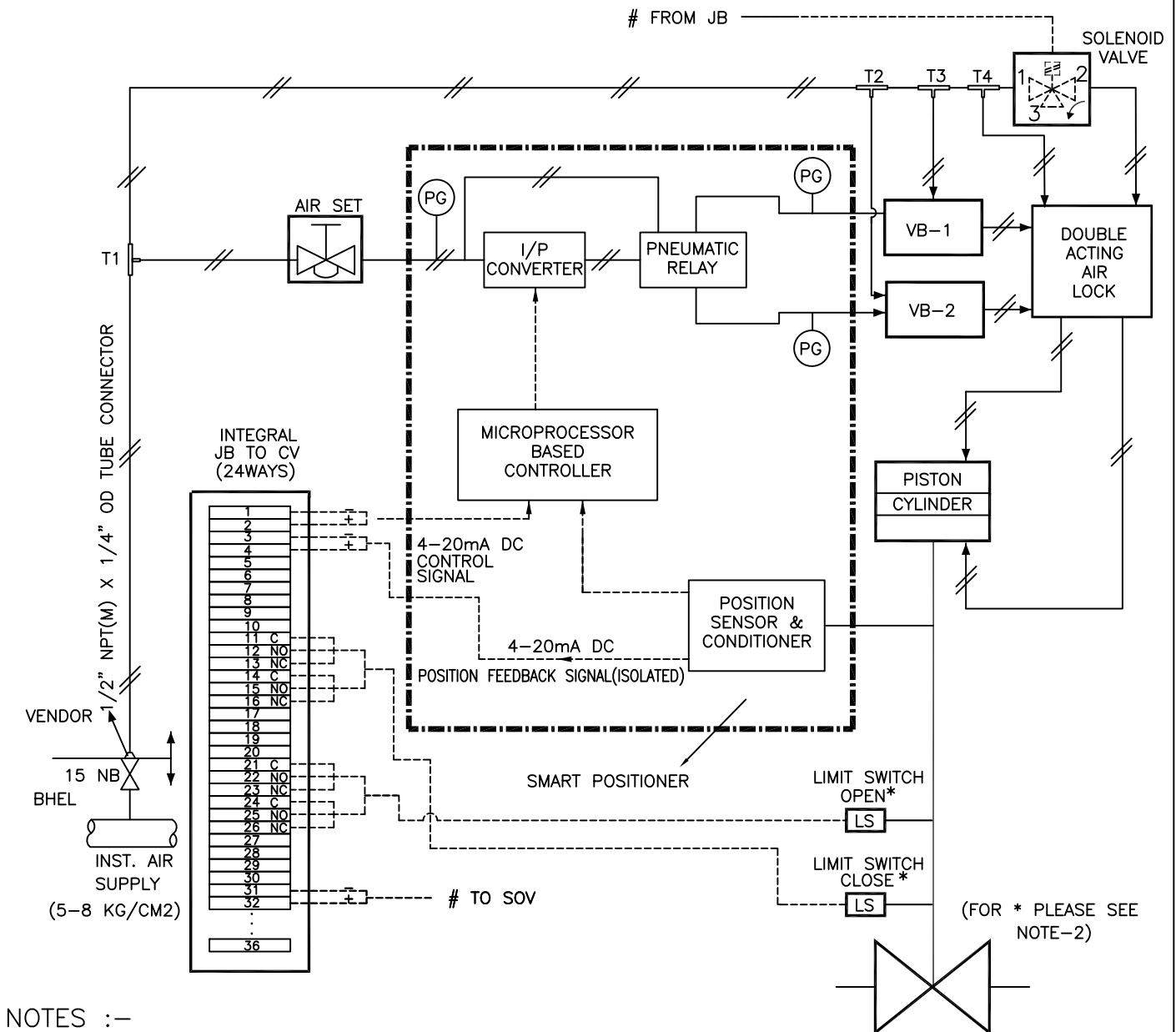
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STANDARD CONTROL VALVE HOOK-UP DIAGRAM (DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS 1/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 & TEE-T3 SHALL BE PROVIDED.



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010715  PEM :: C&I		QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-412-145-I 006				
								VOLUME				
								SECTION				
								REV. NO. 02		DATE: 01.07.15		
								SHEET 2		OF 8		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
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, 4	
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3/2 2		1,4	IBR Certification (if applicable) 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		1,4	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 T	est Certificate	3/2 ---		2,1, 4	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3 2		1,4	After Machining on machined surface only

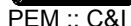
LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

RT- Radiographic Test PT – Dye penetrant Test
UT – Ultrasonic Test MT- Magnetic Test
NDT- Non Destructive Test

\$ P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

4 - TANGEDCO

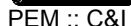


QUALITY PLAN NO.: PE-QP-412-145-I 006		
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
		5. Pressure test 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	1,4	For Body & Bonnet after machining
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1,4	
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1,4	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2		2,1,4	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1,4	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. Standard/ Approved drg. / data sheet	Appd Drg	Record	3	---	2,1,4	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Rele. Standards	Rele. Standards	Test Certificate	3	---	2,1,4	In case TC is not available, Actual test shall be conducted

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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 ^s			Remarks
									P	W	V	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3 ---		2,1,4	
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100% Mfr.	Standard/ Approved drg. / data sheet	Mfr. Standard/ Approved drg. / data sheet	Test Certificate	3 ---		2,1,4	
		2. Marking	MA	Visual	100%	Mfr. Standard/ Approved drg. / data sheet	Mfr. Standard/ Approved drg. / data sheet	Records 3		---	2,1,4	
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 ---		1,4	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100 %	Mfr. Standard/ Approved drg. / data sheet	Mfr. Standard/ Approved drg. / data sheet	Records 2		---	1,4	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard/ Approved drg. / data sheet	Mfr. Standard/ Approved drg. / data sheet	Records 2		---	1,4	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	----- Proper	Physical Contact	--- 2		---	---	
3.0	TESTS ON COMPLETED VALVE											
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard/ Approved drg. / data sheet	No Leakage	Test Certificate	2 1,4		1,4	Refer Note-4

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Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ANSI B 16.34	No Leakage	Test Certificate	2 1,4		1,4	Refer Note-4
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2 1,4		1,4	Refer Note-4
4.0 2.	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	4	1,4	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.
		9. FL factor	MA	Measurement	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	4	1,4	

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								VOLUME				
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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 ^s			Remarks
									P	W	V	
		10. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Report	2	1,4	1,4	On assembled valve Refer Note-4
		11. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Records 2		1,4	1,4	Refer Note-4
		12. Pre defined valve position in case of air failure	MA	Visual	100%	As per spec & Appd drg	As per spec & Appd drg	Test Certificate	2 1,4		1,4	
		13. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2 1,4		1,4	
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/ Approved drg. / data sheet	No leakage	Test Certificate	3/2 ---		1,4	Overall leakage including tubing
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard/ Approved drg. / data sheet	No leakage	Test Certificate	3/2 ---		1,4	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard/ Approved drg. / data sheet	No leakage	Test Certificate	3/2 ---		1,4	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard/ Approved drg. / data sheet	No leakage	Test Certificate	3/2 ---		1,4	

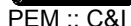
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet	Approved data sheet	Test Certificate	2 1,4		1,4	
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2 ---		2,1, 4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3 ---		2,1, 4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2 ---		1,4	
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2 ---		1,4	
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2 ---		2,1, 4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3 ---		2,1, 4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2 ---		1,4	
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2 ---		1,4	
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2 1,4		1,4	

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								VOLUME					
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Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks	
									P	W	V		
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/ Approved drg. / data sheet	Mfr. Standard/ Approved drg. / data sheet	Inspection Report	2 ---		---	Refer Note-3	

NOTES:

- CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory for each type & size of control valve.
- In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Sea worthy packing shall be provided, if applicable.
- The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
- IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
- Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests(Leak/Operation) shall be submitted to BHEL & TANGEDCO for verification and acceptance.
- Test certificates for following accessories to be provided to BHEL & TANGEDCO for verification:

S.No.	Accessories	Type of test
1	Air Filter Regulator	Calibration Test
		Accuracy Test
2.	Solenoid Valves	Hydro Test
		Seat Leakage Test
		Coil Insulation Test
3.	Junction Box	IP Class

- The fully assembled or completed valves including the operators control devices and accessories shall be functionally tested to demonstrate the operationability of the valve and the operation. This may be done by cycling the valves 3 or 4 times from open to close position.

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	TECHNICAL SPECIFICATION FOR AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION	SPEC. NO.: PE-TS-412-142-N101	
		SECTION II	
		REV. NO. 00	DATE 07.03.17
		SHEET 20	OF 24

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions with regard to same.
- b) There is no other deviations w.r.t. specification other than those furnished in the 'Schedule of Technical Deviation/ Clarification'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn. The acceptance of the deviations is not binding on BHEL/ Customer.
- c) Bidder shall submit stamped QP on compliance basis in the event of order based on the guidelines given in the specification. In case, the bidder is supplying the item from outside India, the third party inspection shall be arranged and considered by the bidder in their offer.
- d) Any drawing/ document/ data-sheet/ calculation/ Quality plan/ Instrumentation etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) Bidder to confirm that any calculation/format required during the contract (in the event of order) to ascertain any calculated/selected value shall be furnished.
- g) Selection of valves and actuators are bidder's responsibility. Any change in selection of type of valve / sizing / percentage opening, calculations, Q P, etc., if desired by BHEL / customer during approval of the documents after award of contract, without major changes in process parameters as per tender specification, shall be carried out by bidder without any commercial implication and time delay.
- h) All sub - vendors shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.

	TECHNICAL SPECIFICATION FOR AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION		SPEC. NO.: PE-TS-412-142-N101			
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Tag No..... Quantity.....			Data Sheet No. PES-145-06-DS2-1			
DATA SHEET-B						
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 CV					
	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)					
	VACUUM SERVICE					
	ANTI CAVITATION TRIM					
	PNEUMATIC ACTUATOR	MODEL NO. & SIZE				
CLOSE AT : OPEN AT (Kg / Cm ² g)						
*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN						
*VALVE POSN. ON SIGNAL AIR FAILURE						
*VALVE POSN. ON SUPPLY AIR FAILURE						
ACCESSORIES	POSITIONER					
	AIR FILTER REGULATOR					
	AIR LOCK RELAY					
	POSITION LIMIT SWITCH					
	POSITION TRANSMITTER					
	SOLENOID VALVE					
	E / P CONVERTER					
	JUNCTION BOX					
	HAND WHEEL (SIDE MOUNTED)					
	LOCAL POSITION INDICATOR					
	ELECTRO PNEUMATIC POSITIONER					

	TECHNICAL SPECIFICATION FOR AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION				SPEC. NO.: PE-TS-412-142-N101				
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Tag No..... Quantity..... Data Sheet No. PES-145-06-DS2-1									
DATA SHEET-B									
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)									
PERFORMANCE OF VALVE	HYTERSIS								
	LINEARITY								
	SENSITIVITY								
	ACCURACY (Overall)								
SERVICE CONDITION*	SL.+ NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM ² (A)	OUTLET PR. (KG/CM ² (A)	TEMP DEG. C	CALCULA TED 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.									
SEA WORTHY PACKING									

	TECHNICAL SPECIFICATION FOR AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION		SPEC. NO.: PE-TS-412-142-N101	
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Tag No.....		Quantity.....		Data Sheet No. PES-145-06-DS2-1	
DATA SHEET-B					
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)					
POSITIONER	MFR. & MODEL NUMBER				
	BYPASS	GAUGES	ENCL. CLASS		
	INPUT SIGNAL (Kg / Cm ²)				
	OUTPUT SIGNAL (Kg / Cm ²)				
AIR FILTER REGULATOR	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm ² g)				
	OUTPUT PRESS (Kg / Cm ² g)				
	OUTPUT GAUGE				
	FILTER SIZE				
AIR LOCK	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm ²)				
	SUPPLY PRESS (Kg / Cm ²)				
	RESET TYPE				
	VENT PLUG				
LIMIT SWITCH	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn		
	CONTACT TYPE				
	RATING (AC / DC)				
	ENCLOSURE CLASS				
POSITION TRANSMITTER	MFR. & MODEL NUMBER				
	TYPE				
	SUPPLY				
	OUTPUT RATING				
	ACCURACY				
	ENCLOSURE CLASS				
SOLENOID VALVE	MFR. & MODEL NUMBER				
	RATING				
	OPERATION QU	ANTITY			
	COIL INSULATION CLASS				
	ENCLOSURE CLASS				
HANDWHEEL	ORIENTATION				
JUNCTION BOX	NO. OF WAYS				
	SIZE				
	CABLE GLANDS (Size / Quantity)				
	ENCLOSURE CLASS				
	BODY MATERIAL				
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY			
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERESIS				
Cu. Tubing & Fittings / per CV	25 Meters of ¼" PVC coated Cu. Tubing, with 1 set of Fittings for connection to IA Header on one end and accessories on another end of CV				
PAINTING	COLOUR/SHADE				
	THICKNESS (DFT)				
	TYPE				
				COMPANY SEAL	
				NAME	
				SIGNATURE	
				DATE	



**TECHNICAL SPECIFICATION FOR
AUXILIARY STEAM PRESSURE REDUCING &
DESUPERHEATING STATION**

SPEC. NO.: PE-TS-412-142-N101

SECTION II

REV. NO. 00

DATE 07.03.17

SHEET 24 OF 24

SCHEDULE OF TECHNICAL DEVIATION/ CLARIFICATION

S. No.	Document Ref/ Title / Section	Page No.	Clause No.	Description	Deviation/ Clarification