

ALL DIMENSIONS ARE IN MM


FIRST ANGLE PROJECTION

RAGHUNATHPUR TPP (2X 660 MW)


TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH ACCESSORIES (Pneumatically operated)

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JOB NO. 390	TITLE TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH ACCESSORIES (Pneumatically operated)	DOC. NO. PE-TS-390-145-I 106 NO OF SHEETS																			
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT CODE 1	<table><tr><td></td><td>NAME</td><td>SIGN</td><td>DATE</td></tr><tr><td>DESN</td><td>RM</td><td></td><td>20.05.13</td></tr><tr><td>CHD</td><td>RKR</td><td></td><td>20.05.13</td></tr><tr><td>APPD</td><td>MAM/AK</td><td></td><td>20.05.13</td></tr></table>		NAME	SIGN	DATE	DESN	RM		20.05.13	CHD	RKR		20.05.13	APPD	MAM/AK		20.05.13		
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Maxhar Wahab
26.07.13

	<p style="text-align: center; color: magenta; font-weight: bold;">PREAMBLE</p>	SPECIFICATION NO. PE-SS-999-100-Q-001
		VOLUME
		SECTION
		REV. NO. DATE
		SHEET 1 OF 1
<p>1.0 The tender document contains three (3) volume s. The bidder shall meet the requirements of all the three volumes.</p> <p>1.1 <u>Volume-I (CONDITIONS OF CONTRACT)</u></p> <p>This consists of four parts as below :-</p> <p>Volume-IA : This part contains instructions to bidders for making bids to BHEL.</p> <p>Volume-IB : This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.</p> <p>Volume-IC : This part contains special conditions of contract.</p> <p>Volume-ID : This part contains commercial conditions for erection & commissioning site work, as applicable.</p> <p>1.2 <u>Volume-II TECHNICAL SPECIFICATIONS</u></p> <p>Technical requirements are stipulated in Volume-II which comprises of :-</p> <p>Volume-IIA : General Technical Conditions</p> <p>Volume-IIB : Technical Specification including Drawings, if any.</p> <p>1.2.1 <u>Volume-IIB</u></p> <p>This volume is sub-divided into following sections :-</p> <p>Section-A : This section outlines the scope of enquiry.</p> <p>Section-B : This section provides "Project Information".</p> <p>Section-C : This section indicates technical requirements specific to the contract, not covered in Section-D.</p> <p>Section-D : This section comprises of technical specifications of equipments complete with data sheet A, B and C.</p> <p style="padding-left: 40px;"><u>Data Sheet - A</u> specifies data and other requirements pertaining to the Equipment.</p> <p style="padding-left: 40px;"><u>Data Sheet - B</u> Specifies data to be filled by the bidder (Data Sheet-B is contained in Volume-III).</p> <p style="padding-left: 40px;"><u>Data Sheet - C</u> Indicates data/documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).</p> <p>1.2.2 <u>Volume-III TECHNICAL SCHEDULES</u></p> <p>This volume contains technical schedules and Data Sheets-B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No. PE-SS-999-100-Q-002 in Volume-III.</p> <p>2.0 The requirements mentioned in Section-C / Data Sheets- A of section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-D.</p>		

**DAMODAR VALLEY CORPORATION
2 X 660MW RAGHUNATHPUR**

**TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)**

VOLUME II-B & III

SPECIFICATION No: PE-TS-390-145-I 106



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

**DAMODAR VALLEY CORPORATION
2 X 660MW RAGHUNATHPUR**

(FOR ONE UNIT)

**TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)**

VOLUME II-B

SPECIFICATION No: PE-TS-390-145-I 106



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



2 X 660 MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-3 -145-I106

VOLUME II B

SECTION

REV. NO.

00

DATE :

SHEET

01

OF

01

CONTENTS

VOL-II B

SECTION	TITLE	NO. OF SHEET(S)
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B	Project Information	3
C	- Specific Technical Requirements	8
	- Typical Hook-up Diagram for Control valve	1
D -	Specification for Control Valves	
	- Equipment specification (PES-145-06)	11+3
	- Data sheets A & B for Control Valves	58
	- Data sheets A & B for Control Valve Accessories	2
	- Data sheets C for Control Valves	4
	- Quality Plan for Control Valves	5
	- Bill of Quantity	1
	- Spares	1


2 X 660 MW RAGHUNATHPUR
**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**
SPEC NO.: **PE-TS-3 -145-I106**

VOLUME II B

SECTION

REV. NO. 00

DATE :

SHEET 01 OF 01

VOL- III

1.	SCHEDULE OF DRAWINGS, DATA SHEETS, DOCUMENTS, CATALOGUES SUBMITTED WITH THE BID.	1
2.	SCHEDULE OF PRICES	1
3.	SCHEDULE OF UNIT PRICES	2
4.	INSPECTION SCHEDULE	1
5.	DEVIATION SCHEDULE	1
6.	SCHEDULE OF SUBMISSION OF DRAWINGS/ DOCUMENTS, EQUIPMENT MANUFACTURE, INSPECTION AND DISPATCH	1
7.	CV TEST CHARGES	1

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION A

REV. NO. 00

DATE : 14.05.2013

SHEET OF

SECTION – A
SCOPE OF ENQUIRY



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

2 X 660MW RAGHUNATHPUR

SPEC NO.: **PE-TS-390-145-I 106**

VOLUME II B

SECTION A

REV. NO. 00 DATE : 14.05.2013

SHEET OF

SCOPE OF ENQUIRY

1.0 SCOPE

- .1 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Control Valves with Pneumatic Actuator along with Accessories, Start-up/Commissioning and Mandatory Spares as mentioned in different sections of this specification for **2X660MW RAGHUNATHPUR TPP**.
- .2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder.
- .3 The enquiry shall be operated in "**COMPLAINT MOD E**" means bidder to comply with the requirement of specification, quality plan, delivery schedule, quantities, start-up/commissioning spares, recommended spares etc, and as a token of acceptance of the same, following formats to be signed, stamped with company seal and submitted for the project.
 - a) Compliance certificate
 - b) Quality plan
 - c) Schedule of price, unit prices, inspection schedule
 - d) Schedule of submission of drawings / documents, equipment manufacture inspection and dispatch
- .4 **No separate technical offer, data sheets to be submitted with the bid. Any such document shall not be taken cognizance of, and document (Compliance certificate) at 3 above shall be final and binding. Data sheets shall be furnished by the successful bidder (vendor), only after the award of contract & shall be subject to Purchaser's Approval.**
- .5 **Bidder to note that CV test is required to be conducted in line with approved Quality Plan on one type per size, CV value. Bidder to group such valves and indicates the same along with the price bid. Unpriced portion to be submitted to engineering.**

2.0 GENERAL TECHNICAL INSTRUCTIONS

- 1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.
- 2 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.
- 3 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 them.
- 4 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.

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION B


REV. NO. 00

DATE :14.05.2013


SHEET OF


SECTION – B


PROJECT INFORMATION

CLAUSE NO.	PROJECT SYNOPSIS			
1.00.00	BACKGROUND			
	Details of proposed Stage / Units			
1.01.00	Project name : RAGHUNATHPUR Thermal Power Project Stage-II			
	No. of existing Units x Stage-I 2 X 600 MW under Erection capacity :			
	No. of Proposed Units x Stage-II 2x660 MW capacity :			
	Project setting up by : Damodar Valley Corporation			
	Location and Approach			
	Location	:	Raghunathpur sub-division of Purulia District, West Bengal.	
	Latitude and longitude	:	23° 37' 20" N, 86° 39' 50" E	
	Nearest Town	:	Raghunathpur – 7 Km	
	District Head Quarters	:	Purulia – 38 Km	
	Approach Road	:	Neamatpur-Purulia State Highway– 7 Km	
Nearest Railhead	:	Sanka R.S. on Adra-Bhajudih Broad Gauge line of S.E. Railway – 11 Km.		
Perennial Source of Cooling and Consumptive Water	:	Damodar River – 2 Km crow flight distance form the proposed plot.		
Source of Coal	:	Mine blocks in Jharkhand and Ranigunge coalfields of ECL.		
Route Distance	:	60 Km from the site.		
Distance of receiving S/S from TPS	:	Maithon Right Bank 400 kV sub-station – 36 Km and Ranchi 400 kV sub-station – 165 Km.		
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A		PROJECT SYNOPSIS
				PAGE 1 OF 10


CLAUSE NO.	<div data-bbox="727 128 1003 155" data-label="Section-Header">PROJECT SYNOPSIS</div> <div data-bbox="1341 113 1455 170" data-label="Image"> </div>		
	NATURE OF LAND		
	Level	:	Within 20 m contour variation. This plot is above highest flood level of the area.
	Soil	:	Fallow, moorum covered plot with alluvial soil underneath followed by rocky substrata.
	Land Use	:	Fallow, unused.
	Crops	:	Rainfed single-crop cultivation only on 10-15% of the area.
	Irrigation	:	None.
1.02.00	<p data-bbox="423 783 1062 810">Vicinity Plan of the project is placed at Exhibit No.-1.</p> <p data-bbox="423 852 493 879">Land</p> <p data-bbox="423 926 537 947">-----</p>		
1.03.00	<p data-bbox="423 993 505 1020">Water</p> <p data-bbox="423 1062 1240 1125">Water Requirement - 6500 M³ / Hr. (without ash water recovery) - 4938 M³/Hr (with ash water recovery)</p> <p data-bbox="423 1167 1117 1194">Water allocation of 112.28 Cusecs from DVC is available</p> <p data-bbox="423 1236 745 1264">Requirement / Availability</p> <p data-bbox="423 1306 1175 1333">Stage-I (2X600 MW): 48.41 Cusecs (with ash water recovery)</p> <p data-bbox="423 1375 1053 1402">Stage-II (2X660MW): 112.28-48.41 = 63.87 Cusecs</p>		
1.04.00	<p data-bbox="423 1455 623 1482">Railway Siding</p> <p data-bbox="423 1524 1459 1614">Rail link to the site for transportation of equipment during construction shall not be available. Bidder has to make alternate arrangement for transporation of equipment in their scope.</p>		
1.05.00	<p data-bbox="423 1661 656 1688">Metrological Data</p> <p data-bbox="423 1730 1227 1757">Data of RAGHUNATHPUR is enclosed as Annexure Annexure-I.</p>		
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 2 OF 10

CLAUSE NO.	PROJECT SYNOPSIS			
1.06.00	Plant Water Scheme The Plant water scheme is elaborated in the tender Drg. No. 0000-102-POM-A-041 enclosed as part of this tender.			
1.06.01	Condenser Cooling (CW) Water System It is proposed to provide recirculating type CW system with cooling towers. For the recirculating type CW system it is proposed to supply clarified water as make up. Raw water from the make-up water pump house shall be pumped to a Water Pretreatment Plant. The treated clarified water shall be led to the cold water channel of CW system. CW system shall be operated at a C.O.C of about 4 . The expected circulating water analysis is given in this sub-section. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with CW pump, condenser and cooling towers, steel pipes would be used. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.			
1.06.02	Equipment Cooling Water (ECW) System (Unit Auxiliaries) The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.			
1.06.03	Station Auxiliaries Cooling Water System The station auxiliaries such as Air compressors, Compressors of ash handling plant, Cooling water circuit of Air Conditioning system, compressor of mill reject system etc. shall be cooled by separate cooling water System using separate set of pumps and cooling towers.			
1.06.04	Ash Water System Necessary LP & HP water pumps, flushing water pumps & seal water pumps for slurry disposal pump gland sealing are provided			
1.06.05	Other Miscellaneous Water Systems a) CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, makeup to the			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 3 OF 10	

CLAUSE NO.	PROJECT SYNOPSIS			
	<p>Ventilation system, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal.</p> <p>b) Separate water Pre-treatment plants are proposed for Circulating Water (PT-CW) system, Demineralization Plant (PT-DM) plant and potable (PT-Pot) water systems.</p> <p>c) The drinking water requirement of the plant and colony shall be provided from the above mentioned Water (PT-Pot) pretreatment plant.</p> <p>d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Dematerializing plant.</p> <p>e) The quality of cooling water & DM water is given in this sub-section.</p>			
1.07.00	<p>Criteria for Earthquake Resistant Design of Structures and Equipment</p> <p>All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed as per the criteria specified in sub-section-D1 of Section-VI (Part-A).</p>			
1.08.00	<p>Criteria for Wind Resistant Design of Structures and Equipment</p> <p>All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed as per the criteria specified in sub-section-D1 of Section-VI (Part-A).</p>			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 4 OF 10	

CLAUSE NO.	PROJECT SYNOPSIS			
	DESIGN RAW WATER ANALYSIS			
	CONSTITUTUENTS	As	CONTENTS	
	Calcium	CaCO ₃	95.0 ppm	
	Magnesium	CaCO ₃	58.0 ppm	
	Sodium & Potassium	CaCO ₃	68.0 ppm	
	TOTAL CATIONS	CaCO ₃	221.0 ppm	
	(except iron in solution)			
	Bicarbonate	CaCO ₃	115.0 ppm	
	Carbonate	CaCO ₃	-- ppm	
	Sulphate	CaCO ₃	80.0 ppm	
	Chloride	CaCO ₃	26.0 ppm	
	Nitrate	CaCO ₃	-- ppm	
	Phosphate	CaCO ₃	-- ppm	
	TOTAL ANIONS	CaCO ₃	221.0 ppm	
	Silica	SiO ₂	13.5 ppm	
	pH value at 25 ⁰ C		8.1	
	Total Suspended Solids		1000 ppm (maximum)	
	Turbidity		1000 NTU (maximum)	
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 5 OF 10

CLAUSE NO.	PROJECT SYNOPSIS		<div>एनटीपीसी NTPC</div>																																																			
	DESIGN CLARIFIED WATER ANALYSIS																																																					
	<table><tr><th>CONSTITUTUENTS</th><th>As</th><th>CONTENTS</th></tr><tr><td>Calcium</td><td>CaCO₃</td><td>116.5 ppm</td></tr><tr><td>Magnesium</td><td>CaCO₃</td><td>58.0 ppm</td></tr><tr><td>Sodium & Potassium</td><td>CaCO₃</td><td>68.0 ppm</td></tr><tr><td>TOTAL CATIONS</td><td>CaCO₃</td><td>242.0 ppm</td></tr><tr><td>(except iron in solution)</td><td></td><td></td></tr><tr><td>Bicarbonate</td><td>CaCO₃</td><td>93.5 ppm</td></tr><tr><td>Carbonate</td><td>CaCO₃</td><td>ppm</td></tr><tr><td>Sulphate</td><td>CaCO₃</td><td>116.0 ppm</td></tr><tr><td>Chloride</td><td>CaCO₃</td><td>33.0 ppm</td></tr><tr><td>Nitrate</td><td>CaCO₃</td><td>Ppm</td></tr><tr><td>Phosphate</td><td>CaCO₃</td><td>ppm</td></tr><tr><td>TOTAL ANIONS</td><td>CaCO₃</td><td>242.5 PPM</td></tr><tr><td>Silica</td><td>SiO₂</td><td>13.5 ppm</td></tr><tr><td>pH value at 25⁰C</td><td></td><td>7.5 – 8.0</td></tr><tr><td>Turbidity</td><td></td><td>15 NTU(maximum)</td></tr><tr><td>Residual Chlorine</td><td>Cl₂</td><td>0.5 ppm</td></tr></table>	CONSTITUTUENTS	As	CONTENTS	Calcium	CaCO ₃	116.5 ppm	Magnesium	CaCO ₃	58.0 ppm	Sodium & Potassium	CaCO ₃	68.0 ppm	TOTAL CATIONS	CaCO ₃	242.0 ppm	(except iron in solution)			Bicarbonate	CaCO ₃	93.5 ppm	Carbonate	CaCO ₃	ppm	Sulphate	CaCO ₃	116.0 ppm	Chloride	CaCO ₃	33.0 ppm	Nitrate	CaCO ₃	Ppm	Phosphate	CaCO ₃	ppm	TOTAL ANIONS	CaCO ₃	242.5 PPM	Silica	SiO ₂	13.5 ppm	pH value at 25 ⁰ C		7.5 – 8.0	Turbidity		15 NTU(maximum)	Residual Chlorine	Cl ₂	0.5 ppm		
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	Note: the above figures have been arrived with due consideration of injection of 80 ppm alum, 20 ppm lime and 5 ppm chlorine in raw water.																																																					
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 6 OF 10																																																			

CLAUSE NO.	PROJECT SYNOPSIS				
	ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER				
	Sl.No.	Characteristics	Value		
	1.	Silica (Max.)	0.02 ppm as SiO ₂		
	2.	Iron as Fe	Nil		
	3.	Total hardness	Nil		
	4.	pH value	6.8 -7.2		
5.	Conductivity the effects of free CO ₂	Not more than 0.1 excluding			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A		PROJECT SYNOPSIS	PAGE 7 OF 10

CLAUSE NO.	PROJECT SYNOPSIS			<div>एनटीपीसी NTPC</div>
	EXHIBIT NO. -1			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 8 OF 10	

DAVCO
DAMODAR VALLEY CORPORATION

DAMODAR VALLEY CORPORATION

STATION : Purulia LAT: 23 20 N LONG: 86 25 E HT. ABOVE M.S.L. 255 METERS
DATA 1951 TO 1980

Detailed Project Report
for 2x500 (+20%) MW Coal Based TPS at Rajmahalpur

Annexure - 4.1
Sheet 1 of 2

CLIMATOLOGICAL TABLE OF PURULIA

MN	SLP	Mean Temperature							Extremes			Cloud			Rainfall							
		DS	WS	MAX	MIN	HIGH	LOW	MAX	DT	MIN	DT	RH	VP	TOT LOW	TOT RAINY	WET	DRY	HEAVY	DAY	WS		
1	988.5	16.4	12.8	25.3	12.4	29.3	8.7	33.4	01	5.9	17	64.11	1.7	1.3	12.9	1.2	50.8	0.0	34.8	04	3.1	
	984.9	22.5	16.2						1977	1962	50	13.5	2.0	1.3		1971		1966				
2	986.4	19.3	14.4	28.5	15.2	33.7	10.6	37.3	22	7.2	08	57	12.5	1.4	1.0	19.3	1.8	75.6	0.0	62.2	02	3.9
	982.4	26.3	17.6						1967	1956	40	13.1	1.9	1.5		1979		1979				
3	983.8	24.8	17.7	34.0	19.8	36.7	15.4	41.7	31	12.5	10	48	14.7	1.7	1.0	21.6	2.1	67.9	0.0	35.6	26	4.5
	979.4	31.6	20.0						1955	1979	32	14.3	2.4	1.6		1956		1977				
4	980.2	29.9	21.3	38.5	24.5	42.5	19.5	44.3	30	13.5	02	46	18.5	1.9	1.1	32.8	2.5	99.0	0.5	60.0	25	5.6
	975.5	35.5	22.2						1980	1965	31	16.3	3.2	2.2		1971		1976				
5	976.0	31.4	24.4	39.6	26.5	44.1	21.6	46.3	20	17.9	08	58	24.9	2.5	1.2	47.9	3.5	162.0	4.3	50.8	31	6.7
	971.7	36.0	24.3						1972	1977	39	21.1	4.3	2.7		1977		1957				
6	972.3	29.8	25.5	36.2	26.2	42.3	22.5	46.2	10	19.2	18	71	29.2	5.5	3.4	190.4	10.0	378.0	75.1	122.8	26	6.7
	969.0	31.8	25.6						1966	1980	63	27.8	6.6	4.8		1968		1958				
7	972.3	27.6	25.4	32.1	25.1	35.6	22.5	38.9	05	17.8	14	83	30.7	6.7	5.2	284.3	16.4	502.7	106.3	148.3	06	6.0
	969.5	29.0	25.8						1966	1953	78	30.7	7.1	5.3		1952		1972				
8	973.5	27.3	25.3	31.5	24.8	34.5	22.6	37.8	03	17.2	27	85	30.7	6.7	5.5	315.4	15.9	520.0	200.5	150.8	28	5.4
	970.4	28.7	25.8						1972	1953	79	30.8	7.2	5.5		1967		1955				
9	977.4	27.2	25.0	31.6	24.4	34.3	22.3	36.1	07	17.2	10	83	29.9	5.4	4.2	280.9	12.7	773.6	52.4	181.6	15	4.9
	974.2	28.4	25.3						1955	1953	78	29.8	6.5	4.9		1978		1968				
10	983.1	25.5	22.4	31.1	21.9	33.9	18.3	39.4	01	15.8	24	76	24.7	3.0	2.3	89.6	4.9	233.1	3.2	116.8	19	3.5
	979.8	27.9	23.4						1974	1964	67	24.9	3.8	2.6		1973		1979				
11	987.0	21.4	17.5	28.6	17.0	31.3	13.6	34.6	23	10.9	27	66	16.9	1.6	1.0	12.6	1.0	78.5	0.0	55.4	08	2.9
	983.6	24.9	19.3						1979	1967	57	18.0	2.0	1.2		1955		1955				
12	989.9	17.3	13.7	25.6	12.9	28.8	9.6	33.3	01	5.7	26	64	12.8	1.4	0.7	3.2	0.4	19.0	0.0	14.8	03	2.8
	985.3	22.0	16.4						1955	1961	54	14.3	1.6	0.8		1978		1978				
YR	980.8	24.8	20.5	31.9	20.9	44.5	8.4	46.3		5.7		67	21.5	3.3	2.3	1347.1	72.4	2138.8	927.6	181.6		4.7
LY	977.1	28.7	21.8									56	21.2	4.1	2.9		1978		1957			
YRS	30	30	30	30	30	30	30	31		31		30	30	30	24	30	30	31	31	31	31	10
	30	30	30									30	30	30	24							

* Occurred More Than Once

<p align="center">RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660MW) STEAM TURBINE & GENERATOR PACKAGE</p>	<p align="center">TECHNICAL SPECIFICATION SECTION-VI PART-A</p>	<p align="center">PROJECT SYNOPSIS</p>	<p align="center">PAGE 10 OF 10</p>
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TECHNICAL REQUIREMENTS

15.07.00

Primer/Painting Schedule

Sl. No	Description S		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				System	Coat	Min. DFT / coat (Microns)	System	Coat	Min. DFT/ Coat (Microns)	System	Coat	Min. DFT/ Coat (Microns)		
1.	All insulated Pippings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS 9*	1 20		-	-	-	PS9*	1 20		40	As per NTPC Colour shade/ coding scheme
2.	All un-insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	Design temperature <60 °C	SP3/SP4 PS	5	2	25	-	-	-	PS 4	3	35	155	
		Design temperature 60 °C-200 °C	SP3/SP4	PS 9*	1 20		-	-	-	PS9*	1 20		40	
		Design temperature > 200 °C	SP3/SP4	PS9*	1 20		-	-	-	PS9*	1 20		40	
3 C	Constant Load Hanger (CLH), Variable Load Hanger (VLH) and other supports		SP4* PS	19	1	40	-	-	-	PS17	1	30	70	
4.	Valves													
	Cast /Forged	Design temperature <95 °C	SP1/SP2/SP3	PS9	1	20	-	-	-	PS9	1	20	40	

MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	A-10 POWER CYCLE PIPING	PAGE 40 OF 41
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TECHNICAL REQUIREMENTS

		Design temperature 95 °C-200 °C	SP1/SP2/SP3	PS 9*	1 20		-	-	-	PS9*	1 20		40	
		Design temperature > 200 °C	SP1/SP2/SP3	PS9*	1 20					PS9*	1 20		40	
5. A	II Structural Steel components	Outside TG building and in SG envelope	SP4* Ino	rganic Ethyl Zinc Silicate	1 75		PS18	1 75		a))Epoxy coat b)Final coat of paint PS17	2 1	35 30	250	
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a))Epoxy coat b)Final coat of paint PS17	2 1	25 30	150	
6. We	ld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	--		-	--		-	
§ The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3 rd finish coat (min.DFT 35 Microns) shall be applied at site.														

16.00.00 Testing Requirements:

The detailed testing requirements for power cycle piping and its components are given in the subsection for Quality Assurance(QA) .The requirements pertaining to testing given in this subsection if in variance with that given in QA subsection, then the more stringent of the two shall be followed.

MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	A-10 POWER CYCLE PIPING	PAGE 41 OF 41
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2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION C

REV. NO. 00

DATE :14.05.2013


SHEET OF

SECTION – C


FOLLOWING DOCUMENTS ARE ENCLOSED

C-1. SPECIFIC TECHNICAL REQUIREMENTS	- 8 Sheets
C-2. HOOK UP DIAGRAM FOR CONTROL VALVE	- 1 Sheet

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनडीपीसी NTPC		
	<p style="text-align: center;">CONTROL VALVES AND ACTUATORS</p> <p>1.00.00 CONTROL VALVES, ACTUATORS & ACCESSORIES</p> <p>1.01.00 General Requirements</p> <p>1.01.01 The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA" or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.</p> <p>1.01.02 All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves.</p> <p>1.01.03 This specification does not cover special type of control valves such as combined pressure and temperature control valve for Aux PRDS applications, Separator Drain Control Valves etc.</p> <p>1.02.00 CONTROL VALVE SIZING & CONSTRUCTION</p> <p>1.02.01 The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.</p> <p>1.02.02 The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves trim exit outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve sizes elected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.</p> <p>1.02.03 Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and downstream piping. Thus for cavitation/flashing service, only valve with anti cavitation trim shall</p>			
MOUDA STPP-II (2X660MW) /	TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-08 CONTROL VALVE AND ACTUATORS	PAGE 1 OF 7	


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p>be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished.</p>			
1.02.04	<p>Control valves for application such as HP/L P heater Emergency level control, Emergency Make-up to Condenser hotwell, GSC minimum flow, Deaerator Drain to condenser hotwell, condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP recirculation control valve shall have permissible leakage rate as per leakage Class V. All other control valve shall have leakage rate as per leakage Class-IV.</p>			
1.02.05	<p>The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.</p>			
2.00.00	VALVE CONSTRUCTION			
2.01.00	<p>All valves shall be of globe body design & straightaway pattern with single or double port, unless otherwise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.</p>			
2.02.00	<p>Valves with high lift cage guided plugs & quick-change trims shall be supplied.</p>			
2.03.00	<p>Cast Iron valves are not acceptable.</p>			
2.04.00	<p>Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.</p>			
2.05.00	<p>Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.</p>			
2.06.00	<p>All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing)</p>			
2.07.00	<p>Valve characteristic shall match with the process characteristics.</p>			
2.08.00	<p>Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.</p>			
2.09.00	<p>Flanged valves shall be rated at no less than ANSI press class of 300 lbs.</p>			
MOUDA STPP-II (2X660MW) /		TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-08 CONTROL VALVE AND ACTUATORS	PAGE 2 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनडीपीसी NTPC</div>	
3.00.00	VALVE MATERIALS					
	Sr. No.	Service	Body material	Trim Material		
	1	Non-corrosive, non-flashing and non-cavitation service except DM service	Carbon steel ASTM-A216 Gr. WCB for fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC9 for fluid temperature above 275 Deg. C	316SS steel lited with stellited facedguide pos ts and bushings.		
	2.	Se vere flashing/cavita tion services	Alloy steel A STM-A217 G r. WC9	440 C		
	3.	Low flashing/cavita tion service	Alloy steel A STM-A217 G r. WC6	17-4 PH SS		
	4.	D M water service	316 SS	316 SS		
	NOTE Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.					
	However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.					
	4.00.00	END PREPARATION				
		Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalised during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per AN SI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.				
MOUDA STPP-II (2X660MW) /			TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-08 CONTROL VALVE AND ACTUATORS	PAGE 3 OF 7	

CLAUSE NO.	TECHNICAL REQUIREMENTS																				
5.00.00	<p>VALVE ACTUATORS</p> <p>All control valves shall be furnished with pneumatic actuators. The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.</p> <p>Valve actuators 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 for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.</p> <p>The travel time of the pneumatic actuators shall not exceed 10 seconds.</p>																				
6.00.00	<p>CONTROL VALVE ACCESSORY DEVICES</p>																				
6.01.00	<p>All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.</p>																				
7.00.00	<p>SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER</p> <table border="1"> <tr> <td data-bbox="418 1056 646 1465" rowspan="4">Electrical</td><td data-bbox="646 1056 878 1119">Input Signal</td><td data-bbox="878 1056 1459 1119">4-20 mA</td></tr> <tr> <td data-bbox="646 1119 878 1213">Power Supply</td><td data-bbox="878 1119 1459 1213">Loop Powered from the output card of Control System.</td></tr> <tr> <td data-bbox="646 1213 878 1350">Hart Protocol</td><td data-bbox="878 1213 1459 1350">Compatibility For Remote Calibration & Diagnostics (Super-Imposed HART signal on Input Signal 4-20 mA)</td></tr> <tr> <td data-bbox="646 1350 878 1465">Valve Position Sensing</td><td data-bbox="878 1350 1459 1465">Position Sensing (Non Contact-Type), 4-20 mA O/P Signal For Control System to be provided</td></tr> <tr> <td data-bbox="418 1465 646 1654" rowspan="3">Environment</td><td data-bbox="646 1465 878 1528">Operating Temp</td><td data-bbox="878 1465 1459 1528">(-)30 To 80 Deg. C</td></tr> <tr> <td data-bbox="646 1528 878 1591">Humidity 0-9</td><td data-bbox="878 1528 1459 1591">5 %</td></tr> <tr> <td data-bbox="646 1591 878 1654">Protection Class</td><td data-bbox="878 1591 1459 1654">IP-65 Minimum</td></tr> <tr> <td data-bbox="418 1654 646 1791">Remote Configuration and Diagnostics</td><td colspan="2" data-bbox="646 1654 1459 1791"> a. The following functions shall be provided in the positioner: Remote Configuration, Calibration and Testing of the Actuator and advanced Diagnostic Features Like Stroke Counter or </td></tr> </table>	Electrical	Input Signal	4-20 mA	Power Supply	Loop Powered from the output card of Control System.	Hart Protocol	Compatibility For Remote Calibration & Diagnostics (Super-Imposed HART signal on Input Signal 4-20 mA)	Valve Position Sensing	Position Sensing (Non Contact-Type), 4-20 mA O/P Signal For Control System to be provided	Environment	Operating Temp	(-)30 To 80 Deg. C	Humidity 0-9	5 %	Protection Class	IP-65 Minimum	Remote Configuration and Diagnostics	a. The following functions shall be provided in the positioner: Remote Configuration, Calibration and Testing of the Actuator and advanced Diagnostic Features Like Stroke Counter or		
Electrical	Input Signal		4-20 mA																		
	Power Supply		Loop Powered from the output card of Control System.																		
	Hart Protocol		Compatibility For Remote Calibration & Diagnostics (Super-Imposed HART signal on Input Signal 4-20 mA)																		
	Valve Position Sensing	Position Sensing (Non Contact-Type), 4-20 mA O/P Signal For Control System to be provided																			
Environment	Operating Temp	(-)30 To 80 Deg. C																			
	Humidity 0-9	5 %																			
	Protection Class	IP-65 Minimum																			
Remote Configuration and Diagnostics	a. The following functions shall be provided in the positioner: Remote Configuration, Calibration and Testing of the Actuator and advanced Diagnostic Features Like Stroke Counter or																				
MOUDA STPP-II (2X660MW) /	TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-08 CONTROL VALVE AND ACTUATORS																			
PAGE 4 OF 7																					

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
		Travel Counter, Leakage In Actuators, On Line Partial Closure Test, Valve Signature Analysis, Step Response Test, Valve Friction/ Jamming Detection etc. (See Note* below) b. Factory Valve Signature Tests Reports (Pressure Vs Valve Travel And Travel Vs I/P Signal) are to be provided.		
	Tests Certificates	Test certificates as per Manufacturer Standard/Relevant Standard are to be submitted		
	Configuration/	Remote Calibration, Auto & Manual Calibration Shall Be Possible		
	Operating O	perating Range	Full Range & Split Range Signal Range	
	Modes	Valve Action	Direct & Reverse. Valve Action	
		Flow Characterisation	Possible To Fit Valve Characteristic Curve Linear & Equal Percentage	
	Fail Safe/Fail Freeze	Fail Safe/Fail Freeze Feature is to Be Provided.		
	Pneumatic	Air Capacity	Sufficient To Handle The Valves Selected/Boosters To Be Supplied If required.	
		Air Supply Pressure	To Suit The Air Supply Pressure/Quality Available.	
		Process Connection	1/4 Inch NPT	
	Performance	Characteristic Deviation	<=0.5 % Of Span	
		Ambient Temp Effect	<=0.01 %/Deg C Or Better	
	EMC & Compliance	CE	Required To International Standard Like EN/IEC.	En50081-2 & En50082 Or Equivalent
Accessories	In Built Operator Panel	Display With Push Buttons For Configuration And Display On The Positioner Itself (Password Protected/Hardware Lock)		
	Hand Held Hart Calibrator	Universal Hart Calibrator To Be Provided, One Per Unit		
MOUDA STPP-II (2X660MW) /		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIC-08 CONTROL VALVE AND ACTUATORS
				PAGE 5 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनडीपीसी NTPC</div>						
	<table><tr><td>Press Gauge Block</td><td>For Supply & Out put Pr., Fi lter Regulator Other A ccessories Sha ll B e Provided A s On Required Ba sis For Making System Complete.</td></tr><tr><td>Electrical Cable Entry</td><td>1/2-Npt,Side O r B ottom Entry To Avoid Water Ingress</td></tr><tr><td>Valves Mounting Assembly</td><td>For Sliding Stem/Rotary/Single Acting/Double Acting On Required Basis</td></tr></table>	Press Gauge Block	For Supply & Out put Pr., Fi lter Regulator Other A ccessories Sha ll B e Provided A s On Required Ba sis For Making System Complete.	Electrical Cable Entry	1/2-Npt,Side O r B ottom Entry To Avoid Water Ingress	Valves Mounting Assembly	For Sliding Stem/Rotary/Single Acting/Double Acting On Required Basis	<p>* Note:</p> <p>Employer is provid ing a cen tralized HART management system including the HART multiplexing/interfacing system. The HA RT signals shall be picked up from marshalling terminals of D DCMIS (SG/TG DDCMIS as well as BOP DDCMIS), as applicable. The details of the abo ve ment ioned empl oyer's HART management system are as below:</p> <p>The following func tionalities are provi ded through software of the HART management system:</p> <p>1. For electronic transmitters, temperature transmitters and analysers:</p> <ul style="list-style-type: none">a. Constant scanning to monitor faults or changes to instrument configuration.b. Employer-defined and standard c alibration an d configuration procedures for all transmitters.c. Constant signal data c ollection facilities to maintain continuously updated records.d. Automatic tracking of configuration changes made in the field, such as may be introduced by hand-held c ommunicator. All conf igation function associated with hand-held communicators shall be available in the system.e. Event and log reports on screen as well as on printer.f. Any addition/deletion of transmitter will be reported on printer and logged in hard disk. <p>2. For electronic positioners:</p> <ul style="list-style-type: none">a. Remote Configuration, Calibration and Testing of the Actuatorb. Advanced Diag nostic Feat ures Like Stroke Count er or Tra vel Counter, Leakage In Ac tuators, O n Li ne Partial Cl osure Test, Valv e Sign ature Analysis, Step Response Test, Valve Friction/ Jamming Detection etc.	
Press Gauge Block	For Supply & Out put Pr., Fi lter Regulator Other A ccessories Sha ll B e Provided A s On Required Ba sis For Making System Complete.								
Electrical Cable Entry	1/2-Npt,Side O r B ottom Entry To Avoid Water Ingress								
Valves Mounting Assembly	For Sliding Stem/Rotary/Single Acting/Double Acting On Required Basis								
MOUDA STPP-II (2X660MW) /		TECHNICAL SPECIFICATION SECTION-VI PART-B	<div>IIC-08 CONTROL VALVE AND ACTUATORS</div> <div>PAGE 6 OF 7</div>						


CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.00.00	<p>Above functionalities are achieved by the Employer's HART management system by providing industry standard softwares. If the bidder has any observations on the above, the same is to be brought out in the bid. Further, Bidder has to list out in his bid the softwares that are compatible with his electronic positioners.</p>			
	<p>TEST AND EXAMINATION</p>			
	<p>All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:</p>			
	8.01.00 Non Destructive Test as per ANSI B-16.34.			
	8.02.00 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.			
	8.03.00 Valve closure test and seat leakage test in accordance with ANSI-B 16.34 and as per the leakage class indicated above.			
8.04.00	<p>Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.</p>			
	<p>CV Test: Please refer Sub-section-IV:110. (Type test requirements).</p>			
8.05.00	<p>CONTROL VALVE QUANTITIES</p> <p>Bidder shall furnish all the control valves under this main plant package as finalised during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.</p>			
MOUDA STPP-II (2X660MW) /		TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-08 CONTROL VALVE AND ACTUATORS	PAGE 7 OF 7


SUB-SECTION – IIIC – 10

TYPE TEST REQUIREMENTS

MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) /
NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) /
RAGHUNATHPUR TPP-II (2X660MW)
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
PART-B

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p style="text-align: center;">TYPE TEST REQUIREMENTS</p> <p>1.00.00 TYPE TEST REQUIREMENTS</p> <p>1.01.00 General Requirements</p> <p>1.01.01 The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.</p> <p>(a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <p>i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. (For control valves, this shall be same size, type & design).</p> <p>ii. There has been no change in the components from the offered equipment & tested equipment.</p> <p>iii. The test has been carried out as per the latest standards along with amendments as on the date of Bid opening.</p> <p>(c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.</p> <p>1.01.02 As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.</p> <p>1.01.03 The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.</p> <p>1.01.04 For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be</p>			
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIIC-10 TYPE TEST REQUIREMENTS PAGE 1 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.01.05	<p>used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.</p> <p>The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective type test in presence of authorized representative of Employer. If a test is waived off, then the cost shall not be payable.</p>			
2.00.00	SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS			
2.01.00	<p>The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below:</p> <p>i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems</p> <p>All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.</p> <p>ii) Dry Heat test as per IEC-68-2-2 or equivalent.</p> <p>iii) Damp Heat test as per IEC-68-2-3 or equivalent.</p> <p>iv) Vibration test as per IEC-68-2-6 or equivalent.</p> <p>v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent.</p> <p>vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent.</p> <p>vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent.</p> <p>Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.</p>			
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-10 TYPE TEST REQUIREMENTS	PAGE 2 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS					<div>एनटीपीसी NTPC</div>
3.00.00	TYPE TEST REQUIREMENT FOR C&I SYSTEMS					
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
	1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes
	2	Thermocouple	Degree of protection test	IS-2147	No	No
	3	CJC Box	Degree of protection test	IS-2147	No	No
	4	RTD	As per standard (col 4)	IEC-60751	No	No
	5	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No Yes	
	6	E/P converter	As per standard (col 4)	Mfr. standard	No Yes	
	7	Instrumentation Cables Twisted & Shielded (Refer Note-B below)				
	-Conductor		Resistance test	VDE-0815	No	Yes
			Diameter test	IS-10810	No	Yes
			Tin Coating test (Persu I-phate test)	IS-8130	No	Yes
	-Insulation		Loss of mass	VDE 0472	No	Yes
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE			TECHNICAL SPECIFICATION SECTION-VI PART-B		IIC-10 TYPE TEST REQUIREMENTS	
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CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Cold bend/ cold impact test	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIIC-10 TYPE TEST REQUIREMENTS	
				PAGE 4 OF 10	


CLAUSE NO.	TECHNICAL REQUIREMENTS				एन टी पी सी NTPC
	<div>Heat shock VDE 0472 No Yes</div> <div>Hot deformation VDE 0472 No Yes</div> <div>Shrinkage VDE 0472 No Yes</div> <div>Bleeding & blooming IS-10810 No Yes</div> <div>Colour fastness to water IS-5831 No Yes</div> <div>Cold bend/cold impact test VDE-0472 No Yes</div> <div>Oxygen index test ASTMD-2863 No Yes</div> <div>Smoke Density Test ASTMD-2843 No Yes</div> <div>Acid gas generation test IEC-60754-1 No Yes</div> <div>-filler s Oxygen index test ASTMD-2863 No Yes</div> <div>Acid gas generation test IEC-60754-1 No Yes</div> <div>-AL-MYL AR shield Continuity test No Yes</div> <div>Shield thickness No Yes</div> <div>Overlap test No Yes</div> <div>-O ver all cable Flammability Test IEEE 383 No Yes</div>				
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIC-10 TYPE TEST REQUIREMENTS	PAGE 5 OF 10

CLAUSE NO.	<div> <div>TECHNICAL REQUIREMENTS</div> <div>एनटीपीसी NTPC</div> </div>			
	<div> <div> <div>Swedish Chimney Test</div> <div>SEN 4241475</div> <div>No</div> <div>Yes</div> </div> <div> <div>Noise interference</div> <div>IEEE Transactions</div> <div>No</div> <div>Yes</div> </div> <div> <div>Dimensional checks</div> <div>IS 10810</div> <div>No</div> <div>Yes</div> </div> <div> <div>Cross talk</div> <div>VDE-0472</div> <div>No</div> <div>Yes</div> </div> <div> <div>Mutual capacitance</div> <div>VDE-0472</div> <div>No</div> <div>Yes</div> </div> <div> <div>HV test</div> <div>VDE-0815</div> <div>No</div> <div>Yes</div> </div> <div> <div>Drain wire continuity</div> <div>No</div> <div>Yes</div> </div> <div> <div>* For Drain wire only</div> </div> <div> <div>**These tests shall be carried out as per VDE0207 Part 6 & ASTM-D-2116 for TEFLON insulated & outer sheathed cables</div> </div> <div> <div>***Applicable for armoured cables only</div> </div> <div> <div>8 DC Power Supply System (Applicable for each model and rating)</div> </div> <div> <div>Degree of protection test</div> <div>IS-13947</div> <div>Yes</div> <div>Yes</div> </div> <div> <div>Short circuit current capability</div> <div>Approved procedure</div> <div>Yes</div> <div>Yes</div> </div> <div> <div>Voltage Proof Test</div> <div>UL 950,IEC950</div> <div>Yes</div> <div>Yes</div> </div> <div> <div>Burn In test</div> <div>Approved procedure</div> <div>Yes</div> <div>Yes</div> </div> <div> <div>Efficiency</div> <div>Approved procedure</div> <div>Yes</div> <div>Yes</div> </div> <div> <div>Audible Noise Test</div> <div>Approved procedure</div> <div>Yes</div> <div>Yes</div> </div> </div>			
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-10 TYPE TEST REQUIREMENTS	PAGE 6 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
		Fuse Clearing Capability	Approved procedure	Yes Yes
		Total harmonic content	Approved procedure /CIGRE's	Yes Yes
		Radio Frequency interference	IEC-CISPR22, IEC-61000-4-12(9b), IEC-61000-4-3, IEC-61000-4-5, IEC-61000-4-6	Yes Yes
	Over Load Test		Approved procedure	Yes Yes
	Restart Test		Approved procedure	Yes Yes
	Output voltage tolerance		Approved procedure	Yes Yes
	Parallel operation		Approved procedure	Yes Yes
	ESD immunity Test		IEC-61000-4-2-9(1)	Yes Yes
	Electrical Fast transient / Burst Immunity Test		IEC-61000-4-4	Yes Yes
	Surge Protection		IEC61312, IEC61024, VDE 100-534	Yes Yes
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIIC-10 TYPE TEST REQUIREMENTS
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CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी</div> <div>NTPC</div>	
		Insulation Test	Approved procedure	Yes	Yes	
		Load Tests.	Approved procedure	Yes	Yes	
		Preliminary light load test (without Battery supply)	Approved procedure	Yes	Yes	
		Load sharing	Approved procedure	Yes	Yes	
	9 Battery (Refer Note-A below)	As per standard (col 4)	IS-10918	No		Yes
	10 Voltage Stabiliser	Over Load Test	Approved procedure	No	Yes	
		Temperature test without redundant fans	Approved procedure	No	Yes	
		Input voltage variation test	Approved procedure	No	Yes	
	11 DDCMIS					
	CLCS Systems	Model test	Approved procedure	No	No	
	BMS	Safety requirements	VDE0116 Sec 8.7	No	Yes	
	12 Conductivity Type Level Switch	Degree of protection test	IS-2147	No		No
	13 Local Gauges	Degree of protection test	IS-2147	No		No
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIIC-10 TYPE TEST REQUIREMENTS		PAGE 8 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS					<div>एनटीपीसी NTPC</div>
	14 Process actuated Switches	Degree of protection test	IS-2147 No		No	
	15 Control Valves	CV test	ISA 75.02	No	Yes	
	16 PLCs	As per standard (Col 4)	IEC 1131	No	No	
	17 LIE / LIR	Degree of protection test	IS-2147	Yes	Yes	
	18 Flue gas O ₂ analyser, other Flue Gas analysers	Degree of protection test	IS-2147	No	Yes	
	19 Flow Nozzles & Orifice plates	Calibration AS ME	PTC BS 1042	Yes	Yes	
<p>Note:</p> <p>Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p> <p>A. For batteries with electric power supply system of TG C&I, the contractor shall submit for Employer's approval the reports of all the type tests as per IS-10918 carried out within last five years from the date of bid opening and the tests should have been either conducted at an independent laboratory or should have been witnessed by a client. The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.</p> <p>For batteries with electric power supply system of auxiliary plants, type test reports for batteries shall be as per standard practice of manufacturer.</p> <p>B. All cables to be supplied shall be of type tested quality. The Contractor shall submit for Employer's approval the reports of all the type tests pertaining to cables as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the cables similar to those proposed to be supplied under this contract and</p>						
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		IIIC-10 TYPE TEST REQUIREMENTS		PAGE 9 OF 10

CLAUSE NO.	<div data-bbox="672 113 1058 142">TECHNICAL REQUIREMENTS</div> <div data-bbox="1318 102 1463 174">  </div>			
	<p data-bbox="516 201 1458 264">the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p data-bbox="516 302 1458 470">In case the Contractor is not able to submit report of the type test(s) for cables conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contract free of cost to the Employer and submit the reports for approval.</p>			
MOUDA STPP-II (2X660MW) / SOLAPUR STPP (2X660MW) / NABINAGAR STPP (3X660MW) / MEJA TPP (2X660MW) / RAGHUNATHPUR TPP-II (2X660MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	IIIC-10 TYPE TEST REQUIREMENTS	PAGE 10 OF 10



2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION C

REV. NO.

00


DATE :14.05.2013

SHEET

OF

SECTION – C-1


SPECIFIC TECHNICAL REQUIREMENTS

	2 X 660MW RAGHUNATHPUR TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
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SPECIFIC TECHNICAL REQUIREMENTS.

THE REQUIREMENTS IN THIS SECTION ARE SPECIFIC FOR THIS PROJECT AND SHALL OVER-RIDE THE SPECIFICATION UNDER SECTION-D IN CASE OF ANY CONTRADICTION.

1. **BIDDER TO NOTE THAT DATA SHEET-B, FOR MAT " SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE, INSPECTION AND DESPATCH" ENCLOSED IN SECTION-D, TO BE SIGNED AND STAMPED AND SUBMITTED WITH THE BID. QUALITY PLAN ENCLOSED IN VOLUME-IIB SHOULD BE FURNISHED DULY SIGNED AND STAMPED.**
2. **ALL THE FORMATS IN VOLUME-III SHOULD FILLED-UP AND FURNISHED WITH THE BID, COMPLETE IN ALL RESPECT. CATALOGUE, LEAFLETS RELATED WITH THE MODELS OF CONTROL VALVES AS WELL AS EACH ACCESSORY MUST BE FURNISHED WITH THE OFFER. IN THE ABSENCE OF THOSE, THE BID WOULD BE CONSIDERED INCOMPLETE AND LIABLE FOR REJECTION.**
3. THE HOOK-UP DIAGRAM FOR CONTROL VALVE, ATTACHED IN SECTION-C. SHOULD BE READ IN PLACE OF HOOK-UP DIAGRAM ATTACHED IN VOLUME-IIB, SECTION-D (EQUIPMENT SPECIFICATION, SHEET 12 OF 12).
4. VALVE BODY SIZES SHALL BE TO TAKE CARE OF THE SPECIFICATION REQUIREMENTS LIKE PARAMETERS, AND LIMITATIONS OF FLUID OUTLET VELOCITIES, NOISE LEVEL ETC. **HOWEVER PORT (TRIM) SIZES SHALL BE SELECTED TO SUIT CV REQUIREMENT FOR ACHIEVING PERCENTAGE VALVE LIFTS**
5. NO SPECIFIC REQUIREMENT HAS BEEN SPECIFIED FOR BONNET TYPE IN THE DATA SHEET-A. TYPE OF BONNET SHALL BE OFFERED ACCORDING TO THE REQUIREMENT OF SERVICE CONDITIONS, HOWEVER EXTENSION BONNETS SHALL BE PROVIDED WHEN THE MAXIMUM TEMPERATURE OF FLOWING FLUID IS GREATER THAN 280 DEG. C.
6. **BIDDER TO NOTE THAT, WHEREVER DOWNSTREAM SIDE OF THE VALVE IS SUBJECTED TO THE VACUUM SERVICE, BIDDER TO OFFER DOUBLE GLAND PACKING, AND IN THAT CASE, FLOW DIRECTION OF WORKING FLUID SHALL BE TO CLOSE THE VALVE. SEPARATE MENTION OF THE SAME HAS NOT BEEN MADE IN THE DATA SHEETS-A.**
7. TOLERANCE ON END TO END, CENTER TO CENTER, CENTER TO FACE SHALL BE IN ACCORDANCE WITH ASME B 16.10
8. THE CONTROL VALVE SIZING (Cv/Kv) SHALL BE BASED ON FOLLOWING GUIDELINES:
 - a). THE VALVES SHALL PASS NORMAL RATE OF FLOW (MCR CONDITION) WITH 65 TO 75 PERCENT OPENING FOR LINEAR CHARACTERISED VALVES AND BETWEEN 75 TO 85 PERCENT OPENING FOR EQUAL PERCENTAGE CHARACTERISED VALVES.
 - b). THE VALVES SHALL HAVE ADEQUATE RANGEABILITY TO PASS THE MINIMUM AND MAXIMUM FLOWS BETWEEN 10% TO 80% OPENING OF THE VALVES, UNLESS CAGE TRIM VALVES HAVING WIDE RANGEABILITY ARE CHOSEN.
 - d). THE VALVE SELECTION SHALL BE BASED ON THE HIGHEST SIZE DICTATED BY THE ABOVE CONSIDERATIONS UNLESS NOISE, FLASHING OR OTHER FACTORS DICTATE THE FINAL SELECTION.
9. IF CAVITATING CONDITION IS FORSEEN MULTISTAGE(& MULTISTAGE BREAK DOWN TRIMS) or LABYRINTH TRIM SHALL BE OFFERED.
10. EXTENSION BONNET SHALL BE PROVIDED FOR SERVICES ABOVE 280 DEGREE C .
10. ACTUATOR FOR CEP MIN. RECIRCULATION VALVE (CDV – 10 , CDV – 12 AND CDV – 14) SHALL BE PISTON TYPE. YOKE MATERIAL FOR CDV-10, 12 & 14 SHALL BE OF CARBON STEEL.
11. TYPE OF FLOW ACTION ("UNDER THE SEAT" OR "OVER THE SEAT") WILL BE SELECTED BY THE VENDOR, HOWEVER WHEREVER DOWNSTREAM SIDE IS SUBJECTED TO VACUUM, FLOW ACTION SHALL BE "FLOW TO CLOSE" (OVER THE SEAT). SEPARATE INDICATION FOR THE SAME HAS NOT BEEN PROVIDED.


	2 X 660MW RAGHUNATHPUR TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-390-145-I 106	
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12. CONTROL VALVE ACCESSORIES SHALL BE FITTED ON THE VALVE BODY. INTEGRAL PNEUMATIC TUBING SHALL BE 1/4 " PVC COATED COPPER, AND FITTINGS SHALL BE OF BRASS. APPLICABLE ACCESSORIES SHALL BE TERMINATED AT THE JUNCTION BOX (MOUNTED ON THE BODY).
13. THE SIZING PROCEDURE FOLLOWED SHALL BE AS PER LATEST EDITION OF ANSI/ISA OR EQUIVALENT STANDARD.
14. TOLERANCE ON END TO END, CENTER TO CENTER, CENTER TO FACE SHALL BE IN ACCORDANCE WITH ANSI B16.10
15. ALL JB & VALVES SHALL BE WITH DOUBLE COMPRESSION TYPE NI PLATED BRASS CABLE GLANDS.
16. ALL LOCAL CABLING UPTO JB'S SHALL BE IN BIDDER'S SCOPE. JB'S TO BE MOUNTED ON THE VALVE.
17. FACILITY TO ADJUST THE MAXIMUM TRAVEL OF THE STEM SHALL BE INCORPORATED.

18. VALVE POSITIONERS SHALL BE SMART ELECTRIC-TO-PNEUMATIC DESIGN TYPE

SMART POSITIONER

- I) SYSTEM AS INPUT AND PROVIDE A COMPATIBLE SIGNAL FOR DRIVING THE PNEUMATIC ACTUATOR.
- II) THE SMART POSITIONER SHALL ACCEPT 4-20 MA SIGNAL FROM THE CONTROL IN ADDITION TO THE ELECTRICAL-TO-PNEUMATIC SIGNAL CONVERSION AND POSITIONING FUNCTIONS, SMART ELECTRO PNEUMATIC DIGITAL POSITIONERS SHALL BE WITH AUTO CALIBRATION FACILITY AND COMPATIBLE WITH HART COMMUNICATION AND HART SYSTEM MAINTENANCE TOOL ALSO. IT SHALL ALSO PERFORM DETAILED DIAGNOSTICS & MAKE AVAILABLE THE ACTUATOR/CONTROL VALVE FAULTS VIA A HART INTERFACE. THE HART SIGNAL FOR THE DETAILED FAULTS SHALL BE SUPERIMPOSED ON THE 4-20 MA CONTROL SIGNAL ITSELF. THE FAULTS TO BE COVERED SHALL INCLUDE VALVE JAMMING, AIR SUPPLY FAILURE, LEAKAGE ETC.
- III) THE POSITIONER SHALL INCLUDE POSITION FEEDBACK MEASUREMENT FOR ITS POSITIONING FUNCTION. IT SHALL HAVE PROVISION OF 4-20 MA POSITION FEEDBACK OUTPUT TO THE CONTROL SYSTEM.
- IV) SMART POSITIONERS SHALL HAVE INTEGRAL NON-CONTACT TYPE POSITION TRANSMITTER.
- V) IT SHALL HAVE FACILITY OF CHARACTERISATION OF THE VALVE (I.E. EQUAL PERCENTAGE, QUICK OPENING, LINEAR, ETC.) IN THE POSITIONERS ITSELF.
- VI) BIDDER TO CLEARLY MENTION IN THE IR OFFER IF ANY SOFTWARE IS REQUIRED TO BE INSTALLED ON THE HMI PC (HMI IN BHEL'S SCOPE) TO COMMUNICATE WITH THE SMART POSITIONERS AND TO ACCESS THE DIAGNOSTIC FEATURES OF THE SMART POSITIONERS. BIDDER TO FURNISH OPTIONAL PRICE FOR SUCH SOFTWARE IN THEIR OFFER.
- VII) THE POSITIONER SHALL HAVE THE FACILITY OF DETECTION OF CONTROL SIGNAL FAILURE AND MAKING THE VALVE EITHER STAY OPEN/CLOSE AS PER PROCESS REQUIREMENT UPON THIS CONDITION.
- VIII) POSITIONERS SHALL BE THREE GAUGE TYPE WITH EQUALIZING LEVER FOR BYPASS.

	2 X 660MW RAGHUNATHPUR		SPECIFICATION NO. PE-TS-390-145-I 106	
	TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES		VOLUME II-B	
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19. **SPARES:** THE FOLLOWING SPARES ARE REQUIRED TO BE OFFERED.

(A) MANDATORY SPARES :

THE ITEMS LISTED IN LIST OF MANDATORY SPARES ATTACHED AT SECTION-D, OF THIS SPECIFICATION, ARE THE ESSENTIAL SPARES REQUIRED TO BE OFFERED BY THE BIDDER, AND THE PRICE FOR WHICH (LUMP SUM AS WELL AS IN DIVIDUAL) FOR EACH ITEM TO BE QUOTED SEPARATELY UNDER THE SEPARATE HEADING. THE FORMAT FOR PRICE SCHEDULE TO BE FILLED-UP BY THE BIDDER IS ENCLOSED IN VOLUME-III.

EACH CASE / CONTAINER CONTAINING MANDATORY SPARES SHALL BE CLEARLY MARKED OR LABELLED ON THE OUTSIDE WITH THE DESCRIPTION OF THE SPARES CONTAINED IN IT. WHEN MORE THAN ONE ITEM OF SPARE PARTS ARE PACKED IN A SINGLE CASE / CARTON, A GENERAL DESCRIPTION OF THE CONTENTS SHALL BE SHOWN OUTSIDE OF SUCH CASE, AND DETAILED LIST ENCLOSED. ALL CASES, CONTAINERS AND PACKAGES MUST BE SUITABLY MARKED AND NUMBERED FOR THE PURPOSE OF IDENTIFICATION.

(B) RECOMMENDED SPARES:

IN ADDITION TO THE MANDATORY SPARES MENTIONED, THE BIDDER SHALL ALSO FURNISH A LIST OF RECOMMENDED SPARES FOR 3 YEARS OF NORMAL OPERATION OF THE CONTROL VALVES / ACCESSORIES. THE BHEL/CUSTOMER RESERVES THE RIGHT TO BUY ANY OR ALL OF THE RECOMMENDED SPARES.

THE PRICES OF THESE SPARES WILL REMAIN VALID FOR A PERIOD OF MINIMUM 6 MONTHS AFTER THE PLACEMENT OF ORDER.

(C) START-UP & COMMISSIONING SPARES:

START-UP AND COMMISSIONING SPARES ARE THOSE SPARES, WHICH MAY BE REQUIRED DURING THE START-UP AND COMMISSIONING OF THE CONTROL VALVES. ALL START-UP SPARES, WHICH ARE SUPPLIED UNDER THIS CONTRACT, SHALL BE STRICTLY INTERCHANGEABLE WITH THE PARTS FOR WHICH THEY ARE INTENDED FOR REPLACEMENTS. THE FORMAT FOR PRICE SCHEDULE TO BE FILLED-UP BY THE BIDDER IS ENCLOSED IN VOLUME-III

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 IS ENCLOSED IN THE SECTION-D OF THIS SPECIFICATION.


20. 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 DESICCATOR'S PACKS AS NECESSARY.

21 DOCUMENTATION:

A. ALONG WITH THE BIDS :

4 SETS OF THE FOLLOWING DOCUMENTS, AND ONE (1) SET OF CDS TO BE ENCLOSED WITH THE BIDS.

1. DATA SHEET-B, COMPLETELY FILLED-UP ALONGWITH ENCLOSURES.
2. HOOK-UP DIAGRAM OF CONTROL VALVE WITH ACTUATOR & ACCESSORIES.
3. VALVE & ACTUATOR ASSEMBLY DIMENSIONAL DRAWINGS WITH WEIGHTS.
4. QUALITY PLAN DULY SIGNED AND STAMPED.
5. ALL CALCULATIONS LIKE CV, NOISE LEVEL, VALVE OUTLET VELOCITY, ACTUATOR SIZING ETC.
6. ALL RELEVANT CATALOGUES FOR THE MODELS OF THE VALVES AS WELL AS ACCESSORIES OFFERED.
7. BAR CHART TO INDICATE THE TIME SCHEDULE FOR PROCUREMENT, MANUFACTURE, TESTING AND DISPATCH.

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(B) AFTER THE AWARD OF CONTRACT:

6 SETS OF THE FOLLOWING DOCUMENTS + 2 CDS FOR APPROVAL:

1. ASSEMBLY (DIMENSIONAL) DRAWINGS.
2. VALVE EDGE PREPARATION DETAILS.
3. DATA SHEET-C COMPLETELY FILLED-UP..
4. HOOK-UP DIAGRAM OF CONTROL VALVE WITH ACTUATOR & ACCESSORIES.
5. VALVE & ACTUATOR ASSEMBLY DIMENSIONAL DRAWINGS WITH WEIGHTS.
6. QUALITY PLAN DULY SIGNED AND STAMPED.
7. ALL CALCULATIONS LIKE CV, NOISE LEVEL, VALVE OUTLET VELOCITY, ACTUATOR SIZING ETC.
8. ALL RELEVANT CATALOGUES FOR THE MODELS OF THE VALVES AS WELL AS ACCESSORIES FINALIZED.
9. BAR CHART TO INDICATE THE TIME SCHEDULE FOR PROCUREMENT, MANUFACTURE, TESTING AND DISPATCH.

(C) FINAL DOCUMENTATION:

1. CATEGORY –I & IV APPROVED FINAL DRAWINGS / DATA SHEETS VALVE SIZING CALCULATIONS, NOISE LEVEL CALCULATIONS OUTLET VELOCITY CALCULATIONS
– 10 SETS WITH 4 CD-ROMS
2. ALL TEST CERTIFICATES – 10 SETS.
3. OPERATION & MAINTENANCE MANUALS FOR CONTROL VALVES, ACTUATORS AND ALL THE ACCESSORIES – 10 SETS WITH 4 CD-ROMS

NOTE: - IN CASE OF ANY CONTRADICTION IN THE TECHNICAL REQUIREMENT BETWEEN SECTION- C AND SECTION –D, SECTION-C WILL PREVAIL.



2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

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VOLUME II B

SECTION C

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SHEET OF

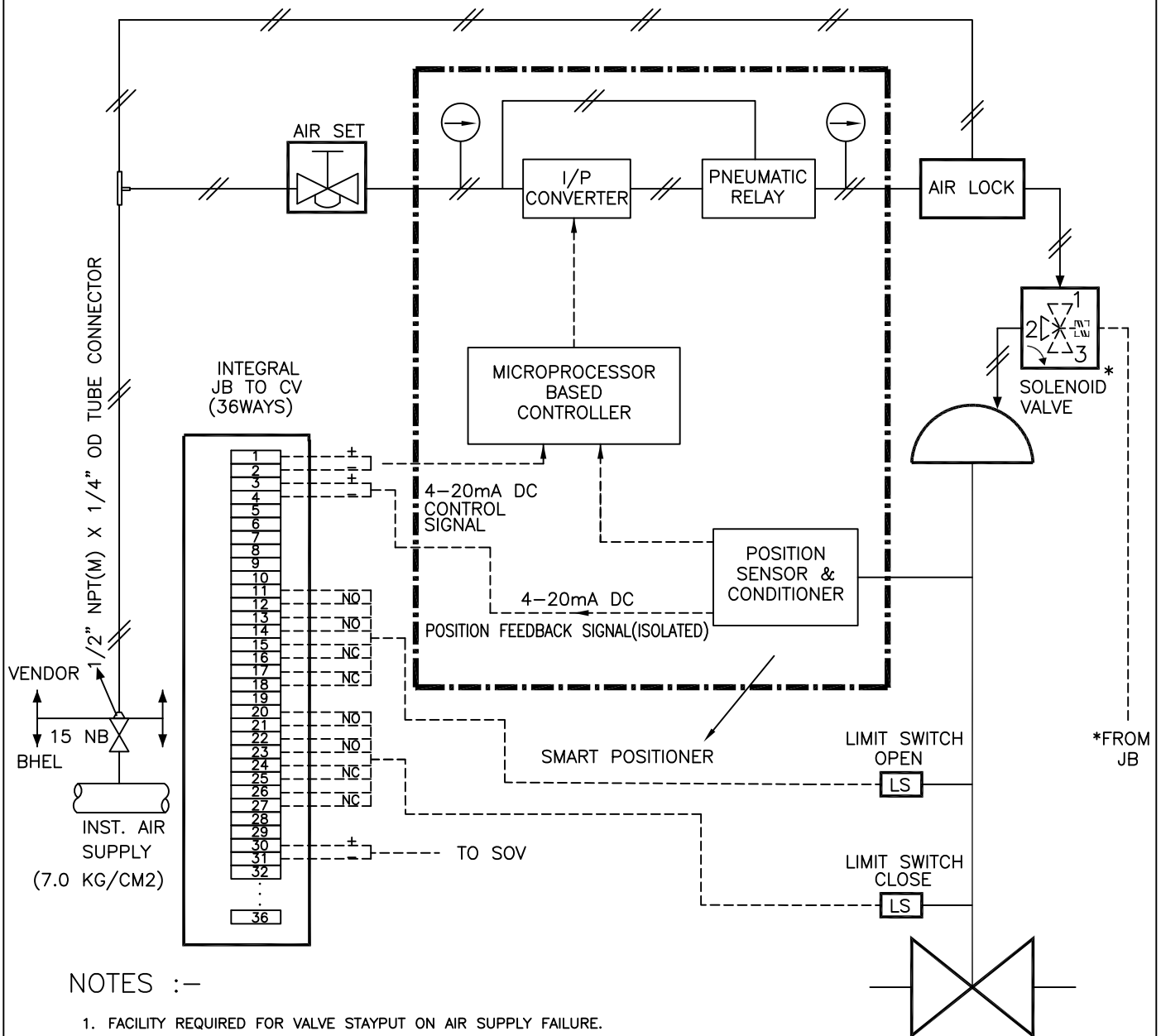
SECTION – C-2

HOOK UP DIAGRAM FOR CONTROL VALVE



RAGHUNATHPUR THERMAL POWER PROJECT - 2 X 660 MW

HOOK-UP DIAGRAM WITH SMART POSITIONER



NOTES :-

1. FACILITY REQUIRED FOR VALVE STAYPUT ON AIR SUPPLY FAILURE.
2. SOLENOID VALVE WILL BE PROVIDED ONLY FOR ON/OFF DUTY VALVES AND FOR CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND 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. GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 4-20mA (ISOLATED SIGNAL)
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
8. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVES
THE FOLLOWING ACCESSORIES SHALL NOT BE APPLICABLE:-
a) SMART POSITIONER b) POSITION TRANSMITTER c) I/P CONVERTER
9. 12 METERS 1/4" PVC COATED COPPER TUBING & 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 BRASS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER SHALL BE PROVIDED IF REQUIRED

* SOLENOID VALVE- IF APPLICABLE AS PER DATASHEET



2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
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ALONGWITH ACCESSORIES**

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SECTION D

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SECTION-D

**EQUIPMENT SPECIFICATION
DATA SHEETS - A&B
DATA SHEETS - C
QUALITY PLAN
BILL OF QUANTITY
SPARES**

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

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SECTION D

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SECTION – D**EQUIPMENT SPECIFICATION**

	SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)	SPECIFICATION NO.: PES – 145 - 06	
		VOLUME II B	
		SECTION D	
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1.0 SCOPE

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

2.0 CODES AND STANDARDS

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

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

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

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

3.0 TECHNICAL REQUIREMENTS

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

3.1 Control Valve

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

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

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

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

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

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

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

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3.2

Pneumatic Actuator

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

3.2.1

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

3.2.2

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

3.2.3

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

3.2.4

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

3.2.5

The actuator shall be painted with epoxy based paint.

3.3

Accessories for Control valve with Pneumatic Actuator

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

3.3.1

Hand wheel

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

3.3.2

Local Position Indicator

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

3.3.3

Position Transmitter

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

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3.3.4

Air Filter Regulator

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

3.3.5

Air Lock Relay

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

3.3.6

Solenoid Valves

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

3.3.7

Limit Switches

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

3.3.8

I/P Converter

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

3.3.9

Positioner

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

3.3.10

Electro pneumatic Positioner

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In p lace of separate E/P Conv erter and pneumatic p ositioner a c ombined el ectro pneumatic positioner can also be supplied. The electro pneumatic positioner shall have 2 gauges.

3.3.11 J unction Box

Wherever specified, an i ntegral junction box with all electrical accessories conduited up to JB shall be supplied. The junction box s hall h ave tw o (2) cable glands for o utgoing cables. Junction box shall have enclosure class of IP-55.

3.4 Guara ntee & Performance

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

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

3.4.2 The gu arantee f or th e c ontrol v alve, p neumatic ac tuator & ac cessories s hall be for 12 m onths continuous operation f rom the date of commissioning, u nless s pecified otherwise i n VOL-IIB Section-B or Section-C.

3.5 Elec tric Actuator

The electric actuator shall be employed for modulating duty.

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

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

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

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

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

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

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

3.5.8 The motor shall operate satisfactorily under the following conditions:

i)	\pm 10% supply voltage variation at rated frequency.
ii)	-5% to + 3% variation in frequency at rated supply voltage.
iii)	Simultaneous va riation i n voltag e an d frequency, t he sum of absolute percentage not exceeding 10%.

3.5.9 The Actuator shall be suitable for mounting directly on the valve and shall be suitable for mounting in any position. Supports required for inclined mounting shall form part of supply of valve assembly.

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3.5.10

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

3.5.11

Each actuator shall have a hand wheel for emergency operation. The hand wheel shall be designed such that it is declutched automatically when the power supply to the motor is restarted.

3.5.12

The hand wheel shall be so arranged that when looking from hand wheel, the valve is closed by rotating the hand wheel in clockwise direction.

3.5.13

Motor shall be totally enclosed conforming to IP-65 or better as per data sheet. The enclosure shall be suitable to protect the motor from leakage steam, water or oil from valve joints and glands.

3.5.14

Where flameproof enclosures are specified, it shall meet the specification IS-2148.

3.5.15

Insulation shall be at least class-B or better and shall be tropicalised to withstand the atmospheric condition.

3.5.16

The actuator shall be provided with antifriction bearing in grease filled cartridge.

3.5.17

Each actuator shall be provided with a mechanical position indicator to indicate accurately the valve position.

3.5.18

The integral starter, if specified in data sheet-A, shall be provided in weatherproof enclosure with protection class not less than IP-65 or better as per data sheet.

The integral starter shall consist of:

i)

Mechanical & Electrically interlocked reversing contractors suitable for class AC4 duty or Thyristor as per data sheet.

ii)

Thermal overload relay.

iii)

Step down control transformer with fuses.

iv)

Interposing relay.

v)

Monitoring relay..

vi)

Open, Close & Stop push buttons.

vii)

Indicating lamps.

viii)

Local-Remote lockable selector switch with spare potential free contacts, wired for remote interface.

ix)

A potential free contact shall be provided for remote annunciation of power failure/overload condition. The contact shall be SPDT, rated for at 5A 240V AC or 0.2A at 220V DC.

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3.5.19	The actuator shall be suitably time rated for the duty cycle involved with the necessary number of starts per hour, but in no case, less than 1200 starts per hour.		
3.5.20	The actuator shall be provided with a suitable control unit for receiving 4-20 mA signal from remote controller.		
3.5.21	The servomotor gear should have self locking or suitable brake so as to maintain it's last position as and when the motor power is switched off.		
3.5.22	Thermostat/Thermistor as specified in the data sheet shall be provided for sensing the winding temperature and giving trip command. The trip contact shall be change over type. The contact shall be wired up to the actuator terminal box.		
3.6	Accessories for Control Valve with Electric Actuator		
3.6.1	Torque Switches		
	<ul style="list-style-type: none"> i) Each actuator shall be provided with at least one open and one close torque switches each with 2 NO+2 NC contacts. The contacts shall be rated for 5A at 240V AC or 0.2A at 220V DC. ii) The torque switches shall have a minimum accuracy $\pm 3\%$ of set value. iii) The torque switches shall be provided with calibrated knobs for setting desired torque. Separate knobs shall be provided for close and open torque switches. iv) The torque switches shall be provided with mechanical latching device to prevent operation when unsealing from the positions. The latching device shall unlatch as soon as the valve leaves the end position. If such provision is not possible, the torque switches shall be bypassed by end position limit switches, which open on valve leaving end position. These limit switches are additional to the number of limit switches specified elsewhere. v) The torque switches or worm gear shall be self-locking type so that when torque switch operates it remains operated until the actuator is operated in the reverse. vi) The torque switch enclosure shall conform to IP-55. 		
3.6.2	Limit Switches		
	Each limit switch shall have 2NO+2NC contact with contacts rated for 5A 240V AC/0.2A 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.		
3.6.3	Space Heater		
	A space heater shall be provided in limit switch and starter compartments to prevent condensation. This shall be suitable for the power supply specified in the data sheet. Where integral starters are provided the space heaters shall be wired to control supply within the actuator.		

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3.6.4 Remote Position Transmitter

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

3.6.5 Wiring

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

3.7 Terminal and Terminal boxes

3.7.1 Motor Terminal Box

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

3.7.2 Actuator Terminal Box

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

3.7.3 Cable Glands

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

3.7.4 Earthing Terminal

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

3.7.5 Painting

The Actuator shall be painted with epoxy-based paint.

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4.0

TESTING AND INSPECTION

4.1

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

4.2

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

4.3

The following test shall be conducted as a minimum requirement.

4.3.1

Control Valve

i)

Radiographic tests on castings.

ii)

Dye penetrant tests on machined surface.

iii)

Ultrasonic tests for the forgings & bars of all valves with 60 Kg/cm² & higher ratings.

iv)

Hydrostatic tests as per ANSI B 16.34 prior to seat leakage tests.

v)

Valve closure and seat leakage tests as per ANSI B 16.104 / FCI-70.2.

4.3.2

Pneumatic Actuators

Functional test of actuator and each accessory.

4.3.3

Electric Actuator

i)

Routine tests on motors as per IS: 325.

ii)

Functional test on actuator and each accessory.

iii)

Insulation resistance and high voltage test.

iv)

Stall current & Stall torque test.

v)

Output shaft speed and torque of actuator and corresponding current tests.

4.3.4

Control valve with Actuator & Accessories fully assembled

i)

Functional tests of control valve operation along with actuator & accessories.

ii)

Dimension checks.

4.3.5

Type tests or Test Reports

i)

Valve lift vs. Flow test (Cv Test)

ii)

Degree of protection tests for the enclosures

ii)

Temperature rise test (applicable for Electrical Actuator only).

iii)

Type test for motor as per IS: 325.

4.4

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

4.5

The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the

	SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)	SPECIFICATION NO.: PES – 145 - 06	
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agreed Q P, taking care of customer requirements mentioned in Sec -C and submit Q P for final approval by BHEL / Customer.

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

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

5.2 Mandatory Spares

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

5.3 Recommended Spares

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

5.4 Special Tools & Tackles

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

6.0 DRAWINGS AND DOCUMENTS

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

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

6.1.2 Wiring diagrams for Electrical Actuators.

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

6.1.4 Valve & actuator assembly dimensional drawings with weights.

6.1.5 Quality Plan

6.1.6 All relevant Catalogs with detailed technical information.

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

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

6.2.1 For approval

i) Dimensional drawings.

ii) Installation drawings with overall dimensions of the completed equipment and clearances for operation and maintenance.

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iii) Data sheet-C, completely filled-up along with all the enclosures including the sizing calculations & noise calculations.

iv) Quality Plan.

v) Test Certificates.

6.2.2 Final / As-built Drawings

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

6.3 Operation & Maintenance Manuals

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

7.0 MARKING AND PACKING

7.1 Marking

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

7.2 Packing

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

55

8.0 APPLICABLE DATA SHEET FORMS

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

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



SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

SPECIFICATION NO.: PES – 145 – 06A

VOLUME

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1.0 Electrical :

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

2.0 Environment :

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

3.0 Diagnostic Features :

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

4.0 Software :

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

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5.0 Hardware :

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

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

6.0 Valve Action :

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

7.0 Flow Characterization :

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

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

9.0 Test Certificates:

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

10.0 EMC & CE compliance

International Standard Like EN/IEC.

To EN 50081-2 & EN 50082 or equivalent



**SPECIFICATION FOR MICROPROCESSOR BASED
ELECTRONIC POSITIONER (SMART)**

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11.0 Accessories

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

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION D

REV. NO.

00

DATE : 14.05.2013

SHEET

OF

SECTION – D**DATA SHEETS A&B**

BHEL PEM	DOCUMENT TITLE	DOCUMENT NUMBER	PE-TS-390-145-N106
	DATA SHEET FOR CONTROL VALVES	REVISION NUMBER	00 DATE 14.05.2013
	2 x660 MW RAGHUNATHPUR	SHEET	OF

Notes:

1. All general technical requirements including material & construction, leakage class, body sizing and CV sizing etc. shall be as per customer specifications.
2. 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 °C.
3. If the downstream is subjected to vacuum, flow direction of the fluid shall be to close. Separate indication for the same has not been made in the data sheet.
4. Valve and actuator shall be designed for full differential pressure (Max. shut-off pressure).
5. Mandatory spares for control valves, shall be as per contractual agreement with NTPC.
6. Testing & other requirements shall be as per customer's specifications.
7. Quantity indicated is for one unit.
8. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.
9. For valves subjected to cavitation service, anti cavitation trim shall be provided.

BHEL PEM	DOCUMENT TITLE	DOCUMENT PE-TS-3- \$-14 5-I104 NUMBER
	DATA SHEET FOR CONTROL VALVES	REVISION 00 DATE NUMBER
	2 x 600 MW k° 8=yV° u=hyk	SHEET 2 OF 50

INDEX

S.No.	SERVICE	Qty. / Unit	Qty. for Two Units
1.	D/A Pegging from Aux. Steam Header (ASV-8)	01	02
2.	D/A Pegging from CRH Line (CRHV-6)	01	02
3.	CEP A/B/C Minimum Recirculation (CDV-10, CDV-12 & CDV-14)	03	06
4.	Main Condensate Control (CDV-22 & CDV-25)	02	04
5.	GSC min. flow recirculation (CDV-39)	01	02
6.	Excess Dump Control (CDV-43)	01	02
7.	Condensate for SD F/T (CDV-67)	01	02
8.	Condensate for Valve Gland Sealing (CDV-72)	01	02
9.	HPH-7A/7B Drain to HPH-6A/6B (DRV-2 & DRV-8)	02	04
10.	HPH-7A/7B Drain to HP Drain F/T (DRV-5 & DRV-11)	02	04
11.	HPH-6A/6B Drain to Deaerator (DRV-15 & DRV-22)	02	04
12.	HPH-6A/6B Drain to HP Drain F/T (DRV-18 & DRV-25)	02	04
13.	LPH-3 Drain to LPH-2 (DRV-28)	01	02
14.	LPH-3 Drain to LP Drain F/T (DRV-31)	01	02
15.	LPH-2 Drain to LPH-1 (DRV-34)	01	02
16.	LPH-2 Drain to LP Drain F/T (DRV-37)	01	02
17.	Deaerator Overflow (DRV-48)	01	02
18.	HPH-8A/8B Drain to HPH-7A/7B (DRV-53 & DRV-59)	02	04
19.	HPH-8A/8B Drain to HP Drain F/T (DRV-56 & DRV -62)	02	04
20.	LPH-4 Drain to LPH-3 (DRV-65)	01	02
21.	LPH-4 Drain to LP Drain F/T (DRV-68)	01	02
22.	DM Normal Makeup to Hotwell (DMV-2)	01	02
23.	Emergency MU to Hotwell (DMV-9)	01	02
24.	DMCW System(03PGC15AA101)	01	02



BHEL PEM

**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)
(FOR ONE UNIT)
2 X 660 MW RAGHUNATHPUR PROJECT**

DRAWING NO.: PE-TS-390-145-I106

VOLUME : IIB

SECTION : D

REV. NO. 00

DATE : 14.05.2013

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OF

GENERAL TECHNICAL REQUIREMENTS FOR CONTROL VALVE WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES:

1. VALVES SELECTION WILL BE BASED ON ENCLOSED CONTROL VALVE DESIGN PARAMETERS.
2. TRIM MATERIAL AND BODY MATERIAL HAS BEEN SPECIFIED. HOWEVER, ANY SUBSTITUTE MATERIAL IF RECOMMENDED BY THE MANUFACTURER, WILL BE PROVIDED IF FOUND TECHNICALLY ACCEPTABLE AFTER EVALUATION. THE SAME SHALL BE INDICATED IN VENDOR'S DOCUMENT.
3. CONTROL VALVES SHALL BE SIZED BASED ON ALLOWABLE PRESSURE DROP AT MAXIMUM FLOW CONDITION AND TO ALLOW MCR FLOW BETWEEN 75% to 90% AND MINIMUM FLOW AT 10% TO 25% OF VALVE OPENING.
4. CHARACTERISTICS OF CONTROL VALVES HAVE BEEN SELECTED BASED ON APPLICATION / SERVICES. HOWEVER, IN CASE SUPPLIER IS NOT ABLE TO OFFER THE REQUIRED CHARACTERISTICS DUE TO DESIGN CONSIDERATIONS, MODIFIED TRIM (MOD.EQ PERCENTAGE OR MOD LINEAR) WILL BE SELECTED AFTER TECHNICAL EVALUATION.
5. ANTICAVITATION TRIMS SHALL BE PROVIDED FOR VALVES WITH CAVITATION SERVICES AND HARDENED TRIMS FOR FLASHING SERVICES
6. VALVE BODY AND TRIM DESIGN SHALL ACHIEVE THE NOISE ABATEMENT. HOWEVER, IF THE REQUIRED NOISE LEVEL IS NOT ACHIEVABLE DUE TO DESIGN CONSTRAINTS, EXTERNAL LOW NOISE PACK (CARTRIDGE/SILENCER) MAY BE USED IN THE DOWN STREAM SIDE OF THE VALVE.
7. CONTROL VALVE ACCESSORIES SHALL BE FITTED ON THE VALVE BODY. INTEGRAL PNEUMATIC TUBING SHALL BE ¼" OD PVC COATED COPPER, AND FITTINGS SHALL BE OF BRASS. APPLICABLE ACCESSORIES SHALL BE TERMINATED AT THE JUNCTION BOX (MOUNTED ON THE BODY).
8. TYPE OF BONNET SHALL BE ACCORDING TO THE SERVICE CONDITIONS. EXTENSION BONNETS SHALL BE PROVIDED WHEN THE MAXIMUM TEMPERATURE OF THE FLOWING FLUID IS GREATER THAN 280 DEG C.
9. TYPE OF FLOW ACTION ("UNDER THE SEAT" OR "OVER THE SEAT") WILL BE SELECTED BY THE VENDOR, HOWEVER WHEREVER DOWNSTREAM SIDE IS SUBJECTED TO VACUUM, FLOW ACTION SHALL BE "FLOW TO CLOSE" (OVER THE SEAT).
10. BHEL'S STANDARD QUALITY PLAN SHALL BE USED & VENDOR'S ACCEPTANCE ON THE SAME SHALL BE OBTAINED.
11. CONTROL VALVE DRAWINGS / DOCUMENTS / DATASHEET GIVING DETAILS OF MODEL NO, VALVE SIZE, AND CALCULATIONS FOR VALVE SIZING, NOISE & VELOCITY AND TECHNICAL DETAILS OF VARIOUS ACCESSORIES (OF THE SUCCESSFUL BIDDER) SHALL BE FURNISHED FOR INFORMATION AND RECORDS AFTER COMPLETION OF ENGINEERING AND SUPPLIES.
12. MANDATORY SPARES SHALL BE AS PER LIST ATTACHED.

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :....ASV-8... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 1% ± 1% ± 0.5% ± 2%						
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	7.5% BMCR	16.64	16	1.65	210				
	2.	15% BMCR (COLD)	33.28	16	1.7	210				
	3.	15% BMCR (HOT)	47.44	16	3.7	210				
	4.	OTHER	57.6	16	3.7	210				
	5.	40% BMCR (COLD)	88.73	16	1.7	210				
	6.	START-UP	118	16	1.7	210				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 20 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 20 | 240 * IBR FORM III-C <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... .....|..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITION INDICATED AT SL. NO. 3 AND SHALL BE CHECKED FOR ALL SPECIFIED CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. :...CRHV-6... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT SERVICE	2X660 MW RAGHUNATHPUR TPP		.....
	LOCATION	D/A PEGGING FROM CRH LINE		.....
DUTY	PIPE SIZE (inlet / outlet)	<input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING		.....
	PIPE MATERIAL (inlet / outlet)	355.6 x 15.09 | 965 x 37 SA 106 GR C | SA 106 GR C		.....|.....
BODY*	MODEL NO.	Bidder to specify		.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input type="checkbox"/> CAGE | ONE		.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to specify		.....|.....|.....
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M		.....|.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE		.....|.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED		.....|.....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED		.....|.....
FLOW	OUTLET VELOCITY	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT		.....
	REQUIRED LEAKAGE CLASS	<input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM)		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input type="checkbox"/> NO		.....
			
			
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify		.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0 <10 sec		.....|.....
*TRAVEL TIME FOR	OPEN TO CLOSE, CLOSE TO OPEN	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input type="checkbox"/> STAYPUT		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE			.....
ACCESSORI ES	POSITIONER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR FILTER REGULATOR	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR LOCK RELAY	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	<input type="checkbox"/> REQUIRED		.....
	LOCAL POSITION INDICATOR	<input type="checkbox"/> REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....

[illegible]

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET	OF	
Tag No. : CDV-22 & CDV-25 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	DESIGN POINT	1900	29.5	27.5	50			
	2.	60% LOAD	916.83	31.9	14.8	46.6			
	3.	100% MCR	1513	32.1	22.3	46.6			
	4.	VWO	1598.6	31.5	23.6	46.6			
	5.	MIN. (10% LOAD)	151.3	35.2	8.5	48.1			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47 | 55 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... .....	
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....	
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>4</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. :...CDV-43... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP EXCESS RETURN TO CST <input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 273 x 9.27 | 273 x 9.27 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 TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input type="checkbox"/> GLOBE <input checked="" type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input checked="" type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.:				
						VOLUME				
						SECTION				
						REV. NO.		DATE :		
						SHEET		OF		
Tag No. :...CDV-43... Qty.: ...1 per Unit ...										
Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				+ 1% + 1% ± 0.5% ± 2%			..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MIN.	38	37.9	4.0	46.6				
	2.	MAX	380	32.6	5.0	50				
	VALVE TYPE						[■] CAVITATION [] FLASHING [■] HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47 | 55 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. 2 AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...CDV-67... Qty.: ...1 per Unit ... <div>Date Sheet No. PES-145-06-DS1-0</div>										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				± 5% # ± 5% ± 0.5% ± 2%				
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MAX.	10	32.6	0.5	50				
	VALVE TYPE						[■] CAVITATION [] FLASHING [■] HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47/VACUUM | 55 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ____1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. 3. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.:			
		VOLUME			
		SECTION			
		REV. NO.	DATE :		
		SHEET	OF		
Tag No. :...CDV-72... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0					
DATA SHEET – A & B					
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP CONDENSATE FOR VALVE GLAND SEALING <input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 60.3 x 5.54 | 60.3 x 5.54 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 TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED *[<input checked="" type="checkbox"/>] A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M *REFER NOTE 3 <input type="checkbox"/> PTFE [<input checked="" type="checkbox"/>] GRAFOIL <input type="checkbox"/> DOUBBLE [<input checked="" type="checkbox"/>] SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input type="checkbox"/> LINEAR [<input checked="" type="checkbox"/>] EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV [<input checked="" type="checkbox"/>] V <input type="checkbox"/> VI LESS THAN 85 dBA <input type="checkbox"/> YES [<input checked="" type="checkbox"/>] NO <input type="checkbox"/> YES [<input checked="" type="checkbox"/>] NO			
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT			
ACCESSORI ES	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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input type="checkbox"/> REQUIRED [<input checked="" type="checkbox"/>] NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED [<input checked="" type="checkbox"/>] NOT REQUIRED			

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET	OF	
Tag No. : DRV-2 & DRV-8 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	50.6	23	10.4	184.5			
	2.	60% MCR	72.2	33.4	15.0	201.6			
	3.	100% MCR	157.0	53.2	24	224.3			
	4.	VWO	170.53	56.4	25.4	227.2			
	5.	BMCR	175.1	55.8	25.2	226.3			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.1 | 240 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... .....	
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....	
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>4</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. : DRV-5 & DRV-11 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP HPH-7A/7B ALT. DRAIN TO HP DRAIN F/T <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 273 x 12.7 | 323.9 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 TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 440 C | 440 C 440 C | 440 C <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

[illegible]

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET		OF
Tag No. : DRV-18 & DRV-25 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0 DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	66.23	10.5	0.3	181.3			
	2.	60% MCR	93.44	14.9	0.3	197.3			
	3.	100% MCR	194.5	23.7	0.3	219.5			
	4.	VWO	212.7	25.1	0.3	222.3			
	5.	BMCR	218.6	24.8	0.5	221.5			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 30 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 30/VACUUM | 230 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... .....	
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....	
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. ....DRV-28... Qty.: ...1 per Unit ...			Date Sheet No. PES-145-06-DS1-0	
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP LPH-3 NORMAL DRAIN TO LPH-2 <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 273 x 6.35 | 323.9 x 9.53 SA 106 GR B | SA 106 GR B		
BODY*	MODEL NO. TYPE OF BODY: GUIDING : NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input checked="" type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 0.2 | 1.0 < 10 sec <input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET	OF	
Tag No. :...DRV-28... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	50.81	1.0	0.7	79.8			
	2.	60% MCR	80.581	1.3	1.0	88.2			
	3.	100% MCR	148.5	1.8	1.3	98.5			
	4.	VWO	159	1.8	1.4	99.8			
	5.	LPH-1 OUT	166.9	1.5	1.2	93.1			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 110 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... .....	
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....	
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...DRV-31... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 1% ± 1% ± 0.5% ± 2%					
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	58.1	1.6	0.3	97.5				
	2.	60% MCR	79.5	1.8	0.3	106.33				
	3.	100% MCR	148.5	2.4	0.3	117.8				
	4.	VWO	159	2.5	0.3	119.3				
	5.	LPH-2 OUT	202.8	1.9	0.5	113.1				
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 130 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. __4__ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...DRV-34... Qty.: ...1 per Unit ... <div>Date Sheet No. PES-145-06-DS1-0</div>										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 1% ± 1% ± 0.5% ± 2%						
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	80.1	0.5	0.3	60.0				
	2.	60% MCR	108.9	0.6	0.4	67.1				
	3.	100% MCR	207.4	0.8	0.6	74.1				
	4.	VWO	222.3	0.8	0.6	75.0				
	5.	ALL HPH OUT	228.9	0.6	0.5	76.2				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 85 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED									
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg									
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. __4__ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. ....DRV-37... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	2X660 MW RAGHUNATHPUR TPP		.....
	SERVICE	LPH-2 ALT. DRAIN TO LP DRAIN F/T		.....
GENERAL*	LOCATION	<input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR		.....
	DUTY	<input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING		.....
	PIPE SIZE (inlet / outlet)	323.9 x 6.35 | 355.6 x 9.53		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B		.....
BODY*	MODEL NO.	Bidder to specify		.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE		.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to specify		.....
	END CONNECTION & RATING (ANSI)	<input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS		.....
		<input type="checkbox"/> A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE		.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
	440 C | 440 C		.....
	440 C | 440 C		.....
BODY*	FLOW	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT		.....
	OUTLET VELOCITY	<input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM)		.....
	REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
			
			
			
			
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify		.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 sec		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE		<input checked="" type="checkbox"/> STAYPUT	.....
ACCESSORIES	POSITIONER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR FILTER REGULATOR	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR LOCK RELAY	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION LIMIT SWITCH	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	<input checked="" type="checkbox"/> REQUIRED		.....
	LOCAL POSITION INDICATOR	<input checked="" type="checkbox"/> REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET	OF	
Tag No. :...DRV-37... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 1% ± 1% ± 0.5% ± 2%			..... ..... ..... .....
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	80.1	1.0	0.3	78.5			
	2.	60% MCR	108.9	1.1	0.3	86.4			
	3.	100% MCR	207.4	1.3	0.3	96.5			
	4.	VWO	222.3	1.3	0.3	97.8			
	5.	LPH-1 OUT	259.5	1.0	0.5	91.9			
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 105 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....	
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....	
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. __4__ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. ....DRV-48... Qty.: ...1 per Unit ...			Date Sheet No. PES-145-06-DS1-0	
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP DEAERATOR OVERFLOW TO LP DRAIN F/T <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input checked="" type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING 219.1 x 6.35 | 323.9 x 9.53 SA 106 GR B | SA 106 GR B		
BODY*	MODEL NO. TYPE OF BODY: GUIDING : NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input checked="" type="checkbox"/> QUICK OPEN (ON/OFF) 440 C | 440 C 440 C | 440 C <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. ....DRV-48... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 5% # ± 5% ± 0.5% ± 2%			..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MAX.-1 10% BMCR	212	15.0	0.3	188.7				
	2.	MAX.-2 10% BMCR	212	6.3	0.5	138.2				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 20 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 20/VACUUM | 200 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... .....|..... .....		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ____1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. 3. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.										

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. : DRV-59 & DRV-62 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP HPH-8A/8B ALT. DRAIN TO HP DRAIN F/T <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 168.3 x 10.97 | 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 TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 440 C | 440 C 440 C | 440 C <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. : DRV-59 & DRV-62 Qty.: 2 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 1% ± 1% ± 0.5% ± 2%					
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	19.0	33.6	0.3	240.9				
	2.	60% MCR	26.9	28.2	0.3	260.6				
	3.	100% MCR	60.7	76.1	0.3	290.2				
	4.	VWO	66.3	81.1	0.3	293.9				
	5.	BMCR	67.9	80.6	0.5	293.3				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 88/VACUUM | 300 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... .....|..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. __4__ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. :...DRV-65... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0				
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT SERVICE	2X660 MW RAGHUNATHPUR TPP		.....
	LOCATION	LPH-4 NORMAL DRAIN TO LPH-3		.....
	DUTY	<input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING		.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 219.1 x 6.35		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B		.....|.....
BODY*	MODEL NO.	Bidder to specify		.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE		.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to specify		.....|.....|.....
	END CONNECTION & RATING (ANSI)	<input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE		.....|.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	<input type="checkbox"/> QUICK OPEN (ON/OFF) 17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
	FLOW	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT		.....
OUTLET VELOCITY	<input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM)		.....
REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input checked="" type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI		.....
NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify		.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0		.....|.....
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 sec		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORIES	POSITIONER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR FILTER REGULATOR	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR LOCK RELAY	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION LIMIT SWITCH	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	<input checked="" type="checkbox"/> REQUIRED		.....
	LOCAL POSITION INDICATOR	<input checked="" type="checkbox"/> REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...DRV-65... Qty.: ...1 per Unit ... <div>Date Sheet No. PES-145-06-DS1-0</div>										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 1% ± 1% ± 0.5% ± 2%						
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	36.23	2.7	1.2	98.6				
	2.	60% MCR	50.8	3.7	1.7	107.6				
	3.	100% MCR	95.4	5.4	2.4	119.8				
	4.	VWO	102.1	5.6	2.5	121.4				
	5.	ALL HPH OUT	104.8	5.9	2.7	123.3				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 135 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED									
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg									
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ____4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. ....DRV-68... Qty.: ...1 per Unit ...			Date Sheet No. PES-145-06-DS1-0	
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP LPH-4 ALT. DRAIN TO LP DRAIN F/T <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 168.3 x 7.11 | 219.1 x 8.18 SA 106 GR B | SA 106 GR B		
BODY*	MODEL NO. TYPE OF BODY: GUIDING : NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) 440 C | 440 C 440 C | 440 C <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 1.0 | 0.2 < 10 sec <input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...DRV-68... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)							DATA SHEET – B (TO BE FILLED UP BY BIDDER)			
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 1% ± 1% ± 0.5% ± 2%					
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	36.2	3.3	0.3	128.3				
	2.	60% MCR	50.8	4.2	0.3	140.4				
	3.	100% MCR	95.3	6.0	0.3	155.0				
	4.	VWO	102.1	6.3	0.3	156.8				
	5.	LPH-3 OUT	130.5	5.3	0.5	151.5				
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 165 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. __4__ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.:				
						VOLUME				
						SECTION				
						REV. NO.		DATE :		
						SHEET		OF		
Tag No. :...DMV-2... Qty.: ...1 per Unit ...										
Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				± 1% ± 1% ± 0.5% ± 2%			..... ..... ..... .....	
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MIN. (1% MU)	21.2	6.7 #	0.5	33				
	2.	NORMAL (3% MU)	63.6	4.9 #	0.55	33				
	3.	MAX. (5% MU)	106	2.6 #	0.6	33				
	4.	NORMAL (3% MU)	63.6	4.9 #	1.6	33				
	VALVE TYPE						[■] CAVITATION [] FLASHING [] HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 10 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/VACUUM | 50 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						..... .....|..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES:										
1. * TO BE FILLED BY MSE										
2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>2</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										
3. # INLET PRESSURE TO BE CONFIRMED BY NTPC.										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE :
			SHEET	OF
Tag No. ....DMV-9... Qty.: ...1 per Unit ...			Date Sheet No. PES-145-06-DS1-0	
DATA SHEET – A & B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL*	PROJECT SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	2X660 MW RAGHUNATHPUR TPP DM EMERGENCY MU TO HOTWELL <input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR <input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING 273 x 4.19 | 273 x 4.19 SA 312 TP 304 (ERW ) | SA 312 TP 304 (ERW)		
BODY*	MODEL NO. TYPE OF BODY: GUIDING : NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	Bidder to specify <input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE | ONE Bidder to specify <input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED <input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS <input checked="" type="checkbox"/> A351 CF8M <input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE <input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED <input type="checkbox"/> LINEAR <input checked="" type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN (ON/OFF) SS 316 STELLITED | SS 316 STELLITED SS 316 STELLITED | SS 316 STELLITED <input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT <input type="checkbox"/> < 7 M/SEC (WATER) <input type="checkbox"/> MAC NO. < 1/3(STM) <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI LESS THAN 85 dBA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM2g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	Bidder to specify 0.2 | 1.0 < 10 sec <input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE <input checked="" type="checkbox"/> STAYPUT		
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	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED PART OF POSITIONER <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.:			
							VOLUME			
							SECTION			
							REV. NO.		DATE :	
							SHEET		OF	
Tag No. :...DMV-9... Qty.: ...1 per Unit ... Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			± 1% ± 1% ± 0.5% ± 2%						
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MIN. (5% MU)	106	5.5 #	0.45	33				
	2.	NORMAL (10% MU)	212	4.8 #	0.5	33				
	3.	CT PUMP DESIGN FLOW	350	3.9 #	0.8	33				
	4.	NORMAL (10% MU)	212	4.8 #	1.5	33				
	VALVE TYPE						<input checked="" type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
* MAX SHUT OFF PRESS (KG/CM2g) 10 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/VACUUM | 50 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1. * TO BE FILLED BY MSE 2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u> 2 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. 3. # INLET PRESSURE TO BE CONFIRMED BY NTPC.										

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-390-145-I106	
			VOLUME IIB	
			SECTION	D
			REV. NO.	00	DATE :14.05.2013
		SHEET		OF
Tag No: Applicable for all tag nos. Quantity: As required Data Sheet No. PES-145-06-DS1-0				
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)				
SMART POSITIONER (UNIVERSAL HART PROTOCOL BASED)	MFR. & MODEL NUMBER		Bidder to Specify	
	BYPASS	GAUGES	ENCL. CLASS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
	INPUT SIGNAL		4- 20 mA DC	
	OUTPUT SIGNAL (Kg / Cm ²) T		O SUIT ACTUATOR	
AIR FILTER REGULATOR TWO (2) Nos./CV ≤5MICRON (SINTERED BRONZE)	MFR. & MODEL NUMBER		Bidder to Specify	
	AIR SUPPLY PRESS (MAX.) (Kg / Cm ² g)		<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
	OUTPUT PRESS (Kg / Cm ² g)		TO SUIT ACTUATOR	
	OUTPUT GAUGE		<input checked="" type="checkbox"/> REQUIRED (2 Inch) <input type="checkbox"/> NOT REQUIRED	
AIR LOCK	MFR. & MODEL NUMBER		Bidder to Specify	
	SET PRESS (Kg / Cm ²)			
	SUPPLY PRESS (MAX.) (Kg / Cm ²)		<input checked="" type="checkbox"/> 7.0 <input type="checkbox"/>	
	RESET TYPE		AUTO	
	VENT PLUG		REQUIRED	
LIMIT SWITCH	MFR. & MODEL NUMBER		Bidder to Specify	
	OPEN posn	INT posn	CLOSE posn	<input type="checkbox"/> 1 NO. <input type="checkbox"/> --- <input type="checkbox"/> 1 NO.
	CONTACT TYPE		SPDT	
	RATING (AC / DC)		5A 240V AC AND 0.5A 220V DC	
	ENCLOSURE CLASS		<input type="checkbox"/> NEMA-4 <input checked="" type="checkbox"/> IP-65	
POSITION TRANSMITTER	MFR. & MODEL NUMBER		Bidder to Specify (Part of SMART Positioner)	
	TYPE		<input checked="" type="checkbox"/> Electronic (2-Wire) Contactless <input type="checkbox"/> OTHER	
	SUPPLY		<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 110V AC <input type="checkbox"/> 240V AC	
	OUTPUT RATING		<input checked="" type="checkbox"/> 4-20mA <input type="checkbox"/> 0-100 ohms	
	ACCURACY +		_ 2% FS	
	ENCLOSURE CLASS		<input type="checkbox"/> NEMA-4 <input checked="" type="checkbox"/> IP-65	
SOLENOID VALVE	MFR. & MODEL NUMBER		ROTEX / ASCO	
	RATING		<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>	
	OPERATION Q	QUANTITY	<input type="checkbox"/> Stayput <input checked="" type="checkbox"/> Interlock <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	
	COIL INSULATION CLASS		CLASS - H	
	ENCLOSURE CLASS		<input type="checkbox"/> NEMA-4 <input checked="" type="checkbox"/> IP-65	
	BODY & TRIM		SS BAR STOCK & AISI SS-316 respectively	
JUNCTION BOX	NO. OF WAYS		<input type="checkbox"/> 24-WAYS <input type="checkbox"/> AS REQUIRED <input checked="" type="checkbox"/> 36-Ways	
	SIZE AS		REQUIRED	
	CABLE GLANDS (Size / Quantity)		AS REQUIRED (Double Compression Type).	
	ENCLOSURE CLASS		<input type="checkbox"/> NEMA-4 <input checked="" type="checkbox"/> IP-65	
I/P CONVERTER (Part of SMART Positioner)	INPUT SIGNAL	POWER SUPPLY	4-20mA DC	24V DC
	SPLIT RANGE		<input type="checkbox"/> YES <input type="checkbox"/> NO	
	ENCLOSURE CLASS		<input type="checkbox"/> NEMA-4 <input checked="" type="checkbox"/> IP-65	
	Accuracy	Repeatability	± 0.5 % FS	± 0.5 % FS
Cu. Tubing & Fittings / per CV	This is in addition to cu. Tubing and fittings which are integral part of CV as per ASTM B68 to B75 (USA)		25 Meters of 1/4" PVC coated annealed Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.	

HANDWHEEL

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION D

REV. NO.


00


DATE : 14.05.2013

SHEET


OF

SECTION – D**DATA SHEETS – C**

	2 X 660MW RAGHUNATHPUR Technical specification for Control Valves with Accessories (Pneumatically Operated)		SPECIFICATION NO. PE-TS-390-145-I 106	
			VOLUME II-B	
			SECTION D	
			REV. NO. 00	DATE: 14.05.2013
			SHEET OF	
Tag No..... Quantity..... Data Sheet No. PES-145-06-DS1-0				
DATA SHEET – A& B				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED-UP BY BIDDER)
GENERAL *	PROJECT			
	SERVICE			
	LOCATION	<input type="checkbox"/> INDOOR	<input type="checkbox"/> OUTDOOR	
	DUTY	<input type="checkbox"/> ON/OFF	<input type="checkbox"/> MODULATING	
	PIPE SIZE (inlet / outlet)			
	PIPE MATERIAL (inlet / outlet)			
BODY	MODEL NUMBER			
	TYPE OF BODY : GUIDING : NO. OF PORTS	<input type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE	<input type="checkbox"/> TOP <input type="checkbox"/> CAGE	ONE
	BODY SIZE : PORT SIZE : DESIGN DV			
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> A217 C5 <input type="checkbox"/> A351 CF8M		
	PACKING MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE		
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		
	TRIM FORM	<input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		
	TRIM MATERIAL : SEAT | PLUG	<input type="checkbox"/> SS 316 STELLITED	<input type="checkbox"/> SS 316 STELLITED	
	TRIM MATERIAL : CAGE | GUIDE	<input type="checkbox"/> 17-4 PH SS	<input type="checkbox"/> SS 316 STELLITED	
	FLOW	<input type="checkbox"/> BELOW SEAT <input type="checkbox"/> ABOVE SEAT		
	OUTLET VELOCITY	<input type="checkbox"/> < 7M/SEC (WATER)	<input type="checkbox"/> MAC NO. < 1/3 (STM)	
	REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI		
	NOISE LEVEL (dBA) (Spec. 3.1.14)	LESS THAN 85 dBA		
	VACUUM SERVICE	<input type="checkbox"/> YES <input type="checkbox"/> NO		
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input type="checkbox"/> NO		
	PNEUMATIC ACTUATOR	MODEL NO. & SIZE		
CLOSE AT : OPEN AT (Kg / Cm ² g)				
*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN				
*VALVE POSN. ON SIGNAL AIR FAILURE		<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		
*VALVE POSN. ON SUPPLY AIR FAILURE		<input type="checkbox"/> STAYPUT		
ACCESSORIES	SMART POSITIONER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	AIR FILTER REGULATOR	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	AIR LOCK RELAY	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	POSITION TRANSMITTER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	E / P CONVERTER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	JUNCTION BOX	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	HAND WHEEL (SIDE MOUNTED)	<input type="checkbox"/> REQUIRED		
	LOCAL POSITION INDICATOR	<input type="checkbox"/> REQUIRED		
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		

	2 X 660MW RAGHUNATHPUR Technical specification for Control Valves with Accessories (Pneumatically Operated)	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 14.05.2013
		SHEET OF	

Tag No..... Quantity.....							Data Sheet No. PES-145-06-DS1-0		
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)							DATA SHEET – B (TO BE FILLED-UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY +		_ 2%						
	HYSTERSIS +		_ 1%						
	SENSITIVITY +		_ 0.5%						
	ACCURACY +		_ 2%						
SERVICE CONDITION*	SL.+ NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM² (A))	OUTLET PR. (KG/CM² (A))	TEMP DEG. C	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		VALVE TYPE					<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
		* MAX SHUT OFF PRESS ((KG/CM ² g)							
		* BODY DESIGN : PRESS ((KG/CM ² g) | TEMP (DEG. C)							
		* IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED							
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.									
NOTES: 1. * = To be filled by MSE. 2. + = Design CV shall be based on Service Conditions indicated at Sl.No. ____ and shall be checked for all other conditions as per specification clause number 3.1.7									

	2 X 660MW RAGHUNATHPUR Technical specification for Control Valves with Accessories (Pneumatically Operated)	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 14.05.2013
		SHEET OF	

	NAME
	SIGNATURE
	DATE
Tag No..... Quantity.....	
Data Sheet No. PES-145-06-DS2-0	


DATA SHEET C

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


GENERAL*	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN DV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA) (Spec. 3.1.14)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
	PNEUMATIC ACTUATOR	MODEL NO. & SIZE
CLOSE AT : OPEN AT (Kg / Cm ² g)		
*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN		
*VALVE POSN. ON SIGNAL AIR FAILURE		
*VALVE POSN. ON SUPPLY AIR FAILURE		
ACCESSORIES	SMART 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	

	2 X 660MW RAGHUNATHPUR Technical specification for Control Valves with Accessories (Pneumatically Operated)	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 14.05.2013
		SHEET OF	

Tag No..... Quantity.....				Data Sheet No. PES-145-06-DS2-0					
DATA SHEET C									
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)									
PERFORMANCE OF VALVE	LINEARITY								
	HYTERSIS								
	SENSITIVITY								
	ACCURACY								
SERVICE CONDITION*	SL.+ NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM² (A))	OUTLET PR. (KG/CM² (A))	TEMP DEG. C	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		VALVE TYPE							
		* MAX SHUT OFF PRESS ((KG/CM ² g)							
		* BODY DESIGN : PRESS ((KG/CM ² g) | TEMP (DEG. C)							
		* IBR FORM III-C							
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.									

	2 X 660MW RAGHUNATHPUR TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 14.05.2013
		SHEET OF	

Tag No..... Quantity.....		Data Sheet No. PES-145-06-DS1-0	
APPLICABLE FOR TAG Nos.WHEREVER STATEMENT "REQUIRED" INDICATED IN THE INDIVIDUAL CV DATA SHEETS			
DATA SHEET – C for ACCESSORIES (for valves with SMART POSITIONER)			
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			
SMART POSITIONER	MFR. & MODEL NUMBER		
	APPLICATION		
	BYPASS:GAUGES: (SUPPLY,OUT PUTS)		
	ENCLOSURE CLASS		
	INPUT SIGNAL		
	OUTPUT SIGNAL RANG		
	INCREASE IN AIR SIGNAL		
	POSITION FEED BACK		
	BOOSTER :		
LINEARITY			
AIR FILTER REGULATOR	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm ² g)		
	OUTPUT PRESS (Kg / Cm ² g)		
	OUTPUT GAUGE		
	QTY		
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		
SOLENOID VALVE	MFR. & MODEL NUMBER		
	RATING		
	OPERATION QUANT	TY	
	COIL INSULATION CLASS		
	ENCLOSURE CLASS		
HANDWHEEL	ORIENTATION		
JUNCTION BOX	NO. OF WAYS		
	SIZE		
	CABLE GLANDS (Size / Quantity)		
	ENCLOSURE CLASS		
VOLUME BOOSTER			
Cu. Tubing & Fittings / per CV	12 Meters of 3/8 " PVC coated Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE

	2 X 660MW RAGHUNAT TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-390-145-I 106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 14.05.2013
		SHEET OF	

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

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

DATA SHEET C for ACCESSORIES (for ON-OFF type valve)**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 GAUGE	SENC. 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		
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 QUANT	TY	
	COIL INSULATION CLASS		
	ENCLOSURE CLASS		
HANDWHEEL	ORIENTATION		
JUNCTION BOX	NO. OF WAYS		
	SIZE		
	CABLE GLANDS (Size / Quantity)		
	ENCLOSURE CLASS		
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY	
	SPLIT RANGE		
	ENCLOSURE CLASS		
Cu. Tubing & Fittings / per CV	12 Meters of 3/8 " PVC coated Cu. Tubing, with 1 set of Fittings for connection to IA Header on one end and accessories on another end of CV		

COMPANY SEAL

NAME

SIGNATURE

DATE

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION D

REV. NO.

00

DATE : 14.05.2013

SHEET

OF

SECTION – D**QUALITY PLAN**



STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: PE-QP-999-145-I 006	
VOLUME	IIB
SECTION	D
REV. NO.	05
SHEET	1

MOUDA STPP ST-II
CONTROL VALVE
9575-110

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

1.0 MATERIAL

1.1	Body & Bonnet casting / forgings, plug, stem.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3	---	2,1	
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3/2	2	1	IBR Certification (if applicable) to be verified by BHEL
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet(NDT)	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1	Only for rating ANSI 900 and above. Applicable for Body and Bonnet only. For Lower rating only if called for in specification.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining

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

RT- Radiographic Test
UT – Ultrasonic Test

PT – Dye penetrant Test
MT- Magnetic Test

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W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor



STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: PE-QP-999-145-I 006	
VOLUME	IIB
SECTION	D
REV. NO.	05
DATE:	24.07.2010
SHEET	2 OF 6

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


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<div></div> <div>PEM :: C&I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO. 05		DATE: 24.07.2010		
								SHEET 3		OF 6		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2,1	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1	
2.0	IN PROCESS INSPECTION											
2.1	Body & Bonnet after machining, Plug with actuator stem	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	Test Records	2			
3.0	TESTS ON COMPLETED VALVE											
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	No Leakage	Test Certificate	2	1	1	Refer Note-4
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1	Refer Note-4
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: PE-QP-999-145-I 006	
VOLUME	IIB
SECTION	D
REV. NO.	05
DATE:	24.07.2010
SHEET	4 OF 6

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

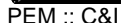
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CONTROL VALVE (PNEUMATIC)

VOLUME	IIB
--------	-----

IIB

D

05

DATE: 24.07.2010

5

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


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<div><div>04/05/2010</div><div></div><div>PEM :: C&I</div></div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006					
								VOLUME		IIB			
								SECTION		D			
								REV. NO.		05		DATE: 24.07.2010	
								SHEET		6		OF 6	
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		
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1		
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1		
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1		
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1		
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2	1	1		
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1	Refer Note-2	
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3	

NOTES:

- Cv test will be conducted if Test Certificate for a similar Model / Size / Cv is not available. Validity of the certificate considered as last 3 years. Cv test conducted at IIT/FCRI/any govt. approved laboratory shall not be witnessed by BHEL.
- In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Sea worthy packing, if applicable.
- 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 for verification and acceptance.

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**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION D

REV. NO.


00

DATE : 14.05.2013

SHEET

OF

SECTION – D**BILL OF QUANTITY**

	2 X 660MW TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-390-145-1106	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 20.05.2013
		SHEET 1 OF 1	

BILL OF QUANTITY

S.NO. ITEM	DESCRIPTION		Qty/Unit	Total Qty.
[A]	CONTROL VALVES COMPLETE WITH PNEUMATIC ACTUATOR AND ALL ACCESSORIES MOUNTED , PIPED AND TERMINATED ON JB			
S. No.	TAG NO.	SERVICE		
1.	ASV-8	D/A Pegging from Aux. Steam Header	1	2
2.	CRHV-6	D/A Pegging from CRH Line	1	2
3.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation	3	6
4.	CDV-22 & CDV-25	Main Condensate Control	2	4
5.	CDV-39	GSC min. flow recirculation	1	2
6.	CDV-43	Excess Dump Control	1	2
7.	CDV-67	Condensate for SD F/T	1	2
8.	CDV-72	Condensate for Valve Gland Sealing	1	2
9.	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B	2	4
10.	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T	2	4
11.	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator	2	4
12.	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T	2	4
13.	DRV-28	LPH-3 Drain to LPH-2	1	2
14.	DRV-31	LPH-3 Drain to LP Drain F/T	1	2
15.	DRV-34	LPH-2 Drain to LPH-1	1	2
16.	DRV-37	LPH-2 Drain to LP Drain F/T	1	2
17.	DRV-48	Deaerator Overflow	1	2
18.	DRV-53 & DRV-56	HPH-8A/8B Drain to HPH-7A/7B	2	4
19.	DRV-59 & DRV-62	HPH-8A/8B Drain to HP Drain F/T	2	4
20.	DRV-65	LPH-4 Drain to LPH-3	1	2
21.	DRV-68	LPH-4 Drain to LP Drain F/T	1	2
22.	DMV-2	DM Normal Makeup to Hotwell	1	2
23.	DMV-9	Emergency MU to Hotwell	1	2
26.	03PGC15AA101	DMCW System	1	2
[B]	1/4” of COPPER TUBING (PVC COATED) (To be supplied Loose)		600 METERS	1200 METERS
[C]	FITTINGS: (To be supplied Loose)	(i) BRASS FITTING for Connection to Air Filter Regulator	1 Lot	2 Lot
		(ii) BRASS FITTING for Connection to Solenoid Valve	1 Lot	2 Lot
		(iii) BRASS FITTING for Connection to IA Header isolation valve	1 Lot	2 Lot
		(iv) BRASS EQUAL TEE	1 Lot	2 Lot

**2 X 660MW RAGHUNATHPUR****TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPEC NO.: PE-TS-390-145-I106

VOLUME II B

SECTION D

REV. NO.


00

DATE : 14.05.2013

SHEET

OF

SECTION – D**SPARES**

	2 X 660MW RAGHUNATHPUR TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES	SPECIFICATION NO. PE-TS-387-145-I 106	
		VOLUME II-B	
		SECTION D	
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[A] LIST OF COMMISSIONING SPARES

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

[B] LIST OF MANDATORY SPARES

S.No.	ITEM DESCRIPTION	QUANTITY
1	Position Feedback Transmitter	10% or 2 nos. for each type of CV whichever is more.(1 LOT)
2	Trim (Plug & stem assembly, seat rings, guide bushings etc.)	1 Set for each type of valve. Cage is not applicable.
3	Actuator Diaphragm	100% of each type, make etc. (1 LOT)
4	Seals	100% of each type, make etc. (1LOT)
5	O rings	100% of each type, make etc. (1LOT)
6	Pressure Guages of all types, make, rating etc.	10% or 2 Nos. of each type whichever is more. (1LOT)
7	Solenoid Valves	10% or 2 nos. of each type whichever is more. (1LOT)
8	Positioner Unit	20% or 2 nos. of each type whichever is more. (1LOT)
9	Pneumatic and electro-hydraulic actuator assembly	10% or 2 Nos. of each type,model and rating ,whichever is more (1LOT)

[C] RECOMMENDED SPARES

Bidder to offer recommended spares as per their recommendation (List to be attached).

**DAMODAR VALLEY CORPORATION
2 X 660MW RAGHUNATHPUR**

**TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)**

VOLUME III

SPECIFICATION No: PE-TS-390-145-I 106



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



2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPECIFICATION NO.: PE-T S-390-145-I106

VOLUME III

SECTION

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EQUIPMENT MANUFACTURE, INSPECTION AND DISPATCH.
7. COMPLIANCE CERTIFICATE

**2 X 660MW RAGHUNATHPUR**
**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
ALONGWITH ACCESSORIES**

SPECIFICATION NO.: PE-T S-390-145-I106

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SCHEDULE OF PRICES

S.NO.	ITEM DESCRIPTION			PRICE/UNIT
[A] CONTROL VALVES WITH ALL THE ACCESSORIES				
S. No.	TAG NO.	SERVICE		
1.	ASV-8	D/A Pegging from Aux. Steam Header		
2.	CRHV-6	D/A Pegging from CRH Line		
3.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation		
4	CDV-22 & CDV-25	Main Condensate Control		
5	CDV-39	GSC min. flow recirculation		
6	CDV-43	Excess Dump Control		
7	CDV-67	Condensate for SD F/T		
8	CDV-72	Condensate for Valve Gland Sealing		
9	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B		
10	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T		
11	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator		
12	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T		
13	DRV-28	LPH-3 Drain to LPH-2		
14	DRV-31	LPH-3 Drain to LP Drain F/T		
15	DRV-34	LPH-2 Drain to LPH-1		
16	DRV-37	LPH-2 Drain to LP Drain F/T		
17	DRV-48	Deaerator Overflow		
18	DRV-53 & DRV-59	HP H-8A/8B Drain to HPH-7A/7B		
19	DRV-56 & DRV-62	HPH-8A/8B Drain to HP Drain F/T		
20	DRV-65	LPH-4 Drain to LPH-3		
21	DRV-68	LPH-4 Drain to LP Drain F/T		
22	DMV-2	DM Normal Makeup to Hotwell		
23	DMV-9	Emergency MU to Hotwell		
24	03PGC15AA101	DMCW System		
[B] 1200 METERS OF 1/4” PVC Coated Cu TUBING FOR CONNECTION BETWEEN IA HEADER ON ONE END AND ACCESSORIES ON THE OTHER END OF CV+1 SET OF FITTINGS FOR EACH VALVE				
[C] START-UP/COMMISSIONING SPARES (1 SET OF BODY AND BONNET GASKET AND GLAND PACKING)				
[D] CV TEST CHARGES				
[E] MANDATORY SPARES – AS PER REQUIREMENT IN SECTION-D (OPTIONAL)				
[F] RECOMMENDED SPARES – FOR THREE (3) YEARS OF OPERATION (ITEM WISE BREAK-UP TO BE ATTACHED BY THE BIDDER)				
[G] DOCUMENTATION CHARGES FOR THE FINAL DOCUMENTS AND SOFT COPIES.				
PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME DES	IGNATION	SIGNATURE	DATE	COMPANY SEAL

**2 X 660MW RAGHUNATHPUR**
**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH PNEUMATIC ACTUATOR
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SCHEDULE OF UNIT PRICES

[B] CONTROL VALVE ACCESSORIES		
S. No.	ITEMS	UNIT PRICE
1.	POSITIONER (SMART) OF EACH MODEL AND TYPE	
2.	AIR FILTER REGULATORS	
3.	AIR LOCK RELAY	
4.	POSITION LIMIT SWITCH OF EACH MODEL AND TYPE	
5.	ELECTRONIC POSITION TRANSMITTER OF EACH MODEL AND TYPE	
6.	SOLENOID VALVE	
7.	VOLUME BOOSTER (PNEUMATIC RELAY)	
8.	PRESSURE GAUGES OF EACH TYPE	
9.	JUNCTION BOX (36 WAYS)	
10.	HANDWHEEL	
11.	ACTUATOR OF EACH TYPE (Separate list to be attached if required)	
12.	BRASS FITTING FOR CONNECTION TO AIR FILTER REGULATOR	
13.	BRASS FITTING FOR CONNECTION TO AIR LOCK RELAY	
14.	BRASS FITTINGS FOR CONNECTING TO AIR HEADER	
15.	EQUAL COPPER TEE	
16.	COPPER TUBING PER METRE	
17. \$	VALVE STEM WITH PLUG & SEAT RING EACH SIZE & TYPE	
18. \$	GASKET OF EACH SIZE AND TYPE	
19. \$	BODY SEAL GASKETS OF EACH SIZE AND TYPE	
20. \$	CAGE OF EACH SIZE AND TYPE	
21. \$	GLAND PACKING EACH SIZE AND TYPE	
22. \$	VALVE TRIM OF EACH SIZE AND TYPE(CAGE, PLUG, SEAT, STEM)	
23. \$	DIAPHRAM/ POWER CYLINDER OF EACH SIZE AND TYPE	
24.	VALVE DIAGNOSTIC SOFTWARE FOR SMART POSITIONER(OPTIONAL ITEM)	
25.	HAND HELD HART CALIBRATOR (OPTIONAL ITEM)	

NOTE :

\$: Separate list to be attached for each size and type of these control valve accessories tag number wise.

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



2 X 660MW RAGHUNATHPUR

**TECHNICAL SPECIFICATION FOR
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CV TEST CHARGES

S.NO.	ITEM DESCRIPTION		
[A] CONTROL VALVES WITH ALL THE ACCESSORIES			
S. No.	TAG NO.	SERVICE	CV TEST CHARGES
4.	ASV-8	D/A Pegging from Aux. Steam Header	
5.	CRHV-6	D/A Pegging from CRH Line	
6.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation	
7.	CDV-22 & CDV-25	Main Condensate Control	
8.	CDV-39	GSC min. flow recirculation	
9.	CDV-43	Excess Dump Control	
10.	CDV-67	Condensate for SD F/T	
11.	CDV-72	Condensate for Valve Gland Sealing	
12.	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B	
13.	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T	
14.	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator	
12	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T	
13	DRV-28	LPH-3 Drain to LPH-2	
14	DRV-31	LPH-3 Drain to LP Drain F/T	
15	DRV-34	LPH-2 Drain to LPH-1	
16	DRV-37	LPH-2 Drain to LP Drain F/T	
17	DRV-48	Deaerator Overflow	
18	DRV-53 & DRV-59	HPH -8A/8B Drain to HPH-7A/7B	
19	DRV-56 & DRV-62	HPH-8A/8B Drain to HP Drain F/T	
20	DRV-65	LPH-4 Drain to LPH-3	
21	DRV-68	LPH-4 Drain to LP Drain F/T	
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23	DMV-9	Emergency MU to Hotwell	
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2 X 660MW RAGHUNATHPUR

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INSPECTION SCHEDULE

(PLACE & ADDRESS OF TESTING/ INSPECTION AND ITS SCHEDULE DATE & DURATION IN
NUMBER OF DAYS ITEM/COMPONENTWISE TO BE LISTED)

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME DESI	GNATION	SIGNATURE	DATE	COMPANY SEAL



2 X 660MW RAGHUNATHPUR

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DEVIATION SCHEDULE

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME D	ESIGNATION	SIGNATURE	DATE	COMPANY SEAL



2 X 660MW RAGHUNATHPUR

TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH PNEUMATIC ACTUATOR ALONGWITH ACCESSORIES

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SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE INSPECTION AND DESPATCH

1.	<u>ZERO DATE</u>	<u>DATE of LOI / FOI / TOI</u>
2.	Submission of Data Sheets / documents / catalogues / Valve sizing calculations / Noise calculations for approval.	2 Weeks from the Zero date.
3.	Technical finalization, freezing of inputs of manufacture by way of vetting of documents and technical discussions and resubmissions of documents (if required)	6 Weeks from the Zero date.
4.	Inspection of Equipment as per Approved (Category-I) drawings / documents.	24 Weeks from the Zero date.
5.	Release of MDCC by BHEL	26 Weeks from the Zero date.
6.	Dispatch (Packaging & Dispatch)	26 Weeks from the Zero date.
7.	Final documents submission as per Contract	28 Weeks from the Zero date.

NOTE: Delays due to non-fulfillment of the requirements of approved Quality Plan and approved Data sheets; Drawings, Catalogues and Sizing Calculations observed during inspection shall be to the Vendor's account.

Delays due to INCOMPLETE (Partly) submission of Data sheets, Drawings, Catalogues and Sizing Calculations also be considered as **"DOCUMENTS NOT SUBMITTED"**.

(Signature and Stamp of the Bidder)

COMPLIANCE CERTIFICATE
For
Control Valve with accessories
(To be Signed & Stamped by the Bidder)

Project: 2x 660 MW RAGHUNATHPUR.

Specification no.: PE-TS-390-145-I106

We shall comply with the following:-

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / Drawings, BHEL quality plan etc as enclosed in the tender, shall be fully complied **without any deviation**.
2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith **without any deviation**.
3. Calculation of Cv, Noise level, Valve outlet velocity, Trim exit velocity, Actuator sizing, Data sheet-C in line with Data sheet-A of specification, dimensional drawings / edge preparation details, etc shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.
4. Selection of valves and Actuators are our (bidder's) responsibility. Any change in selection of type of valve / Sizing / percentage opening, calculations, QP, 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 without any commercial implication and time delay.
5. Body material and Trim material combinations offered are equivalent or better than the material specified in data sheet-A. Wherever Trim material combinations offered differ from the specification, its superiority shall be authenticated with documentary evidence and justification produced for BHEL / Customer's concurrence. BHEL / Customer reserves the right to accept/rejects any variation to the specification.

Signature with date	
Name	
Company seal	