TITLE	TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEM FOR FGD
ITEM	PNEUMATICALLY OPERATED CONTROL VALVE
CUSTOMER	NTPC

	NAME	DESIGNATION	SIGN	DATE
PREPARED	G.RAVINDER	SE		15.04.2019
CHECKED	G.RAVINDER	SE		15.04.2019
APPROVED	M JEYAMURUGANAND	AGM		15.04.2019

CONTENTS

1.0	**PROJECT INFORMATION**	
	▪ Owner	NTPC
	▪ Buyer	BHEL, Ranipet
	▪ Process / application	Wet Lime Stone FGD system
1.1	**SITE CONDITIONS**	
	▪ Ambient temperature (Guarantee)	27 Deg C
	▪ Ambient temperature (Design)	45 Deg C
	▪ Relative Humidity	60 %
1.2	**LOCATION AND APPROACH**	
	▪ Project location	Dadri
	▪ State	Uttar Pradesh
	▪ District	Gautam Buddha Nagar

2.0	**INTENT OF SPECIFICATION**
	This specification together with the attached Technical Data Sheet and other attachments to inquiry / order defines the minimum mandatory requirements governing the design, sizing and selection of control valves along with their accessories /auxiliaries for use in the process of Flue gas Desulphurization (FGD) system
2.1	The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed.
2.2	Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.
2.3	In case the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, he shall recommend the same along with reasons in a separate section along with his proposal and include the same in his scope of supply. The Bidder shall offer only proven design in successful operation.
3.0	**STANDARDS AND CODES**
	The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Valves in general shall conform to the requirements of the following standards: ASME B 1.20.1 Pipe Threads, general purpose (Inch) ASME B 16.5 Steel Pipe Flanges and flanged fittings ASME B 16.10 Face to Face and End to End dimension of valves ASME B 16.20 Ring –Joint Gaskets and grooves for steel Pipe flanges ASME B 16.34 Valves – Flanged, Threaded and welding end API-598 Valves inspection test.

4.0 GENERAL SPECIFICATION FOR DESIGN / CONSTRUCTION / MATERIAL PARTICULARS OF CONTROL VALVE

a) All Control valves shall be designed based on the requirements of the application, process operating conditions and this specification.

b) Vendor shall supply all interconnecting instrument tubing and fittings between the valve actuator, positioner and filter regulator.

c) Any special tool required for assembly, disassembly & maintenance shall also be supplied by vendor.

d) Valves to be installed outside shall be required to have the stem properly protected against atmospheric corrosion.

e) All rising stem valves shall be provided with back seat to permit repacking (of glands) with valves in operation. All valves shall preferably be of outside screw and yoke type.

f) All valves shall have indicators or direction clearly marked so that the valves opening/ closing can be readily determined.

g) The valves shall be designed taking into consideration the abrasive nature of lime slurry. Valves shall be designed suitable to take care of provided parameters of slurry, waste water vide annexure-III.

h) All be pneumatically operated and will be used for regulation of slurry flow. These valves shall be provided with the following accessories in addition to other standard items:

1. Pneumatic actuator
2. Electronic positioner to regulate the opening/closing of valve
3. Air filter, solenoid valve and limit switch
4. Draining arrangement wherever required.
5. A hand wheel with provision for switching to manual operation
6. Pressure gauge

i) All control valves shall be provided with bonnet-back seating arrangement to enable on line changing of gland packing.

j) The control valve must be provided with all data important for

their identification such as:

i. Flow direction
ii. Type
iii. Nominal diameter
iv. Nominal pressure
v. Seating
vi. Cv value
vii. Pressure drop across the valve

k) Leakage through a closed control valve shall not exceed 1% for single ported valves or 2% for balanced ported valves.

l) All control valves shall be designed for reconditioning seating surfaces and replacement of stem and disc without removing the valve body from the line

m) All valves shall be provided with embossed name plate giving details such as tag number (as indicated in Annexure I), type, size etc.

n) For control valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.

o) All valves shall be provided with proper name plates indicating complete information about the valves.

5.0 MATERIAL OF CONSTRUCTION

5.1 CONTROL VALVE

Material of Control valves for slurry application shall be as per enclosed **Annexure I or** its equivalent.

Vendor shall provide the counter flange along with necessary nuts, bolts, gaskets etc.

Note: All parts of the valve exposed to slurry shall be rubber lined of Ceramic material.

Valve Type	Control

Valve Size & Quantity	Refer Annexure I
Body Material	Ceramic for waste water (GS) & Limestone slurry(LS)
	316 SS or equivalent for air vent valve
Ball & Liner material	Ceramic for waste water (GS) & Limestone slurry(LS)
	316 SS or equivalent for air vent valve
Seat material	Ceramic for waste water (GS) & Limestone slurry(LS)
	316 SS or equivalent for air vent valve
Stem material	Hastelloy-C22
Flange material	Limestone slurry-ASTM-CF8
	Waste water (GS)-1.4462UNS S31803/S32205)
End Connection	Refer Annexure I
Rating	Vendor to specify
Sleeve Material	Natural rubber
Sleeve Cone Size	Vendor to specify
Stroke Length	Vendor to specify
Leakage Class	CLASS IV
Gland Packing	Viton steel/PTFE/CPTFE
Max Sound Level	<85 dBA
Bolt & Nut material	SUS 304

5.2	**CONTROL VALVE SIZING**
	1. Each control valve shall be sized and selected to provide reliable operation and control at the specified operating and design conditions. 2. Control valve sizing shall generally be based on ISA S75.01.
	3. The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80 % of total valve stem travel & 4. Minimum flow conditions with valve stem travel not less than 10% of total valve stem material.
	5. All the valves shall have capable of handling at least 120% of the required maximum flow.
	6. 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.
5.3	**Control Valve design**
	1. The control valve shall be rated to meet the design pressure and design temperature of the application. 2. Flange rating for valve bodies16-inch nominal size and larger shall be minimum ASME Class 150. 3. Control valve body Material shall meet or exceed, the requirements of the application. Trim materials shall be selected to withstand corrosion, erosion and wear under severe service conditions.
5.4	**Trim Design**
	Valve trim shall be of the quick change type for ease of maintenance. No internal components shall be screwed or welded into the valve bodies or bonnets. Trim shall be designed to provide equal pressurization around the plug in order to minimize vibration and prevent any potential for binding.

5.5 SPECIFICATION FOR PNEUMATIC ACTUATOR

a)	**Quantity**	**01 No. for each valve**
b)	Type	Rotary actuator, Pneumatic (spring return)
c)	Action	Refer Annexure 1
d)	Failure position (air failure)	Refer Annexure 1
e)	Close/open at air Pressure	Vendor to decide. Preferably 4 to 6 Kg/sq.cm
f)	Air Connection	Vendor to decide. Preferably ¼" NPT(F)
g)	Local Position Indicator	To be provided.
h)	Hand wheel for manual open	Required
i)	Actuator travel time	Vendor to specify
j)	Actuator Protection Class	IP-65 (Min)
k)	Actuator Thrust	Vendor to specify
l)	Spring range (kg/cm2)	Vendor to specify
m)	Speed adjustment for actuator operation	To be provided to facilitate speed adjustments both during opening &closing by means of flow control valve
n)	Solenoid valve type	3/2 way, 24V DC power supply, ex. proof, 1/4" NPT pneumatic connection, 1/2" NPT Electrical connection. Solenoid Valve Energised for valve to open & Solenoid valve De-energised for valve to close.

	o)	Air filter regulator	Size of filter shall be 5 Micron, Filter material shall be sintered bronze/equivalent, Body shall be aluminium, 1/4" NPT Pneumatic connection shall be envisaged

5.3	**LIMIT SWITCHES (Proximity sensor based):**	
	Quantity /valve	One for Open & one for Close position
	No. of Contacts	Two normally open & two normally closed potential free contacts in each limit switch corresponding to open & close positions of the valve.
	Contact Rating	24 V DC
	Protection	Weather proof IP 65.
	Limit Switch Box:	Limit Switch terminals shall be brought to a Terminal Box
6.0	**ELECTRONIC POSITIONER:**	

Type	ELECTRO PNEUMATIC, MICROPROCESSOR BASED, LOOP POWERED.
Input (mA)	4-20mA
Valve position sensing Output	4-20mA O/P Signal for Control System
Protection class	IP-65 (MIN)
Electrical connection	1/2" NPT SIDE/BOTTOM ENTRY
Pneumatic connection	1/4" NPT
Inbuilt display with Push button	Required for Configuration
Pressure gauge	Required
EMC or CE Compliance	Required, EN50081-2 & EN50082 (Or) Equivalent
Positioner transmitter	Required

7.0	**CERAMIC SHORT PIECE**
	Ceramic short piece as detail below shall be provided, if the medium is waste

	water (GS)/Limestone slurry.
	Size of ceramic short pieces shall be as per annexure-II
8.0	**NAME PLATES**
	Each equipment / instrument shall be provided with rating plate or nameplate or label designating the tag no., service of the item etc.
9.0	**INSPECTION**
	Inspection shall be carried out by BHEL Engineers/BHEL authorized/Customer/Customer authorized representative at vendor works.
10	**DOCUMENTS / DETAILS ALONG WITH BID**
	The following information / documents shall be submitted along with the offer: a) Duly filled up data sheet for each valve type as per Annexure-V in the enclosed format. b) Detailed assembly drawing with overall dimensions. c) Valve cross sectional drawings with Bill of Material including the material specifications. d) Valve Regulation Characteristic Curve. e) C_v calculation. f) List of applicable standards for shop test. g) Reference list for the offered model. h) Typical Quality plan for supply of the above equipment's. i) Valves Catalogues. j) List of commissioning spares. k) Recommended spares list for 3-year O&M along with item wise price. **NOTE: 1** i. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure-IV**.

	ii. In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure-IV**. If there is no deviation "**NIL**" statement shall be furnished. iii. In the absence of **Annexure-IV**, it will be construed that the bid confirms strictly to the specification. iv. Acceptance or rejection of the offer with or without deviations (either fully or partially) is sole discretion of the purchaser without seeking further clarification from the bidder. **NOTE:2** Bidders to note that failing to submit the above documents, the bid shall be considered as incomplete and liable for rejection
11	**DOCUMENTS / SERVICE AFTER ORDER**
11.1	The following documents are to be submitted for BHEL's approval. 1. Duly filled up data sheet in the enclosed format. 2. Detailed assembly drawing with overall dimensions. 3. Valve cross sectional drawings with Bill of Material including the material specifications. 4. C_v Calculation 5. Quality plan
11.2	The following are to be submitted to BHEL's review and acceptance. 1. Material test certificate 2. Hydraulic & Leak test certificates 3. Performance guarantee certificate 4. Erection manual 5. O&M manuals
12	**DOCUMENTATION**
	1. The documentation during bid and post order stage shall meet the following requirements. 2. All documents and drawings shall be submitted in English.

	3. Hard copies of all documents and drawings during bid stage to be submitted in duplicate. 4. Hard copies of all documents for approval to be submitted in triplicate. 5. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate. 6. Soft copies of all final documents in MS office in the form of CD-1 set. 7. Soft copies of all final drawings in AutoCAD, latest version in the form of CD-1 set 8.
13	**PACKING**
	Valves to be packed based on the sizes and each package or shipping units shall be clearly marked or stencilled on at least two sides as follows. **BHEL SITE OFFICE,** **2 X 490 MW, FGD PACKAGE (STAGE 2)** **NCTPS — NTPC DADRI** **GAUTAM BUDH NAGAR, UP — 201008** **INDIA.** In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.

14.0

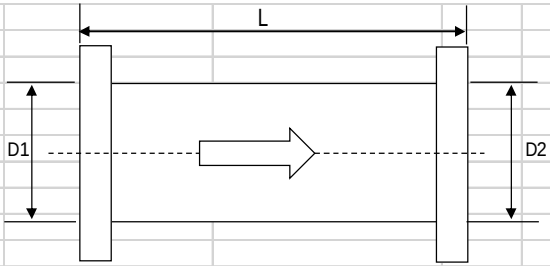
ANNEXURE-I

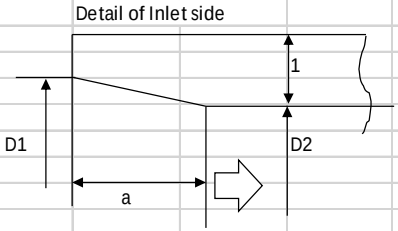
List of Control Valves

S.No	TAG No	Service	Quantity (No's)	Process Condition						Material of construction				Trim				Actuator				Accessories			Medium	Slurry concentration	Max Pressure Drop across the Valve
				Press. (kPag)	Temp.(degC)	Flow (m3/hr)	Head in Meter of water	Spec gravity	Vapour pressure kg/cm2	Process Connection		Body / Bonnet	Ball & linear - Material	Stem	Chara.	Material	Seat Leak	Type	actuator to be designed for instrument air pressure	opening	Fail Action						
				Max./Nor.	Max./Nor.					Type/ Rating	Size																
1	00HTM4AA464	Waste Water Bleed Valve	1	800/670	70/ 58	19.6	60	1.022	0.215	B16.5 CL 150	DN 100	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV	Pneumatic actautor regulating	5kg/cm2	0 to 90 Deg	Fail Keep	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Waste Water (Gypsum Slurry)	3 wt%	<0.5Bar
2	00HTM4AA564	Waste Water Bleed Valve	1	800/670	70/ 58	19.6	60	1.022	0.215	B16.5 CL 150	DN 100	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV		5kg/cm2	0 to 90 Deg	Fail Keep	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Waste Water (Gypsum Slurry)	3 wt%	<0.5Bar
3	10HTD2AA506	Unit1 Absorber Limestone Slurry Feed Valve	1	1150 / 980	55/ 40	24.1	70	1.215	0.098	B16.5 CL 150	DN 80	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV		5kg/cm2	0 to 90 Deg	Fail Open	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Limestone Slurry	30 wt%	<0.5Bar
4	10HTD2AA510	Unit1-Filtrate Water Absober Return Flow Valve	1	560 / 470	70 / 51	45.3	40	1.068	0.182	B16.5 CL 150	DN 125	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV		5kg/cm2	0 to 90 Deg	Fail Close	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Filtrate water (Gypsum Slurry)	11 wt%	<0.5Bar
5	20HTD2AA506	Unit2 Absorber Limestone Slurry Feed Valve	1	1150 / 980	55/ 40	24.1	70	1.215	0.098	B16.5 CL 150	DN 80	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV		5kg/cm2	0 to 90 Deg	Fail Open	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Limestone Slurry	30 wt%	<0.5Bar
6	20HTD2AA510	Unit2-Filtrate Water Absober Return Flow Valve	1	560 / 470	70 / 51	45.3	40	1.068	0.182	B16.5 CL 150	DN 125	Ceramics	Ceramics	Hastelloy-c / C22 or C 276	EQ%	Ceramics	ANSI / FCI Class IV		5kg/cm2	0 to 90 Deg	Fail Close	Positioner Transmitter 4-20mA signal	Pneumatic operated input signal 4-20 mA	ceramic lined spool after divergent conic portion when outlet velocity>main pipe line velocity	Filtrate water (Gypsum Slurry)	11 wt%	<0.5Bar

15.0 ANNEXURE-II

CERAMIC SHORT PIECE DATA SHEET





Note:
1. a As long possible
2. In case of D1 = D2 : Inner surface shall be straighten
3. Arrow mark of flow direction shall be indicated outer surface

LINE NO. FOR INSTALLATIN AREA	TAG NO	TYPE	SHORT PIECE MATERIAL	MATERIAL QUANTITY	SHORT PIECE DIMENSION				CONNECTION TYPE		SHORT PIECE SIZE	NOTE	
					D1 (INLET)	D2 (OUTLET)	L (Flange to Flange)	t (thickness)	SIDE A	SIDE B		CV ID (mm)	PIPE ID (mm)
00-100-FS-4522-AA60	00HTM04AA464	A	CERAMIC	1	Vendor to decide	90.26	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	100	Vendor to decide	90.26
00-100-FS-4522-AA60	00HTM04AA564	A	CERAMIC	1	Vendor to decide	90.26	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	100	Vendor to decide	90.26
10-80-LS-5320-AA40	10HTD2AA506	A	CERAMIC	1	Vendor to decide	65.92	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	80	Vendor to decide	65.92
10-125-FS-4322-AA60	10HTD2AA510	A	CERAMIC	1	Vendor to decide	117.9	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	125	Vendor to decide	117.9
20-80-LS-5320-AA40	20HTD2AA506	A	CERAMIC	1	Vendor to decide	65.92	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	80	Vendor to decide	65.92
20-125-FS-4322-AA60	20HTD2AA510	A	CERAMIC	1	Vendor to decide	117.9	200	Vendor STD	ANSI 150 FF	ANSI 150 FF	125	Vendor to decide	117.9

16.0 ANNEXURE-III

SLURRY PARAMETERS				
Sl.No	Parameter	Limestone slurry (LS)	Waste water slurry (GS)	Filtrate Slurry(GS)
1	Slurry to be handled	Limestone slurry (LS)	Gypsum slurry (GS)	Gypsum slurry (GS)
2	Maximum solid particle size	200 mesh (75 Micron)	200 mesh (75 Micron)	200 mesh (75 Micron)
3	Normal solid particle size,d50	325 mesh (43 Micron)	325 mesh (43 Micron)	325 mesh (43 Micron)
4	Chloride concentration	300 ppm Max	20,000 ppm Max	20,000 ppm Max
5	Hardness of particle	5-7 (Mho scale)	5-7 (Mho scale)	5-7 (Mho scale)
6	Slurry concentration	30% by weight	3% by weight	11.1% by weight
7	Sp.Gravity of slurry	1.215	1.022	1.069
8	Viscosity of pump	30 cp	3 cp	3 cp
9	Ph Value	5 to 8	4 to 8	4 to 8
10	SiO2 content	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l
11	Fluid Temparature	45 Deg C	61.3 Deg C	57.7 Deg C

17.0 ANNEXURE-IV

17	FORM FOR TECHNICAL DEVIATIONS (If any)

SL. NO	SEC / CLAUSE NO.	AS PER SPECIFICATION	STATEMENT OF DEVIATIONS/VARIATIONS	REASON FOR DEVIATION

Date: **Signature & seal of the Bidder**

18.0 ANNEXURE-V

18 DATA SHEET FOR VALVES (Separately for each type of valve)

Sl No	DESCRIPTION	TO BE FILLED BY VENDOR
I	Valve Details	
a.	Valve size (Suitable for)	
b.	Make	
c.	Model/ Type	
d.	Fluid details -(Medium)	
	Temperature range (°C)	
e.	Rated flow (m^3/hr.)	
f.	Design Cv of the valve	
g.	Valve rating	
h.	Valve operation- (Lever/ Gear box)	
i.	Pressure Drop for rated flow (bar(g))	
j.	Design pressure (bar(g))	
k.	Hydraulic test pressure	
	➢ Body (bar(g))	
	➢ Seat (bar(g))	
l.	Max. Shut off pressure (bar(g))	
m.	Fail action	
II	**CONSTRUCTION DETAILS**	
a.	Material of construction	
	➢ Body	
	➢ Ball	
	➢ Liner material	
	➢ Stem	
	➢ Disc	
	➢ Seat	
	➢ Bushing	
	➢ Handle	
b.	Fasteners	
c.	End Connection / Rating / Standard	

d.	Recommended minimum pipe ID mm	
e.	Details of Gearbox if applicable	
f.	Seat Leak (Class)	
g.	Pressure drop across Valve	
h.	Flange size	
III	**GENERAL**	
a.	Weight per valve	
b.	Applicable standards	
c.	Valve GA Drawing / Cross Sectional Drg.	
d.	Enquiry / PO reference	

Vendor's Signature & Seal

19.0 ANNEXURE-VI

19	DATA SHEET FOR ACTUATOR (Separately for each type of valve)	
1)	**Actuator**	
	➢ Make	
	➢ Model	
	➢ Type	
	➢ Mode of actuator	
	➢ Torque Rating	
	➢ Air Consumption	
	➢ Operating Time For Opening	
	➢ Operating Time For Closing	
	➢ Accessories Offered	
	➢ Type Of Stay Put	
	➢ Air Connection	
	➢ Input Signal	
	➢ Enclosure	
2)	Limit Switch	
	➢ Make	
	➢ Type	
	➢ Quantity	
	➢ Contact Rating	
	➢ Reset Type	
3)	Electronic Positioner Transmitter	
	➢ Make	
	➢ Type	
	➢ Quantity	
	➢ Connection	

Vendor's Signature & Seal