ANNEXURE –C to Open tender ENQ. No. BAP/PUR/FGD/VALVES/4230426E dt.20.06.2013

S.NO	MATERIAL CODE	ITEM DESCRIPTION	SPECIFICATION REFERENCE	QUANTITY (NO)	DESTINATION
1	RFW000820001 & RFW201050001	MANUALLY OPERATED DIAPHRAGM VALVES FOR FLUE GAS APPLICATION	NTPC:BONG:FGD:FGVALVES-DPGM VALVE-SPEC-036:REV-02	7	NTPC BONGAIGAON SITE
2	RFW000940001 & RFW201170001	PNEUMATICALLY OPERATED BUTTERFLY VALVES FOR PROCESS WATER APPLICATION	NTPC:BONG:FGD:WVALVES-BUTTERFLY VALVE SPEC-027A:REV-01 (ANNEXURE-I;TABLE 1 AND TABLE 3)	15	NTPC BONGAIGAON SITE
3	RFW000940002 & RFW201170002	PNEUMATICALLY OPERATED BUTTERFLY VALVES FOR PROCESS WATER APPLICATION	NTPC:BONG:FGD:WVALVES-BUTTERFLY VALVE SPEC-027A:REV-01 (ANNEXURE-I;TABLE 2 AND TABLE 4)	2	NTPC BONGAIGAON SITE
4	RFW000730000	PNEUMATICALLY OPERATED BUTTERFLY VALVES FOR PROCESS WATER APPLICATION	NTPC:BONG:FGD:WVALVES-BUTTERFLY VALVE SPEC-027:REV-01	6	NTPC BONGAIGAON SITE

BONGAIGAON– 3X250 MW
FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION FOR MANUALLY OPERATED DIAPHRAGM VALVES HANDLING FLUE GAS

CUSTOMER : NATIONAL THERMAL POWER CORPORATION LIMITED

NTPC: BONG: FGD: FGVALVES-DPGM VALVE -SPEC-036: REV-02

Flue Gas Desulphurization Group
Air Quality Control Systems
BAP::BHEL::Ranipet

TECHNICAL SPECIFICATION FOR MANUALLY OPERATED DIAPHRAGM VALVES FOR FLUE GAS APPLICATION

Prepared	Checked	Approved
SRIDHAR Engineer-FGD	ASHWIN Engineer-FGD	SASHI KUMAR Sr. Engineer-FGD
R02 Dated 23 03 2013		

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)	50 Deg C
	▪ Height above sea level	47 m
	▪ Relative Humidity	60 %
1.2	**LOCATION AND APPROACH**	
	▪ Project location	
	▪ State	Assam
	▪ District	Kokrajhar
	▪ Place	Kumkuri near Salakati, Bongaigaon
	▪ Height above sea level	47 m

2.0 INTENT OF SPECIFICATION

This specification together with the attendant Technical Data Sheet and other specifications/attachments to inquiry / order defines the minimum requirements for diaphragm valves along with their accessories /auxiliaries for use in the process of Flue gas Desulphurization (FGD) system using flue gas.

Bidder shall make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.

In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), these shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (Annexure-II)". Deviation shall be listed separately for each document with cross reference to Page No./Section/Clause No./Para etc. of the respective document supported with proper reasons for the deviation for purchaser's consideration. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable. No deviation or exception shall be permitted without the written approval of the purchaser.

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. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. 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.

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

Valves in general shall conform to the requirements of the following standards:

ANSI B 16.34 Standard for valves.

BS5156 Specification for diaphragm valves

ANSI-B-16.10 Valves face to face and other relevant dimension.

API-598 Valves inspection test.

ANSI-16.5 Valves Flange standard

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

a. All valves shall be suitable for the service conditions i.e flow, temperature and pressure at which they are required to operate.
b. The valves as well as all accessories shall be designed for easy disassembly and maintenance.
c. Valves to be installed outside shall be required to have the stem properly protected against atmospheric corrosion.
d. 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.
e. All valves shall be closed by rotating the hand wheel in the clockwise direction when looking at the face of the hand wheel. In case where the hand wheel is not directly attached to the valve spindle suitable gearing shall be introduced.
f. All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/ closing can be readily determined.
g. The valves shall be designed taking into consideration temperature and pressure of flue gas.
h. Diaphragm valves shall be used for isolation of flow. These valves shall be provided with the following accessories in addition to other standard items :
    - Hand wheel
    - Draining arrangement wherever required.
i. All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore. Valves of 65 mm Nb & above with rising stem shall be provided with position indicator/ visual indication either through plastic stem covers or through metallic stem covers. All diaphragm valves of size 50 mm and below in vacuum service shall have extra deep gland packing without requiring water gland sealing. All diaphragm valves of size 65 mm Nb and above in vacuum services shall have adequately deep gland packing and shall be equipped with lantern rings to admit pressurized water for gland sealing.
j. All diaphragm valves shall be provided with bonnet-back seating arrangement to enable on line changing of gland packing.
k. Hand wheels for all the valves shall close the valve in clockwise direction when viewing from the top. All hand wheels shall be clearly marked indicating the direction of opening/closing. Manual gear operators shall be provided to open/close the valve against the maximum differential pressure across the valve such that the effort required to operate the valve does not exceed 25 kgf.
l. All diaphragm 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, type, size etc.
n. For diaphragm 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 (DIAPHRAGM VALVE)

Material of Diaphragm valve for flue gas application shall be as per enclosed **Annexure – I** or its equivalent.

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

Valve Type	Diaphragm
	Straight Through Pattern
Bonnet Type	Standard Sealed Bonnet With Tight Shut-Off Condition
Rating	Vendor To Specify
Diaphragm Material	**Viton or Superior Material Considering Process Condition**
Stroke Length	Vendor To Specify
Leakage Class	Class IV
Gland Packing	Viton
Fastener Type	AISI 316
Hand Wheel	Cast Iron Or Mild Steel or equivalent

6.0 END CONNECTIONS

End connection for Diaphragm valve shall be as per enclosed Annexure-I.

7.0 TESTING OF VALVES:

- Applicable Standard BS-5156s
- Test pressure: As per BS-5166
- Duration of test: 30minutes (minimum)
- Rated flow and Pressure Drop Rated flow at rated pressure is to be indicated for
- Manual and open/close valves and flow characteristics for modulating valves.
- Differential pressure at rated flow is to be indicated across the valve.

8.0 RATING PLATE, NAME PLATES AND LABELS:

Each equipment / instrument shall be provided with rating plate or nameplate or label designating the tag no., service of the item etc.

9.0 PAINTING OF VALVES:

The detailed painting procedure is enclosed in **Annexure-IV**

10.0 INSPECTION

The valves shall be inspected at Vendor's works by BHEL Engineer as per the procedure submitted by the Vendor.

11.0 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-II** 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. Cv 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 equipments.
i. Valves Catalogues.
j. Recommended spares list for 3 year O&M along with item wise price.
k. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure-III**.

In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure-III**. If there is no deviation "**NIL**" statement shall be furnished. In the absence of **Annexure-III**, it will be construed that the bid confirms strictly to the specification. 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: Bidders to note that failing to submit the above documents, the bid shall be considered as incomplete and liable for rejection.

12.0 DOCUMENTS / SERVICE AFTER ORDER

a. The following documents are to be submitted for BHEL's approval.

- Duly filled up data sheet in the enclosed format.
- Detailed assembly drawing with overall dimensions.
- Valve cross sectional drawings with Bill of Material including the material specifications.
- C_v Calculation
- Quality plan

b. The following are to be submitted to BHEL's review and acceptance.

- Material test certificate
- Hydraulic & Leak test certificates
- Performance guarantee certificate
- Erection manual
- O&M manuals

13.0 DOCUMENTATION

a. The documentation during bid and post order stage shall meet the following requirements.
b. All documents and drawings shall be submitted in English.
c. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
d. Hard copies of all documents for approval to be submitted in triplicate.
e. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
f. Soft copies of all final documents in MS office in the form of CD-1 set.
g. Soft copies of all final drawings in AutoCAD, latest version in the form of CD-1 set.

ANNEXURE-I

15.0 DETAILED LIST OF VALVES WITH OPERATING PARAMETERS:

Indent no	**RFW00082**
Material Code	**RFW000820001**
Process Liquid	**Flue Gas Application**
Service	**Isolation**
Type of valve	**Diaphragm Valve**
Mode of Operation	**Manual**
Size	**4 inch**

Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction (As indicated below or its equivalent)				End Connection (FLD-Flanged)	QTY
	T (°C)	P (Kg/ cm^2)	T (°C)	P (Kg/ cm^2)	Body Material	Disc	Stem	Lining		
10HTA01AA003	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1
10HTA01AA004	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1
20HTA01AA003	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1
20HTA01AA004	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1
30HTA01AA003	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1
30HTA01AA004	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276 -410	NATURAL RUBBER	FLD	1

16.0 MANDATORY SPARE

Indent no	**RFW20105**
Material Code	**RFW201050001**
Process Liquid	**Flue Gas Application**
Service	**Isolation**
Type of valve	**Diaphragm Valve**
Mode of Operation	**Manual**
Size	**4 inch**

Valve / Instrument Tag No	**Operating Conditions**		**Design Conditions**		**Material of Construction (As indicated below or its equivalent)**				**End Connection (FLD-Flanged)**	**QTY**
	T (°C)	**P (Kg/ cm^2)**	**T (°C)**	**P (Kg/ cm^2)**	**Body Material**	**Disc**	**Stem**	**Lining**		
M1-DFM-MN-AL- 4	103	0.003	120	0.066	A216 WCB	NATURAL RUBBER	A276-410	NATURAL RUBBER	FLD	1

ANNEXURE-II

17.0 DATA SHEET FOR VALVES (TO BE FILLED SEPARATELY FOR EACH TYPE OF VALVE)

Sl No	DESCRIPTION	TO BE FILLED BY VENDOR
I	**Valve Size**	
a.	Make	
b.	Model/ Type	
c.	Fluid details - Medium handled	
	Temperature range (°C)	
d.	Rated flow (m^3/hr.)	
e.	Design Cv of the valve	
f.	Valve rating	
g.	Valve operation- (Lever/ Gear box)	
h.	Pressure Drop for rated flow (bar(g))	
i.	Design pressure (bar(g))	
j.	Hydraulic test pressure	
	➢ Body (bar(g))	
	➢ Seat (bar(g))	
k.	Max. Shut off pressure (bar(g))	
II	**CONSTRUCTION DETAILS**	
a.	Material of construction	
	➢ Body	
	➢ Stem	
	➢ Disc	
	➢ Seat	
	➢ Bushing	
	➢ Handle	
b.	Fasteners	
c.	End Connection / Rating / Standard	
d.	Recommended minimum pipe ID mm	
e.	Details of Gearbox if applicable	
III	**GENERAL**	
a.	Weight per valve	
b.	Applicable standards	
c.	Valve GA Drawing / Cross Sectional Drg.	
d.	Enquiry / PO reference	

ANNEXURE-III

18.0 FORM FOR TECHNICAL DEVIATIONS (If any):

SL. NO	SEC / CLAUSE NO.	SPECIFICATION	STATEMENT OF DEVIATIONS/VARIATIONS	REASON FOR DEVIATION	COST OF WITHDRAWAL

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

ANNEXURE-IV

19.0 PAINTING PROCEDURE:

Primer Coat		**Intermediate Coat**		**Finish coat**			**Total DFT µm (min)**
Paint	No of Coats /DFT	Paint	No of Coats	Paint	No of Coats	Shade	
HB Chlorinated Rubber based Zinc Phosphate Primer DFT= 50 µm per coat (Solid by Volume min 60%)	2	--	--	Chlorinated Rubber Based Finish paint DFT= 30 µm per coat (Solid by Volume min 60%)	3	Gray shade to R9002	160

BONGAIGAON– 3X250 MW
FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION FOR PNEUMATICALLY OPERATED BUTTERFLY VALVES FOR PROCESS WATER

CUSTOMER : NATIONAL THERMAL POWER CORPORATION LIMITED

NTPC: BONG: FGD: WVALVES-BUTTERFLY VALVE SPEC-027: REV-01

Flue Gas Desulphurization Group
Air Quality Control Systems
BAP: BHEL: Ranipet

TECHNICAL SPECIFICATION FOR PNEUMATIC OPERATEDATE BUTTERFLY VALVES FOR PROCESS WATER APPLICATION

Prepared	Checked	Approved
Sashi Kumar Sr.Engineer, EDC/AQCS-FGD	Sashi Kumar Sr.Engineer, EDC/AQCS-FGD	Shaktikanta Dash Manager, EDC/AQCS-FGD

R00 dated	----
R01 dated 10 06 13	**Clause no : 4** In sl no. 4, the valves supplied shall be applicable for process water application instead of slurry application. **Clause no : 5 (Material of construction)** Description changed from Globe valve type to butterfly valve.

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)	50 Deg C
	▪ Height above sea level	47 m
	▪ Relative Humidity	60 %
1.2	**LOCATION AND APPROACH**	
	▪ Project location	
	▪ State	Assam
	▪ District	Kokrajhar
	▪ Place	Kumkuri near Salakati, Bongaigaon
	▪ Height above sea level	47 m

2.0 INTENT OF SPECIFICATION

This specification together with the attendant Technical Data Sheet and other specifications/attachments to inquiry / order defines the minimum requirements for pneumatically operated butterfly valves along with their accessories /auxiliaries for use in the process of Flue gas Desulphurization (FGD) system handling limestone slurry.

Bidder shall make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.

In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), these shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (Annexure-II)". Deviation shall be listed separately for each document with cross reference to Page No./Section/Clause No./Para etc. of the respective document supported with proper reasons for the deviation for purchaser's consideration. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable. No deviation or exception shall be permitted without the written approval of the purchaser.

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. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. 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.

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

Valves in general shall conform to the requirements of the following standards:

- ANSI B 16.34 Standard for valves.
- AWWA-C-504 Rubber seated butterfly valves.
- BS-5155/EN-593 Cast iron and carbon steel butterfly valves for general purpose.
- ANSI-B-16.10 Valves face to face and other relevant dimension.
- API-598 Valves inspection test.

4.0 DESIGN/CONSTRUCTION OF BUTTERFLY VALVES

a. Valves shall be suitable for the service conditions i.e flow, temperature and pressure at which they are required to operate.
b. All The valves as well as all accessories shall be designed for easy disassembly and maintenance.
c. Valves to be installed outside shall be required to have the stem properly protected against atmospheric corrosion
d. The valves supplied shall be suitable for process water application.
e. The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition.
f. The valves shall be suitable for installation in any position (horizontal/ vertical etc.) and shall be of double-flanged construction. However for sizes 150 NB and below the valves may be lugged Wafer construction .
g. The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disk shall be continuous type and easily replaceable.
h. For all types of valves, the design with shaft eccentric to the disc is preferred. The shaft shall be solid type and shall pivot on bushings. Bushings/sleeve type bearings shall be contained in the hub of valve body. The bearing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on water and on valve components.
i. The design of the shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft and any key (taper pin etc.) for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However, the shaft diameter shall not be less than the minimum shaft diameter specified in relevant code. Necessary Torque Calculation and the torque class selected on the basis of the same shall be furnished to the Employer for information.
j. The disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration. The operating mechanism shall be mounted directly on or supported from the valve body.
k. All valves shall be complete with: position indicator (located in a visible place), arrow indicating the flow direction; adjustable mechanical stop limiting devices to prevent over travel of valve disc in open/close position; all valves shall be "tight shut off"
l. Fabricated steel (IS:2062 Gr B) butterfly valves instead of cast Iron body valves are also acceptable for size above 300 mm NB diameter for water application other than Sea-water / corrosive water. In such a case, however, the bidder will have to necessarily submit thickness calculations, in order to establish the integrity of the fabricated valve body under the system operating pressure condition. Bidder has

to clearly indicate the material offered in the bid. No change shall be entertained during detailed engg.

m. Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

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

o. All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.

p. The actuator-operated valves shall be designed on the basis of the following :
   - The internal parts shall be suitable to support the pressure caused by the actuators;
   - The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.
   - All actuator operated valves shall be provided with hand operated gearing mechanism also.
   - All actuators operated valves shall open/ close fully within time required by the process but not later than 60 seconds after actuators starts.

5.0 MATERIAL OF CONSTRUCTION (BUTTERFLY VALVES)

Material of butterfly valves for process water application shall be as per enclosed **Annexure – I** or its equivalent.

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

SCOPE OF SUPPLY

a) Valve as per specification
b) Pneumatic actuator as per the specification
c) Limit switch – 2 Nos. for each valves as per the spec.
d) Air filter Regulator -1 No. per valve as per the spec.
e) Solenoid valve – 1 No. for each valve as per the

6.0 END CONNECTIONS

End connection for valves shall be as per enclosed **Annexure-I.**

7.0 PROOF OF DESIGN TEST (TYPE TEST) FOR BUTTERFLY VALVES

Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder in the presence of Employer's representative.

All valves that are designed and manufactured as per AWWA-C-504 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504. For Butterfly valves designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro

test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504

8.0 NAME PLATES

Each valve shall be marked with rating plate or nameplate or label designating the tag number and service of the item etc.

9.0 PAINTING OF VALVES:

The detailed painting procedure is enclosed in **Annexure-IV**.

10.0 SPECIFICATION FOR PNEUMATIC ACTUATOR

a) Quantity	: 01 No. for each valve
b) Type	: Rotary actuator, Pneumatic (spring return)
c) Action	: Air to Open
d) Failure position (air failure)	: Close
e) Close/open at air Pressure	: 0.2 to 1 Kg /sq. cm
e) Air Connection	: ¼" NPT(F) SS tube.
f) Local Position Indicator	: To be provided.
g) Hand wheel for manual opn	: Required
h) Actuator travel time	: Vendor to specify
i) Actuator Protection Class	: IP-65 (Min)
j) Actuator Thrust	: Vendor to specify
k) Spring range (kg/cm2)	: Vendor to specify
l) Speed adjustment for actuator operation	: To be provided to facilitate speed adjustments both during opening &closing by means of flow control valve .
m) Solenoid valve type	: 3/2 way, 24V DC power supply , ex. proof, 1/4" BSPT pneumatic connection, 1/2" NPT Electrical connection. Solenoid Valve Energised for valve to open & Solenoid valve De-energised for valve to close.
n) 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

10.1 LIMIT SWITCHES:

a) Quantity /valve	: One for Open & one for Close position
b) No. of Contacts	: Two normally open & two normally closed potential free contacts in each limit switch corresponding to open & close positions of the valve.
c) Contact Rating	: 24 V DC
d) Protection	: Weather proof IP 55.
e) Limit Switch Box	: Limit Switch terminals shall be brought out to a Terminal Box

11.0 INSPECTION

Shall be done by BHEL inspector at Vendor's works.

12.0 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-II** 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. Cv 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 equipments.
i. Valves Catalogues.
j. List of commissioning spares.
k. Recommended spares list for 3 year O&M along with item wise price.
l. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure-III**.

In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure-III**. If there is no deviation "**NIL**" statement shall be furnished. In the absence of **Annexure-III**, it will be construed that the bid confirms strictly to the specification. 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: Bidders to note that failing to submit the above documents, the bid shall be considered as incomplete and liable for rejection.

13.0 DOCUMENTS / SERVICE AFTER ORDER

13.1. The following documents are to be submitted for BHEL's approval.

- Duly filled up data sheet in the enclosed format.
- Detailed assembly drawing with overall dimensions.
- Valve cross sectional drawings with Bill of Material including the material specifications.
- C_v Calculation
- Quality plan

13.2. The following are to be submitted to BHEL's review and acceptance.

- Material test certificate
- Hydraulic & Leak test certificates
- Performance guarantee certificate

- Erection manual
- O&M manuals

14.0 DOCUMENTATION

a. The documentation during bid and post order stage shall meet the following requirements.
b. All documents and drawings shall be submitted in English.
c. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
d. Hard copies of all documents for approval to be submitted in triplicate.
e. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
f. Soft copies of all final documents in MS office in the form of CD-1 set.
g. Soft copies of all final drawings in AutoCAD, latest version in the form of CD-1 set.

15.0 GUARANTEE:

Vendor to provide guarantee for a period of 12 months from the date of commissioning or 24 months from the date of supply whichever is earlier.

ANNEXURE-I

16.0 DETAILED LIST OF VALVES WITH OPERATING PARAMETERS:

Indent no	**RFW00073**
Material Code	**RFW000730000**
Process Liquid	**Process Water Application**
Service	**Isolation**
Type of valve	**Butterfly Valve**
Mode of Operation	**Pneumatic**
Size	**2 inch**

S. No	Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction				End Connection (WFR-Wafer)	QTY
		T (°C)	P (Kg/cm^2)	T (°C)	P (Kg/cm^2)	Body Material	Disc	Stem	Lining		
1	10HTQ08AA201	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
2	10HTQ08AA203	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
3	20HTQ08AA201	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
4	20HTQ08AA203	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
5	30HTQ08AA201	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
6	30HTQ08AA203	50	4	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1

ANNEXURE-II

17.0 DATA SHEET FOR VALVES

I. TECHNICAL PARAMETERS

A. VALVE SIZE :

a. Make :
b. Model/ Type :
c. Fluid details - Medium handled :
- Temperature range ° C :
d. Rated flow m^3/Hr :
e. Design Cv of the valve :
f. Valve rating :
g. Valve operation- (Lever/ Gear box) :
h. Pressure Drop for rated flow bar(g) :
i. Design pressure bar(g) :
j. Hydraulic test pressure
- Body bar(g) :
- Seat bar(g) :
k. Max. Shut off pressure bar(g) :

II. CONSTRUCTION DETAILS

a. Material of construction - Body :
(whatever applicable) - Ball :
- Stem :
- Disc :
- Seat :
- Bushing :
- Handle :
- Fasteners :
b. End Connection / Rating / Standard :
c. Recommended minimum pipe ID mm :
d. Details of Gearbox if applicable :

III. GENERAL

a. Weight per valve :
b. Applicable standards :
c. Valve GA Drawing / Cross Sectional Drg. :
d. Enquiry / PO reference :

IV. ACTUATOR

a) Make :
b) Model :
c) Type :
d) Torque rating :
e) Air consumption :
f) Operating time for opening :
Operating time for closing :
g) Accessories offered :
h) Type of stay put :
i) Air Connection :

V. LIMIT SWITCH

a) Make :
b) Type :
c) Quantity :
d) Contact rating :
e) Reset type :

NOTE:

Vendor should fill up the "Vendor's Confirmation column"
and submit a signed copy of this specification with his offer.

Vendor's Signature & Seal

ANNEXURE-III

18.0 FORMS FOR TECHNICAL DEVIATIONS (If any)

SL. NO	SEC / CLAUSE NO.	SPECIFICATION	STATEMENT OF DEVIATIONS/VARIATIONS	REASON FOR DEVIATION	COST OF WITHDRAWAL

ANNEXURE-IV

19.0 PAINTING PROCEDURE

Primer Coat		**Intermediate Coat**		**Finish coat**			**Total DFT µm (min)**
Paint	No of Coats /DFT	Paint	No of Coats	Paint	No of Coats	Shade	
HB Chlorinated Rubber based Zinc Phosphate Primer DFT= 50 µm per coat (Solid by Volume min 60%)	2	--	--	Chlorinated Rubber Based Finish paint DFT= 30 µm per coat (Solid by Volume min 60%)	3	Gray shade to R9002	160

BONGAIGAON– 3X250 MW
FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION FOR PNEUMATICALLY OPERATED BUTTERFLY VALVES FOR PROCESS WATER

CUSTOMER : NATIONAL THERMAL POWER CORPORATION LIMITED

NTPC: BONG: FGD: WVALVES-BUTTERFLY VALVE SPEC-027A: REV-01

Flue Gas Desulphurization Group
Air Quality Control Systems
BAP: BHEL: Ranipet

TECHNICAL SPECIFICATION FOR PNEUMATIC OPERATED BUTTERFLY VALVES FOR PROCESS WATER APPLICATION

Prepared	Checked	Approved
Sashi Kumar Sr.Engineer, EDC/AQCS-FGD	Shaktikanta Dash Manager, EDC/AQCS-FGD	K Rajavel SDGM, EDC/AQCS-FGD

R00 dated	----
R01 dated 10 06 13	• **Clause no : 4.e is revised**

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)	50 Deg C
	▪ Height above sea level	47 m
	▪ Relative Humidity	60 %
1.2	**LOCATION AND APPROACH**	
	▪ Project location	
	▪ State	Assam
	▪ District	Kokrajhar
	▪ Place	Kumkuri near Salakati, Bongaigaon
	▪ Height above sea level	47 m

2.0 INTENT OF SPECIFICATION

This specification together with the attendant Technical Data Sheet and other specifications/attachments to inquiry / order defines the minimum requirements for pneumatically operated butterfly valves along with their accessories /auxiliaries for use in the process of Flue gas Desulphurization (FGD) system handling limestone slurry.

Bidder shall make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.

In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), these shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (Annexure-II)". Deviation shall be listed separately for each document with cross reference to Page No./Section/Clause No./Para etc. of the respective document supported with proper reasons for the deviation for purchaser's consideration. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable. No deviation or exception shall be permitted without the written approval of the purchaser.

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. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. 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.

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

Valves in general shall conform to the requirements of the following standards:

- ANSI B 16.34 Standard for valves.
- AWWA-C-504 Rubber seated butterfly valves.
- BS-5155/EN-593 Cast iron and carbon steel butterfly valves for general purpose.
- ANSI-B-16.10 Valves face to face and other relevant dimension.
- API-598 Valves inspection test.
- ANSI B 16.5 for flange end connection

4.0 DESIGN/CONSTRUCTION OF BUTTERFLY VALVES

a. Valves shall be suitable for the service conditions i.e flow, temperature and pressure at which they are required to operate.

b. All The valves as well as all accessories shall be designed for easy disassembly and maintenance.

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

d. The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition.

e. The valves shall be suitable for installation in any position (horizontal/ vertical etc.) and shall be of double-flanged construction. However for sizes 150 NB and below the valves may be lugged Wafer construction except table-2 & table- 4

f. The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disk shall be continuous type and easily replaceable.

g. For all types of valves, the design with shaft eccentric to the disc is preferred. The shaft shall be solid type and shall pivot on bushings. Bushings/sleeve type bearings shall be contained in the hub of valve body. The bearing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on water and on valve components.

h. The design of the shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft and any key (taper pin etc.) for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However, the shaft diameter shall not be less than the minimum shaft diameter specified in relevant code. Necessary Torque Calculation and the torque class selected on the basis of the same shall be furnished to the Employer for information.

i. The disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration. The operating mechanism shall be mounted directly on or supported from the valve body.

j. All valves shall be complete with: position indicator (located in a visible place), arrow indicating the flow direction; adjustable mechanical stop limiting devices to prevent over travel of valve disc in open/close position; all valves shall be "tight shut off"

k. Fabricated steel (IS:2062 Gr B) butterfly valves instead of cast Iron body valves are also acceptable for size above 300 mm NB diameter for water application other than Sea-water / corrosive water. In such a case, however, the bidder will have to necessarily submit thickness calculations, in order to establish the integrity of the fabricated valve body under the system operating pressure condition. Bidder has

to clearly indicate the material offered in the bid. No change shall be entertained during detailed engg.

l. Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

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

n. All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.

o. The actuator-operated valves shall be designed on the basis of the following :

- The internal parts shall be suitable to support the pressure caused by the actuators;
- The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.
- All actuator operated valves shall be provided with hand operated gearing mechanism also.
- All actuators operated valves shall open/ close fully within time required by the process but not later than 60 seconds after actuators starts.

5.0 MATERIAL OF CONSTRUCTION (BUTTERFLY VALVES)

Material of valves for process water application shall be as per enclosed **Annexure – I** or its equivalent.

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

SCOPE OF SUPPLY

a) Valve as per specification
b) Pneumatic actuator as per the specification
c) Limit switch – 2 Nos. for each valves as per the spec.
d) Air filter Regulator -1 No. per valve as per the spec.
e) Solenoid valve – 1 No. for each valve as per the

6.0 END CONNECTIONS

End connection for valves shall be as per enclosed **Annexure-I.**

7.0 PROOF OF DESIGN TEST (TYPE TEST) FOR BUTTERFLY VALVES

Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder in the presence of Employer's representative.

All valves that are designed and manufactured as per AWWA-C-504 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504. For Butterfly valves designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro

test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504

8.0 NAME PLATES

Each valve shall be marked with rating plate or nameplate or label designating the tag number and service of the item etc.

9.0 PAINTING OF VALVES:

The detailed painting procedure is enclosed in **Annexure-IV**.

10.0 SPECIFICATION FOR PNEUMATIC ACTUATOR

a) Quantity	: 01 No. for each valve
b) Type	: Rotary actuator, Pneumatic (spring return)
c) Action	: Air to Open
d) Failure position (air failure)	: Close
e) Close/open at air Pressure	: 0.2 to 1 Kg /sq. cm
e) Air Connection	: ¼" NPT(F) SS tube.
f) Local Position Indicator	: To be provided.
g) Hand wheel for manual opn	: Required
h) Actuator travel time	: Vendor to specify
i) Actuator Protection Class	: IP-65 (Min)
j) Actuator Thrust	: Vendor to specify
k) Spring range (kg/cm2)	: Vendor to specify
l) Speed adjustment for actuator operation	: To be provided to facilitate speed adjustments both during opening &closing by means of flow control valve .
m) Solenoid valve type	: 3/2 way, 24V DC power supply , ex. proof, 1/4" BSPT pneumatic connection, 1/2" NPT Electrical connection. Solenoid Valve Energised for valve to open & Solenoid valve De-energised for valve to close.
n) 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

10.1 LIMIT SWITCHES:

a) Quantity /valve	: One for Open & one for Close position
b) No. of Contacts	: Two normally open & two normally closed potential free contacts in each limit switch corresponding to open & close positions of the valve.
c) Contact Rating	: 24 V DC
d) Protection	: Weather proof IP 55.
e) Limit Switch Box	: Limit Switch terminals shall be brought out to a Terminal Box

11.0 INSPECTION

Shall be done by BHEL inspector at Vendor's works.

12.0 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-II** 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. Cv 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 equipments.
i. Valves Catalogues.
j. List of commissioning spares.
k. Recommended spares list for 3 year O&M along with item wise price.
l. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure-III**.

In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure-III**. If there is no deviation "**NIL**" statement shall be furnished. In the absence of **Annexure-III**, it will be construed that the bid confirms strictly to the specification. 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: Bidders to note that failing to submit the above documents, the bid shall be considered as incomplete and liable for rejection.

13.0 DOCUMENTS / SERVICE AFTER ORDER

13.1. The following documents are to be submitted for BHEL's approval.

- Duly filled up data sheet in the enclosed format.
- Detailed assembly drawing with overall dimensions.
- Valve cross sectional drawings with Bill of Material including the material specifications.
- C_v Calculation
- Quality plan

13.2. The following are to be submitted to BHEL's review and acceptance.

- Material test certificate
- Hydraulic & Leak test certificates
- Performance guarantee certificate

- Erection manual
- O&M manuals

14.0 DOCUMENTATION

a. The documentation during bid and post order stage shall meet the following requirements.
b. All documents and drawings shall be submitted in English.
c. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
d. Hard copies of all documents for approval to be submitted in triplicate.
e. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
f. Soft copies of all final documents in MS office in the form of CD-1 set.
g. Soft copies of all final drawings in AutoCAD, latest version in the form of CD-1 set.

15.0 GUARANTEE:

Vendor to provide guarantee for a period of 12 months from the date of commissioning or 24 months from the date of supply whichever is earlier.

ANNEXURE-I

16.0 DETAILED LIST OF VALVES WITH OPERATING PARAMETERS:

Table-1

Indent no	**RFW00094**
Material Code	**RFW000940001**
Process Liquid	**Process Water Application**
Service	**Isolation**
Type of valve	**Butterfly Valve**
Mode of Operation	**Pneumatic**
Size	**2 inch**

S. No	Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction				End Connection (WFR- Wafer)	QTY
		T (°C)	P (Kg/cm^2)	T (°C)	P (Kg/cm^2)	Body Material	Disc	Stem	Lining		
1	00HTQ03AA205	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
2	00HTQ03AA207	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
3	00HTQ03AA201	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
4	00HTQ03AA203	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
5	00HTM01AA208	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
6	00HTM01AA209	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
7	00HTQ05AA201	50	3	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
8	00HTQ04AA201	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
9	00HTQ06AA201	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
10	00HTQ06AA203	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
11	00HTQ06AA205	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
12	00HTQ07AA201	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
13	00HTQ07AA203	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1
14	00HTQ07AA205	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1

Table-2

Indent no	**RFW00094**
Material Code	**RFW000940002**
Process Liquid	**Process Water Application**
Service	**Isolation**
Type of valve	**Butterfly Valve**
Mode of Operation	**Pneumatic**
Size	**2 inch**

S. No	Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction				End Connection (WFR- Wafer)	QTY
		T (°C)	P (Kg/cm^2)	T (°C)	P (Kg/cm^2)	Body Material	Disc	Stem	Lining		
1	00HTQ05AA203	50	3	100	10	A216 WCB	SS304	SS304	NA	FLD	1

MANDATORY SPARES:

Table-3

Indent no	**RFW20117**
Material Code	**RFW20117001**
Process Liquid	**Process Water Application**
Service	**Isolation**
Type of valve	**Butterfly Valve**
Mode of Operation	**Pneumatic**
Size	**2 inch**

S. No	Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction			Lining	End Connection (WFR- Wafer)	QTY
		T (°C)	P (Kg/cm^2)	T (°C)	P (Kg/cm^2)	Body Material	Disc	Stem			
1	M1-BFV-PN-PW-2	50	2.5	100	10	A216 WCB	A217 CA15	A479-410	NATURAL RUBBER	WFR	1

Table-4

Indent no	**RFW20117**
Material Code	**RFW20117002**
Process Liquid	**Process Water Application**
Service	**Isolation**
Type of valve	**Butterfly Valve**
Mode of Operation	**Pneumatic**
Size	**2 inch**

S. No	Valve / Instrument Tag No	Operating Conditions		Design Conditions		Material of Construction			Lining	End Connection (WFR- Wafer)	QTY
		T (°C)	P (Kg/cm^2)	T (°C)	P (Kg/cm^2)	Body Material	Disc	Stem			
1	M1-BFV-PN-PW-2A	50	3	100	10	A216 WCB	SS304	SS304	NA	FLD	1

ANNEXURE-II

17.0 DATA SHEET FOR VALVES

I. TECHNICAL PARAMETERS

A. VALVE SIZE :

a. Make :
b. Model/ Type :
c. Fluid details - Medium handled :
- Temperature range ° C :
d. Rated flow m^3/Hr :
e. Design Cv of the valve :
f. Valve rating :
g. Valve operation- (Lever/ Gear box) :
h. Pressure Drop for rated flow bar(g) :
i. Design pressure bar(g) :
j. Hydraulic test pressure
- Body bar(g) :
- Seat bar(g) :
k. Max. Shut off pressure bar(g) :

II. CONSTRUCTION DETAILS

a. Material of construction - Body :
(whatever applicable) - Ball :
- Stem :
- Disc :
- Seat :
- Bushing :
- Handle :
- Fasteners :
b. End Connection / Rating / Standard :
c. Recommended minimum pipe ID mm :
d. Details of Gearbox if applicable :

III. GENERAL

a. Weight per valve :
b. Applicable standards :
c. Valve GA Drawing / Cross Sectional Drg. :
d. Enquiry / PO reference :

IV. ACTUATOR

a) Make :
b) Model :
c) Type :
d) Torque rating :
e) Air consumption :
f) Operating time for opening :
Operating time for closing :
g) Accessories offered :
h) Type of stay put :
i) Air Connection :

V. LIMIT SWITCH

a) Make :
b) Type :
c) Quantity :
d) Contact rating :
e) Reset type :

NOTE:

Vendor should fill up the "Vendor's Confirmation column"
and submit a signed copy of this specification with his offer.

Vendor's Signature & Seal

ANNEXURE-III

18.0 FORMS FOR TECHNICAL DEVIATIONS (If any)

SL. NO	SEC / CLAUSE NO.	SPECIFICATION	STATEMENT OF DEVIATIONS/VARIATIONS	REASON FOR DEVIATION	COST OF WITHDRAWAL

ANNEXURE-IV

19.0 PAINTING PROCEDURE

Primer Coat		**Intermediate Coat**		**Finish coat**			**Total DFT µm (min)**
Paint	No of Coats /DFT	Paint	No of Coats	Paint	No of Coats	Shade	
HB Chlorinated Rubber based Zinc Phosphate Primer DFT= 50 µm per coat (Solid by Volume min 60%)	2	--	--	Chlorinated Rubber Based Finish paint DFT= 30 µm per coat (Solid by Volume min 60%)	3	Gray shade to R9002	160