

(The Technical requirements in this entire Annexure A/ Section-C are specific to the project and shall prevail/ over/ over-ride the corresponding technical requirements specified under Section-D, in case of any contradiction)

**1.0 SCOPE OF SUPPLY:** Following are the Requirements of Steam Service Butterfly Valves along with commissioning & Mandatory spares. Detailed technical requirement, technical data & materials of construction shall be as per Annexure-A1 and shall be considered for design & selection of valves, actuators & operators.

S NO.	TAG NO.	SIZE (MM)	TYPE OF VALVE	BODY MATL	RATING	END . CONN.	MATCHING PIPE OD X THK (MM) (MM)	SPECIAL FEATURES	TOTAL QTY (VALVES)	COMMISSIONING SPARES			MANDATORY SPARES (CLAUSE 8.00.00 SL. NO. 15-2 OF MANDATORY SPARES AS PER LOI.
										GLAND PACKING (VALVES)	GASKET (VALVES)	O' RING AND SEALS FOR ELECTRIC ACTUATORS	
1	EXV-27, EXV-28 (EACH 2 NOS.)	1600	BUTTERFLY VALVE (LONG BODY DESIGN )	CCS (ASTM A216 GR. WCB)	CL.75B OF AWWA-C-504	BW TO ASME B16.25	1626 X 12	SG.MO, OT = 50 ~ 70 SEC, IBR, SHAFT AXIS ORIENTATION HORIZONTAL)	4	4 SETS	4 SETS	4 SETS	01

**ABBREVIATIONS:-**

BW- BUTT WELDED CCS - CAST CARBON STEEL, SG - SEALED GLAND, MO - MOTORIZED ELECTRIC ACTUATOR  
 OT - OPENING/CLOSING TIME OF VALVE WITH ELECTRIC ACTUATOR OPERATION IBR - INDIAN BOILER REGULATION  
 NOTE:

-Valve POD test charges/ Gear box POD test charges or any other test charges, required as per this technical specification, shall be not be included in the unit quoted prices of main valves as these tests are the mandatory requirements of valve governing standard AWWA C504 and this enquiry specification. If the bidder have not earlier carried these valve POD test and gear box POD test for any NTPC project, then the bidder is required to do these tests without any charges to BHEL, in case of order on the bidder i.e. NO EXTRA CHARGES ON THIS ACCOUNT IS ADMISSIBLE TO BIDDERS.

-Main valves shall be quoted exclusive of the cost of commissioning spares prices. Therefore, the bidders shall quote Unit price of each and every item under commissioning spares separately and individually.  
 Mandatory Spares valves ( complete valve with actuator) are required without any commissioning spares. Hence the quoted unit price of Mandatory spare valve shall not be inclusive of cost of Commissioning spares.


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- 1.0 Main valves shall be quoted exclusive of the cost of commissioning spares prices. Therefore, the bidders shall quote Unit price of each and every item under commissioning spares separately and individually. Mandatory Spares valves ( complete valve with actuator) are required without any commissioning spares. Hence the quoted unit price of Mandatory spare valve shall not be inclusive of cost of Commissioning spares.
- 2.0 An offer for Recommended Spares as specified at clause 1.3 of Standard Spec No. PE-SS-999-100-M016 shall be submitted with unit rates with validity for 5 years for future ordering by BHEL.
- 3.0 The design, manufacture and performance & testing of butterfly valves shall in general be as per attached Spec No. PE-SS-999-100-M016.
- 4.0 Valve P.O.D. Test and gear box POD test shall be as per clause 3.5 & 3.6 of standard Spec No. PE-SS-999-100-M016.
- 5.0 Valve POD test charges/ Gear box POD test charges or any other test charges, required as per this technical specification, shall be not be included in the unit quoted prices of main valves as these tests are the mandatory requirements of valve governing standard AWWA C504 and this enquiry specification . If the bidder have not earlier carried these valve POD test and gear box POD test for any NTPC project, then the bidder is required to do these tests without any charges to BHEL, in case of order on the bidder i.e. NO EXTRA CHARGES ON THIS ACCOUNT IS ADMISSIBLE TO BIDDERS. Valve POD test charges/
- 6.0 These valves are required for vacuum service and shall be provided with gland sealing arrangement which shall be vacuum tested with vacuum and helium gas (refer Quality Plan).
- 7.0 All NDT tests on castings, forgings, spindle and other parts shall be carried out as per the Quality Plan attached herewith. (also refer clause 7.0 of Spec No. PE-SS-999-100-M016). The bidder are required to return the QP duly signed with their company seal as token of acceptance by them.
- 8.0 Bidder to procure all castings (body & disc) and forgings (spindle) from reputed forging & casting supplier/ NTPC approved vendors only, if insisted by customer at contract stage without any commercial implications.
- 9.0 Bidder to submit Experience List for the offered valves.
- 10.0 Specifications of Electric Actuators FOP 2 X 500 MW SAGARDIGHI TPP, STAGE-II - UNITS # 3 & 4 shall be as per "Specification for Motorised Valve Actuators - Doc. No.: PE-TS-373-145-I006 in place of specifications indicated at clause 6.2.4 of Specification No. PE-SS-999-100-M016, Section-D of this specification. Actuators shall be selected for Full open & Full close operation.
- 11.0 The bidder shall submit in their offer the Electric Actuator sizing calculations as specified at clause Spec No. 6.2.2 OF SPEC NO. PE-SS-999-100-M016. Based on the calculations, the bidder to indicate in their Technical Offer, the size/type/rating/make & model of selected electric actuator and gear box.
- 12.0 Bidder to submit all relevant testing procedures to purchaser's approval and all their Plant testing standards as per the QP.
- 13.0 Final approval of drawings/ documents, Quality Plans & testing procedures etc. shall be by customer and the successful bidder should proceed with manufacture only after obtaining necessary approvals of customer.
- 14.0 Inspection and testing shall be both by BHEL & Customer jointly or separately
- 15.0 DRAWINGS/DOCUMENTS TO BE SUBMITTED WITH THE TECHNICAL BID/ OFFER. ( These documents are required for evaluating the bidder's offer and therefore, in the absence of these below mentioned documents, their offers will not be evaluated.)
  - 15.1 G.A. drg for the offered valves showing following information:
    - i) Complete cross sectional arrangement of the valves indicating gear box, actuator and all accessories.
    - ii) Bill of material incorporating all the materials of construction of various parts.
    - iii) Dimensional details, dismantling clearance, valve weight, test pressure etc.
    - iii) Special features such GA drawing for selected gear box with all technical details and electric actuator etc.
    - iv) List of sub-vendors for castings & forgings.
    - v) Experience list for specified size/ rating only.

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- 15.2 All Data sheet-A & B of this enquiry duly filled up with technical details of Annexure-A
- 15.3 Detailed Electric Actuator sizing/ torque calculations for seating or unseating torque, dynamic torque and bearing friction torque indicating various coefficients of seating or unseating, dynamic torque, flow, bearing friction etc.
- 15.4 Wiring diagram and Data sheets for actuators duly filled up with technical details of actuator
- 15.5 CV testing reports, if any, already carried out for the offered enquiry Butterfly valves.
- 15.6 BHEL's standard Quality Plan duly stamped & signed as token of acceptance.
- 15.7 Relevant Proof-of-Design ( P.O.D.) test procedure for offered valve, disc strength test procedure and Gear box POD (cycle) test procedure etc. along with Data sheet. Test certificates (test results) of POD test for valve and POD (cycle) test for Gear box. Also procedures for Gland leak test (Top & bottom flanges) with helium gas and Vacuum test for Gland sealing arrangement . In case PODs on valve & gear box already done for any NTPC project, the vendor shall submit the relevant customer approved test procedures, GA drgs of BF valve/ gear box, Inspection test reports etc. along with their offers.
- 15.8 Confirmation that there is no deviations to Standard specification of Two way butterfly valves for steam service.

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	<b>TITLE:</b> STANDARD SPECIFICATION FOR TWO WAY BUTTERFLY VALVES FOR STEAM SERVICE	SPECIFICATION NO. PE-SS-999-100-M016	
		VOLUME . II B	
		SECTION D	
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## 1.0 GENERAL AND SCOPE

- 1.1 This standard specification covers the design, material, constructional features, manufacture, inspection and testing at the Vendor's and/or his Sub-vendor's works, suitable painting and packing requirements of two way butterfly valves (soft seated) complete with all accessories as specified hereinafter and dispatch to site.

### 1.2 SCOPE OF SUPPLY

Requirement of butterfly valves, as per this specification, shall be of size  $\geq 1200$  mm NB (design generally as per AWWA only) and the class rating of valves shall be selected as per "Requirements of Steam service Butterfly Valves" as attached Annexure-A and the Technical Data Sheet and Materials of construction attached as Annexure-A1 or at Section -C of this specification.

### 1.3 RECOMMENDED SPARES

An offer for **Recommended Spares** for valves (3 years operation) and for actuators (5 years of operation) shall be submitted with unit rates with validity for 5 years. Bidders to submit list of these Recommended Spares for Butterfly valves and actuators indicating clearly the valve part name of the valve & actuator alongwith their quantities as recommended by the bidder for each size/type/rating of Main valves and actuators, for 3 years operation for valves and for actuators (5 years operation). Details of these each spares shall be clearly indicated along with separate price of each spares. The details of these Recommended Spares are required by BHEL/Customer for future ordering and therefore must be quoted by the bidders for evaluation.

## 2.0 CODES AND STANDARDS:

- 2.1 The design, dimensions, manufacture, inspection and testing of the butterfly valves shall comply with the requirements of latest revisions of American Water Works Association (AWWA - C504- Current revision year 2004). Intermediate Size not covered in AWWA C504 shall be extrapolated of nearest sizes available in AWWA C504.
- 2.2 However, butterfly valves designed, manufactured and conforming to BS 5155 and MSS-SP-67 shall suit the service conditions/ design parameters and the Materials of construction as specified in Annexure-A & A1 or attached at Section-C of this specification. For Butterfly valves designed and manufactured as per BS 5155/ MSS-SP-67 or equivalent, the POD test methods (valve & gear box) and testing procedures shall generally follow the guidelines of AWWA C504 only in all respect except that the body & seat hydrostatic and disc strength test shall be conducted at pressures specified in BS 5155 or the applicable code. Actuators shall also meet the requirements of P.O.D test of AWWA C504/ AWWA C504..
- 2.3 In case of any conflict between the above Code/Standard, the interpretation of the specification by the purchaser's Engineer shall be final & binding.

## 3.0 DESIGN REQUIREMENTS:

- 3.1 The butterfly valves shall be suitable for Indoor/outdoor installation with shaft either in horizontal or vertical position.
- 3.2 The valve shall have double off-set type disc (design with shaft eccentric to disc) and long/short body design as specified in Annexure-A / or at Sec-C of Vol IIB.
- 3.3 The butterfly valves shall be with butt welded/ flanged end body as specified in Annexure-A & A1 and designed to ensure bubble tight shut off at the rated pressure of valve.

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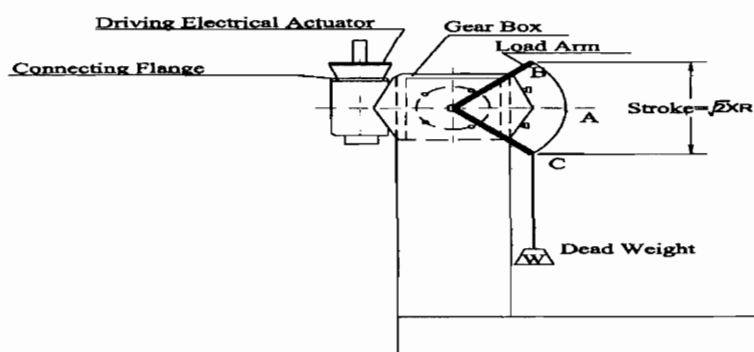


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- 3.4 The butterfly valve shall be suitable for handling the fluid as specified in Annexure- A& A1
- 3.5 **VALVE P.O.D. TEST** :-Bidder to carry out P.O.D. (Proof-of-design) Test as per AWWA C504. In case, the valve POD Test done earlier for 500MW NTPC project, bidder to submit Test Report of POD test for same model/ type/size/ rating for verification. Valve operators (Gear Box and Electric Actuator) shall be designed & tested in accordance with latest editions of AWWA C 504 and AWWA C 540 (actuator) respectively. Gear Box shall be so designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering.
- 3.6 **GEAR BOX P.O.D. TEST** :- BIDDER TO NOTE THAT VALVE POD AND GEAR BOX POD TESTS SHOULD BE DONE INDIVIDUALLY AND SEPARATELY ON EACH ONE OF THE VALVE & THE GEAR BOX. GEAR BOX P.O.D. TEST ( CYCLE TESTING) SHALL BE DONE AS PER THE PROCEDURE AS DESCRIBED BELOW OR AS PER THE PROCEDURE AGREED WITH THE PURCHASER BY THE BIDDER...:-

Gear box POD Test (cycle testing) shall be carried out only at full rated torque of gear box, through out the full cycle of testing i.e. at no point during each full cycle of testing, the applied torque should be less than the full rated torque of Gear Box. Refer Sketch below for Gear Box P.O.D set up Test. Dead weight and length of arm shall be so selected that the torque generated at point "C" and "B" shall IN NO CASE be less than the full rated torque of the gear box.




**TEST SET UP**

FIG. 1

- 3.7 Valve POD test charges/ Gear box POD test charges or any other test charges, required as per this technical specification, shall not be included in the unit quoted prices of main valves as these tests are the mandatory requirements of valve governing standard AWWA C504 and the enquiry specification. Hence the bidder is required to do these tests without any charges to BHEL, in case of order on the bidder i.e. NO EXTRA CHARGES ON THIS ACCOUNT IS ADMISSIBLE TO BIDDERS FROM BHEL.
- 3.8 These valves are for vacuum service and shall be provided with gland sealing arrangement which shall be vacuum tested with vacuum and helium gas (refer Quality Plan).
- 4.0 ACCESSORIES:
- 4.1 The butterfly valve shall be complete with Gear Box/Hand wheel/Electric actuator and to be selected as per the technical details given in Annexure-A' &A1
- 5.0 CONSTRUCTIONAL FEATURES:
- 5.1 Valve Body

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5.1.1 The valve body shall have integral hubs for shaft bearing housing. The minimum body shell thickness and minimum diameter of seat bore shall be as per the requirement of the applicable table of AWWA-C504. Material of construction of body and valve parts shall be as per materials indicated in Annexure-A & A1.

5.1.2 An arrow shall be embossed/ engraved and painted on outside of body to clearly indicate the direction of flow.

## 5.2 Valve Shaft

5.2.1 The shaft of each butterfly valve shall be securely attached to the disc through Bolting, Rivetting, threading, upsetting or cross pinning, adequately locked.

5.2.2 The shaft material shall be as specified in Annexure-A&A1. Valve shaft design shall consist of one piece unit extending completely through the valve disc. or may be the "Stub Shaft" type which consists of two separate shafts inserted into the disc. Each stub shaft shall be inserted into the valve disc. hubs for a minimum distance of at least 1.5 times shaft diameter. The connection between the shaft and the disc. shall be designed to transmit shaft torque equivalent to at least 75% of the torsional strength of the shaft diameter. The shaft shall be capable of nondestructive separation from the disc. The minimum shaft diameter sizing shall be such that the smallest diameter of shaft shall be capable of transmitting the maximum calculated valve operating torque without the torsional shear stress exceeding 40% of the tensile yield strength of the shaft material. In addition, maximum valve shaft stresses in full size portion of shaft shall not exceed the lesser of 1/5 of tensile strength or 1/3 of yield strength of the material used such that it will safely sustain the maximum differential pressure across the closed valve and transmit the maximum torque required to operate the valve.

5.2.3 Surface finish for shaft shall be of mirror finish/ very fine finish (16 RMS approx minimum) in the area of gland packing

## 5.3 Valve Disc:

The valve disc shall have no external ribs transverse to the flow and shall sustain full differential pressure across a closed valve disc without exceeding a working stress of one fifth of the tensile strength of the material used. The thickness of the valve disc shall not be more than 2 ¼ times the shaft diameter listed in AWWA C504. The valve disc. shall be designed to rotate 90° from full open to tight shut off position. Material of Disc shall be as per the Annexure-A&A1.

## 5.4 Body Seat & Disc Seal(Valve seat)

The disc. seal (valve seat) shall be of suitable grade resilient material, adequately reinforced, securely attached to the disc, replaceable type and shall be designed to provide bubble tight shut off in both directions at all operating differential pressures upto and including the rated pressure of valve class. The disc seal shall be attached to the disc by clamping/ retaining continuous circular ring & easily replaceable, bolting or other suitable methods as per the standard design of the manufacturer in line with design indicated in AWWA C504. Disc seal Material shall be as specified in the Annexure-A&A1.

The mating seat surface in the valve body shall be of stainless steel ring and shall be securely attached to the body by clamping, bolting or other suitable methods of suitable SS316 weld overlay. All clamps, retaining rings (continuous type), nuts and screws used with clamps and retaining rings shall be of stainless steel as specified in the Annexure-A&A1.

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5.5 Valve Bearing:

Each butterfly valve shall be fitted with sleeve type bearings contained in the hub of the valve body. The bearing shall be of self lubricating type and the coefficient of friction of bearing material shall not exceed 0.25 when rubbing at the maximum bearing pressure. Thrust pad shall also be provided for vertical shaft installation. The material of the bearing shall be as specified in the Annexure-A/A1, the bottom bearing also shall have accessibility for easy maintenance, may have bottom flanges to remove bottom bearing.

5.6 Shaft Seal:

Wherever the shaft project through the valve body for actuator connection, a shaft seal shall be provided. Shaft seal shall be designed for use of Standard 'O' rings seals and they shall be contained in a removable corrosion resistant recess. Shaft seals shall be designed to allow its replacement without removal of the valve shaft.

5.7 The handwheel shall be of malleable iron only.

5.8 Body Ends:

These shall be as butt welded as per ASME B 16.25 / AWWA C-504/ as specified in Annexure-A&A1.

5.9 Nameplate:

Each valve shall be fitted with a circular Stainless steel 2MM thick nameplate indicating the valve Tag No. and service description given in Technical Data sheet-A&A1. All details shall be engraved 1 mm deep and filled with black enamel paint.

5.10 *All valves shall be fitted with indicators so that intermediate position of opening at 10° intervals/ open or shut positions may be readily seen.*

5.11 The stops which limit the travel of any valve in the 'Open' or 'Shut' position shall be arranged exterior to the valve body.

5.12 All valves shall be closed by rotating the handwheel in a clockwise direction when looking at the face of the handwheel. The pulling force required on handwheel rim shall not exceed 25 Kgf when operating the valve under full flow and operating pressure. The face of each handwheel shall be clearly marked with the words 'Open' and 'Shut' with arrows adjacent to indicate the direction of rotation to which each refers.


5.13 *Special attention shall be given to the operating mechanism for large size valves in order that quick and easy operation is obtained and maintenance is kept to a minimum.*

5.14 Eyebolts shall be provided where necessary to facilitate handling heavy valves or part of valves.

5.15 Wherever practicable, heavy valves of total weight including actuator, drive motor, integral bypass etc. equal to or greater than 500 Kgs. shall be provided with suitable lugs to permit direct suspension by hanger rods or direct resting on bottom support, as applicable.

5.16 The valves as well as accessories shall be designed for easy disassembly and maintenance.

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- 5.17 The disc shall rotate through  $90^{\circ}$  from full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to the flow and suitable for throttling operation. While the disc is in throttled position, the valve shall not create any noise or vibration.

6.0 SPECIAL FEATURES:

6.1 Gland Sealing Arrangement:

Butterfly valves, provided with gland sealing arrangement, shall be vacuum tested. All valves required with this arrangement shall be provided with G3/8" connection (duly plugged) for water sealing. Sealing water shall be supplied at 4 ata and 50°C unless otherwise specifically indicated for the particular project.

6.2 Motorised Valves:

- 6.2.1 The motorised valves shall be provided with electric actuators of any of the following make.(approved by customer):

- i) Rotork
- ii) AUMA
- iii) Limitorque
- iv) Antrieb

A particular type and make of the actuator shall be selected based on the Technical Specification of valve actuators attached and to meet customer's specific requirements.

**The actuator shall be designed for the maximum differential working pressure. However the selected actuator stall torque shall be minimum 1.5 times the valve unseating torque requirement at maximum differential working pressure (design pressure). Also it has to be established that the offered actuator will open/close with design pressure & timing 60 +/- 10 seconds (unless otherwise mentioned in specific requirements) or as indicated in specific requirements/ Annexure-A&A1 with testing of valve with actuator. All electric actuators shall be tested for seat tightness test at 1.1 times of design/ operating pressure.**

- 6.2.2 Electric Actuator sizing calculations (valve torque, shall be furnished with the offer for the selected actuator. This Actuator sizing calculations to be submitted by the bidder with their offer, shall indicate in detail, the total required operating Valve Torque required for opening as well as for closing of valve with break-up of seating or un-seating torque, dynamic torque, bearing friction torque etc. The calculations shall be furnished for both with shaft vertical and with shaft horizontal. Opening and closing times shall be furnished. Bidder to submit technical details of gear box (mechanical advantage, speed reduction ratio, turns to close, max. output of torque etc.) and also submit GA drawing for Gear Box indicating materials of construction and hardness of worm & worm wheel etc. The bidder to indicate in their technical offer the size/type/ rated torque/ make & model of selected Electric Actuator and Gear box model.


- 6.2.3 Motor of actuators shall be provided with class "F" insulation for the design of class "B" insulation.

- 6.2.4 A particular make and type of actuator shall be selected based on the Technical specification (spec no PE-SS-999-145-1007) of valve actuators. However basic design shall be of three types i.e standard (basic type/conventional type syncroset i.e. without integral starters) /with integral starter/smart / intelligent. Control connection types shall be standard (convectional without integral starters) i.e with cable glands & cable lugs / 9 pin plug and socket wired & suitably mounted in starter box itself to terminate open/close command and status feedback signals with external control systems along with 1 No. additional same 9 pin spare plug & socket for ON-OFF duty. For inching duty 1 No. additional 9 pin plug and socket wired & suitably mounted in the starter

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box itself for actuators with 4-20mA for position transmitter alongwith necessary glands for power cables, Type of motor protection shall be thermistor /thermostat –one for each phase (trip unit to be included for thermistor type for standard type actuator for mounting in MCC & for integral starter type it shall be a part of actuator).

- 6.2.5 The actuator shall be provided with hand wheel (gearing and disengaging) & the same shall be adequate to open and close the valve under full unbalanced design pressure and shall be completely assembled on the respective valve and shop tested before shipment.
- 6.2.6 All motor operated globe valve's actuator for regulating duties shall be suitable for inching operation i.e S-4 25% / S2 - 150 min starts per hour. For on/off it shall S2-15 minutes
- 6.2.7 Type Test Certificate for Type Tests carried out as per IS 9334 on similar actuator shall be furnished for PURCHASER's review. If type test has not been carried out on similar actuator, then the vendor shall carry out the type tests (type tested actuators shall not be supplied). Performance tests of the actuators such as operation of limit switches, smooth functioning, noise, vibration, opening and closing time, torque required etc shall also be done.
- 6.2.8 The motors, gearing and disengaging handwheel shall be adequate to open and close the valve under full unbalanced design pressure and shall be completely assembled on the respective valve and shop tested before shipment.
- 6.2.9 Gear box and Electric Actuator shall also meet the inspection & testing requirements of latest revision of AWWA C504 in addition to technical specification requirements given at 6.2.3 above.
- 6.2.10 .Inspection and Testing of actuator shall, if required, has to be carried out as per customer/ BHEL approved Quality Plan for Electric actuator.

#### 7.0 INSPECTION AND TESTING:-

All inspection & Testing for valve, Gear box and actuators shall be as per the requirements of AWWA C504. Gear box P.O.D. (cycle) test shall be carried out at the full gear box rated torque during complete cycle testing.

**The minimum NDT/testing and inspection requirements for valve, Gear Box, electric actuator etc. shall be as per the attached Quality Plan.** However, in case of order, final inspection and testing shall be carried out as per the customer approved quality Plans and drawings which to be got finalized as per customer Technical Requirements without any price implications.

#### 8.0 PERFORMANCE GUARANTEE:


- 8.1 The vendor shall guarantee the material & workmanship of all components as well as operation of the equipment as per the requirements of the specification.
- 8.2 The vendor shall also guarantee for each of the butterfly valve for the following:

- Pressure drop as per the approved drop vs. opening curve.
- The valve opening and closing time.

#### 9.0 SURFACE PREPARATION & PAINTING

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Surface preparation shall be done SSPC-SP-3/ Power Tool Cleaning followed by 2 coat of Heat Resistance Aluminium paint to IS 13183 Gr. I, paint shade Aluminium and total DFT of paint= 80 microns minimum; unless otherwise specifically indicated for the particular project.

**10.0 CLEANING AND PROTECTION FOR DESPATCH:**

- 10.1 Each valve shall be drained, cleaned, prepared and suitably protected in such a way so as to minimize the possibility of damage and deterioration during transit and storage.
- 10.2 Discs of all valves shall be unseated when they are despatched but care shall be taken to ensure that there is no risk of damage to the disc.
- 10.3 Body ends shall be suitably sealed to protect them against damage during transit and storage.
- 10.4 Valve Tag Nos. shall be incorporated in all the despatch documents.

**11.0 DRAWINGS/DOCUMENTS TO BE SUBMITTED WITH THE BID**

**11.1 G.A. drg for the offered valves showing following information:**

- i) Complete cross sectional arrangement of the valves indicating gear box, actuator and all accessories.
- ii) Bill of material incorporating all the materials of construction of various parts.
- iii) Dimensional details, dismantling clearance, valve weight, test pressure etc.
- iv) Special features such GA drawing for selected gear box with all technical details and electric actuator etc.
- v) List of sub-vendors for castings & forgings.
- vi) Experience list for specified size/ rating only.

**11.2 Detailed Electric Actuator sizing/ torque calculations for seating or unseating torque, dynamic torque and bearing friction torque indicating various coefficients of seating or unseating, dynamic torque, flow, bearing friction etc.**

**11.3 Wiring diagram and Data sheets for actuators.**

**11.4 Cv testing reports, if any, already carried out for Butterfly valves size greater than 1200 NB**

**11.5 BHEL's standard Quality Plan duly stamped & signed as token of acceptance.**

**11.6 Relevant Proof-of-Design ( P.O.D.) test procedure for offered valve, disc strength test procedure and Gear box POD (cycle) test procedure etc. along with Data sheet. Test certificates (test results) of POD test for valve and POD (cycle) test for Gear box. Also procedures for Gland leak test (Top & bottom flanges) with helium gas and Vacuum test for Gland sealing arrangement .**

**11.7 Confirmation that there is no deviations to Standard specification of Two way butterfly valves for steam service.**

**12.0 POST CONTRACT DOCUMENTS**

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STANDARD SPECIFICATION  
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Requirement of drawings/ documents to be furnished after award of contract/ LOI,  
shall be as follows unless specified for the project.

	DOCUMENT	NO. OF CD-ROMS (SETS)	NO. OF COPIES	
			FOR APPROVAL	AFTER APPROVAL
	SUBMISSION OF GA DRGS./ DOCS ( SUCH AS ACTUATOR DATA SHEET ETC.) EACH TIME FOR APPROVAL	--	10 Prints + one soft copy	--
	FINAL SUBMISSION OF DRGS & DOCS AS BUILT DRGS. & DOCS.	*	---	25
	DATA SHEETS, DESIGN CALCULATIONS. ACTUATOR DATA SHEET ETC.	--	10 + one soft copy	--
	MATERIALS TEST CERTIFICATES, TEST REPORTS, IBR CERTIFICATES ETC.	--	3	7 + one original
	QUALITY PLANS	*	10	--
	O & M MANUALS DRAFT FINAL	-- *	11 + one soft copy --	-- 25
	TOTAL 4CDs. (EACH CD SHALL CONTAINS ALL MARKED AS*)			

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DOCUMENT TITLE	DOCUMENT NUMBER	PE-DC-373-100-N306
DATA SHEET FOR B.F.P TURBINE EXHAUST BUTTERFLY VALVES	REVISION NUMBER	00 DATE 28-06-11
WBPDCI – SAGARDIGHI TPP (2 X 500MW)	SHEET 1	OF 3

### MATERIAL DATASHEET (A-1)

SL NO.	PART NAME	MATERIALS
<b><u>VALVE</u></b>		
a.	Valve Body Buttwelded: (Long body as per AWWA C504, butt weld ends )	ASTM A-216 Gr. WCB
b.	Valve Disc.	ASTM A-216 Gr.WCB
c.	Shaft	ASTM A182 Gr..F304
d.	Disc Seal/Seat	EPDM (70 ~ 75 SHORE 'A')
e.	Valve body seat edge	AISI 316 (WELD OVERLAY/ DEPOSIT)
f.	Seat retaining ring and internal Bolts etc.	SS 304/316
g.	Bearing	SLEEVE TYPE, SELF LUBRICATED
h.	Shaft seal :	'O' RINGS TYPE ( 65~70 SHORE 'A')
i.	Fasteners (bolts & nuts)	ASTM A193 Gr. B7 (BOLTS) / ASTM A194 Gr. 2H(BOLTS)
j.	Hand wheel (actuator)	MALLEABLE IRON (NO OTHER ALTERNATE MATERIAL ACCEPTABLE)
<b><u>GEAR BOX. (Bevel type)</u></b>		
k.	Main Housing /Cover (Totally enclosed construction)	Cast Iron IS:210 Gr. FG 220/260
l.	Input shaft	13/% Cr SS/ EN8 ( ~200 BN)
m.	Worm	EN8 ( ~200 BN)
n.	Worm Wheel	Ductile iron / S.G iron
o.	Handwheel	Malleable Iron


*Amul*

	DOCUMENT TITLE	DOCUMENT NUMBER <b>PE-DC-373-100-N306</b>
	DATA SHEET FOR B.F.P TURBINE EXHAUST BUTTERFLY VALVES	REVISION 00 DATE 28-06-11 NUMBER
	WBPCL – SAGARDIGHI TPP (2 X 500MW)	SHEET 2 OF 3

**TECHNICAL REQUIREMENTS**

- |     |                                    |   |   |                                       |
|-----|------------------------------------|---|---|---------------------------------------|
| 1.  | Tag no.                            | : | EXV-27 & EXV-28   |                                       |
| 2.  | Quantity                           | : | One each (Total 2 nos.) per unit  |                                       |
| 3.  | Total Qty.                         | : | Four nos. for two units   |                                       |
| 4.  | Type                               | : | Resilient seal.   |                                       |
| 5.  | Service                            | : | Butterfly valves shall be located in the exhaust ducts of the auxiliary drive turbines of the boiler feed pumps to isolate the aux. drive turbine from the surface condenser. |                                       |
| 6.  | Size (Nominal ) mm                 | : | 1600  |                                       |
| 7.  | Flow medium                        | : | Wet Steam, 2-7% moisture  |                                       |
| 8.  | Flow Velocity (Design)             | : | 100 m/sec..   |                                       |
| 9.  | Operating parameters               | : | At normal condition   | At maximum condition                  |
|     |                                    |   | (Ref. HBD no.:<br>PE-DC-373-100-N156)   | (Ref. HBD no.:<br>PE-DC-373-100-N249) |
| 9.1 | Pressure ( kg/cm <sup>2</sup> (a)) | : | 0.1064  | 0.106                                 |
| 9.2 | Flow (T/hr)                        | : | 32.8  | 35.62                                 |
| 9.3 | Dryness fraction                   | : | 0.95  | 0.946                                 |

*Auth.*

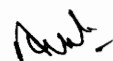
	DOCUMENT TITLE	DOCUMENT NUMBER PE-DC-373-100-N306
	DATA SHEET FOR B.F.P TURBINE EXHAUST BUTTERFLY VALVES	REVISION 00 DATE 28-06-11
	WBPDCL – SAGARDIGHI TPP (2 X 500MW)	SHEET 3 OF 3

**TECHNICAL DATA**


1. Design Pressure : Full vacuum and 2 kg/cm<sup>2</sup> (g)
2. Design temp. : 100 Deg. C
3. End Connections : Butt welded
4. Connecting pipe size and material : OD1626 X 12 thk.  
SA672 Gr. B70
5. Valve operation type : Motor operated
6. Shaft Axis orientation : Horizontal
7. Pipe line axis orientation : Horizontal
8. Operation : Full open & full close
9. Design pressure drop at max. flow.: 0.0002 kg/cm<sup>2</sup> (max.)

10. **MATERIAL OF CONSTRUCTION:**

- a) Valve Body : ASTM A-216 Gr.WCB
- b) Valve Disc. : AS PER Customer Spec.
- c) Shaft : ----- do -----
- d) Valve seating edge and fittings : ----- do -----
- e) Valve seat material : ----- do -----
- f) Valve Trim : ----- do -----
- g) Bearing : ----- do -----
- h) Shaft seal : ----- do -----
11. Valve rating : ANSI 75B / Customer Spec.






		<b>QUALITY PLAN</b>		CUSTOMER: WBPDCL		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO : PE-SS-999-100-M016		
				VENDOR:		QP NO. PE-QP-999-100-M024		REV 00 DT 01-11-11		SPEC. TITLE STANDARD SPEC. FOR TWO WAY BF VALVE FOR STEAM SERVICE
SHEET 2 OF 7		SYSTEM		STEAM SERVICE		ITEM: CAST CARBON STEEL BUTTERFLY VALVE SIZE 1600 MM NB/ CLASS 75B MOTORISED		SECTION - VOLUME		
S.N O.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CAT E-GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P W V	REMARKS

			2) MECH TESTS	ONE PER HEAT & HEAT TREATMENT BATCH	APPD DRG/ TECH SPEC.	APPD DRG/ TECH SPEC	TEST CERT.	3/2	2	1	
1.3	DISC SEAL (FROM VENDOR'S REGULAR & APPROVED SOURCE)	1. VISUAL INSPN 2. DIMENSIONS 3. TENSILE AND HARDNESS FOR VULCANISING 4. OZONE CRACK RESISTANCE 5. AGEING TEST 6. HYDRAULIC STABILITY TEST (AFTER AGEING) 7. WEAR RESISTANCE	MA MA MA MA MA MA MA	100% 100% 1/BATCH 1/ BATCH 1/ BATCH 1/BATCH 1/BATCH	APPD DRG APPD DRG IL TECH. SPEC/ APPD DRG TECH. SPEC + ASTM D1149 TECH. SPEC + IS 3400 PART IV TECH SPEC./ REL STD. AWWA C-504	APPD DRG APPD DRG IL TECH. SPEC/ APPD DRG TECH. SPEC + ASTM D1149* TECH. SPEC + IS 3400 TECH. SPEC./ REL STD. NO DAMAGE	INSPN. REPORT LOG BOOK TEST CERT TEST CERT. TEST CERT TEST REPORT	3/2 3/2 3/2 3/2 3/2 3/2	2 2 2 2 2 2	1 1 1 1 1 1	    SPECIMEN TYPE A, 40 DEG CENTIGRADE FOR 70 HRS   *TEST TEMP. 125 DEG C, TEST DURATION 72 HRS, MAX CHANGE IN TENSILE STRENGTH. 20% ELONGATION: 20% ELONGATION: 20%, HARDNESS: 3%  TYPE TEST REPORT WILL BE FURNISHED FOR REVIEW
1.4	FASTENERS ASTM A193 GR B7, ASTM A194 GR2H, GRB8M	1. VERIFICATION OF MAKE, GRADE, REVIEW OF TEST CERTIFICATES 2. DIMENSIONS	MI MA	100% SAMPLING PLAN	TECH. SPEC/ DATA SHEET APPD DRG	TECH. SPEC/ DATA SHEET APPD DRG	INSPN REPORT INSP REPORT	3/2 2	2 2	1 1	


<b>BHEL</b>		<b>PARTICULARS</b>		<b>BIDDER/VENDOR</b>	
A.M. TRIPATHI		NAME			
Date: 01.11.11		SIGNATURE			
		DATE		BIDDER'S/ VENDOR'S COMPANY SEAL	



		<b>QUALITY PLAN</b>		CUSTOMER: WBPDC		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO : PE-SS-999-100-M016			
				VENDOR:		Q/P NO. : PE-QP-999-100-M024		REV 00 DT 01-11-11		SPEC. TITLE STANDARD SPEC. FOR TWO WAY BF VALVE FOR STEAM SERVICE	
S.N O.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CAT E- GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	SYSTEM	STEAM SERVICE	ITEM: CAST CARBON STEEL BUTTERFLY VALVE SIZE 1600 MM NB/CLASS 75B MOTORISED		SECTION - VOLUME	REMARKS
								REFERENCE DOCUMENT	ACCEPTANCE E NORMS		


1.5 OPERATORS											
1.5.1 GEAR OPERATOR											
	A)GEAR, WORM & SHAFT	1. CHEM. COMP. & PHYS PROPERTIES	MA	CHEM & PHYS TEST	1/BATCH	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	TEST CERT	3/2	2	1
		2. DIMENSIONS	MA	MEASURE-MENT	100%	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	INSP REPORT	3/2	2	1
		3. HARDNESS	MA	MEASURE-MENT	100%	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	TEST CERT	3/2	2	1
	B) TORQUE TEST	1. TORQUE TRANSMITTING	MA	TORQUE TEST AT TWICE THE RATED TORQUE	ONE/ TYPE	AWWA C-504 CL 4.3.8.5.8 / DATA SHT/ MFG DRG.	AWWA C-504 CL 4.3.8.5.8 / DATA SHT/ MFG DRG.	INSP REPORT*	3/2	1*	--
		2. DESIGN VERIFICATION	MA	CYCLE TEST AT FULL RATED TORQUE OF GEAR BOX	ONE/ TYPE	AWWA-C507 (at full rated torque of gear box) / APPD PROCEDURE FOR GEAR BOX MODEL AT500/ 1/ S3E	CL. 4.5.8.5.9 OF AWWA-C504-2000 / APPD PROCEDURE FOR GEAR BOX MODEL AT500/ 1/ S3E	INSP REPORT*	3/2	1*	--
1.6	ELECTRICAL ACTUATOR										
		1. TORQUE TESTING & SETTING OF TORQUE SWITCH	MA	}}MECH., }}ELEC. }}TESTS	100%	TECH. SPEC./ APPD. DRG./ DATA SHEET/ IS-9334	TECH. SPEC./ APPD. DRG./ DATA SHEET/ IS-9334	INSP REPORT	3	2	1

BHEL	PARTICULARS		BIDDER/VENDOR	
	NAME			
	SIGNATURE			
	DATE		BIDDER'S/ VENDOR'S COMPANY SEAL	

		<b>QUALITY PLAN</b>  SHEET 4 OF 7		CUSTOMER: WBPDCCL		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO : PE-SS-999-100-M016			
				VENDOR:		Q.P. NO. : PE-QP-999-100-M024		REV. 00 DT 01-11-11		SPEC. TITLE STANDARD SPEC. FOR TWO WAY BF VALVE FOR STEAM SERVICE	
				SYSTEM		STEAM SERVICE		ITEM: CAST CARBON STEEL BUTTERFLY VALVE SIZE 1600 MM NB/CLASS 75B MOTORISED		SECTION - VOLUME	
S.N O.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CAT E-GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P W V	REMARKS	

		1. TRAVEL/STROKE	MA							
		2. TRAVEL TIME	MA							
		3. OPERATION OF LIMIT SWITCH	MA							
		4. MANUAL OPERATION THROUGH HAND WHEEL	MA							
		5. OPERATION TEST WITH POWER SUPPLY VARIATION ENERGISES TO OPEN/CLOSE	MA							
		6. IR, HV, IR	MA							
		7. DEGREE OF PROTECTION	MA		1/TYPE	TECH. SPEC./ APPD. DRG./ DATA SHEET/ IS-9334	TECH. SPEC./ APPD. DRG./ DATA SHEET/ IS-9334	3rd PARTY TEST CERT.	-	1
		DESIGN VERIFICATION	MA		1/TYPE	AWWA C504 & AWWA C540	AWWA C504 & AWWA C540	TEST CERT	3/2	1
2.0	INPROCESS CONTROL:-									
2.1	BODY & DISC	1 DIMENSIONS	MA		100%	MFG DRG	MFG DRG	INSPN. REPORT	2	1
		2. SURFACE DEFECTS	CR		100%	ASTM E165	ASME B 16.34 APPENDIX III	INSPN. REPORT	2	1
2.2	WELDING OVERLAY	WELDING PROCEDURE AND WELDER PERFORMANCE	CR		100%	ASME IX	ASME IX	INSPN. REPORT	3/2	--
										ONLY BHEL / CUSTOMER QUALIFIED WELDERS SHALL BE ENGAGED FOR WELDING


BHEL		PARTICULARS		BIDDER/VENDOR	
A.M. TRIPATHI		NAME			
Amit		SIGNATURE			
01.11.11		DATE			
BIDDER'S/ VENDOR'S COMPANY SEAL.					

	<b>QUALITY PLAN</b>			CUSTOMER: WBPDCCL		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO : PE-SS-999-100-M016		
				VENDOR:		Q.P. NO. PE-QP-999-100-M024		REV 00 DT 01-11-11		
	SHEET 5 OF 7			SYSTEM STEAM SERVICE		ITEM: CAST CARBON STEEL BUTTERFLY VALVE		SECTION - VOLUME		
S.N. O.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CAT E-GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P W V	REMARKS

DEPOSIT	QUALIFICATION	MA	DEPTH MEASUREMENT	100%	MFG. DWG	MFG. DWG	TEST REPORT	2	2	1	WPS SHALL BE SUBMITTED FOR APPROVAL
	CLADDING										
		MA	SURFACE DEFECT LPI ON WELD OVERLAY AND ADJACENT AREA	100%	ASTM E 165	FREE FROM POROSITY/ CRACK	NDT REPORT	2	2	1	
2.3	BODY ( BUTT WELD ENDS)	CR	MPI	100% ON BW AREA	ASTM A709	ASME B 16.34 APPENDIX II	INSP REPORT	2	2	1	
		CR	PT	100% ON BW AREA	ASTM E165	ASME B 16.34 APPDX III	INSP REPORT	2	2	1	RT (100%) OF BODY INCLUDING BW ENDS AS PER SL. NO. 1.1
2.4	SHAFT	MA	MEASURE- MENT	100%	MFG DRG	MFG DRG	LOG BOOK	2	--	--	
		MA	P.T.	100%	ASTM E165	ASME B 16.34 APPENDIX III	INSPN REPORT	2	2	1	
3.1	VERIFICATION OF ALL PREVIOUS TESTS AND DOCUMENTS	MA	---	100%	TECH SPEC	TECH SPEC	---	2	1	1	
3.2	TESTS (HYDRAULIC)	CR	HYDRO TEST	100%	AWWA C-504 / APPD DRG.	NO LEAKAGE	INSP. REPORT	2	1	--	
		CR	HYDRO TEST	100%	AWWA C-504/ APPD DRG.	NO LEAKAGE AT 10.5 Kg/cm <sup>2</sup>	INSP. REPORT	2	1	-	ONE VALVE/SIZE SHALL BE TESTED FOR TWICE THE DESIGN

BHEL	PARTICULARS		BIDDER/VENDOR
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/ VENDOR'S COMPANY SEAL

QUALITY PLAN				CUSTOMER: WBPDCL		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO. PE-SS-999-100-M016			
SHEET 6 OF 7				VENDOR:		Q.P. NO. PE-QP-999-100-M024		SPEC. TITLE STANDARD SPEC. FOR TWO WAY BF VALVE FOR STEAM SERVICE			
COMPONENT/ OPERATION		CHARACTERISTICS CHECKED	CAT E-GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	
S.N O.									P	W	V
		3. SEAT LEAKAGE WITH ACTUATOR (BOTH DIRECTION)	CR	HYDRO/ AIR TEST	100%	AWWA C-504/ APPD. DRG.	NO LEAKAGE	INSP. REPORT	2	1	-
		4. PERFORMANCE TEST	CR	PERFORMANCE	100%	AWWA C-504*	SMOOTH OPERATION	INSP. REPORT	2	1	-
		5. GLAND LEAK TEST (TOP GLAND AND BOTTOM FLANGES)	CR	HELIUM LEAK TESTS	100%	ILPS 201 Rev V	ILPS 201 Rev V	INSP. REPORT	2	1	-
		6. VACUUM TEST	CR	VACUUM TEST	100%	ILPS 0126	ILPS 0126	INSP. REPORT	2	1	--
		7. PROOF OF DESIGN TEST (LIFE CYCLE TEST)	CR	CYCLE TEST	AS PER AWWA C 504 ON	APPROVED TEST PROCEDURE / AWWA C504		INSP. REPORT	2	1	1
<p>PRESSURE FROM BOTH SIDE OF THE VALVE IN ADDITION TO 100% TESTING IN THE NORMAL FLOW DIRECTION. NO PART OF DISC/ VALVE SHALL BE PERMANENTLY DEFORMED/DAMAGED. DISC DEFORMATION IS MEASURED USING DIAL GAUGE AND BODY DEFORMATION BY MEASURING TAPE</p> <p>*COMPLETE VALVE ASSEMBLY ALONGWITH ACTUATOR SHALL BE 1) PARTIALLY OPENED 3 TIMES UNDER LOAD (5.25 kg/sqcm) IN HORIZONTAL POSITION ONLY</p> <p>2) OPERATED 25 CYCLES UNDER NO LOAD IN HORIZONTAL OR VERTICAL POSITION AND FOLLOWING SHALL BE CHECKED</p> <p>i) OPERATING TIME</p> <p>ii) OPERATION OF TORQUE &amp; LIMIT SWITCHES</p> <p>iii) CURRENT DRAWN BY ACTUATORS</p>											
<p>BHEL</p> <p>A.M. TRIPATHI</p> <p>01.11.11</p>											
<p>BIDDER/VENDOR</p> <p>NAME</p> <p>SIGNATURE</p> <p>DATE</p>											
<p>BIDDER'S/ VENDOR'S COMPANY SEAL</p>											


		<b>QUALITY PLAN</b>		CUSTOMER: WBPDCCL		PROJECT : 2X500 MW SAGARDIGHI TPP		SPEC. NO : PE-SS-999-100-M016	
				VENDOR:		Q.P. NO. PE-QP-999-100-M024		REV 00 DT 01-11-11	
SHEET 7 OF 7		SYSTEM		STEAM SERVICE		ITEM: CAST CARBON STEEL BUTTERFLY VALVE SIZE 1600 MM NB/ CLASS 75B MOTORISED		SECTION - VOLUME	
S.N. O.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CAT E-GO RY	TYPE/METH OD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE E NORMS	FORMAT OF RECORD	AGENCY P W V
REMARKS									

					ONE VALVE/ SIZE/ TYPE/ RATING				
4.0	SHIPPING RELEASE								
4.1	FINAL INSPECTION	1. OVERALL DIMENSION 2. DOCUMENTATION REVIEW 3. CLEANLINESS 4. NAMEPLATE	MA MA MA MA	MEAS. REVIEW VISUAL VIAUAL	100% 100% 100% 100%	APPD DRG APPD DRG/ TECH SPEC APPD DRG/ TECH SPEC APPD DRG/ TECH SPEC	INSP REPORT INSP REPORT INSP REPORT INSP REPORT	2 2 2 2	1 1 1 1
5.0	PAINTING	1. SURFACE PREPARATION 2. UNIFORMITY & THICKNESS	MI MI	VISUAL & MEASURE- MENT VISUAL & MEASURE- MENT	100% 100%	APPROVED DATA SHEET FROM BHEL/ CUSTOMER -DO-	INSP REPORT -DO-	2 2	1 1
6.0	PACKING	SOUNDNESS	MI	VISUAL	100%	AS PER TECH SPECIFICATION	INSP REPORT	2	1

NOTES:- CR- MEANS CRITICAL MA- MEANS MAJOR MI- MINOR  
PT-PENETRATION TEST UT- ULTRA SOUND TEST MPI= MAGNETIC PARTICAL EXAMINATION  
1- BHEL (PURCHASER) 2- VENDOR (MAIN) 3- SUB-VENDOR OF VENDOR  
ALL MATERIALS SHALL BE AS PER APPROVED DRGS/ DATA SHEET FOR VALVES.

NOTE : ALL THE NDT TEST PROCEDURES SHALL BE AS PER ASME B 16.34

BHEL		PARTICULARS		BIDDER/VENDOR	
A.M. TRIPATHI		NAME			
[Signature]		SIGNATURE			
01.11.11		DATE			
				BIDDER'S/ VENDOR'S COMPANY SEAL	

	<b>SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.: PE-ID-375-145-1902	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 25.10.11
			SHEET 2	OF 5
TAG No :- <b>REFER ANNEXURE-A</b> Qty :-.....Nos.....				
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>GENERAL *</b>	* PROJECT	2X500 MW SAGARDIGHI TPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE	<b>Refer Annexure- A</b>		
	* DUTY	<input checked="" type="checkbox"/> ON / OFF <input type="checkbox"/> INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input checked="" type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME	<b>50-70</b> SECONDS		
	* WORKING PRESSURE	..... KG/SQ.CM.		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
<b>CONSTRUCTION AND SIZING</b>	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90 % OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. . For regulating service 150 starts/Hr min.		
<b>HANDWHEEL</b>	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED		
	TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
<b>ELECTRIC ACTUATOR</b>	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT.		
	ACTUATOR WIRING DIAGRAM & No.	<input checked="" type="checkbox"/> ENCLOSED (3-V-MISC-24227)		
	COLOUR SHADE	<input checked="" type="checkbox"/> GREY ENAMEL PAINT (SHADE 631 AS PER IS.5) OR EQUIVALENT <input type="checkbox"/> .....		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415V±10%, 3PH, AC, 50Hz±5%, 10%(ABSOLUTE) COMBINED VOLTAGE & FREQUENCY VARIATION		
	@ CONTROL VOLTAGE REQUIREMENT	110V AC- TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER		
	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP 67 <input type="checkbox"/> FLAME PROOF TOTALLY ENCL, SELF VENTILATED.		

Ans -



## SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.: PE-ID-375-145-1902

VOLUME II B

SECTION D

REV. NO. 00

DATE: 25.10.11

SHEET 3

OF 7

TAG No :-

Qty :-.....Nos.....

### Data Sheet A & B

DATA SHEET-A  
(TO BE FILLED BY PURCHASER)

DATA SHEET-B  
(TO BE FILLED-UP BY BIDDER)

	@ INSULATION CLASS	<input type="checkbox"/> CLASS-B <input checked="" type="checkbox"/> CLASS-F WITH TEMPERATURE RISE LIMITED TO CLASS-B	
	@ CONTINUOUS OPERATION TIME	S2-15 MINUTES	
	@ POWER CABLE TYPE / SIZE	LATER (TO BE PROVIDED IN THE CONTRACT STAGE)	
	@ CONTROL CABLE TYPE / SIZE	LATER (TO BE PROVIDED IN THE CONTRACT STAGE)	
	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT <input type="checkbox"/> THERMISTOR WITH SWITCHING UNIT <input checked="" type="checkbox"/> 3 Nos., 1 IN EACH PH <input type="checkbox"/> ONE	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED	
<b>INTEGRAL STARTER</b>	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS	
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)	
	IF SMART		
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED	
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> TCP/IP <input type="checkbox"/> .....	
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC	
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	e) MASTER STATION (See note-10)	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	f) MASTER STN INTRFACE WITH DCS	<input type="checkbox"/> REQUIRED MODBUS <input type="checkbox"/> TCP/IP	
	g) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED	
	WIRING DIAGRAM & No.	<input checked="" type="checkbox"/> BIDDER TO ENCLOSE <input type="checkbox"/> ENCLOSED	
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED(O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED,S/S IN LOCAL, THERMOSTAT TRIP, TORQUE SWITCH (OPTD MID WAY)		
<b>INTERPOSING RELAY</b> (Applicable for Integral Starter)	INTERPOSING RELAY	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INTERPOSING RELAY (QUANTITY)	<input checked="" type="checkbox"/> 2 NOS. <input type="checkbox"/> 3 NOS.	
	DRIVING VOLTAGE	<input checked="" type="checkbox"/> 20.5 – 24V DC <input type="checkbox"/> _____ V DC	
	DRIVING CURRENT	<input checked="" type="checkbox"/> 125 mA MAX <input type="checkbox"/> _____ mA MAX	
	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - < 25 K ohms <input type="checkbox"/> > _____ ohms - < _____ ohms	
<b>TORQUE SWITCH</b> (Not Applicable for Smart Actuator)	MECHANICAL LATCHING DEVICE	<input checked="" type="checkbox"/> REQUIRED(REFER NOTE-6)	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A, 240 V AC / 0. 5A,220 V DC	
	ENCLOSURE	IP 66	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	±3% OF SET VALUE	
<b>LIMIT SWITCH</b> (Not Applicable for Smart Actuator)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2 NOS.	2 Nos. (ADJ.) <input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.

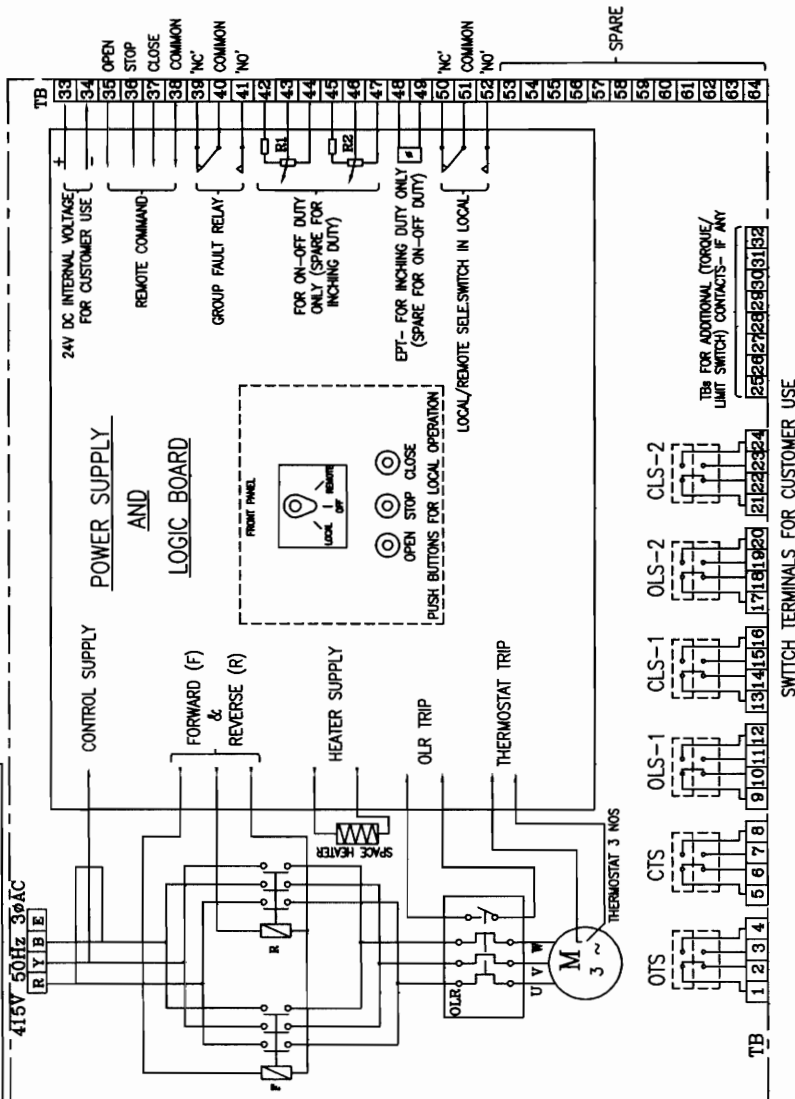
*Auth*

	<b>SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO PE-ID-375-143-1902	
			VOLUME II B	
			SECTION D	
			REV NO. 00	DATE: 25.10.11
			SHEET 4	OF 5
TAG No :- Qty :-.....Nos.....				
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>POSITION TRANSMITTER</b>	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A, 240 V AC / 0.5A, 220 V DC		
	ENCLOSURE CLASS	IP 66		
	POSITION TRANSMITTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	<input checked="" type="checkbox"/> ELECTRONIC (2-WIRE) CONTACTLESS (LVDT TYPE) <input type="checkbox"/> ELECTRONIC (2 WIRE) RA CONVERTER		
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> .....		
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA		
<b>TERMINAL BOX</b>	ACCURACY	± 1% FS		
	ENCLOSURE CLASS	IP 65		
	MOTOR TERMINAL BOX	REQUIRED		
	ACTUATOR TERMINAL BOX	REQUIRED		
	ENCL CLASS MTR T.B. / ACTUATOR T.B.	<input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP67..... <input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP67.....		
	@ EARTHING TERMINAL	PROVIDED		
	PLUG & SOCKET (9 PIN) (FOR COMM, LS/TS FEED BACK, PoT)	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED <input type="checkbox"/> 2 NOS. <input type="checkbox"/> .....		
	@ POWER CABLE GLAND	SIZE : TO BE FURNISHED LATER		
<b>CABLE GLANDS</b>	@ SPACE HEATER CABLE GLAND	SIZE : TO BE FURNISHED LATER		
	OTHER CONTROL CABLE GLANDS	QUANTITY & SIZE : TWO (SIZE TO BE FURNISHED LATER)		Suitable for 4Px 0.5 sq mm Cable
	@ SPACE HEATER	REQUIRED		
<b>SPACE HEATER</b>	@ POWER SUPPLY	240V AC SINGLE PHASE		
	@ RATING	BIDDER TO SPECIFY		
	<b>WEIGHT</b>	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	
NOTES: 1. SCOPE. DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. 2. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691, IS-4722 AND IEC 34-1. 3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. 4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE HEAVY DUTY BRASS MACHINE FINISHED & NICKEL CHROME PLATED CONFORMING TO BS:6121 SHALL BE PROVIDED. 5. THE MAKE OF THE MOTOR WILL BE AS PER APPROVED VENDOR LIST 6. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END 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 OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. 7. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10% 8. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING				
NAME  SIGNATURE  DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL   SIGNATURE  DATE
	SEEMA KHATRI	ANISHA B. SINGHAL	ANISHA B. SINGHAL	
	25.10.2011	25.10.2011	25.10.2011	
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY), @ = TO BE FILLED BY ES				

Aut:











DRAWING NO. 3-V-MISC-24227



NOTE:-

1. ALL TORQUE AND LIMIT SWITCHES (OTS, CTS, OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS '1NO+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE.
2. ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
3. CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
4. OLS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
5. OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
6. CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
7. EPT - ELECTRONIC POSITION TRANSMITTER (CONTACTLESS, LVDT TYPE, FOR INCHING DUTY)
8. R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
9. FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
10. M - MOTOR 3φ 415V 50 Hz AC SUPPLY

## CONTACT DEVELOPMENT DIAGRAM

OTS	1-2	OPEN AT OVER TORQUE DURING OPENING TRAVEL		
	3-4	CLOSE AT OVER TORQUE DURING OPENING TRAVEL		
CTS	5-6	OPEN AT OVER TORQUE DURING CLOSING TRAVEL		
	7-8	CLOSE AT OVER TORQUE DURING CLOSING TRAVEL		
OLS-1	9-10			
	11-12			
OLS-1	13-14			
	15-16			
OLS-2	17-18			
	19-20			
CLS-2	21-22			
	23-24			
SWITCH	TERMINAL NO.	FULL OPEN	INTERMEDIATE	FULL CLOSE
		a	b	VALVE POSITION

INDICATES CONTACT CLOSED  
INDICATES CONTACT OPEN

CONTACT RATING: 5A AT 250V AC & 0.5A AT 220V DC

## SETTING PROCEDURE OF POSITION LIMIT AND TORQUE SWITCH

VALVES	OPEN		CLOSE	
	MAIN	BACK UP	MAIN	BACK UP
GATE VALVE OF 100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	OLS	OTS	CLS	CTS
ALL OTHER GATE & GLOBE VALVES	OLS	OTS	CLS	CTS
# - CLS NOT TO BE CONNECTED IN TRIP CIRCUIT				
* - BYPASS OTS FOR INITIAL 5% OF TRAVEL (FOR GATE VALVES ONLY)				

TYPE OF PRODUCT ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS  
OR NAME OF CUSTOMER/PROJECT  
(DRAWN FOR INTERMEDIATE POSITION OF VALVES)

BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT, TIRUCHIRAPPALLI-620014.		DRN N.P.ESWAR	SIGN N.P.	DATE 07.10.04
DEPT 365-121	SCALE	WEIGHT (KG)	REFERENCE INFORMATION	NO. OF TRIAL
CODE				
TITLE WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER		CARD CODE U 01	DRAWING NO. 3-V-MISC-24227	REV 0

**All the 3 sheets to be compulsorily filled & submitted by bidder at the time of submitting the technical offer, without which offer will not be evaluated.**

DEVIATION SHEET					
SL. NO	NAME OF BHEL SPEC.	CLAUSE NO.	BHEL REQUIREMENTS	COMMENTS/ DEVIATIONS	REMARKS



## COMPLIANCE SHEET FOR VALVES

All the 3 sheets to be compulsorily filled & submitted by bidder at the time of submitting the technical offer, without which offer will not be evaluated.

**PROJECT:** 2X500 MW SAGARDIGHI TPP UNIT 3&4 , PHASE -2

**PACKAGE NAME:** BUTTERFLY VALVE (STEAM SERVICE)

**ENQUIRY NO.:**

**A) SCOPE:** Bidder to tick whichever is applicable.

ANNEXURE-A (Bill of Material)	Quoted Fully	Quoted Partly
1. Main valves		
2. Spares		
a) Commissioning spares		
b) Mandatory spares (If applicable)		
c) Recommended spares (If applicable)	NA	NA

**B) Technical Details:** Bidder to tick whichever is applicable.

1.	BHEL Technical Specification-Section-D	Accepted	Not Accepted
2.	Material of construction (If Applicable)- ANNEXURE-A1	Accepted	Not Accepted
3.	ANNEXURE-B (Documentation Requirement)	<del>Accepted</del>	<del>Not Accepted</del>
4.	Quality Plan (s)	Accepted	Not Accepted
5.	Actuator data sheet with wiring diagram (If applicable)	Accepted	Not Accepted
6.	Project specific requirements if specified by BHEL	<del>Accepted</del>	<del>Not Accepted</del>

### Guidelines for filling the compliance sheet:

1. If **quoted partly**, the regretted items shall be clearly specified in the sheet-2 & shall be submitted along with this compliance sheet. In case of no regretted items sheet-2 to be filled as **NIL** by bidder.
2. Deviation in the **technical details**, if any, shall be clearly specified in the sheet-3 & shall be submitted along with this compliance sheet. In case of no deviations, sheet-3 to be filled as **NIL** by bidder.



**All the 3 sheets to be compulsorily filled & submitted by bidder at the time of submitting the technical offer, without which offer will not be evaluated.**

REGRETTED ITEMS					
SL. NO	SL. NO. OF ANNEXURE-A	TYPE	SIZE	QTY	REMARKS