3x800MW PATRATU STPP

TECHNICAL SPECIFICATION

FOR

BUTTERFLY VALVE (STEAM SERVICE)

SPECIFICATION NO.: PE-TS-434-100-M016
Rev. No.: 00

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

	3x800MW PATRATU STPP	SPECIFICATION NO.: PE-TS-434-100-M016	
	TECHNICAL SPECIFICATION FOR BUTTERFLY VALVE (STEAM SERVICE)	REV. NO.: 00	DATE: 14.02.2022
		SHEET 1 OF 1	

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SECTION-I

SPECIFIC TECHNICAL REQUIREMENTS

BHEL Maharatna Company	SPECIFIC TECHNICAL REQUIREMENTS FOR BUTTERFLY VALVES (STEAM SERVICE)	SPECIFICATION NO.: PE-TS-434-100-M016
		SECTION: I
		REV. NO.: 00 / DATE: 14.02.2022
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1.0 GENERAL

1.1 The valves shall meet the technical requirements and conform to the requirements of Section-I and Data Sheet-A of Section-II. However, in the event of contradictions between Section-I & Section-II/ Data Sheet-A, Data Sheet-A will prevail.

1.2 The technical requirements for valves shall, in general, be as per the attached Data Sheet-A of Section-II.

2.0 SCOPE OF SUPPLY

2.1 The valves complete with all accessories shall be supplied as per Data Sheet-A of Section-II. For detail refer the same. Each valve (quantity and other details specified in Data Sheet-A) shall be complete with the following accessories.

i) Lifting arrangement provision for handling i.e. lifting lugs, eye bolts etc.
ii) Actuators and limit switches as required to make valve complete in all respects.

2.2 Commissioning spares, if any.
2.3 Set of special tools and tackles if required for the maintenance, erection etc. of the equipment supplied.
2.4 Mandatory spares as applicable depending upon the project requirement.
2.5 Finish paints for touch-up painting of equipment after erection at site in sealed containers.

3.0 CODES AND STANDARDS:

The design, manufacture, inspection and testing of the butterfly valves shall suit the design parameters specified in Data Sheet-A & comply with the requirements of latest revisions of the following standards. However, the testing shall be as per American Water Works Association AWWA C504-10 and C516-10 (whichever is applicable) including disc strength test (all sizes of valves), gear box POD Test & valve POD test.

a) AWWA C504-10 upto size 1800 mm,
b) AWWA C516-10 upto for size 2000 mm and above.

3.1 In case of any conflict between the above Codes/ Standards and this specification, the later shall prevail and in case any further conflict in this matter, the interpretation of the specification by the BHEL engineer shall be final & binding.

4.0 **DESIGN REQUIREMENTS:**

4.1 All valves shall be suitable for the service conditions i.e. flow, temperature and pressure under which they are required to operate and those performing similar duties shall be interchangeable with each other unless otherwise specified.

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4.2 The butterfly valves shall be suitable for indoor/ outdoor installation with shaft either in horizontal or vertical position.

4.3 The valves shall have double off-set type disc (design with shaft eccentric to disc) and long body design for AWWA C504-10 and maximum laying length for AWWA C516-10 as specified in Data Sheet-A.

4.4 The butterfly valves shall be with butt welded ends as specified in Data Sheet-A and designed to ensure bubble tight shut-off at the rated pressure of valve.

5.0 MATERIALS

5.1 The materials of construction of main parts of the Butterfly Valves (Steam Service) shall be specified in Data Sheet-A.

5.2 The materials of construction of the remaining parts shall be as per relevant standard governing the valves and to suit the service conditions. These materials shall be subject to approval of the purchaser.

5.3 Materials used in manufacture of valves shall be of tested quality.

6.0 CONSTRUCTION FEATURES

6.1 Valve Body

6.1.1 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 requirement of the applicable table/ equation of AWWA C504-10/ C516-10 (whichever is applicable). Material of construction of body and valve parts shall be as per materials indicated in Data Sheet-A.

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

6.2 Valve Shaft

6.2.1 The shaft of each butterfly valve shall be securely attached to the disc through bolting, riveting, threading, upsetting or cross pinning, adequately locked.

6.2.2 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 minimum required shaft diameter. The minimum shaft diameter shall be as per the relevant standard and shall be such that it will safely sustain the maximum differential pressure across the closed valve and transmit the maximum torque required to operate the valve.

6.2.3 Surface finish for shaft shall be minimum 16 RMS in the area of gland packing.

6.3 Valve Disc:

The valve disc shall have no external ribs transverse to the flow and shall sustain full differential pressure across closed valve disc without exceeding 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 C504-10/ C516-10 (whichever is applicable). 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 Data Sheet-A.

6.4 Body Seat & Disc Seal (Valve Seat)

The soft seat shall be of replaceable type of suitable grade resilient material, adequately reinforced, securely attached to the disc or to the body, and shall be designed to provide bubble tight shut off under all operating conditions. The soft seat/ seal shall be attached by clamping ring, bolting or other suitable methods as per the standard design of the manufacturer. All clamping rings, bolts/studs, nuts used shall be of stainless steel. The sealing ring on the disc shall be continuous type and easily replaceable.

The mating seat surface accordingly shall be on valve body or disc and shall be of stainless steel and securely attached to the body/disc by directly clamping, bolting or suitable methods. All clamps, retaining rings, nuts, screws/ all hardware shall be of stainless steel.

6.5 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. The housing for this bearing shall be rigidly attached to the valve body. Thrust bearings shall also be provided for vertical shaft installation. For valves of 350 NB and larger, the bearing should be capable of taking axial thrust also. The material of the bearing shall be self-lubricated type & low coefficient of friction in accordance with the relevant standard.

6.6 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.

6.7 The hand wheel shall be of malleable iron or equivalent.

6.8 Body Ends:

These shall be as butt welded as per ASME B 16.25 as specified in Data Sheet-A.

6.9 Nameplate:

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

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

6.11 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 hand wheel shall be clearly marked with the words 'Open' and 'Shut' with adjacent arrows to indicate the direction of rotation to which each refers.

6.12 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.

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

6.14 Wherever practical, valves (including actuator, drive motor, integral bypass etc.) of total weight 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.

6.15 The valves as well as accessories shall be designed for easy dismantling and maintenance.

6.16 The disc shall rotate through 90 deg. from full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and be suitable for throttling operation. While the disc is in throttled position, the valve shall not create any noise or vibration.

6.17 It may be noted that all construction features design and parameters will be governed by AWWA C504-10 for sizes upto 1800 mm and AWWA C516-10 for sizes 2000 mm and above.

7.0 SPECIAL FEATURES:

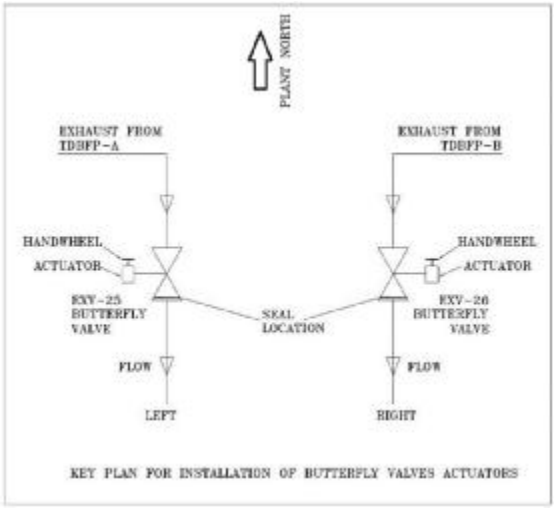
7.1 Gland Sealing Arrangement:

Butterfly valves, provided with glad 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.

7.2 Motorized Valves:

7.2.1 The motorized valves shall be offered with the electric actuators of reputed make observing strict quality control and approved by reputed customers. A particular make and type of actuator shall be designed for the maximum differential working pressure. However, the stall torque of the selected actuators shall be minimum 1.5 times the valve unseating torque requirement at the maximum differential working pressure (design pressure) and required operating time as mentioned in in Data Sheet-A.

7.2.2 Electric actuators shall be mounted directly on the valves. Orientation of actuator shall be as shown below.
For total 6 nos. of Main Supply Valves, electric actuator orientation for 3 valves will be on left side & for other 3 valves, it will be on right side.
For total 3 nos. of Mandatory Spare Valves, electric actuator orientation for 1 valve will be on left side & for other 2 valves, it will be on right side.



KEY PLAN FOR INSTALLATION OF BUTTERFLY VALVES ACTUATORS

7.2.3 The motors, gearing and disengaging hand wheel shall be adequate to open and close the valve under maximum differential pressure and shall be completely assembled on the respective valve and shop tested before shipment.

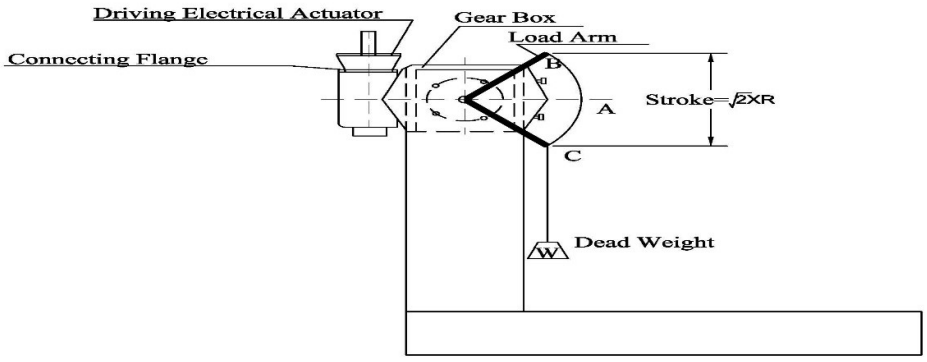
Gear box and Electric Actuator shall also meet the inspection & testing requirements of latest revision of AWWA C504-10 /AWWA C542-10 respectively.

8.0 **INSPECTION AND TESTING:**

All inspection & Testing for valve, Gear box and actuators shall be as per the requirements of the relevant standard.

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 final approved quality plan without any price implications.

8.1 P.O.D. Tests:



TEST SET UP

FIG. 1

a) POD (Proof-of-design) Test as per AWWA C504-10/C516-10 (whichever is applicable) is required to be carried out for valves. In case the valve POD Test has been done earlier, only Test Report of POD test for same model/ type/size/ rating is required to be submitted for verification.

b) Gear Box and Electric Actuator shall be designed & tested in accordance with latest editions of AWWA C504-10 (gearbox) and AWWA C542-10 (actuator) respectively. Gear Box shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering.

c) For valves designed and manufactured as per AWWA POD shall follow the guidelines of AWWA C504-10/C516-10 (whichever is applicable) and Actuators shall meet the requirements of POD test of AWWA C542-10.

d) Gear box POD test: - Valve POD and gear box POD tests should be done separately on each one of the valve & the gear box. Gear box POD test shall be done as per the procedure described below or as per the procedure agreed between purchaser & vendor.

e) Gear box POD Test shall be carried out only at full rated torque of gear box, throughout 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 for Gear Box POD test set-up. 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 (refer FIG. 1).

f) Irrespective of the requirement of conducting the type tests, the vendor shall submit the reports of the type tests carried out within last five years from the date of bid opening of this project i.e. 08.03.2018. These reports should be for the tests conducted on the equipment same (model / type/ size / rating) to those proposed to be supplied. Tests should have been conducted at an independent laboratory or should have been witnessed by a client.

These valves are for vacuum service and shall be provided with gland sealing arrangement which shall be vacuum tested with vacuum and helium gas.

9.0 PERFORMANCE GUARANTEE:

9.1 The vendor shall guarantee the material & workmanship of all components as well as operation of the equipment as per the requirements of the specification.

9.2 The vendor shall also guarantee the following for each butterfly valve:

a) Pressure drop as per the approved drop v/s opening curve.
b) The valve opening and closing time.

10.0 EXCLUSIONS:

Erection & Commissioning of equipment at site.

11.0 QUALITY ASSURANCE

11.1 The items covered under this contract shall be subjected to inspection, testing and quality surveillance. The Inspection Agency shall, at all reasonable times have access to Vendor's works, Quality Control records and all facilities as reasonably required for carrying out the inspection and testing efficiently, and these shall be provided by the vendor free of cost.

11.2 The Quality Plan enclosed with this specification specify minimum quality control requirement. During contract stage vendor shall furnish this Quality Plan duly signed & stamped for BHEL approval. Quality plans shall be approved by BHEL and customer. All inspection and testing shall be carried out by BHEL/ BHEL representative and customer (as applicable). In case inspection is by both BHEL and their customer, then the inspection can be carried out jointly or separately, which will be informed later. In case of the foreign bidder, inspection shall be carried out by reputed third party.

11.3 The charges for third party inspection (Lloyds, TUV or equivalent) for foreign bidders shall be included in the base price of the item by the bidder. This third party agency shall be approved by BHEL. Bidder to inform the same in the offer and mention the same in Quality Plan.

NOTE: There may be minor changes in quality plan depending on customer/consultant comments which will have to be accommodated by vendor at no extra cost.

12.0 PAINTING REQUIREMENT:

Surface preparation shall be as per SP1(Solvent cleaning), SP2(Application of rust converter (Ruskil or equivalent grade)), SP3(Power tool cleaning) followed by 2 coats of Heat Resistance Aluminium Paint to IS:13183 Gr.-I, paint shade Aluminium of DFT minimum 20 microns each and total DFT of paint will be equal to 80 microns minimum.

13.0 PACKING INSTRUCTIONS:

a) 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.
b) The valve has to be dispatched in total assembled form.
c) Discs of all valves shall be properly secured while dispatching so that there is no risk of damage to the disc & seat.
d) Body ends shall be suitably sealed to protect them against damage during transit and storage.
e) Valves with butt-welding ends shall be protected by means of polythene caps/rubber and protectors to prevent damage to ends & also to avoid foreign material entering the valve while shipment & storage.
f) Valve Tag Nos. shall be incorporated in all the dispatch documents.
g) Proper care shall be taken to avoid damage to the painted surface during transit.
h) All the valves shall be packed suitably in wooden cases in order to avoid damage during transit and also during storage at site in tropical climate.
i) Vendor to provide the following:
- Photographs (soft) of Valves duly placed inside the wooden box just before final packing.
- Photographs (soft) of the wooden box in which the valves have been finally packed just before dispatch.

14.0 SPARES

a) **Mandatory Spares:** These shall be as per Data Sheet-A.

b) Order for the spares may be placed simultaneously or otherwise at the option of purchaser.

15.0 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER

Bidder shall submit the following documents duly filled, signed and stamped along with the bid:

a) Compliance sheet,
b) Documents as per the list indicated in the NIT.

The above are the only documents which will be used for technical evaluation unless other documents are asked for during technical clarifications. Any other technical document enclosed with the bid shall be ignored for the purpose of technical evaluation. All other documents attached with the specification are for information of the vendor and no comments shall be marked on these

16.0 DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

16.1 Category-A:

a) GA Drawing indicating complete cross sectional arrangement of valve, binding dimensions, dismantling clearances, weight and Bill of Material incorporating all material of construction (MOC) of various parts & relevant standard to which MOC confirms to.

b) Filled in actuator data sheet

c) Quality plan duly signed and stamped.

Submission/ Resubmission of above documents shall be considered for delay analysis by BHEL.

16.2 Category-B:

a) Opening closing time calculations (applicable for motorized valves).

b) Proof of design (POD) test reports earlier carried out tests for butterfly valves, gear box and actuators (as applicable). If the tests are not carried out earlier then supplier to furnish POD test procedure.

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	TECHNICAL SPECIFICATION FOR BUTTERFLY VALVE (STEAM SERVICE)	REV. NO.: 00	DATE: 14.02.2022
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SECTION-II

- **DATA SHEET - A**
- **ACTUATOR DATA SHEET & WIRING DIAGRAM**
- **QUALITY PLAN**
- **COMPLIANCE SHEET**

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	DATA SHEET- A **BUTTERFLY VALVE (STEAM SERVICE)** **3x800MW PATRATU STPP**	**SPECIFICATION NO.: PE-TS-434-100-M016** **SECTION: II** **REV. NO.: 00** **DATE: 14.02.2022** **SHEET 1 of 2**

BUTTERFLY VALVE (STEAM SERVICE)

1	2	3	4	5	6	7	8	9	10	11	12				13	
											COMMISIOMIMG SPARES				MANDATORY SPARES	
SL. NO.	TAG NOS.	SIZE (NB)	DESIGN PRESSURE KG/CM2(G)	DESIGN TEMP (DEG. C)	OPERATION	RATING, DESIGN CODE	BODY & DISC MATERIAL	END CONN.	SPECIAL FEATURES	MAIN VALVES (ALONG WITH ACTUATOR) QTY WITHOUT COMMISSIONING SPARES (NOS.)	GLAND PACKING (VALVES) (SETS)	BOTTOM GASKET (VALVES) (SETS)	O' RING AND SEALS FOR ELECTRIC ACTUATORS (SETS)	DISC SEAL (SETS)	COMPLETE VALVE WITH ACTUATOR (NOS.)	COMPLETE ACTUATOR
1	EXV-25 & EXV-26	1600	Full vacuum and 1.1 kg/sq.cm	70	MOTOR OPERATED	CL.75B (MINIMUM) OF AWWA C504-2010	CCS (ASTM A216 GR. WCB)	BW AS PER ASME B16.25	SG, MO, OT = 50 ~ 90 SEC., SHAFT AXIS ORIENTATION HORIZONTAL/ VERTICAL SUITABLE FOR BOTH DIRECTIONS;	6	6	6	6	6	3	1
									TOTAL	**6**	**6**	**6**	**6**	**6**	**3**	**1**

NOTE:
ABBREVIATIONS:BW- BUTT WELDED, CCS - CAST CARBON STEEL, SG - SEALED GLAND, MO - MOTORISED ELECTRIC ACTUATOR OT - OPENING/CLOSING TIME OF VALVE WITH ELECTRIC ACTUATOR OPERATION
1. Valve POD , Gear box POD & Actuator POD test, if already carried out by bidder for similar model/ type/ size/ rating for any NTPC/BHEL/REPUTED CUSTOMER project within last five years from project start date of this project i.e.08.03.2018, shall be considered applicable for this project, if found satisfactory by BHEL/CUSTOMER.
2. Valve POD, Gear box POD & Actuator POD test, if required, as per technical specification & AWWA C504-10/ AWWA C516-10, then the charges for the same shall deemed to be included in the unit quoted prices of main valves. Bidder shall not indicate these charges as a separate head in the price bids.
3. Main valve prices shall BE EXCLUSIVE of cost of Commissioning Spares prices.
4. Bidder is required to quote unit price of each item under commissioning spares & mandatory spares separately & individually i.e. prices of all commissioning spares shall not be clubbed/ included in the unit price of Main valves.
5. Commissioning spares --> One set each of Disc Seal, Bottom/ Cover Gasket with 'O' Rings & Seals, Gland Packing with 'O' ring & seals in Gland packing area and actuator 'O' rings and seal as applicable.
6. Valve design rating shall be as per Col. No. 7.

	DATASHEET-A BUTTERFLY VALVE (STEAM SERVICE) 3800MW PATRATU STPP	SPECIFICATION NO.: PE-TS-434-100-M016	
		SECTION -II	
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Material of Construction

SL. NO.	PART NAME	MATERIALS
VALVE		
a.	Valve Body Butt Welded	ASTM A216 Gr. WCB
b.	Valve Disc.	ASTM A216 Gr. WCB
c.	Shaft	ASTM A182 Gr. 304 (MIN. HERDNESS 200HB)
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
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 (NUTS)
j.	Hand wheel	MALLEABLE IRON/ CARBON STEEL (or equivalent)
GEAR BOX		
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 / SG Iron

Technical Requirement/Data

1. Flow medium: Wet Steam, 2-8% moisture
2. Design pressure drop at max. flow: 0.0002 kg/cm2 (max.)
3. Flow Velocity (Design): 100 m/sec.
4. Connecting pipe size & material: OD 1626 x 16 thk. (SA672 Gr. B70 CL22)
5. Parameters:

Operating parameters		At EMCR condition	At VWO condition
Pressure (kg/cm^2 (a))	:	0.2257	0.2271
Flow (T/hr)	:	76.380	83.211
Dryness fraction	:	0.955	0.952

FORM NO. PEM-6666-0

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	REV. NO. 01 / DATE: 11.05.2018
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Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
GENERAL*	* PROJECT	3 x 800 MW PATRATU TPP
	OFFER REFERENCE	
	* TAG NO. SERVICE	
	* DUTY	☐ ON / OFF ☐ INCHING
	* LINE SIZE (inlet/outlet): MATERIAL	
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY
	* OPENING / CLOSING TIME	
	* WORKING PRESSURE	
	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
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55
	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 INCHING /REGULATING SERVICE - 150 STARTS/HR MINIMUM.**
HANDWHEEL	* REQUIRED	■ YES ☐ NO
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.	
ELECTRIC ACTUATOR	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-INCLUSIVE OF **I.S.** TOLERANCE
	ACTUATOR APPLICABLE WIRING DIAGRAM	■ ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ☐ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram
	COLOUR SHADE	■ BLUE (RAL 5012) ENAMEL ☐ …….
	PAINT TYPE **(## Refer Notes)**	☐ ENAMEL ☐ EPOXY ☐ …….
	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,3 W, AC 50 HZ +/- 5 %
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ■ 110 V AC/24V DC

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FORM NO. PEM-6666-0

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	REV. NO. 01 / DATE: 11.05.2018
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Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
	MOTOR BEARING WITH 2 EARTH TERMINALS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI FRICTION
	@ ENCLOSURE CLASS OF MOTOR	IP 67 FOR OUTDOOR & IP 55 FOR INDOOR(TOTALLY ENCLOSED SELF VENTILATED)
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos.,1 IN EACH PHASE) ☐ ----------
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED ☐ NOT REQUIRED
	TYPE OF SWITCHING DEVICE	■ CONTACTORS ☐ THYRISTORS
	TYPE	■CONVENTIONAL ☐ SMART (NON-INTRUSIVE)
	IF SMART	(NOT APPLICABLE)
	a) SERIAL LINK INTERFACE	☐ INTEGRAL ☐ FIELD MOUNTED
	b) SERIAL LINK PROTOCOL	☐ FOUNDATION FIELD-BUS ☐ PROFI-BUS ☐ DEVICE NET ☐.....
	c) SERIAL LINK MEDIA	☐ TWISTED PAIR Cu-CBL ☐ CO-AXIAL Cu-CBL ☐ OFC
	d) HAND HELD PROGRAMMER	☐ REQUIRED ☐ NOT REQUIRED
	e) TYPE OF HAND HELD PROGRAMMER	☐ BLUETOOTH ☐ INFRARED ☐.....
	f) MASTER STATION	☐ REQUIRED ☐ NOT REQUIRED
	g) MASTER STN INTRFACE WITH DCS	☐ MODBUS ☐ TCP/IP
	h) DETAILS OF SPECIAL CABLE	☐ ENCLOSED ☐ NOT REQUIRED
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED
	OPEN / CLOSE PB	■ REQUIRED ☐ NOT REQUIRED
	STOP PB	■ REQUIRED ☐ NOT REQUIRED
	INDICATING LAMPS	■ REQUIRED ☐ NOT REQUIRED
	LOCAL REMOTE S/S	■REQUIRED ☐ NOT REQUIRED
	STATUS CONTACTS FOR MONITORING	■ REQUIRED ☐ NOT REQUIRED
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	■ INTERPOSING RELAY ☐ OPTO COUPLER ☐ EITHER
	QUANTITY	■ 2 NOs. ☐ 3 NOs.
	DRIVING VOLTAGE	■ 20.5 – 24V DC ☐ _____V DC
	DRIVING CURRENT	■ 125mA MAX ☐ _____mA MAX
	LOAD RESISTANCE	■ > 192 ohms - <25 k ohms ☐ > _____ohms - < _____ohms
TORQUE SWITCH (Not Applicable for Smart Actuator) **($$ Refer Notes)**	MFR & MODEL NO.	BIDDER TO SPECIFY
	OPEN / CLOSE	■1 No. ☐2Nos. / ■1 No. ☐2Nos
	CONTACT TYPE	2 NO + 2 NC
	RATING	5A 240V AC AND 0.5A 220V DC
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE
	ACCURACY	+3% OF SET VALUE
LIMIT SWITCH (Not Applicable for Smart Actuator) ($$	MFR & MODEL NO.	BIDDER TO SPECIFY
	OPEN : INT : CLOSE	☐1 No ■2 Nos. : : ☐1 No. ■2Nos.
	CONTACT TYPE	2 NO + 2 NC

FORM NO. PEM-6666-0

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	REV. NO. 01	DATE: 11.05.2018
		SHEET 3 OF 4	

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
Refer Notes)	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC
Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of control system subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.		

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty applications)	■ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ELECTRONIC (2 WIRE) R/I CONVERTER ■ ELECTRONIC (2 WIRE) CONTACTLESS INDCUTIVE TYPE ,EXTERNAL 24 V DC OPERATED ,SUITABLE FOR STABILISED 4-20 mA SIGNAL	
	SUPPLY	■ 24V DC ☐	
	OUTPUT	■ 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	POWER SUPPLY DERIVED FROM MAIN POWER SUPPLY AVAILABLE AT ACTUATOR END.	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	■ IP 68 @☐.....	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	■ REQUIRED ☐ NOT REQUIRED☐ ■ 2 NOS. PRE WIRED ☐ ----------	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:----------	
	@ SPACE HEATER CABLE GLAND	SIZE:----------	
	OTHER CONTROL CABLE GLANDS-1	2 NOS SUITABLE FOR 4P,0.5SQ MM	
	OTHER CONTROL CABLE GLAND	1 No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	

FORM NO. PEM-6666-0

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	REV. NO. 01 / DATE: 11.05.2018
		SHEET 4 OF 4

Data Sheet A & B

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

WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.

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 INTERNATION STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
   IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
5. 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.
6. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
7. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.

$$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.

EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.

8. IT SHALL BE POSIIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR.
9. POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL
10. WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE.

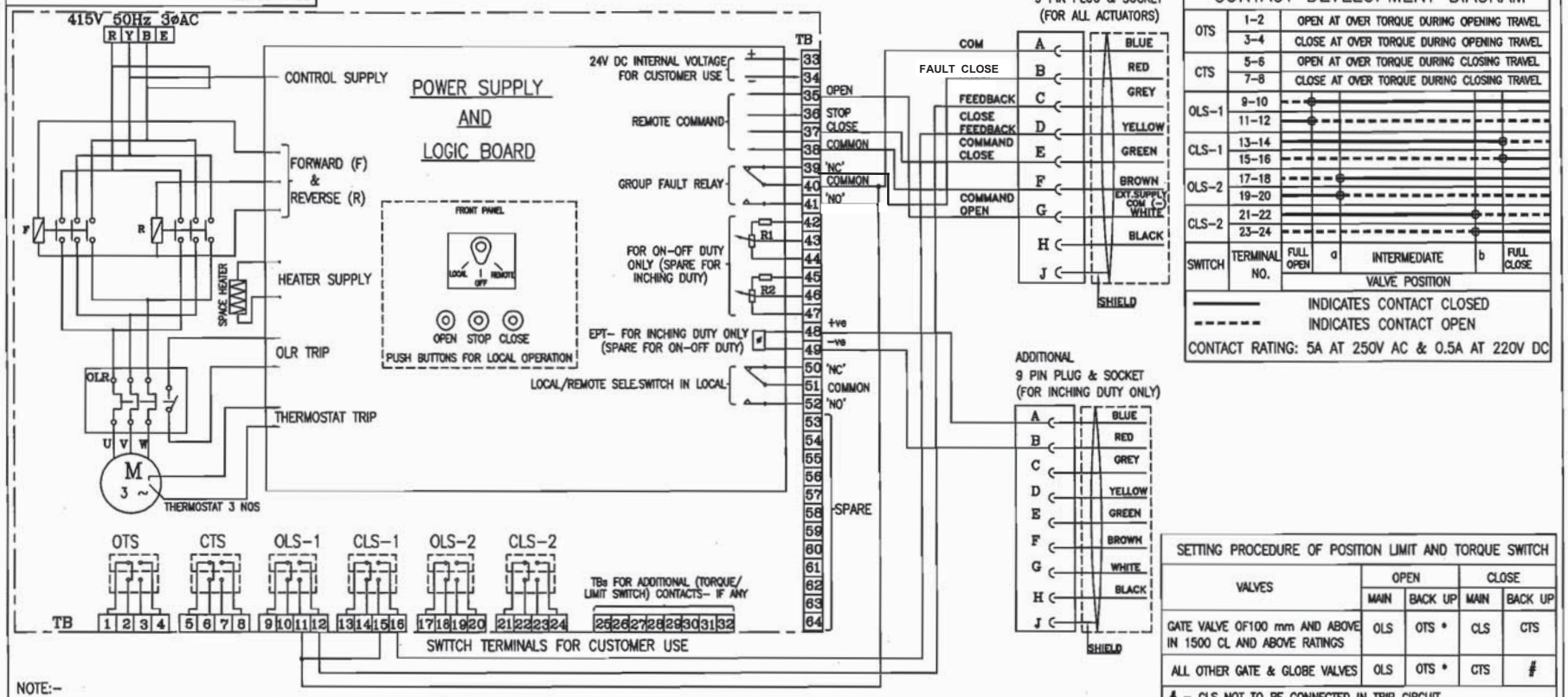
.

	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
NAME	Madhav gupta	Mayank kesharwani	Bharat Singh	NAME
SIGNATURE				SIGNATURE
DATE	01.03.02018 01.	03.2018	01.03.2018	DATE

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-MISC-24283



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	
CLS-1	13-14	
	15-16	
OLS-2	17-18	
	19-20	
CLS-2	21-22	
	23-24	

SWITCH	TERMINAL NO.	FULL OPEN	a	INTERMEDIATE	b	FULL CLOSE
		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 OF100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	OLS	OTS *	CLS	CTS
ALL OTHER GATE & GLOBE VALVES	OLS	OTS *	CTS	#

- CLS NOT TO BE CONNECTED IN TRIP CIRCUIT
* - BYPASS OTS FOR INITIAL 5% OF TRAVEL(FOR GATE VALVES ONLY)

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. ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
2. CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
3. OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
4. OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
5. CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
6. EPT - ELECTRONIC POSITION TRAMSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
7. R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
8. FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
9. M - MOTOR 3ø 415V 50 Hz AC SUPPLY
10. TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

REV	DATE	ALTERED
		CHD & APPD

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

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	N.P.ESWAR	N.P	17.03.05	-
CHD	D.DINAKARAN	D.D	17.03.05	
APPD	K.ARUNACHALAM	K.A	17.03.05	

DEPT VL		SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
CODE	-	NTS	-		-

TITLE: WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS

CARD CODE: U 01

DRAWING NO.: 3-V-MISC-24283 REV: 0

Size A3

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 1 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
1.0 MATERIALS														
1.1	BODY, DISC & SHAFT	1.CHEMICAL COMPOSITION & MECHANICAL PROPERTIES	MA	1)CHEMICAL TESTS	ONE PER HEAT	---	APPD. DRG. / REL. STD.	APPD. DRG. / REL. STD.	MILL TEST CERT.	√	P/ W	V	V	CORRELATION OF MILL TEST CERTIFICATE OF CASTING BODY WITH HEAT NO.
				2)MECH. TESTS	ONE PER HEAT	---	APPD. DRG. / REL. STD.	APPD. DRG. / REL. STD.	MILL TEST CERT.	√	P/ W	V	V	
		2.SUB-SURFACE DEFECTS OF CASTING	MA	1) MPI	100%	---	ASTME E709	ASME B16.34 APPENDIX II	NDT REPORT	√	P/ W	V	V	MPI ON 100% AREA (ACCESSIBLE).
				2) RT	100%	---	ASTM E 94	ASME B16.34 APPENDIX I	NDT REPORT	√	P/ W	V	V	RT ON CHANGE OF SECTION & BW ENDS (RT FILM REVIEW BY BHEL)
		3.SUB-SURFACE DEFECTS OF SHAFT	CR	UT	100%	---	ASTM A388	REFER REMARKS**	NDT REPORT	√	P/ W	V	V	**NORMAL BEAM PROBE OF 20 MM/10 MM DIA AND 2/2.5 MHz SHALL BE USED. USING THIS PROBE THE BACK WALL ECHO SHALL BE SET AT 100% FULL SCREEN.HEIGHT(FSH) IN SOUND AREA.AT THIS SENSITIVITY LEVEL THE ITEM SHALL BE SCANNED AND ANY DEFECT ECHO MORE THAN 20% FSH IS NOT ACCEPTABLE.ALSO ANYWHERE COMPLETE LOSS OF BACK WALL ECHO IS NOT ACCEPTABLE
		4. CASTING DEFECTS	MA	VISUAL	100%	---	MSS SP55	MSS SP55	INSP. REPORT	√	P/ W	V	V	
1.2	CLAMP RING	CHEMICAL COMPOSITION & MECHANICAL PROPERTIES	MA	1)CHEMICAL TESTS	ONE PER HEAT	--	APPD. DRG. / REL. STD.	APPD. DRG. / REL. STD.	TEST CERT.	√	P/ W	V	V	
				2)MECH.	ONE PER	--	APPD. DRG. /	APPD. DRG. /	TEST CERT.	√	P/	V	V	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi		
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 2 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
				TESTS	HEAT		REL. STD.	REL. STD.			W			
1.3	DISC SEAL (FROM VENDOR'S REGULAR & APPROVED SOURCE)	1.VISUAL INSPECTION	MA	VISUAL	100%	--	APPD. DRG.	APPD. DRG.	INSP. REPORT	√	P/ W	V	V	
		2. DIMENSIONS	MA	MEASURE-MENT	100%	--	APPD. DRG.	APPD. DRG.	LOG BOOK	√	P/ W	V	V	
		3. TENSILE AND HARDNESS FOR VULCANISING	MA	MEASURE-MENT	1/BATCH	--	IS 3400 PART-I	IS 3400 PART-I	TEST CERT.	√	P/ W	V	V	
		4. OZONE CRACK RESISTANCE	MA	TESTING	1/BATCH	--	ASTM D1149 METHOD B PROCEDURE B4	ASTM D1149 METHOD B PROCEDURE B4	TEST CERT.	√	P/ W	V	V	SPECIMEN TYPE SHALL BE UNSTRESSED SAMPLE FOR 70 HRS AT 40 DEG CENTIGRADE.
		5. ELONGATION	MA	TESTING	1/BATCH	--	IS 3400 PART-I	MINIMUM 250%	TEST CERT	√	P/ W	V	V	
		6. BLEED RESISTANCE	MA	TESTING	1/BATCH	--	SAMPLE TO BE KEPT IN 33% HCL, DM WATER, 48% NaOH FOR 72 HRS.	NO DISCOLOURA-TION. WEIGHT GAIN +/-0 TO 2%	TEST CERT	√	P/ W	V	V	
		7.AGEING TEST	MA	TESTING	1/BATCH	--	APPD. DRG / IS 3400 PART IV	APPD. DRG / IS 3400 PART IV*	TEST CERT	√	P/ W	V	V	*TEST TEMP. 125 DEG C, TEST DURATION 72 HRS, MAX CHANGE IN TENSILE STRENGTH. 20%, ELONGATION: 20%, HARDNESS: 3%
		8. HYDRAULIC STABILITY TEST (AFTER AGEING)	MA	TESTING	1/BATCH	--	AWWA C-504/ AWWA C516/	AWWA C-504/ AWWA C516/	TEST CERT.	√	P/ W	V	V	
		9. WEAR RESISTENCE	MA	TESTING	1/BATCH	--	AWWA C-504/ AWWA C-516	NO DAMAGE	TEST CERT.	√	P/ W	V	V	TYPE TEST REPORT WILL BE FURNISHED FOR

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi		
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	R.K. Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 3 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
														REVIEW-PART OF POD (REFER POINT 3.7)
1.4	FASTNERS	1.VERIFICATION OF MAKE, GRADE, REVIEW OF TEST CERTIFICATES	MI	VISUAL	100%	--	APPD. DRG. / REL. STD.	APPD. DRG. / REL. STD.	TEST CERT.	√	P/ W	V	V	
		2. DIMENSIONS	MA	MEASURE-MENT	100%	--	APPD. DRG.	APPD. DRG.	INSPECTION REPORT	√	P/ W	V	V	
1.5	OPERATORS GEAR-OPEARTORS													
	A) GEAR, WORM &SHAFT	1.CHEMICAL COMPOSITION & MECHANICAL PROPERTIES	MA	CHEMICAL & MECHANICAL TESTING	1/BATCH	--	DATA SHEET/ REL. STD./	DATA SHEET/ REL. STD./	TEST CERT.	√	P/ W	V	V	
		2. DIMENSIONS	MA	MEASURE-MENT	100%	--	MFG. DRG.	MFG. DRG.	INSPECTION REPORT	√	P/ W	V	V	
		3. HARDNESS	MA	MEASURE-MENT	100%	--	DATA SHEET/ REL. STD./	DATA SHEET/ REL. STD./	TEST CERT.	√	P/ W	V	V	
	B) TORQUE TEST	1. TORQUE TRANSMITTING	MA	TORQUE TEST AT TWICE THE RATED TORQUE	ONE/ TYPE/ MODEL	--	AWWA C-504/ AWWA C516/ DATA SHEET	AWWA C-504/ AWWA C516/ DATA SHEET	INSPECTION REPORT*	√	P/ W	V *	V *	*VERTIFICATION OF TEST REPORT ON GEAR BOX EARLIER CARRIED OUT FOR NTPC PROJECT / REPUTED CUSTOMER (SAME MODEL & RATING)
		2. DESIGN VERIFICATION	MA	CYCLE TEST AT FULL RATED TORQUE OF GEAR BOX	ONE/ TYPE/ MODEL	--	AWWA-C504/ C516 (at full rated torque of gear box) / APPD PROCEDURE FOR GEAR BOX MODEL	AWWA-C504/ C516 / APPD PROCEDURE FOR GEAR BOX	INSPECTION REPORT*	√	P/ W	V *	V *	*VERTIFICATION OF TEST REPORT ON GEAR BOX EARLIER CARRIED OUT FOR NTPC PROJECT / REPUTED CUSTOMER (SAME MODEL & RATING)

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 4 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
1.6	ELECTRICAL ACTUATOR													
		1. TORQUE TESTING & SETTING OF TORQUE SWITCH	MA	MECHANICAL AND ELECTRICAL TESTS.	100%	--	APPROVED ACTUATOR DATA SHEET/ IS:9334	APPROVED ACTUATOR DATA SHEET/ IS:9334	INSPECTION REPORT	√	P/ W	V	V	
		2.TRAVEL/STROKE	MA											
		3.TRAVEL TIME	MA											
		4.OPERATION OF LIMIT SWITCH	MA											
		5.MANUAL OPERATION THROUGH HAND WHEEL	MA											
		6.OPERATION TEST WITH POWER SUPPLY VARIATION ENERGISES TO OPEN/CLOSE	MA											
		7.IR,HV,IR	MA											
		8.DEGREE OF PROTECTION	MA											
		9.DESIGN VERIFICATION	MA	TYPE TEST (CYCLE TEST)	ONE/ TYPE/ MODEL	--	AWWA C542	AWWA C542	INSPECTION REPORT	√	P/ W	V	V	VERIFICATION OF TYPE TEST REPORT EARLIER CARRIED OUT FOR NTPC PROJECT / REPUTED CUSTOMER (SAME, MODEL & RATING)
2.0 INPROCESS CONTROL														
2.1	BODY AND DISC	1.DIMENSION	MA	MEASURE-MENT	100%	--	MFG. DWG.	MFG. DWG.	INSPECTION REPORT	√	P/ W	V	V	
		2.SURFACE DEFECTS	CR	P.T.	100%	--	ASTM E165	ASME B16.34 APPENDIX III	INSPECTION REPORT	√	P/ W	V	V	ON MACHINED AREA ONLY.

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi			Reviewed by:			
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal			Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 5 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
2.2	A) WELDING OVERLAY DEPOSIT	1. WELDING PROCEDURE AND WELDER PERFORMANCE QUALIFICATION	CR	VISUAL MECH. TESTS	100%	--	ASME IX	ASME IX	INSPECTION REPORT	√	P/ W	#	-	# APPROVED WPS & PQR ALONG WITH QUALIFIED WELDERS BY REPUTED CUSTOMER/ BHEL/ REPUTED THIRD PARTY INSPECTION AGENCY TO BE USED AND THE SAME TO BE VERIFIED DURING INSPECTION.IN CASE THE SAME NOT AVAILABLE, SUPPLIER TO ARRANGE FOR WITNESS OF WELDING FOR WPS APPROVAL AND WELDER QUALIFICATION.
		2. CLADDING DEPTH & SURFACE DEFECTS	MA	DEPTH MEASUREMENT	100%	--	MFG. DWG	MFG. DWG	TEST REPORT	√	P/ W	V	V	
			MA	LPI	100%	--	ASTM E 165	FREE FROM POROSITY/ CRACK	NDT REPORT	√	P/ W	V	V	LPI ON WELD OVERLAY AND ADJACENT AREA
	B) SEAT RING	1.SUB-SURFACE DEFECT	MA	RT/UT	100%	--	ASME B 16.34	ASME B 16.34	INSPECTION REPORT	√	P/ W	V	V	
		2. SURFACE DEFECTS	MA	LPI	100%	--	ASTM E 165	FREE FROM POROSITY/ CRACK	INSPECTION REPORT	√	P/ W	V	V	
2.3	BODY (BUTT WELD ENDS)	1.SUB-SURFACE DEFECT	CR	MPI	100% ON BW AREA	--	ASTM E 709	ASME B 16.34	INSPECTION REPORT	√	P/ W	V	V	
		2. SURFACE DEFECTS	CR	RT	100%	--	ASME B 16.34	ASME B 16.34	RT REPORT	√	P/	V	V	RT (100%) OF BODY

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi		
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 6 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
					ON BW AREA						W			INCLUDING BW ENDS AS PER SL. NO. 1.1 CLAUSE NO.2. FILM REVIEW BY BHEL/CUSTOMER
2.4	SHAFT	1. DIMENSION	MA	MEASURE-MENT	100%	--	MFG DRG	MFG DRG	LOG BOOK	√	P/ W	-	-	
		2. SURFACE DEFECTS	MA	LPI	100%	--	ASTM E 165	ASME B 16.34	INSPECTION REPORT	√	P/ W	V	V	
2.5	VERIFICATION OF ALL PREVIOUS TESTS AND DOCUMENTS	VERIFICATION OF RECORDS	MA	--	100%	--	APPD. DRG./ DATA SHEET	APPD. DRG./ DATA SHEET	INSPECTION REPORT	√	P/ W	V	V	
3.0 TESTING														
3.1	COMPLETE VALVE	1.BODY TEST	CR	HYDRO TEST	100%	REFER NOTE-6	AWWA C-504 / AWWA C-516/ APPD DRG.	NO LEAKAGE	INSP. REPORT	√	P/ W	W	W	
		2.DISC STRENGTH	CR	HYDRO TEST	100%		AWWA C-504 / AWWA C-516/ APPD DRG.	NO DEFORM-ATION, NO STRUCTURAL DAMAGE TO DISC	INSP. REPORT	√	P/ W	W	W	ONE VALVE/SIZE SHALL BE TESTED FOR TWICE THE DESIGN PRESSURE FROM BOTH SIDE OF THE VALVE IN ADDITION TO 100% TESTING IN THE NORMAL FLOW DIRECTON. NO PART OF DISC/ VALVE SHALL BE PEERMANENTLY DEFORMED/DAMAGED. DISC DEFORMATION IS MEASURED USING DIAL GAUGE AND BODY DEFORMATION BY MEASURING TAPE.

BHEL					
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	Sign & Date	Name		Sign & Date	Name
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	R.K. Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 7 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
		3.SEAT LEAKAGE WITH ACTUATOR (BOTH DIRECTION)	CR	HYDRO/ AIR TEST	100%	REFER NOTE-6	AWWA C-504 / AWWA C-516/ APPD DRG.	NO LEAKAGE	INSP. REPORT	√	P/ W	W	W	
		4. PERFORMANCE TEST	CR	PERFORM-ANCE	100%		AWWA C-504* / AWWA C-516 *	SMOOTH OPERATION	INSP. REPORT	√	P/ W	W	W	*COMPLETE VALVE ASSEMBLY ALONGWITH ACTUATOR SHALL BE 1) PARTIALLY OPENED (CRACK OPEN 3 TIMES) UNDER DESIGN PRESSURE CONDITION IN HORIZONTAL ONLY, 2) OPERATED 25 CYCLES UNDER NO LOAD IN HORIZONTAL & VERTICAL POSITION, AND FOLLOWING SHALL BE CHECKED: i) OPENING & CLOSING TIME ii) OPERATION OF TORQUE & LIMIT SWITCHES iii) CURRENT DRAWN BY THE ACTUATORS
		5. GLAND LEAK TEST (TOP GLAND AND BOTTOM FLANAGES)	CR	HELIUM LEAK TESTS	100%		MFG APPD PROCEDURE	MFG APPD PROCEDURE	INSP. REPORT	√	P/ W	W	W	PROCEDURE SHALL BE SUBMITTED TO BHEL FOR REVIEW.
		6. VACUUM TEST	CR	VACUUM TEST	100%		MFG APPD PROCEDURE	MFG APPD PROCEDURE	INSP. REPORT	√	P/ W	W	W	PROCEDURE SHALL BE SUBMITTED TO BHEL FOR REVIEW.
		7.PROOF OF DESIGN TEST (LIFE CYCLE TEST)	CR	CYCLE TEST	AS PER AWWA C 504/516 ON ONE VALVE/ SIZE/ TYPE/ RATING		APPROVED TEST PROCEDURE / AWWA C504/ AWWA C-516	APPROVED TEST PROCEDURE / AWWA C504/ AWWA C-516	INSP. REPORT	√	P/ W	W *	W *	* VERIFICATION OF TEST REPORTS OF POD TEST ON SAME MODEL/ TYPE/ SIZE/ RATING CARRIED OUT EARLIER FOR ANY BHEL/ NTPC/ REPUTED CUSTOMER PROJECT WITHIN THE LAST 5 YEARS FROM THE DATE OF BID OPENING OF THIS PROJECT I.E. 08.03.2018.

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi		
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal		

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 8 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
4.0 FINAL INSPECTION														
4.1	COMPLETE VALVE	1. OVERALL DIMENSION	MA	MEASURE-MENT	100%	REFER NOTE-6	APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	W	W	
		2. DOCUMENTATION REVIEW	MA	REVIEW	100%		APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	W	W	
		3. CLEANLINESS	MA	VISUAL	100%		APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	W	W	
		4. NAMEPLATE	MA	VISUAL	100%		APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	W	W	
5.0 PAINTING														
5.1	PAINTING	1. SURFACE PREPARATION	MI	VISUAL & MEASURE-MENT	100%	--	APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	V	V	
		2. UNIFORMITY & THICKNESS	MI	VISUAL & MEASURE-MENT	100%	--	APPD DRG.	APPD DRG.	INSP. REPORT	√	P/ W	V	V	
6.0 PACKING														
6.1	PACKING	APPD. DRG.	MA	VISUAL	100%	100%	APPD. DRG. / PACKING PROCEDURE (IF APPLICABLE)	APPD. DRG. / PACKING PROCEDURE (IF APPLICABLE)	INSP. REPORT	√	P/ W	W	V	**REFER NOTE '7'**

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Rohit Chawla	Rohit Chawla	Checked by:	Ashish Panigrahi	Ashish Panigrahi		
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal		

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-434-100-M016	DATE: 05.02.2022
	CUSTOMER: PVUNL		QP NO.: PE-V0-434-100-M024	DATE: 05.02.2022
	PROJECT: 3x800 MW PATRATU STPP		PO NO.:	DATE:
	ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM: STEAM SERVICE	SECTION: II	SHEET 9 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	

NOTE:

1. All the NDT Test Procedures shall be as per ASME B 16.34
2. All materials shall be as per Approved drgs./ Data sheet for valves.
3. BW ends to be machined after final tests (3.0), Documents related to BW ends shall be reviewed by BHEL & Customer after final inspection and subsequent machining.
4. After the BW end preparation, the test carried out are MPI (as per QAP clause no. 2.3) and dimension check (as per QAP clause no. 4.1).
5. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
6. 10% or min. 2 nos. at random by BHEL/Customer & 100% by supplier for each type, size & rating.
7. Following to be noted for packing:
   a. Material shall be packed suitably in order to avoid damage of paint and valve during transit and also during storage at site in tropical climate conditions.
   b. Photographs of the packing just before dispatch for information of PEM.
8. The latest revisions/year of issue of all the standard indicated in the QP shall be referred.
9. BHEL reserves the right for conducting repeat test, if required.
10. Welding and Impregnation of castings are not permitted.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE, **D**: DOCUMENTATION
MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL, **MTC:** Mill Test Certificate, **RT:** Radiographic Test, **PT**: Penetrant Test

BHEL					
ENGINEERING			QUALITY		
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Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	RITESH KUMAR JAISWAL	RK Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
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	COMPLIANCE SHEET BUTTERFLY VALVES (STEAM SERVICE) 3x800MW PATRATU STPP	SPECIFICATION NO. PE-TS-434-100-M016
		SECTION: II
		Rev.: 0
		DATE: 14.02.2022
		SHEET 1 OF 1

I hereby comply/not comply (*) to all the requirements of this technical specification in totality.

*** In case the bidder does not comply to the technical specification, the deviations shall be explicitly listed in**

TABLE-1 below in case of procurement through GeM portal

Or else

Cost of Withdrawal sheet of GCC

TABLE – 1

S. NO.	VOLUME / SECTION	PAGE NO.	CLAUSE NO.	COMPLETE DESCRIPTION OF DEVIATION	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS ONLY					

NOTES FOR TABLE-1:

1. All the bidders have to list out Technical deviations (if any) in detail in the above format.
2. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
3. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at the discretion of the Purchaser.
4. Bidders to note that any Technical deviation not listed above and requested after Part-I opening shall not be considered.

PARTICULARS OF BIDDER'S AUTHORISED REPRESENTATIVES		
NAME	**DESIGNATIONS**	**SIGN & DATE**