

2X660MW MAITREE BANGLADESH

**TECHNICAL SPECIFICATION
FOR
BUTTERFLY VALVE-STEAM SERVICE**

**SPECIFICATION NO. PE-TS-421-100-M016
Rev. no.: 00**



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

	TECHNICAL SPECIFICATION BUTTERFLY VALVE-STEAM SERVICE		SPECIFICATION NO. PE-TS-421-100-M016
			REV. NO.: 00 DATE: 23.11.2017
	SHEET 1 OF 1		

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	BUTTERFLY VALVE-STEAM		REV. NO.: 00
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SECTION-I

SPECIFIC TECHNICAL REQUIREMENTS

	SPECIFIC TECHNICAL REQUIREMENTS BUTTERFLY VALVES (STEAM SERVICE)		SPECIFICATION NO.: PE-TS-421-100-M016
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1. 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. SCOPE OF SUPPLY

- 2.1 The valves complete with all accessories shall be supplied as per Data sheets 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 as per Data Sheet-A
- 2.3 Set of special tools and tackles if required for the maintenance, erection etc. of the equipment supplied.
- 2.4 Mandatory spares as specified in Data Sheet-A
- 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 datasheet-A & complying with the requirements of latest revisions of AWWA C516 standard. The testing shall be as per American Water Works Association AWWA C516 including disc strength test, gear box POD Test & Valve POD test.

- 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.
- 4.2 The butterfly valves shall be suitable for installation of shaft in horizontal position.
- 4.3 These valves are for vacuum service and shall be provided with gland sealing arrangement which shall be vacuum tested with vacuum and helium gas.
- 4.4 The valves shall have min. single off-set type disc (design with shaft eccentric to disc) and maximum laying length as per AWWA C516-10.
- 4.5 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.

4.6 MATERIALS

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- 4.6.1 The materials of construction of main parts of the butterfly valves (steam service) shall be as specified in Data sheet-A.
- 4.6.2 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.
- 4.6.3 Materials used in manufacture of valves shall be of tested quality.
- 4.6.4 Carbon steel having carbon contents of more than 0.25% shall not be used in welded construction valves.

5.0 CONSTRUCTION FEATURES

5.1 Valve Body

- 5.1.1 The valve body shall have integral hubs for shaft bearing housing as per AWWA C516. The minimum body shell thickness shall be as per AWWA C-516. Material of construction of body and valve parts shall be as per materials indicated in Data sheet-A.
- 5.1.2 An arrow shall be embossed/ engraved and painted on the outside of body to clearly indicate the direction of flow.

5.2 Valve Shaft

- 5.2.1 Valve shaft sizing shall be done as per AWWA C-516.
- 5.2.2 The shaft of each butterfly valve shall be securely attached to the disc through Bolting, Riveting, threading, upsetting or cross pinning, adequately locked.
- 5.2.3 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 70 percent of the torsional strength of the minimum required shaft diameters. Rigid shaft restraint shall be provided. Hardware used in connecting the shaft to the disc shall be stainless steel or free-machining stainless steel. The disc shall be mechanically secured to the shaft by a positive means such as bolting or cross-pinning, and shall not rely solely on chemical bonding, adhesives, or welding. The shaft shall be capable of non-destructive disassembly from the disc.
- 5.2.4 Valve shafts or extensions of the valve shaft shall be provided with a keyed or splined connection to actuators capable of transmitting the full valve torque with less than 0.1 degree of backlash.

5.3 Valve Disc:

The valve disc shall have no external ribs transverse to the flow and shall sustain full operating torque and differential pressure across closed valve disc without exceeding working stress of one fifth of the tensile strength or one third of yield strength of the material used. The design shall be based on the combination of distributed pressure loads, seat friction loads, and shaft restraints. 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.

5.4 Body Seat & Disc Seal (Valve seat)

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Valve seats shall be designed to be leak-tight in both directions at all differential pressures up to and including the rated pressure of the valve. Seat removal shall be possible without removal of the valve shaft.

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.

5.5 Valve Bearing:

5.5.1 Sleeve bearings. Valves shall be fitted with sleeve-type bearings contained in the hubs of the valve body. The maximum distance from the inside metal surface of the valve body to the inside end of the sleeve bearings shall not exceed 1/ 2 in. (12.7 mm). Bearings shall be designed for a pressure to exceed neither the published design load for the bearing material nor 1/ 5 the compressive strength of the bearing or shaft material. The length of each bearing shall not exceed twice the shaft diameter.

5.5.2 Thrust bearings. Each valve shall be equipped with a two-way thrust bearing assembly, which shall hold the valve disc securely in the center of the valve seat.

5.5.3 Self-lubricating materials. Sleeve and other bearings fitted into the valve body shall be of sintered metal or self-lubricated materials that do not have a harmful effect on water or rubber and that do not have a coefficient of friction in excess of 0.25 when run at the maximum bearing pressure.

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 cartridge constructed of corrosion resistant material. Shaft seals shall be designed to allow its replacement without removal of the valve shaft.

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

5.8 Body Ends:

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

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 Data sheet-A. All details shall be engraved 1 mm deep and filled with black enamel paint.

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

5.11 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

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

- 5.12 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.
- 5.13 Eyebolts shall be provided where necessary to facilitate handling heavy valves or part of valves.
- 5.14 Wherever practical, valves (including actuator, drive motor, integral bypass etc.) of total weight equal to or greater than 500 Kg shall be provided with suitable lugs to permit direct suspension by hanger rods or direct resting on bottom support, as applicable.
- 5.15 The valves as well as accessories shall be designed for easy dismantling and maintenance.
- 5.16 The disc shall rotate through 90° 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.
- 5.17 It may be noted that all construction features design and parameters will be governed by AWWA-C516-10.

6.0 SPECIAL FEATURES:

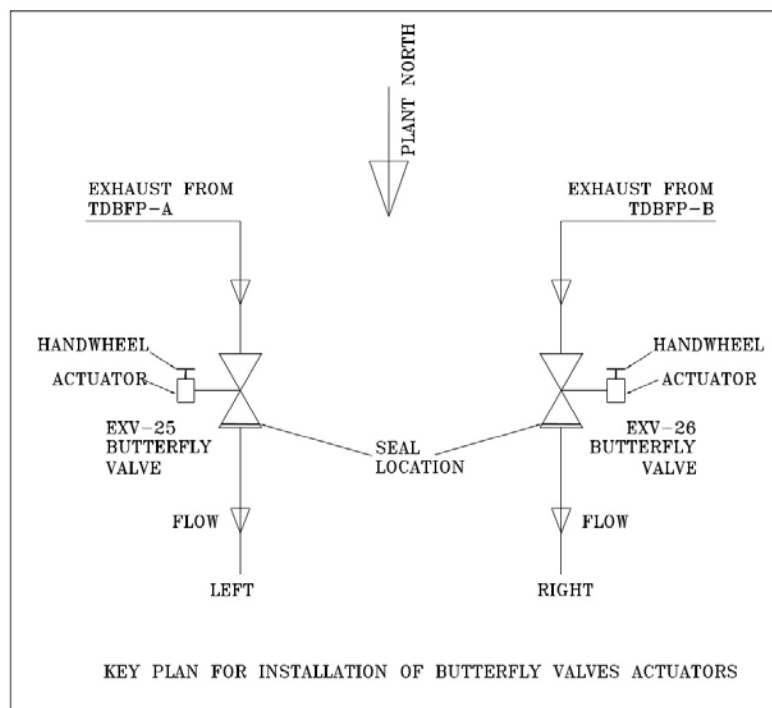
6.1 Gland Sealing Arrangement:

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 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).
- 6.2.2 Electric actuators shall be mounted directly on the valves. Orientation of actuator shall be as shown below.
For total 4 nos of Main supply valves, Actuator orientation for 2 valves will be on left side & for other 2 valves, it will be on right side.
For total 2 nos of Mandatory spares valves, Actuator orientation for 1 valve will be on left side & for other 1 valve, it will be on right side.

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- 6.2.3 Valve actuators shall have local indicators fitted to show whether the valves are in an Open or Shut position.
- 6.2.4 Actuator shall meet requirement as specified in "Part of customer spec for Electrical actuator" (Total 6 sheets) attached in Section-II.
- 6.2.5 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 /AWWA C542 respectively.

7.0 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.

7.1 P.O.D. Tests:

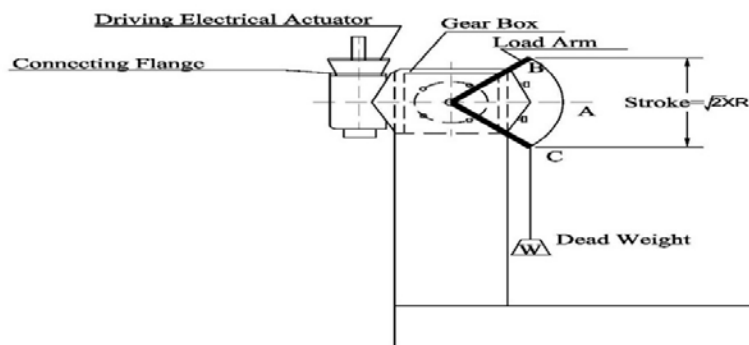
- a) POD (Proof-of-design) Test is required to be carried out for valves, Gear box and Actuator. In case the POD Test has been done earlier for similar model, type, size & rating for any NTPC/BHEL/REPUTED CUSTOMER project within 5 years from date of bid-opening for this tender, only Test Report of POD test for same model, type, size,

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size, rating is required to be submitted for verification subject to acceptance by Customer/BHEL.

In case, the test reports of earlier POD tests, submitted by vendor are not acceptable to Customer/BHEL, then POD tests will have to be carried out by vendor and charges for the same shall be deemed to be included in the unit quoted prices of main valves & No additional charge for the same will be admissible to BHEL.

- b) POD test of valve shall be carried out in accordance with latest edition of AWWA - C516.
- c) Valve POD test & Gear Box POD tests should be done separately.
- d) Gear box POD test shall be done in accordance with latest editions of AWWA C 504 as per the procedure described below or as per the procedure agreed between purchaser & vendor. The procedure to be submitted by vendor for BHEL approval. 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)



Gear Box shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering.

- e) Design & POD test of Electric Actuator shall be in accordance with latest edition of AWWA C-542-10.

8.0 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 Pressure drop as specified in Data Sheet-A.
- 8.3 Tight shut off.

9.0 EXCLUSIONS:

Erection & Commissioning of equipment at site.

10.0 QUALITY ASSURANCE

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10.1 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.

10.2 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.

10.2.1 In case of Domestic vendor, 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.

10.2.2 In case of the foreign bidder, inspection shall be carried out by reputed third party. 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 some changes in quality plan depending on customer/consultant comments which will have to be accommodated by vendor at no extra cost.

11.0 PAINTING REQUIREMENT:

Surface preparation shall be as per SA 2.5 followed by 1 primer coat of Zinc Epoxy with min. 80 microns DFT and subsequently 2 finish coats of Epoxy High Solid with DFT of 50 microns each. Total DFT of paint will be min. 180 microns.

12.0 PACKING INSTRUCTIONS:

Sea-worthy packing to be provided as per attached document number PE-TS-888-100-A001. Additionally following requirement also to be fulfilled.

- 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 conditions for a period of 15-18 months.
- 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.

 Maharatna Company	SPECIFIC TECHNICAL REQUIREMENTS BUTTERFLY VALVES (STEAM SERVICE)	SPECIFICATION NO.: PE-TS-421-100-M016	
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Clearance for dispatch of valves will be given only after receiving the photos of valves in satisfactory condition as mentioned in the condition stated above.

13.0 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.

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. All other documents attached with the specification are for information of the vendor and no comments shall be marked on these.

Any other technical document enclosed with the bid shall be ignored for the purpose of technical evaluation.

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SECTION-II

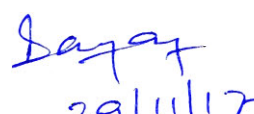
- DATA SHEET – A
- QUALITY PLAN
- ACTUATOR DATA SHEET & WIRING DIAGRAM
- PART OF CUSTOMER SPEC FOR ELECTRIC ACTUATOR
- COMPLIANCE SHEET
- SEA WORTHY PACKING

						DATA SHEET-A (SHEET 1 OF 3) BUTTERFLY VALVE (STEAM SERVICE) 2X660MW BIFPCL MAITREE TPP								SPECIFICATION NO. PE-TS-421-100-M016 SECTION: II REV. NO.: 00 DATE: 23.11.2017				
BUTTERFLY VALVES (STEAM SERVICE)																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
SL NO.	TYPE OF SUPPLY	TAG NOS	TYPE OF VALVE	SIZE mm (NB)	DESIGN PRESSURE KG/CM2(G)	DESIGN TEMP (DEG OC)	OPERATION	RATING/DESIGN CODE	BODY & DISC MATERIAL	END CONN	CONNECTING PIPE SIZE	HSN CODE	SPECIAL FEATURES	VALVES (ALONG WITH ACTUATOR) QTY WITHOUT COMMISSIONING SPARES (NOS.)	COMMISSIONING SPARES			
											OD (MM)X THK (MM)				GLAND PACKING (VALVES) (SETS)	BOTTOM GASKET (VALVES) (SETS)	O' RING AND SEALS FOR ELECTRIC ACTUATORS (SETS)	DISC SEAL (SETS)
1	MAIN SUPPLY	EXV-25 & EXV-26	BUTTERFLY VALVES (STEAM SERVICE)	2000	Full vacuum and 1.1 kg/sq.cm	120	MOTOR OPERATED	CL.75B (MINIMUM) OF AWWA C516-2010	CCS (ASTM A216 GR. WCB)	BW AS PER ASME B16.25	2032X16	8481	SG, MO, SHAFT AXIS ORIENTATION - HORIZONTAL; ELECTRIC ACTUATOR WITH INTEGRAL STARTER	4	8	8	8	8
2	MANDATORY SPARES	COMPLETE VALVE ASSEMBLY WITH ACTUATOR & GEAR BOX	BUTTERFLY VALVES (STEAM SERVICE)	2000	Full vacuum and 1.1 kg/sq.cm	120	MOTOR OPERATED	CL.75B (MINIMUM) OF AWWA C516-2010	CCS (ASTM A216 GR. WCB)	BW AS PER ASME B16.25	2032X16	8481	SG, MO, SHAFT AXIS ORIENTATION - HORIZONTAL; ELECTRIC ACTUATOR WITH INTEGRAL STARTER	2	-	-	-	-
TOTAL														6	8	8	8	8
NOTE: ABBREVIATIONS: BW- BUTT WELDED, CCS - CAST CARBON STEEL, SG - SEALED GLAND, MO - MOTORISED ELECTRIC ACTUATOR 1. Valve POD , Gear box POD & Actuator POD test needs to be carried out as per standards mentioned in technical specification. If these tests are already carried out for similar model, type, size & rating for any NTPC/BHEL/REPUTED CUSTOMER project within the last 5 years from the date of bid opening for this tender, the same shall be considered applicable for this tender, if found satisfactory by BHEL/CUSTOMER. 2. Prices for Valve POD, Gear box POD & Actuator POD test,(if applicable) 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 shall consist 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. Quantity of commissioning spares shall be as indicated in Column 16. 6. Mandatory spares consist of complete valve assembly with Actuator & gear box (without commissioning spares). Quantity of mandatory spares shall be as given in SI. no. 2 7. Valve design rating shall be as per Col. no. 9																		

NOTE:
 ABBREVIATIONS: BW- BUTT WELDED, CCS - CAST CARBON STEEL, SG - SEALED GLAND, MO - MOTORISED ELECTRIC ACTUATOR
 1. Valve POD, Gear box POD & Actuator POD test needs to be carried out as per standards mentioned in technical specification. If these tests are already carried out by bidder for similar model, type, size & rating for any NTPC/BHEL/REPUTED CUSTOMER project within the last 5 years from the date of bid opening for this tender, the same shall be considered applicable for this tender, if found satisfactory by BHEL/CUSTOMER.
 2. Prices for Valve POD, Gear box POD & Actuator POD test, (if applicable) shall 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 shall consist 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. Quantity of commissioning spares shall be as indicated in Column 16.
 6. Mandatory spares consist of complete valve assembly with Actuator & gear box (without commissioning spares). Quantity of mandatory spares shall be as given in Sl. no. 2
 7. Valve design rating shall be as per Col. no. 9


 29/11/17
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 (Approved By)
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General Design Parameters

SL NO.	Description		
1.	Flow medium	Wet Steam, 2-7% moisture	
2.	Flow Velocity (Design)	80 m/sec (However Valve rating shall be as per column no. 9 of Data Sheet-A (Sheet 1 of 3))	
3.	Connected pipe material	SA672 Gr. B70	
4.	Pipe line axis orientation	Horizontal	
5.	Valve Shaft Axis orientation	Horizontal	
6.	Design pressure drop at max. flow	0.0002 kg/cm ² (max.)	
7. Operating parameters		<u>At Normal condition</u>	<u>At MAX. condition</u>
7.1	Pressure (kg/cm ² (a))	0.0897/0.1074	0.0926/0.1108
7.2	Flow (T/hr)	53.504/54.939	59.188/60.772
7.3	Dryness fraction	0.9405/0.9459	0.9398/0.9451

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Material of Construction

SL NO.	PART NAME	MATERIALS
VALVE		
a.	Valve Body Butt welded	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(NUTS)
j.	Hand wheel (actuator)	MALLEABLE IRON (or equivalent)
GEAR BOX. (WORM type)		
k.	Main Housing /Cover (Totally enclosed construction)	Cast Iron
l.	Input shaft	13/% Cr SS/ EN8 (~200 BN)
m.	Worm	EN8 (~200 BN)
n.	Worm Wheel	Ductile iron / S.G iron
o.	Hand wheel	Malleable Iron (or equivalent)

MFGR.'s LOGO		MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : 2X660 MW BIFPCL MAITREE STPP																
				ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB-QA-120233-PEM-0 REV.NO.: DATE : PAGE:1 OF 9		PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA																
SL. NO	COMPONENT & OPERATIONS		CHARACTERISTICS		CLA SS	TYPE OF CHECK		QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS		FORMAT OF RECORD		AGENCY			REMARKS							
					M		C / N																		
1.	2.		3.		4.	5.		6.		7		8		9.		10.		D*		M	C	N	11.		

1.	MATERIALS													
1.1	BODY, DISC	1 CHEM. COMPOSITION & MECH.PROPERTIES	MA	1) CHEM. TESTS	ONE PER HEAT	ONE PER HEAT	APPD DRG/ TECH SPEC	APPD DRG/ TECH SPEC	TEST CERT.	√	P/ W	V	V	NOTE: BODY CASTINGS TO BE PROCURED FROM REPUTED FOUNDRY.
				2) MECH TESTS	ONE PER HEAT & HEAT TREATMENT BATCH	ONE PER HEAT & HEAT TREATMENT BATCH	APPD DRG/ TECH SPEC	APPD DRG/ TECH SPEC	TEST CERT.	√	P/ W	V	V	
		2.INTERNAL DEFECTS OF CASTINGS	MA	1. MPI	100%	100%	ASTME E 709	ASTME E 709	NDT REPORT	√	P/ W	V	V	MPI ON 100% AREA (ACCESSIBLE). RT ON CHANGE OF SECTION & BW ENDS (RT FILM REVIEW)
				2. RT	100%	100%	ASME B16.34	ASME B16.34	NDT REPORT	√	P/ W	V	V	
		3. SUB-SURFACE DEFECTS OF SHAFT DIA> 50 MM	CR	UT	100%	100%	ASTM A388	REFER REMARKS**	INSPN REPORT	√	P/ W	W	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
		4. CASTING DEFECTS	MA	VISUAL	100%	100%	MSS SP55	MSS SP55	INSPN REPORT		P/ W	V	V	

MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER	SIGNATURE	LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: CUSTOMER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: CUSTOMER HOLD POINT	DOC. NO.:	REV..... CAT.....		
					REVIEWED BY	APPROVED BY	APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN				PROJECT : 2X660 MW BIFPCL MAITREE STPP			
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE	QP NO : MAITREE-00-LB-QA-120233-PEM-0 REV.NO.: DATE : PAGE:2 OF 9			PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA			

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N				D*	M	C	N	
1.	2.	3.	4.	5.	6.	7	8	9.	10.					11.
														ANY DEFECT ECHO MORE THAN 20% FSH IS NOT ACCEPTABLE.ALSO ANYWHERE COMPLETE LOSS OF BACK WALL ECHO IS NOT ACCEPTABLE
1.2	CLAMP RING	CHEM., MECH PROPS	MA	1) CHEM. TESTS	ONE PER HEAT	ONE PER HEAT	APPD DRG/ TECH SPEC	APPD DRG/ TECH SPEC	TEST CERT.	√	P/ W	V	V	
			MA	2) MECH TESTS	ONE PER HEAT & HEAT TREATM- ENT BATCH	ONE PER HEAT & HEAT TREATM -ENT BATCH	APPD DRG/ TECH SPEC	APPD DRG/ TECH SPEC	TEST CERT.	√	P/ W	V	V	
1.3	DISC SEAL (FROM VENDOR'S REGULAR & APPROVED SOURCE)	1. VISUAL INSPN	MA	VISUAL	100%	100%	APPD DRG	APPD DRG	INSPN. REPORT	-	P/ W	V	V	
		2. DIMENSIONS	MA	MEASURE- MENT	100%	100%	APPD DRG	APPD DRG	LOG BOOK	-	P/ W	V	V	
		3. TENSILE AND HARDNESS FOR VULCANISING	MA	MEASURE MENT	100%	100%	TECH. SPEC/ APPD DRG	TECH. SPEC/ APPD DRG	TEST CERT	√	P/ W	V	V	
		4. OZONE CRACK RESISTANCE	MA	TESTING	1/ BATCH	1/ BATCH	TECH. SPEC + ASTM D1149*	TECH. SPEC + ASTM D1149*	TEST CERT.	√	P/ W	V	V	SPECIMEN TYPE A, 40 DEG CENTIGRADE FOR 70 HRS

MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER	SIGNATURE	LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: CUSTOMER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: CUSTOMER HOLD POINT		DOC. NO.: REV..... CAT.....		
					REVIEWED BY	APPROVED BY	APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : 2X660 MW BIFPCL MAITREE STPP						
			ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB-QA-120233-PEM-0 REV.NO.: DATE : PAGE:3 OF 9		PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA						
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.	10.	D*	M	C	N	11.
								AWWA C516						
		5.AGEING TEST	MA	PHYSICAL	1/BATCH	1/BATCH	TECH SPEC+ RELEV STD.	TECH SPEC+ RELEV STD.	TEST CERT	√	P/W	V	V	*TEST TEMP. 125 DEG C, TEST DURATION 72 HRS, MAX CHANGE IN TENSILE STRENGTH. 20% ELOGATION: 20%, HARDNESS:3%
		6. HYDRAULIC STABILITY TEST (AFTER AGEING)	MA	HYDRAULIC STABILITY	1/BATCH	1/BATCH	TECH SPEC./ REF STD.	TECH SPEC./ REF STD.	TEST CERT	√	P/W	V	V	
		7. WEAR RESISTANCE	MA	TYPE TEST	TYPE TEST	TYPE TEST	AWWA C-516	NO DAMAGE	TEST REPORT	√	P/W	V	V	TYPE TEST REPORT WILL BE FURNISHED FOR REVIEW -PART OF VALVE POD
1.4	FASTENERS ASTM A193 GR B7 ASTM A194 GR2H, GRB8M	1. VERIFICATION OF MAKE, GRADE, REVIEW OF TEST CERTIFICATE	MI	VISUAL	100%	100%	TECH. SPEC/ DATA SHEET	TECH. SPEC/ DATA SHEET	INSPN REPORT	√	P/W	V	V	
		2. DIMENSIONS	MA	MEASUREMENT	SAMPLING PLAN	SAMPLING PLAN	APPD DRG	APPD DRG	INSPN REPORT	√	P	V	V	
1.5	OPERATORS													
1.5.1	GEAR OPERATOR													GEAR BOX MANUFACTURER
		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: CUSTOMER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: CUSTOMER HOLD POINT							DOC. NO.: REV..... CAT.....					
MANUFACTURER/ SUB-SUPPLIER							MAIN-SUPPLIER							
SIGNATURE											REVIEWED BY		APPROVED BY	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN						PROJECT : 2X660 MW BIFPCL MAITREE STPP							
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:4 OF 9			PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA							
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS	
					M	C / N				D*	M	C	N		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	D*	M	C	N	11.	
	A)GEAR, WORM & SHAFT (BS970Gr En8)	1. CHEM. COMP. & PHYS PROPERTIES	MA	CHEM & PHYS TEST	1/ BATCH	1/ BATCH	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	TEST CERT		P/ W	V	V		
		2. DIMENSIONS	MA	MEASURE- MENT	100%	100%	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	INSPN REPORT		P/ W	V	V		
		3. HARDNESS	MA	MEASURE- MENT	100%	100%	RELV STD/ DATA SHT/ MFG DRG	RELV STD/ DATA SHT/ MFG DRG	TEST CERT		P/ W	V	V		
	B) TORQUE TEST	1. TORQUE TRANSMITTING (TORQUE TEST AT TWICE THE RATED TORQUE)	MA	TYPE TEST	ONE/ TYPE/ MODEL/ RATING	ONE/ TYPE/ MODEL/ RATING	AWWA C- 516/DATA SHT/ MFG DRG.	AWWA C- 516/DATA SHT/ MFG DRG.	INSPN REPORT*	√	P/ W	V*	V*	* PL. REFER CLAUSE NO. 7.1 (a) OF TECH SPEC NO. PE- TS-421-100-M016	
		2. DESIGN VERIFICATION (CYCLE TEST AT FULL RATED TORQUE OF GEAR BOX)	MA	TYPE TEST	ONE/ TYPE/ MODEL	ONE/ TYPE/ MODEL/ RATING	AWWA-C- 516 (AT FULL RATED TORQUE OF GB) / APPD PROCEDU RE	CL. 4.5.8.5.9 OF AWWA- C-516-2000/ APPD PROCEDUR E	INSPN REPORT*	√	P/ W	V*	V*	* PL. REFER CLAUSE NO. 7.1 (a) OF TECH SPEC NO. PE- TS-421-100-M016	
		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: CUSTOMER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: CUSTOMER HOLD POINT								DOC. NO.: _____ REV..... CAT.....					
MANUFACTURER/ SUB-SUPPLIER		MAIN-SUPPLIER													
SIGNATURE												REVIEWED BY		APPROVED BY	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : 2X660 MW BIFPCL MAITREE STPP									
			ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:5 OF 9		PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS			
					M	C / N				D*	M	C	N				
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	D*	M	C	N	11.			
1.6	ELECTRICAL ACTUATOR		INSPECTION / TESTING SHALL BE CARRIED OUT AS PER ATTACHED QUALITY PLAN NO. PE-DG-421-100-M025														
2.0	INPROCESS CONTROL																
2.1	BODY & DISC	1 DIMENSIONS	MA	MEASURE- MENT	100%	100%	MFG DRG	MFG DRG	INSPN. REPORT		P/ W	-	V				
		2. SURFACE DEFECTS	CR	P.T.	100%	100%	ASTM E165	ANSI B 16.34 APPENDIX III	INSPN. REPORT	√	P/ W	V	V	ON MACHINED AREA ONLY.			
2.2	WELDING OVERLAY DEPOSIT	WELDING PROCEDURE AND WELDER PERFORMANCE QUALIFICATION	CR	-	-		ASME IX	ASME IX	INSPN. REPORT		P/ W						
		CLADDING	MA	DEPTH MEASURE MENT	100%	100%	MFG. DWG	MFG. DWG	TEST REPORT		P/ W	V	V				
			MA	SURFACE DEFECT LPI ON WELD OVERLAY AND ADJACENT AREA	100%	100%	ASTM E165	FREE FROM POROSITY/ CRACK	NDT REPORT		P/ W	V	V				
2.3	BODY (BUTT WELD ENDS)	SUB-SURFACE DEFECT	CR	MPI	100% ON BW AREA	100% ON	ASTM E709	ANSI B 16.34	INSPN REPORT	√	P/ W	V	V				
				LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: CUSTOMER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: CUSTOMER HOLD POINT						DOC. NO.: REV..... CAT.....							
MANUFACTURER/ SUB-SUPPLIER		MAIN-SUPPLIER															
SIGNATURE												REVIEWED BY		APPROVED BY		APPROVAL SEAL	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN						PROJECT : 2X660 MW BIFPCL MAITREE STPP						
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:6 OF 9			PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA						
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N				D*	M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	D*	M	C	N	11.
						BW AREA		APPENDIX II						
		INTERNAL DEFECT	CR	R.T.	100% ON BW AREA	100% ON BW AREA	ANSI B16.34	ANSI B 16.34 Appdx. III	RT		P/ W	V	V	RT 100% of Body including BW ends as per SL.NO.1.1 Clause no.2 Film review by BHEL/Customer
2.4	SHAFT	1. DIMENSIONS	MA	MEASURE- MENT	100%	100% ON BW AREA	MFG DRG	MFG DRG	INSPN REPORT		P/ W	-	-	
		2.SURFACE DEFECTS	MA	P.T.	100%	100%	ASTM E165	ANSI B 16.34 APPENDIX III	NDT REPORT	√	P/ W	V	V	
3.1	VERIFICATION OF ALL PREVIOUS TESTS AND DOCUMENTS	VERIFICATION OF RECORDS	MA	---	100%	100%	TECH SPEC	TECH SPEC		√	P	V	V	
3.2	TESTS													
		1. BODY TEST	CR	HYDRO TEST	100%	100%	AWWA C516/ APPRD DRG	NO LEAKAGE	QAC	√	P/ W	W	W	CHP

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SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN						PROJECT : 2X660 MW BIFPCL MAITREE STPP						
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:7 OF 9			PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA						
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N				D*	M	C	N	
1.	2.	3.	4.	5.	6.	7	8	9.	10.					11.
		2. DISC STRENGTH	CR	HYDRO TEST	100%	100%	AWWA C516/ APPRD DRG	NO PERMANENT DEFORMATI ON	QAC	✓	P/ W	W	W	CHP 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
		3.SEAT LEAKAGE WITH ACTUATOR (BOTH DIRECTION)	CR	HYDRO TEST	100%	100%	AWWA C516/ APPRD DRG	AWWA C 516 / APPD DRG	QAC	✓	P	W	W	CHP
		4. PERFORMANCE TEST @	CR	PERFORM- ANCE	100%	100%	AWWA C516/ MFR STD	SMOOTH OPERATION	QAC	✓	P	W	W	CHP (@ - *COMPLETE VALVE ASSEMBLY ALONGWITH ACTUATOR SHALL BE (1) PARTIALLY OPENED 3 TIMES UNDER LOAD (5.25 kg/sqcm) IN HORIZONTAL POSITION ONLY (2) OPERATED 25 CYCLES UNDER NO LOAD IN

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MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN						PROJECT : 2X660 MW BIFPCL MAITREE STPP						
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE			QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:8 OF 9			PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA						
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N				D*	M	C	N	
1.	2.	3.	4.	5.	6.	7	8	9.	10.					11.
														HORIZONTAL & VERTICAL POSITION AND FOLLOWING SHALL BE CHECKED. (i) OPERATING TIME (ii) OPERATION OF LIMIT & TORQUE SWITCH (iii) CURRENT DRAWN BY ACTUATOR
		5. GLAND LEAK TEST (top & bottom flanges)	CR	HELIUM LEAK TEST	100%	100%	TECH SPEC	TECH SPEC	QAC	√	P	W	W	<u>CHP</u>
		6. VACUUM TEST	CR	VACUUM TEST	100%	100%	TECH SPEC	TECH SPEC	QAC	√	P	W	W	<u>CHP</u>
		7.PROOF OF DESIGN TEST (LIFE CYCLE TEST)	CR	CYCLE TEST	AS PER AWWA C516 ON ONE VALVE/ SIZE/ TYPE/ RATING	100%	APPROVED TEST PROCEDURE / AWWA C516	INSPN REPORT	√	P/ W	V	V		* PL. REFER CLAUSE NO. 7.1 (a) OF TECH SPEC NO. PE-TS- 421-100-M016

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MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN						PROJECT : 2X660 MW BIFPCL MAITREE STPP						
		ITEM : CS BUTTERFLY VALVES DESIGN STD: AWWA C 516 SIZE : 2000 NB CL. 75 RATING SUB-SYSTEM: STEAM SERVICE				QP NO : MAITREE-00-LB- QA-120233-PEM-0 REV.NO.: DATE : PAGE:9 OF 9		PACKAGE : MAIN PLANT PACKAGE CONTRACT NO. : --- MAIN-SUPPLIER : BHEL PEM NOIDA						
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK		REFEREN CE DOCUME NT	ACCEPTAN CE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N				D*	M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	D*	M	C	N	11.
4	SHIPPING RELEASE													
4.1	FINAL INSPECTION	1. OVERALL DIMENSION	MA	MEASUREM ENT	100%	100%	APPD DRG	INSPN REPORT		P/ W	V	V		
		2. DOCUMENTATION REVIEW	MA	REVIEW	100%	100%	APPD DRG/ TECH SPEC			P	V			
		3. CLEANLINESS	MA	VISUAL	100%	100%	APPD DRG/ TECH SPEC			P/ W	V			
		4. NAMEPLATE	MA	VIAUAL	100%	100%	APPD DRG/ TECH SPEC			P/ W	V			
5.0	PAINTING	1. SURFACE PREPARATION 2. UNIFORMITY & THICKNESS	MI MI	VISUAL & MEASURE- MENT	100%	100%	APPD DRG/ TECH SPEC	INSPN REPORT		P	V			
6.0	PACKING	SOUNDNESS	MA	VISUAL	100%	100%	AS PER TECH SPECIFICATION	INSPN REPORT		P	V			

CR=CRITICAL
MA=MAJOR
MI=MINOR

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MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER					
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD: AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM: STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 1 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N				D *	M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.			11.
1.0	RAW MATERIALS													
1.1	ACTUATOR HOUSING CASTING	MECHANICAL PROPERTIES a TENSILE STRENGTH b. HARDNESS c. SURFACE DEFECTS	MAJOR MAJOR	MECHANICAL TESTING VISUAL	One / heat 100%	- -	MFG DRG & RELEV STD. RELEV STD.	RELEV STD. & MFG DRG RELEV. STD.	SUPPLIER TC & GRN GRN	- P	P/V P	- -	- -	HEAT NUMSER ON CASTING
1.2	WORM WHEEL	CHEMICAL COMPOSITION MECHANICAL PROPERTIES a TENSILE STRENGTH b. ELONGATION c. SURFACE DEFECTS	MAJOR MAJOR MAJOR	CHEMICAL ANALYSIS MECHANICAL TESTING VISUAL	One / heat One / heat 100%	- - -	MFG DRG, BS 1400 AB2/HTBI 	MFG DRG, BS 1400 AB2/HTBI 	SUPPLIER TC & GRN GRN	- -	P/V 	- 	- 	
1.3	BEARING FLANGE CASTING	MECHANICAL PROPERTIES a TENSILE STRENGTH b. HARDNESS c. SURFACE DEFECTS	MAJOR MAJOR	MECHANICAL TESTING VISUAL	One / heat 100%	- -	MFG DRG. & RELEC STD. RELEV STD.	RELEV STD. & MFG DRG RELEV STD.	SUPPLIER TC & GRN GRN	- P	P/V P	- -	- -	
1.4. 1.4.1	CLUTCH RING (FOR SA/SAR 3,6,12,15)	a. CHEMICAL COMPOSITION b. SURFACE DEFECTS	MAJOR MAJOR	Chemical analysis VISUAL	One / heat 100%	- -	MFG DRG. & RELEV STD RELEV STD	ZnAl4CuI, RELEV STD.	SUPPLIER TC & GRN	- -	P/V P	- -	- -	
1.4.2	CLUTCH RING (FOR SA/SAR 25,30,50,60, 100)	a TENSILE STRENGTH b. HARDNESS c. ELONGATION d. SURFACE DEFECTS	MAJOR MAJOR	MECHANICAL TESTING VISUAL	One / heat 100%	- -	MFG DRG & RELEV STD. RELEV STD.	SG - 400/1S SG-500/7 RELEV STD.	SUPPLIER TC & GRN	- -	P/V P	- -	- -	
1.5	OUTPUT DRIVE STEM NUT (A-TYPE ONLY)	CHEMICAL COMPOSITION b. MECHANICAL PROPERTIES b.1 TENSILE STRENGTH b.2 ELONGATION c. SURFACE DEFECTS	MAJOR MAJOR MAJOR	CHEMICAL ANALYSIS MECHANICAL TESTING VISUAL	One / heat One / heat 100%	- - -	MFG DRG, BS 1400 BS 1400 BS 1400	AB2/BS 1400 & MFG DRG. AB2/BS 1400 BS 1400	SUPPLIER TC & GRN SUPPLIER TC & GRN GRN	- - -	P/V P/V P	- - -	- - -	

MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER	LEGEND				
		"D" RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/SUB-SUPPLIER "C" MAIN SUPPLIER, "N" CUSTOMER "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE, "GRN"-GOODS RECEIPT NOTE				
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD : AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM : STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 2 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY				REMAR KS
					M	C/N				D *	M	C	N		
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.				11.
1.6	BARSTOCK WORMSHAFT	a. CHEMICAL COMPOSITION b. MECHANICAL PROPERTIES c. SURFACE DEFECTS	MAJOR MAJOR MAJOR	CHEMICAL ANALYSIS HARDNESS VISUAL	ONE SAMPLE/HEA T ONE SAMPLE/HEA T 100%	- - -	4M-3532 R2 & MFG DRG MFG DRG BS970	4M-3532 R2 & MFG DRG MFG DRG BS970	NABL LAB/ SUPP. TC / GRN GRN GRN	- - -	P/V P/V P	- - -	- - -		
1.7	HOLLOW DRIVE SHAFT	a. CHEMICAL COMPOSITION b. SURFACE DEFECTS	MAJOR MAJOR MAJOR	Chemical analysis VISUAL	ONE SAMPLE/HEA T 100%	- -	4M-3532 R2 & MFG DRG BS970	4M-3532 R2 & MFG DRG BS970	SUPPLIER TC & GRN GRN	- -	P/V P	- -	- -		
1.8	PINION	a. CHEMICAL COMPOSITION b. MECHANICAL PROPERTIES c. SURFACE DEFECTS	MAJOR MAJOR MAJOR	CHEMICAL ANALYSIS HARDNESS VISUAL	ONE SAMPLE/HEA T ONE SAMPLE/HEA T 100%	- - -	4M-3532 R2 & MFG DRG MFG DRG BS970	4M-3532 R2 & MFG DRG MFG DRG BS970	NABL LAB/ SUPP. TC / GRN GRN GRN	- - -	P/V P/V P	- - -	- - -		
1.9	DRIVE SHAFT	a. CHEMICAL COMPOSITION b. MECHANICAL PROPERTIES c. SURFACE DEFECTS	MAJOR MAJOR MAJOR	CHEMICAL ANALYSIS HARDNESS VISUAL	ONE SAMPLE/HEA T ONE SAMPLE/HEA T 100%	- - -	4M-3532 R2 & MFG DRG MFG DRG BS970	4M-3532 R2 & MFG DRG MFG DRG BS970	NABL LAB/ SUPP. TC / GRN GRN GRN	- - -	P/V P/V P	- - -	- - -		
2	IN PROCESS CONTROL (MACHINED ITEMS)														
2.1	ACTUATOR HOUSING	a. DIMENSIONS b. SURFACE FINISH	MAJOR MAJOR	MEASUREMENT VISUAL	One / batch 100%	- -	MFG COMP/DRG/FIR MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG	GRN/ MCN/FIR GRN/ MCN	- - P	P P	- - -	- - -		

		LEGEND				
		"D" RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/SUB-SUPPLIER "C" MAIN SUPPLIER, "N" CUSTOMER "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE, "GRN"-GOODS RECEIPT NOTE				
MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER				REVIEWED BY	APPROVED BY
SIGNATURE						APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD: AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM: STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 3 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY				REMAR KS
					M	C/N				D *	M	C	N		
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.				11.
2.2	WORM WHEEL	a. DIMENSIONS b. ROLL CHECK c. SURFACE DEFECTS d. MATCHING	MAJOR MAJOR MAJOR MAJOR	MEASUREMENT ROLL CHECK VISUAL VISUAL	One / batch One / batch One / batch 100%	- - - -	MFG COMP/DRG/FIR MFG COMP/DRG/FIR MFG COMP/DRG. 4-M-3335	MFG COMP/DRG/FIR MFG COMP/DRG/FIR MFG COMP/DRG. 4-M-3335	GRN/ MCN/FIR GRN/ MCN/FIR GRN/ MCN GRN/ MCN	- P P P -	P P P P -	- - - - -	- - - - -		
23	BEARING FLANGE	a. DIMENSIONS b. SURFACE FINISH	MAJOR MAJOR	MEASUREMENT VISUAL	One / batch 100%	- -	MFG COMP/DRG/FIR MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG.	GRN/MCN/FIR GRN/ MCN	- -	P P	- -	- -		
2.4	OUTPUT DRIVE STEM NUT (A-TYPE)	a. DIMENSIONS b. SURFACE FINISH	MAJOR MAJOR	MEASUREMENT VISUAL	One / batch 100%	- -	MFG COMP/DRG/FIR MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG	GRN/ MCN/FIR GRN/ MCN	- -	P P	- -	- -		
2.5	WORMSHAFT	a. DIMENSIONS b. HARDNESS AFTER NITRIOING c. SURFACE FINISH	MAJOR MAJOR MAJOR	MEASUREMENT TESTING VISUAL	One / batch One / batch 100%	- - -	MFG COMP/DRG/FIR MFG COMP DRG. MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG MFG COMP. DRG	GRN/ MCN/FIR SUPPLIER TC & GRN GRN	- P P -	P P P -	- - - -	- - - -		
2.6	HOLLOW DRIVESHAFT	a. DIMENSIONS b. SURFACE FINISH	MAJOR MAJOR	MEASUREMENT VISUAL	One / batch 100%	- -	MFG COMP/DRG/FIR MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG	GRN/ MCN/FIR GRN/ MCN	- -	P P	- -	- -		
2.7	PINION	a. DIMENSIONS b. SURFACE FINISH	MAJOR MAJOR	MEASUREMENT VISUAL	One / batch 100%	- -	MFG COMP/DRG/FIR MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG	GRN/ MCN/FIR GRN/ MCN	- -	P P	- -	- -		
2.8	DRIVE SHAFT	a. DIMENSIONS b. HARDNESS AFTER NITRIOING c. SURFACE FINISH	MAJOR MAJOR MAJOR	MEASUREMENT TESTING VISUAL	One / batch One / batch 100%	- - -	MFG COMP/DRG/FIR MFG COMP DRG. MFG COMP. DRG	MFG COMP/DRG/FIR MFG COMP. DRG MFG COMP. DRG	GRN/ MCN/FIR SUPPLIER TC & GRN GRN	- P P -	P P/V P -	- - - -	- - - -		

		LEGEND "D" RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/SUB-SUPPLIER "C" MAIN SUPPLIER, "N" CUSTOMER "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE, "GRN'-GOODS RECEIPT NOTE			
MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER			REVIEWED BY	APPROVED BY
SIGNATURE					APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD: AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM: STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 4 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY				REMAR KS
					M	C/N				D *	M	C	N		
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.				11.
3	MOTORS	a. RPM b. NO LOAD CURRENT c. IR/HV d. THERMO SWITCHES e. NOISE f. MOUNTING DIMENSIONS g. NAME PLATE h. TYPE TEST	MAJOR MAJOR MAJOR MAJOR MAJOR MAJOR MAJOR	ELECTRICALS PERFORMANCE TEST " " " " " " DIMENSIONAL VISUAL TESTING	100% " " " " " ONE IN LOT 100% ONE/TYPE	- - - - - - -	RELEV STD " " " " " AS PER DRG " RELEV STD.	RELEC STD " " " " " AS PER DRG " RELEV STD.	MFG INS. RECORD " " " " " " Test Certificate	- - - - - - -	P " " " " " " "	- - - - - - -	- - - - - - -	- - - - - - -	
4	SOUGHT OUT ITEMS														
4.1	FASTENERS	a. DIMENSIONS b. GRADE	MINOR MAJOR	MEASUREMENT VISUAL	One / batch One / batch	- -	RELEV STD. RELEV STD.	RELEV STD. RELEV STD.	GRN GRN	- P	P P	- -	- -	- -	
4.2	LIMIT & TORQUE SWITCHES	a. CONTINUITY (MAKE/BREAK)	MAJOR	PERFORMANCE	One / batch	-	QC/QW.047	QC/QW.047	GRN	-	P	-	-		
4.3	POTENTIOMETE R	a. RESISTANCE VALUE	MAJOR	MEASUREMENT	One / batch	-	QC/QW.031	QC/QW.031	GRN	-	P	-	-		
4.4	SPACE HEATER	a. IR b. HV	MAJOR MAJOR	MEASUREMENT MEASUREMENT	One / batch One / batch	- -	QC/QW.045	QC/QW.045	GRN	-	P	-	-	With actuator	
4.5	ELECTRONIC POSITION TRANSMITTER	a. OUTPUT MEASUREMENT	MAJOR	MEASUREMENT	One / batch	-	CATALOGUE CHECK	CATALOGUE CHECK	GRN	-	P	-	-		
4.6	BEARINGS	a. MAKE b. TYPE	MAJOR MAJOR	VISUAL VISUAL	One / batch One / batch	- -	QC/QW.023, RELEV STD. MFG COMP. DRG	QC/QW.023	GRN	-	P	-	-	SKF, INA, ABC FAG, ZKL,	
4.7	'O' RINGS AND QUADRINGS	a. MATERIAL IDENTIFICATION b. ELOGATION	MAJOR MAJOR	MEASUREMENT MEASUREMENT	One / batch One / batch	- -	MFG COMP. DRG MFG COMP. DRG	QC/QW.024, RELEV STD. QC/QW.024, RELEV STD.	GRN	-	P	-	-	NBR	
4.8	SPRINGS	DIMENSIONS	MAJOR	MEASUREMENT	One / batch	-	QC/QW.019 &DIN 2093	QC/QW.019 &DIN 2093	SUPPLIER TC/GRN	-	P	-	-		
5	ASSEMBLY INSPECTION														

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MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER				
SIGNATURE				REVIEWED BY	APPROVED BY
				APPROVAL SEAL	

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD: AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM: STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 5 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY			REMAR KS
					M	C/N				D *	M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.			11.
5.1	WORM SHAFT ASSEMBLY	a. SRFACE DEFFECTS b. FREE ROTATION	MAJOR MAJOR	VISUAL VISUAL	100% 100%	- -	4M - 3335 4M - 3335	4M – 3335 4M - 3335	MFG LOGBOOK MFG LOGBOOK	- -	P P	- -	- -	
5.2	WORM WHEEL ASSEMBLY	a. SRFACE DEFFECTS b. FREE ROTATION	MAJOR MAJOR	VISUAL VISUAL	100% 100%	- -	4M - 3335 4M - 3335	4M – 3335 4M - 3335	MFG LOGBOOK MFG LOGBOOK	- -	P P	- -	- -	
6.0	FINAL TESTING	a. WIRING CONTINUITY	CRITICAL	FUNCTIONAL	100%	10%	CUSTOMER APPRD DATA SHEET; MFG STD.	CUSTOMER APPRD DATA SHEET; MFG STD.	QM-FINAL INSP. REPORT QC/FM.006	√	P	W	V	Document review on 100% basis by Contractor /TPIA and Customer/ Customer
		b. PHASE SEQ. CORRECTION												
		c. OPERATION & SETIING OF UMIT & TORQUE SWITCH												
		d. NO LOAD CURRENT												
		e. HANDWHEEL - MANUAL & AUTO DECLUTCH OPERATION												
		f. OUTPUT SPEED												
		g. POTENTIOMETER												
		h. SPACE HEATER												
		i. MECHANICAL POSITION												
		INDICATOR												
		J. VOLTAGE VARIATION TEST												
		k. INSULATION RESISTANCE												
		l. HV TEST												
		1.1 NORM ACT.: 1.6 kV, 1 min												
		1.2 EPAC ACT.: 1.1 kV, 1 min												

		LEGEND		
		"D" RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/SUB-SUPPLIER "C" MAIN SUPPLIER, "N" CUSTOMER "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE, "GRN"-GOODS RECEIPT NOTE		
MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER		REVIEWED BY	APPROVED BY
SIGNATURE				APPROVAL SEAL

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : 2X600 MW BIFPCL MAITREE STPP
		ITEM : ELECTRIC ACTUATOR OF CS BUTTERFLY VALVE(STEAM SERVICE) DESIGN STD: AWWA C516-2010 SIZE : 2000 NB SUB-SYSTEM: STEAM SERVICE	QP NO: PE-QP-421-100-M025 REV. NO : DATE. : Page 6 of 6	PACKAGE : MAIN PLANT PACKAGE CONTRACT NO : MAIN SUPPLIER : BHEL PEM NOIDA.

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPT-ANCE NORMS	FORMAT OF RECORD		AGENCY			REMAR KS
					M	C/N				D *	M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.		10.			11.
	FINAL TESTING (Contd.)	m. GREASE LEAKAGE		VISUAL	100%	10%	CUSTOMER APPRD DATA SHEET; MFG STD.	CUSTOMER APPRD DATA SHEET; MFG STD.	QM-FINAL INSP. REPORT QC/FM.006	√	P	W	V	Document review on 100% basis by Contractor / TPIA and Customer/ Customer
		n. VISUAL INSPECTION		VISUAL										
		o. ELECTRONIC POSITION TRANSMITTTER		OUTPUT MEASUREMENT										
		p. STALL TORQUE and Current		MEASUREMENT	1 PER TYRE	1 PER TYRE	TD/QW.005 Tech Spec./ CUSTOMER Approved Data Sheet	TD/QW.005 Tech Spec./ CUSTOMER Approved Data Sheet		P	V	V		
		q. PAINTING and Rust Prevention		SHADE & DRY PAINT THICKNESS	One / batch	-								
		r. MOUNTING DIMENSION		PHYSICAL	100%	1 NO. PER BATC H							MFG DRG./CATALOGUE	
7	ACCESSORIES PLUG & SOCKET	a. VISUAL b. ELECTRICAL	MAJOR MAJOR	VISUAL HV	One / batch One / batch	- -	CATALOGUE INSPECTION REPORT	CATALOGUE INSPECTION REPORT	GRN & INSP. REPORT GRN	- -	P P	- -	- -	WITH ACTUAT OR
8	ELECTRICAL TEST FOR INTEGRAL STARTERS	a. HV TEST b. BURN IN TEST c. 24V DC OUTPUT d. OPERATIONAL CHECK	MAJOR	ELECTRICAL/ FUNCTIONAL	100%	10%	MFG STD.	MFG STD.	SUPPLIER-TC	√ -	P P P	V W -	V V -	WITH ACTUAT OR
9	SHIPPING INSPECTION	a. NAME PLATE b. PAINTING c. Rust Prevention d. ACCESSORIES e. ANCHORING					PACKING SLIP	PACKING SLIP	PACKING SLIP	-	P	-	-	

		LEGEND "D" RECORDS IDENTIFIED WITH `TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION "M" MANUFACTURER/SUB-SUPPLIER "C" MAIN SUPPLIER, "N" CUSTOMER "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE, "GRN"-GOODS RECEIPT NOTE			
MANUFACTURER/ SUB-SUPPLIER	MAIN SUPPLIER			REVIEWED BY	APPROVED BY
SIGNATURE					APPROVAL SEAL

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-SS-421-145-I007	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 06.10.16
			SHEET 1	OF 3
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL*	* PROJECT	2X660MA BIFPCL, MAITREE BANGLADESH		
	OFFER REFERENCE			
	* TAG NO. SERVICE	EXV-25/EXV-26		
	* DUTY	☒ ON / OFF ☐ INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL	OD 2032X16 THK	VALVE MAT'L:ASTMA216Gr.WCB	
	* 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, DUST TIGHT, WEATHER PROOF, SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, IP:65		
	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 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 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 SEVEN TIMES THE RATED CURRENT as per IEC-60034-30		
	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 9003) ☐		
	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		
				Starting current shall not exceed 7 times rated current as per IEC 60034 for IE-3 motors.



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.: PE-SS-421-145-I007

VOLUME II B

SECTION D

REV. NO. 00

DATE: 06.10.16

SHEET 2

OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

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

	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC			
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☐ 110 V			
	@ ENCLOSURE CLASS OF MOTOR	☐ IP 67 ☐ FLAME PROOF			
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B		As per IEC-60034	
	@ 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				
	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		The coils of interposing relays shall be connected to freewheeling diode.	
	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)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN : INT : CLOSE	☒ 1 No ☐ 2 Nos.	2 Nos. (ADJ.)	☒ 1 No. ☐ 2Nos.	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.: PE-SS-421-145-I007

VOLUME II B

SECTION D

REV. NO. 00

DATE: 06.10.16

SHEET 3

OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

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

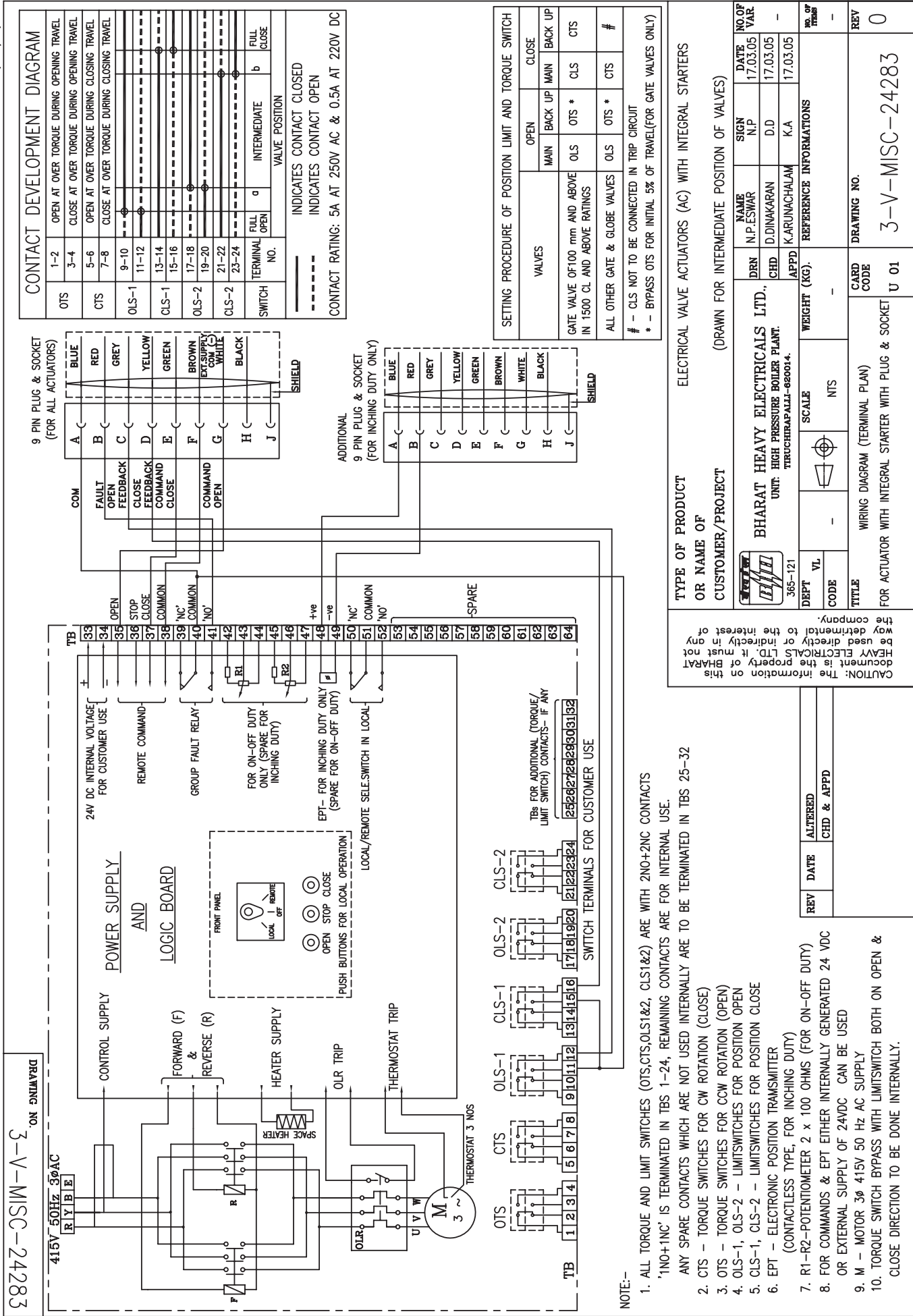
for Smart Actuator) (\$ Refer Notes)	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC	

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	☒ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	☒ 24V DC ☐	
	OUTPUT	☒ 4-20mA	
	ACCURACY	$\pm$ 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ 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. ☐	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----	
	@ SPACE HEATER CABLE GLAND	SIZE:-----	
	OTHER CONTROL CABLE GLANDS-1	☐ 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE :-----	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.

NOTES:

- SCOPE:** DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
 - CODES & STANDARDS:** DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST INTERNATIONAL STANDARD (INDIAN CODES ARE NOT ACCEPTABLE).
 - TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
 - CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
 - 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.
 - THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, **-6% TO +4%** VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
 - 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.**

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



B0.6.18.8 Technical conditions for low voltage motors

If not specified otherwise all motors must be designed to meet IP 55 enclosure according IEC60034-5.

All motors with rated power (referred to 40 °C ambient temp.) less than 160 kW must be designed as LV motors with premium efficiency class IE3.

The equipments which are only operating for short period shall not be covered under IE3 such as:

- a) Sootblower Motors- operates only during sootblowing sequence
- b) Seal air fan motor for damper sealing operation-operated only during maintenance.

B0.6.18.8.1 Constructive features

The same features as for high voltage motors shall apply.

Anti-condensing heating shall be provided for motors of 55 kW and above.

B0.6.18.8.2 Electric features

All motors shall be designed as 3-phase squirrel-cage motors suitable for direct on line starting.

The motors must be capable of being switched on to a large and stable network and with phases in opposition.

The electric features a), b) and c) of high voltage motors also apply here.

Motors starting current must not exceed 7.0 times rated current (referred to the motor rating and 45 °C ambient temp).

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The Starting current of LV Motor (IE3) shall be inline with IEC 60034-30. Applicable de-rating factor for design temperature of 45 Deg C shall also be applied.

B0.6.18.8.3 Protective features

An earthing clamp inside the terminal box has to be provided.

B0.6.18.8.4 Other features

Cable leads

All cable connecting boxes are to be designed to meet the requirements of IP 55 or IP 58 protection class respectively.

The cable connecting boxes are to be installed easily accessible on the motor. The connecting boxes must be capable of being turned by 90° or 180° and of being opened up longitudinally. The connection boxes are to be fitted with a terminal block.

Shafts

Where not otherwise specified, motors must be fitted with a free shaft end.

Protection against explosion hazards

Low-voltage motors, which are to be installed in areas exposed to the risk of explosion, must comply with the rules laid down in VDE 0165/0170/0171 for explosion-proof design in relation to the flash-point group classification for the particular explosive mixture.

B0.6.18.10 | Actuator drives

As far as applicable the above “Technical conditions for low voltage motors” shall apply.

In addition, all actuators for valves, dampers etc are to be fitted with socket and plug of well-established make to IEC 60309 or equivalent for the power cable connection. For the control cable connection separate socket and plug shall be provided.

Self-cooling at respective ambient temperature conditions is mandatory. Fan cooling is not accepted.

Actuators shall have integrated starters. Regulation type shall be continuous modulation type (min. 3000 starts per minutes).

B0.6.19.16 Actuators

Intelligent drives with integrated power switch unit and further electronics shall be installed. Actuators equipped with integral controls shall be supplied which can be operated via the operation elements on the local controls as soon as power is connected. Only operation commands and feedback signals shall be exchanged between the control system and the actuator. Motor switching shall be performed within the device and virtually without delay.

Unless otherwise specified actuators for modulating valves and dampers shall either be pneumatic or electrically operated. Self contained sealed hydraulic units may be considered where high thrusts or high speeds of operation are required.

Actuators for ON/OFF duty or manually positioned units shall generally be electrical motor and/or pneumatic driven, however the use of solenoid types on small valves shall be allowed dependent on duty.

The various types and sizes of actuators shall be rationalized and as far as possible each type shall be from a common manufacturer to facilitate interchangeability and spares.

In order to prevent the risk of fire or explosion pneumatic actuators shall be used in hazardous areas and associated equipment (e.g. positioners) must be intrinsically safe in accordance with IEC 60079-11.

Pneumatic actuators must be designed in such a way that in the event of air failure the actuator will remain in the position immediately prior to loss of power, or assume a position which is safe for the process.

With either action the failure mode shall be suitably monitored and the Plant operator informed by some form of alarm. The failure response of all actuators in the event of the loss of the prime mover (air pressure, oil pressure, electrical power) shall be indicated on the Piping and Instrumentation (P&I) diagrams, valve schedules, etc.

All pneumatic tubing to control drives or actuators shall, unless otherwise agreed to by the Employer/Engineer, be in copper which shall be sheathed in PVC or alternatively in stainless steel.

For all actuators of control valves and dampers of main systems local indicating pointer and position transmitters for remote indication and closed loop feedback shall be provided in accordance with the most severe operating conditions to be expected. The transmitters shall be designed to withstand conditions such as high temperature, vibrations and leakage of steam and of hot water wherever required. The protection class shall be IP 65 according to IEC 60529.

All actuators shall have a handwheel for direct manual operation. The diameter of the handwheel and geared effort shall be such that they can be reasonably operated by one man. A lockable mechanical clutch mechanism shall be provided to inhibit power control of the actuators when the handwheel is operated.

The speed of response of actuators used for modulating control shall be chosen to suit each particular application. Facilities shall be provided for limiting the actuator movement in each direction.

Special attention must be paid to adequately dimensioned drives and care must be taken to avoid any unintended displacement of the actuator on sudden rises of pressure in the piping.

Actuators shall have fail safe operation and actuator locking device in the event of abnormal conditions. Any abnormality on the valve shall be transmitted to the DCS.

All electrical actuator drives necessary for the safe operation and shut-down of the Plant in the event of 0.4 kV switchgear failure shall be connected to the UPS.

	COMPLIANCE SHEET BUTTERFLY VALVE- STEAM SERVICE (2X660MW MAITREE BANGLADESH)	SPECIFICATION NO. PE-TS-421-100-M016	
		SECTION : II	
		REV. NO.: 00	DATE: 23.11.2017
		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 the technical deviation sheet of GCC. Deviations listed in technical deviation sheet shall only be considered.**

Name of Bidder / Authorized Representative :- _____

Designation :- _____

Signature :- _____

Company Seal :- _____

Date :- _____

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