

BHEL PEM NOIDA/PG-III

PROJECT: - 1 X 660 MW BHUSAWAL TPP

PACKAGE: - BUTTERFLY VALVES (STEAM SERVICE)

GeM Bid No. GEM/2021/B/1136004, Dated 24.03.21

1. Detailed technical specification (**PE-TS-415-100-M016**) are also uploaded on <https://www.bhel.com/tenders> and https://pem.bhel.com/Current_Tender.aspx on GeM portal.

2. Further, it is to be noted that parameters mentioned in criteria for experience and past performance in GeM bid portal is only for fulfilling system (GeM) requirements, however technical PQR shall prevail.

3-PQR, Vendor approval format from End Customer is attached alongwith Technical Specification.

Enclosure: -

- 1) Technical PQR
- 2) End Customer (MAHAGENCO) approval Performa
- 3) BOQ
- 4) Technical Specification

For & on behalf of BHEL

Sd/- R P Yadav/ Dy. Mgr./BHEL PEM Noida

	PRE - QUALIFYING REQUIREMENTS	DOCUMENT NO: PE-TS-415-100-M058
		REVISION NO: 00, DATE: 23.02.2021
		SHEET: 1 of 3

Project: 1x660 MW BHUSAWAL TPS UNIT-6

Package: BUTTERFLY VALVES (STEAM SERVICE)

CRITERIA FOR EVALUATION (TECHNICAL):

1. Technical Pre-Qualifying Requirements:

1.1 The bidder should have designed, in-house manufactured, tested, inspected and supplied valves (as mentioned below) for use in a power plant or for similar application.

Butterfly valves (Steam service)

Minimum size of 1600NB with material of construction as CCS (grade WCB) and min. #75B of AWWA-C504/ AWWA-C516

1.2 The item(s) mentioned in point 1.1 should have performed successfully for atleast one year. To establish meeting this requirement, the bidder shall conform to any one of the following clauses:

- (i) Execution of two purchase orders for different End-users with the item(s) performing successfully for one (1) year from date of commissioning to the date of bid submission as defined by BHEL-PEM in NIT. Different projects of a customer shall be considered as different End-users.
- (ii) Minimum one (1) repeat contract from two (2) different Purchasers (i.e. 2 Nos of Purchase orders from each purchaser). A contract shall be considered as repeat, when the second contract is given by the same purchaser after lapse of minimum one (1) year from supply completion of first contract.
- (iii) Execution of one (1) purchase order as per sl. no. (i) above from one End-user and one (1) repeat contract from another Purchaser as per sl. No. (ii) above.
- (iv) Three (3) repeat contracts from one (1) Purchaser. Second and third repeat contract shall be after lapse of minimum one (1) & two (2) years respectively from supply completion of first contract.

1.3 The bidder to furnish the following documents, as applicable, in support of the above:

- a) For point 1.2(i): Performance certificates from End-user (duly signed & dated) specifying that the product is performing successfully for one (1) year from date of commissioning along with correlated purchase order(s).
- b) For point 1.2 (ii) & (iv): Purchase order(s), Material dispatch clearance certificate (MDCC)/ Material receipt certificate (MRC)/Lorry receipt (LR)/ Invoice.

PREPARED BY:	REVIEWED BY:	APPROVED BY:
NAME: ANUJ AWASTHI DESIGNATION: DY.MGR. DEPT.: PS-PEM/ MPL	NAME: PRINCE MALIK DESIGNATION: SR MGR DEPT.: PS-PEM/ MPL	NAME: BK AGARWAL DESIGNATION: DH DEPT.: PS-PEM/ MPL

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1.4 In addition to above, bidder should have the following facilities for different size of butterfly valves (Steam Service) as per BHEL requirement as mentioned in Data sheet-A of technical specification:

a). Capability of designing and manufacturing of the item(s).

b). In-house testing facilities for carrying out tests as per relevant standards & Quality plan. In case, the in-house testing facilities are not available, then bidder shall furnish undertaking that test(s) will be carried out from govt. approved lab or test house recognized by reputed customers.

Bidder to submit supporting documents (Purchase order (s) / Certificate indicating capacity and details/ undertaking of manufacturing & testing facilities) for point (a) & (b) above.

1.5 To establish business continuity, bidder is required to submit at least two (2) Purchase order for minimum size of 1200NB butterfly valves in last 3 (three) years prior to the date of bid submission as defined by BHEL-PEM in NIT for each category.

2. Bidder to also comply with general points mentioned below.

2.1 Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/ Indian subsidiaries shall be evaluated as follows:

- If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
- If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
- If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. and warranty/ guarantee shall be submitted along with the offer.

2.2 Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of contract(s).

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**PRE - QUALIFYING REQUIREMENTS**

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2.3 Consideration of offer shall be subject to customer's approval of bidders, if applicable.

2.4 Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.

2.5 Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

2.6 After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

2.7 Bidder to ensure that Third Party/customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document/ certificate issuing authority such as name & designation of issuing authority and its organization contact number and email-id etc. In case the same found not available, purchaser has right to reject such document from evaluation.

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Revised ANNEXURE A

Maharashtra State Power Generation Company Limited			
Bhusawal Project (1x660MW)			
Proforma of Vendor Approval			
Sr. No.	Information/ Particulars required	Details furnished along with documents thereof	Remarks if any
1	Name of System /Package/Item:		
2	Name of agency on whom order for the main work is placed		
3	Approval for (Name of construction material)		
4	Name of the vendors specified in contract document for this material		
5	Name of the proposed Sub Contractor(Vendor)		
6	Reasons for asking new vendor		
7	Details of supporting documents in lieu of above reasons		
8	Specific requirement of material in terms of dia, size, quantity etc.		
9	When the material is required & for which structure		
10	Whether vendor is Partnership/ Pvt./Public Ltd. Company		
11	Particular of registration with Government		
	i) GST registration No.		
	ii) Company registration No. & Incorporation Certificate		
	iii) PF & ESIC Certificate.		
	iv) Pan No.		
12	Address of vendor's factory		
13	Contact No. of vendor's representative for additional information		
14	Production Business Area		
16	Average annual turnover for last three years as per CA's Certificate		
17	Name of Companies where the vendor is registered		
18	Details of orders completed last 3 years (Quantity & amount)		
19	Details of orders in hand (Quantity & amount)		
20	Maximum value & quantity of work executed during last 3 years		
21	Name of the reputed, well known clients to whom the vendor has supplied the material		
22	End users Performance Certificate (Name & documents) along with the relevant PO.		
23	Any additional information		
24	Recommendation		

M/s BHEL

Sub-Contractor

		BOQ-BUTTERFLY VALVE (STEAM SERVICE)-Mandatory Spares 1x660 MW BHUSAWAL TPS UNIT-6															
1	2	3	4	5	6	7	8										
SL NO.	SIZE mm (NB)	RATING,DESIGN CODE	BODY & DISC MATERIAL	END CONN	SPECIAL FEATURES	PIPE SIZE	MANDATORY SPARES										
							COMPLETE VALVE ASSEMBLY WITH ACTUATOR & GEAR BOX (WITHOUT COMMISSIONING SPARES)	COMPLETE ACTUATOR (NOS)	DC-DC UNIT/POWER PACK UNIT (Nos.)	ELECTRONIC CARD (Nos)	CONTROL UNIT (Nos.)	LIMIT SWITCH ASSEMBLY (Nos)	TORQUE SWITCH ASSEMBLY (Nos)	AUXILIARY CONTACT (Nos)	COMPLETE MOTOR USED IN ACTUATOR (Nos)	COMPLETE SEALKIT (SET)	COMPLETE 'O' RING (SET)
1	1800	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; ELECTRIC ACTUATOR WITH INTEGRAL STARTER.	OD 1829 x 16 thk.	1	1	2	5	2	2	2	2	1	1	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 the last 5 years from the date of bid opening of this project i.e. 06-08-2018, 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.

1x660 MW BHUSAWAL TPS UNIT-6 FOR BUTTERFLY VALVE (STEAM SERVICE)

TECHNICAL SPECIFICATION FOR BUTTERFLY VALVE (STEAM SERVICE)

**SPECIFICATION NO. PE-TS-415-100-M016
Rev. No.: 00**



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

	TECHNICAL SPECIFICATION BUTTERFLY VALVE (STEAM SERVICE) 1x660 MW BHUSAWAL TPS UNIT-6		SPECIFICATION NO. PE-TS-415-100-M016
			REV. NO.: 00 DATE: 19.02.2021
	SHEET 1 OF 1		

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	TECHNICAL SPECIFICATION BUTTERFLY VALVE-STEAM SERVICE 1x660 MW BHUSAWAL TPS UNIT-6		SPECIFICATION NO. PE-TS-415-100-M016	
			REV. NO.: 00	DATE: 19.02.2021
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SECTION-I

SPECIFIC TECHNICAL REQUIREMENTS

 Bharat Heavy Electricals Company	SPECIFIC TECHNICAL REQUIREMENTS BUTTERFLY VALVES (STEAM SERVICE)	SPECIFICATION NO.: PE-TS-415-100-M016	
		SECTION - I	
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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 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, 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 datasheet-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.
- 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.

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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 $2 \frac{1}{4}$ 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.

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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-A1. 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 Kg 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 Kg 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.

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6.16 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.

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 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.

7.2 Motorised 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 Datasheet A.

7.2.2 Electric actuators shall be mounted directly on the valves.

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.

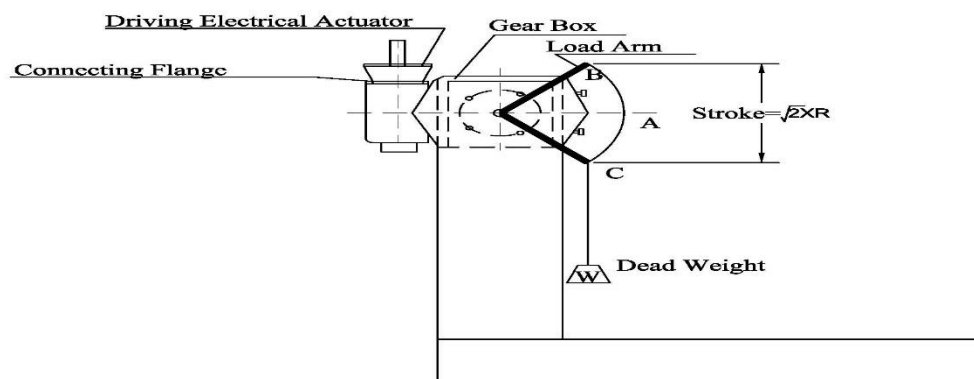
8.0 INSPECTION AND TESTING:-

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.

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8.1 P.O.D. Tests:



TEST SET UP

FIG. 1

- 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.
- Gear Box and Electric Actuator shall be designed & tested in accordance with latest editions of AWWA C 504-10(gearbox) and AWWA C 542-10 (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.
- 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-C-542-10.
- 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.
- 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)
- 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 placement of Purchase order for respective project (the same will be informed during detail engineering). 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.

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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:
- Pressure drop as per the approved drop vs. opening curve.
 - 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 SSPC-SP-3/ Power Tool Cleaning followed by 2 coat of Heat Resistance Aluminium paint to IS 13183 Gr. I or equivalent, paint shade Aluminium and total DFT of paint will be equal to 100 microns minimum.

13.0 PACKING INSTRUCTIONS:

- 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.
- The valve has to be dispatched in total assembled form.
- Discs of all valves shall be properly secured while dispatching so that there is no risk of damage to the disc & seat.

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- 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.

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 FRAMEWORK AGREEMENT

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 for project specific POs shall be considered for delay analysis by BHEL.

	SPECIFIC TECHNICAL REQUIREMENTS BUTTERFLY VALVES (STEAM SERVICE)	SPECIFICATION NO.: PE-TS-415-100-M016	
		SECTION - I	
		REV. NO.: 00	DATE: 19.02.2021
		Sheet 8 of 8	

The drawings/documents mentioned in Category-A will be considered as reference documents for different projects Purchase order which will be placed later.

16.2 Category-B:

- Design calculations for shell thickness and shaft diameter.(applicable for butterfly valves (steam service) of sizes greater than 1600 NB)
- Opening closing time calculations (applicable for motorized valves).
- 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.

	TECHNICAL SPECIFICATION BUTTERFLY VALVE (STEAM SERVICE)		SPECIFICATION NO. PE-TS-415-100-M016
			REV. NO.: 00 DATE: 19.02.2021
	1x660 MW BHUSAWAL TPS UNIT-6		SHEET 1 OF 1

SECTION-II

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

						DATA SHEET- A BUTTERFLY VALVE (STEAM SERVICE) 1x660 MW BHUSAWAL TPS UNIT-6					SPECIFICATION NO. PE-TS-415-100-M016 SECTION: II REV. NO.: 00 DATE: 19.02.2021 SHEET 1 of 2															
BUTTERFLY VALVES (STEAM SERVICE)																										
1	2	3	4	5	6	7	8	9	10	11	12	13				14										
SL. NO.	TAG NOS.	SIZE mm (NB)	DESIGN PRESSURE KG/CM2(G)	DESIGN TEMP (DEG OC)	OPERATION	RATING/DESIGN CODE	BODY & DISC MATERIAL	END CONN	SPECIAL FEATURES	PIPE SIZE	MAIN VALVES (ALONG WITH ACTUATOR) QTY WITHOUT COMMISSIONING SPARES (NOS.)	COMMISSIONING SPARES				MANDATORY SPARES										
												GLAND PACKING (VALVES) (SETS)	BOTTOM GASKET (VALVES) (SETS)	O' RING AND SEALS FOR ELECTRIC ACTUATORS (SETS)	DISC SEAL (SETS)	COMPLETE VALVE ASSEMBLY WITH ACTUATOR & GEAR BOX (WITHOUT COMMISSIONING SPARES)	COMPLETE ACTUATOR (NOS)	DC-DC UNIT/POWER PACK UNIT (Nos.)	ELECTRONIC CARD (Nos)	CONTROL UNIT (Nos.)	LIMIT SWITCH ASSEMBLY (Nos)	TORQUE SWITCH ASSEMBLY (Nos)	AUXILIARY CONTACT (Nos)	COMPLETE MOTOR USED IN ACTUATOR(Nos)	COMPLETE SEALKIT (SET)	COMPLETE O' RING (SET)
1	EXV-25 & EXV-26	1800	Full vacuum and 1.1 kg/sq.cm	100	MO	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; ELECTRIC ACTUATOR WITH INTEGRAL STARTER.	OD 1829 x 16 thk.	2	2	2	2	2	1	1	2	5	2	2	2	2	1	1	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 the last 5 years from the date of bid opening of this project i.e. 06-08-2018, 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.										TOTAL	2	2	2	2	2	1	1	2	5	2	2	2	2	1	1	1

	DATASHEET-A BUTTERFLY VALVE (STEAM SERVICE) 1x660 MW BHUSAWAL TPS UNIT-6		SPECIFICATION NO. PE-TS-415-100-M016
			SECTION : II
	REV. NO.: 00		DATE: 19.02.2021
	Sheet 2 of 2		

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		
k.	Main Housing /Cover (Totally enclosed construction)	Cast Iron IS:210 Gr. FG 220/260
l.	Input shaft	13/% Cr SS/ EN8 (~200 BN)
m.	Worm	EN8 (~200 BN)
n.	Worm Wheel	Ductile iron / S.G iron
o.	Hand wheel	Malleable Iron (or equivalent)

Technical Requirement/Data

- Flow medium: Wet Steam, 2-7% moisture
- Design pressure drop at max. flow: 0.0002 kg/cm² (max.)
- Flow Velocity (Design) : 100 m/sec.
- Connecting pipe size & material: OD 1829 x 16 thk & SA672 Gr. B60 Cl.12/22
- Parameters

<u>Operating parameters</u>		<u>At normal condition</u>	<u>At maximum condition</u>
Pressure (kg/cm ² (a))	:	0.1062	0.1123
Flow (T/hr)	:	47.437	55.568
Dryness fraction	:	0.956	0.955

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FORM NO. PEM-6666-0

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-ID-415-145-I902	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 18.02.19
			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)	

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GENERAL *	* PROJECT	1x660 MW BHUSAWAL TPS UNIT-6	
	OFFER REFERENCE		
	* TAG NO. SERVICE	EXV-25 & EXV-26	
	* 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% IN HOT HUMID AND TROPICAL ATMOSPHERE AND HIGHLY POLLUTED AT PLACES OF COAL DUST AND FLY DUST.	
	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, DUST TIGHT SUITABLE FOR OUTDOOR USE WITHOUT CANOPY IP:68	
	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 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) ☐	
	PAINT TYPE (## Refer Notes)	☐ ENAMEL ☐ EPOXY ☐	
	SHAFT RPM	BIDDER TO SPECIFY	
	OLR SET VALUE	BIDDER TO SPECIFY	

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR	SPECIFICATION NO.: PE-ID-415-145-I902	
		VOLUME	II B
		SECTION	D
		REV. NO.	00
		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)	

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	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ 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 68 ☐ FLAME PROOF		
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B		
	@ WINDING TEMP PROTECTION	☒ THERMOSTAT (3 Nos.,1 IN EACH PHASE) ☒ ---THERMOSTAT- 1 NO+1 NC CONTACT -----		
		SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED(THERMISTOR PTC)	
INTEGRAL STARTER	INTEGRAL STARTER	☒ REQUIRED ☐ NOT REQUIRED		
	TYPE OF SWITCHING DEVICE	☒ CONTACTORS ☐ THYRISTORS		
	TYPE	☒ CONVENTIONAL ☐ SMART (NON-INTRUSIVE)		
	STEP DOWN CONT. TRANSFORMER	☒ REQUIRED		
	OPEN / CLOSE PB	☒ REQUIRED ☐ NOT REQUIRED		
	STOP PB	☒ REQUIRED ☐ NOT REQUIRED		
	INDICATING LAMPS(POWER SUPPLY ON/OPEN /CLOSE)	☒ REQUIRED ☐ NOT REQUIRED		
	LOCAL REMOTE OFF S/S	☒ REQUIRED ☐ NOT REQUIRED		
	STATUS CONTACTS FOR MONITORING	☒ REQUIRED ☐ NOT REQUIRED		
		INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (THERMAL O/L RELAY OPERATED, MOTOR THERMOSTAT TRIP,CONT./POWER SUPPLY FAILED, LOCAL/OFF/REMOTE S/S IN LOCAL or OFF MODE , TORQUE OPEN/CLOSE CUT OFF,VALVE JAMMED)	
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) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY		
	OPEN : INT : CLOSE(Total:-06 nos.)	☐ 1 No. ☒ 2 Nos.	2 Nos. (ADJ.)	☐ 1 No. ☒ 2Nos.
	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC		

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FORM NO. PEM-6666-0

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR	SPECIFICATION NO.: PE-ID-415-145-I902		
		VOLUME	II B	
		SECTION	D	
		REV. NO.	00	DATE: 18.02.19
		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)	

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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	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	240V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING	decided as per load data received tender stage	
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: decided as per load data received tender stage	
	@ SPACE HEATER CABLE GLAND	SIZE: decided as per load data received tender stage	
	OTHER CONTROL CABLE GLANDS	QUANTITY & SIZE: Cable glands suitable for 8Px0.5 sq mm & 2P x 0.5 sq mm cable.	
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 NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
- TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
- CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL & TINNED COPPER LUGS 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, +/-5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING +/-10%.
- THE MOTOR SHALL BE CAPABLE OF STARTING AT 85 PERCENT OF RATED VOLTAGE AND RUNNING AT 80 PERCENT OF RATED VOLTAGE AT RATED TORQUE AND 85 PERCENT RATED VOLTAGE AT 33 PERCENT EXCESS RATED TORQUE FOR A PERIOD OF 5 MINUTES EACH.
- THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
- COMMANDS SHALL BE LATCHED AT INTEGRAL STARTER END.
- SS TAG NAME PLATE SHALL BE PROVIDED.
- CANOPY FOR OUTDOOR SERVICES SHALL BE PROVIDED.
- CONTROL WIRING SHALL BE OF SUITABLE VOLTAGE GRADE COPPER WIRE 1.5 SQ.MM.
- THE TERMINAL IN TERMINAL BOX SHALL BE SUITABLE FOR CONNECTION 2.5 SQ.MM COPPER CONDUCTOR.
- ATTAIN FULL SPEED OPERATION BEFORE VALVE LOAD IS ENCOUNTERED AND IMPART AN UNSEATING BLOW TO START THE VALVE IN MOTION (HAMMER BLOW EFFECT).
- ALL ELECTRICAL EQUIPMENT, ACCESSORIES AND WIRING SHALL BE PROVIDED WITH TROPICAL FINISH TO PREVENT FUNGUS GROWTH.

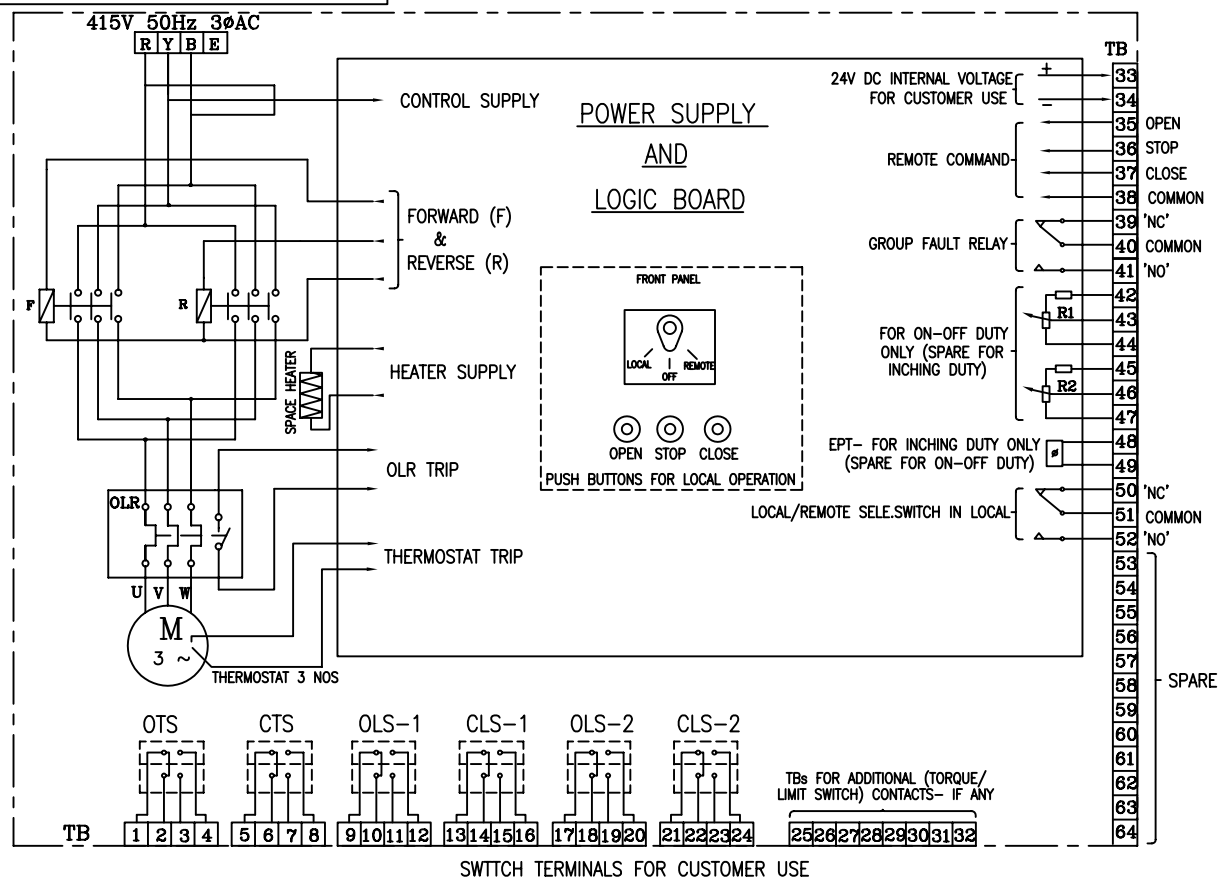
TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.
EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.

NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
				NAME
				SIGNATURE
				DATE

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

3-V-MISC-24227

DRAWING NO.



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 OF 100 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:-

- 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
- CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
- OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
- OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
- CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
- EPT - ELECTRONIC POSITION TRANSMITTER (POTENTIOMETRIC TYPE, FOR INCHING DUTY)
- R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
- FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
- M - MOTOR 3Φ 415V 50 Hz AC SUPPLY

REV	DATE	ALTERED
		CHD & APPD

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

TYPE OF PRODUCT ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS OR NAME OF CUSTOMER/PROJECT (DRAWN FOR INTERMEDIATE POSITION OF VALVES)		DRN N.P.ESWAR		SIGN N.P	DATE 07.10.04	NO.OF VAR.
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.		CHD D.DINAKARAN	D.D	07.10.04		
365-121		APPD K.ARUNACHALAM	K.A	07.10.04		
DEPT VL	SCALE	WEIGHT (KG).	REFERENCE INFORMATION			NO. OF ITEMS
CODE						
TITLE WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER		CARD CODE U 01	DRAWING NO. 3-V-MISC-24227			REV 0

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN				SPEC. NO : PE-TS-415-100-M016		DATE: 19.02.2021		
				CUSTOMER: M/S MAHAGENCO				QP NO.: PE-QP-415-100-M024		DATE: 19.02.2021		
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6				PO NO.: LATER				
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)			SYSTEM:	SECTION:			SHEET 1 OF 8	
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	

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). RT ON CHANGE OF SECTION & BW ENDS (RT FILM REVIEW BY BHEL)
				2) RT	100%	---	ASTM E 94	ASME B16.34 APPENDIX I	NDT REPORT	√	P/ W	V	V	
		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. TESTS	ONE PER HEAT	--	APPD. DRG. / REL. STD.	APPD. DRG. / REL. STD.	TEST CERT.	√	P/ W	V	V	

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:	ANUJ AWASTHI	Anuj Awasthi	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-415-100-M016			DATE: 19.02.2021		
				CUSTOMER: M/S MAHAGENCO				QP NO.: PE-QP-415-100-M024			DATE: 19.02.2021		
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6				PO NO.: LATER					
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)		SYSTEM:	SECTION:		SHEET 2 OF 8				
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	

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 (REFER REMARKS)	TEST CERT	√	P/ W	V	V	TEST TEMP. 125 DEG C, TEST DURATION 72 HRS, MAX CHANGE IN TENSILE STRENGTH. 20% ELOGATION: 20%, ELONGATION: 20%, HARDNESS: 3%
		8. HYDRAULIC STABILITY TEST (AFTER AGEING TEST)	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 REVIEW-PART OF POD (REFER POINT 3.7)

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
Sign & Date			Name			Sign & Date		Name		Seal	
Prepared by:	ANUJ AWASTHI	Anuj Awasthi	Checked by:	Ashish Panigrahi	Ashish Panigrahi	Seal		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-415-100-M016		DATE: 19.02.2021		
				CUSTOMER: M/S MAHAGENCO					QP NO.: PE-QP-415-100-M024		DATE: 19.02.2021		
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6					PO NO.: LATER				
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)			SYSTEM:	SECTION:			SHEET 3 OF 8		
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	

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:	ANUJ AWASTHI	Anuj Awasthi	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-415-100-M016			DATE: 19.02.2021		
				CUSTOMER: M/S MAHAGENCO					QP NO.: PE-QP-415-100-M024			DATE: 19.02.2021		
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6					PO NO.: LATER					
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)			SYSTEM:		SECTION:			SHEET 4 OF 8		
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	

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
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

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:	ANUJ AWASTHI	Anuj Awasthi	Checked by:	Ashish Panigrahi	Ashish Panigrahi			Reviewed by:			
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	Ritesh Kumar Jaiswal	RK Jaiswal			Approved by:			

बी एच ई एल BHEL		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN					SPEC. NO : PE-TS-415-100-M016			DATE: 19.02.2021	
				CUSTOMER: M/S MAHAGENCO					QP NO.: PE-QP-415-100-M024			DATE: 19.02.2021	
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6					PO NO.: LATER				
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)			SYSTEM:		SECTION:			SHEET 5 OF 8	
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	* D	**		
					M	C/N					M	C	

														AGENCY TO BE USED AND THE SAME IS 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 DEFECT	MA	DEPTH MEASUREMENT LPI	100% 100%	-- --	MFG. DWG ASTM E 165	MFG. DWG FREE FROM POROSITY/ CRACK	TEST REPORT NDT REPORT	√ √	P/ W P/ W	V V V V	V V 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% ON BW AREA	--	ASME B 16.34	ASME B 16.34	RT REPORT	√	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. 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	

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:	 ANUJ AWASTHI Digitally signed by Anuj Awasthi DN: cn=Anuj Awasthi, o=BHEL Date: 2023.02.28 10:55:02 +05'30'	Anuj Awasthi	Checked by:	 Ashish Panigrahi Digitally signed by Ashish Panigrahi DN: cn=Ashish Panigrahi, o=BHEL Date: 2023.02.28 10:55:02 +05'30'	Ashish Panigrahi			Reviewed by:			
Reviewed by:	 Prince Malik Digitally signed by Prince Malik DN: cn=Prince Malik, o=BHEL Date: 2023.02.19 13:53:56 +05'30'	Prince Malik	Reviewed by:	 Ritesh Kumar Jaiswal Digitally signed by Ritesh Kumar Jaiswal DN: cn=Ritesh Kumar Jaiswal, o=BHEL, ou=Creating a BHEL email id=jaiswal@bhel.in, c=IN Date: 2023.02.28 11:59:44	RK Jaiswal			Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			QUALITY PLAN				SPEC. NO : PE-TS-415-100-M016			DATE: 19.02.2021				
								CUSTOMER: M/S MAHAGENCO			QP NO.: PE-QP-415-100-M024			DATE: 19.02.2021	
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6				PO NO.: LATER							
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)				SYSTEM:		SECTION:			SHEET 6 OF 8		
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			

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	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.
		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	
		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	*COMPLETE VALVE ASSEMBLY ALONGWITH ACTUATOR SHALL BE 1) PARTIALLY OPENED 3 TIMES, UNDER LOAD (5.25 kg/cm ²) 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
		4. PERFORMANCE TEST	CR	PERFORM- ANCE	100%		AWWA C-504* / AWWA C-516 *	SMOOTH OPERATION	INSP. REPORT	√	P/ W	W	W	

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
Sign & Date			Name			Sign & Date		Name		Seal	
Prepared by:	ANUJ AWASTHI	Anuj Awasthi	Checked by:	Ashish Panigrahi	Ashish Panigrahi	Seal		Reviewed by:		Seal	
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	Ritesh Kumar Jaiswal	RK Jaiswal	Seal		Approved by:		Seal	

बी एच ई एल BHEL		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN					SPEC. NO : PE-TS-415-100-M016			DATE: 19.02.2021		
				CUSTOMER: M/S MAHAGENCO					QP NO.: PE-QP-415-100-M024			DATE: 19.02.2021		
				PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6					PO NO.: LATER					
				ITEM: BUTTERFLY VALVE (STEAM SERVICE)			SYSTEM:		SECTION:			SHEET 7 OF 8		
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

		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	
		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.....

4.0 FINAL INSPECTION

4.1	COMPLETE VALVE	1. OVERALL DIMENSION	MA	MEASUREMENT	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 & MEASUREMENT	100%	--	APPD DRG.	APPD DRG.	INSP. REPORT	√	P/W	V	V	
		2. UNIFORMITY & THICKNESS	MI	VISUAL & MEASUREMENT	100%	--	APPD DRG.	APPD DRG.	INSP. REPORT	√	P/W	V	V	

6.0 PACKING

6.1	PACKING	SOUNDNESS OF PACKING	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'
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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:	ANUJ AWASTHI	Anuj Awasthi	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-SS-415-100-M016	DATE: 19.02.2021
		CUSTOMER: M/S MAHAGENCO		QP NO.: PE-QP-415-100-M024	DATE: 19.02.2021
		PROJECT: 1x660 MW BHUSAWAL TPS UNIT-6		PO NO.: LATER	
		ITEM: BUTTERFLY VALVE (STEAM SERVICE)	SYSTEM:	SECTION:	SHEET 8 OF 8

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 (with LR no.) just before dispatch, to be sent to BHEL-PEM for information.
8. The latest revisions/year of issue of all the standard indicated in the QP shall be referred.
9. BHEL reserves the right for repeating of any test, if required.
10. Welding and Impregnation of castings are not permitted.

LEGENDS:

*RECORDS, IDENTIFIED 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						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:	ANUJ AWASTHI	Anuj Awasthi	Checked by:	Ashish Panigrahi	Ashish Panigrahi						
Reviewed by:	Prince Malik	Prince Malik	Reviewed by:	Ritesh Kumar Jaiswal	RK Jaiswal						

212757/2021/PS-PEM-MPL

	COMPLIANCE SHEET BUTTERFLY VALVE (STEAM SERVICE) 1x660 MW BHUSAWAL TPS UNIT-6		SPECIFICATION NO. PE-TS-415-100-M016	
			SECTION : II	
	REV. NO.: 00		DATE: 19.02.2021	
	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	