

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Total Pages: 8

Document Control Sheet:

Technical specification of Butterfly Valve (Raw water application) with Electro Hydraulic Actuator

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 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 1 of 8

This specification covers requirements of butterfly valves along-with electro hydraulic actuator which include design, material procurement, preparation of drawing & getting approval from BHEL and customer, vendor approval from customer, manufacturing, inspection & testing as per the approved QAP, packing & dispatch of butterfly valves complete with all accessories required for successful operation.

1) **General Requirements**

- a. Butterfly Valves shall be offered as per the specifications as mentioned herein. The valve shall be of fabricated design as per AWWA C516-10 with minimum single offset disc with maximum laying length as per AWWA C516-10 and flanged end connection.
- b. GA & cross sectional drawings showing dimensions and MOC of major items, valve datasheet along with applicable quality assurance plan (QAP), calculation of oil for each BFV EHA assembly & make of the oil along with applicable properties, paint schedule, test procedure, actuator datasheet & drawing and civil foundation details of valve & EHA components need to be submitted for approval after award of contract. Documents other than above, if required by customer (end user), shall be submitted by bidder as and when asked.
- c. BHEL's/Customer's representative shall be given access to the shop in which butterfly valves are being manufactured and tested. All test records shall be made available to BHEL's/Customer's representative.
- d. Erection & commission of equipment at site are excluded from the bidder's scope without affecting the guarantee & warranty associated with the offered butterfly valves in all respect.
- e. Supply of piping & its accessories and oil for EHA meeting layout requirement is sole responsibility of bidder. In case extra piping, its accessories or oil is required for completion of system, the same shall be supplied by vendor without commercial implication.
- f. Optional Price (Not part of bid evaluation)- Bidder to submit price schedule in open condition (i.e. not through sealed bid) in Technical bid for deputation of their service engineer afterwards for our reference. This price schedule for deputation shall not be used for bid evaluation however prices shall be negotiable with the bidder. This optional offer shall be valid up to 6 months from the actual delivery date of main equipment. (i.e. 6 months from the last date of supply of item)
- g. Any special tools, tackles & touch up paint etc. if required, for service action as spelt at S. No. 1(d) & (e) above shall be in bidder's scope.
- h. Complete valve needs to be machined at the works of valve manufacturer. Hence valve manufacturer should have suitable in-house machining facilities.

2) **Scope of supply:**

Butterfly valves are required as per the details and the requirements mentioned in this specification. Refer **Annexure-I & II** for technical details along-with other associated scope of butterfly valves.

BF Valve price shall be quoted for complete scope (i.e. BFV ready for use condition) which shall comprise of items mentioned at (a) below

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 2 of 8

a. List of items in the scope of supply:- (Use Price bid format)

1. BF Valve
2. BF valve Operator (power pack unit, hyd. Cylinder, hyd. Oil, Control panel, etc.)
3. Both side companion Flanges along-with associated Gasket & Hardware
4. Complete foundation items (e.g. foundation plate, associated fasteners, etc.) required for erection of valves.
5. Commissioning spares.

Note: Any items other than as listed above, if required “for ready to use for operation of BFV” shall be deemed to be included in above list along with their prices.

b. Price Schedule Spares –

b1. Commissioning Spares (as applicable)

- i) Gland packing – 2 Sets
- ii) Bearing – 2 Sets
- iii) Rubber seal - 2 sets

Note – 1 Set of quantity means, quantity applicable for 01 no. of B. F. Valve Assembly. The above prices will be considered for bid evaluation.

b2. Recommended Spares – These items to be listed by bidder along with item, unit rate, but will not be used for bid evaluation.

3) Design & Construction Requirements:

- a) Butterfly valves shall be designed for the design pressure & temperature of the system where it is installed and in accordance with AWWA C504 / **C516** standard (Latest edition) and Valve Class rating shall be selected accordingly. Valve Class Rating is to be clearly mentioned in the offer. **Hydro test & seal leak test pressure shall be as per Annexure-I only.**
- b) The layout of the piping arrangement near BFV is given in **Annexure-II**. Bidder to take care of the location of the Power pack unit & other accessories while designing the EHA assembly.
- c) In case of any contradiction between reference standard and this specification, the provisions of this specification will prevail.
- d) Butterfly Valves shall be of **bi-directional type with** double flanged construction and shall be complete with Electro Hydraulic Actuating mechanism along-with power pack unit (for successful operation of the valve at site), matching counter flanges and all associated bolts, studs, nuts, gaskets and lifting lugs.
- e) Butterfly Valves shall be suitable for the stated service conditions (i.e. flow, type of fluid, design temperature and pressure) as mentioned at **Annexure-I**.
- f) Butterfly valves shall be designed to ensure drop tight shut off at rated pressure.

	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 3 of 8

- g) The Sealing ring on the disk shall be continuous type and easily replaceable. Shaft seal shall be designed such that replacement can be made without valve shaft removal.
- h) For all types of valves, the design with shaft eccentric to the disc is required. The shaft shall be solid type and shall pivot on bushings.
- i) Bearing / Bushing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on water and on valve components. The housing for bearing shall be rigidly attached to the valve body and shall be protected from dirt and sand particles by suitable seals.
- j) A thrust collar shall be provided to hold the disc secured in the center.
- k) Design of shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft shall be connected to the disk through keys or taper pins or screws of stainless steel. The connections shall be designed so as to avoid looseness during the operation, moreover, they shall be provided with suitable disassembling systems.
- l) The shaft and any key for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However, shaft diameter shall not be less than the minimum shaft diameter specified in relevant code.
- m) The disc shall rotate from full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While disc is in throttled position, valve shall not create any noise or vibration.
- n) Lifting arrangement provision i.e., lifting lugs, eye bolts for handling of valve shall be provided.
- o) **Flange shall comply with the standard BS EN-1092-1. Face to face dimension of the complete butterfly valves shall be as per applicable AWWA C516 standard only.**
- p) Hydraulic operation of valve shall be designed to meet the required operating torque. It shall be designed to hold the valve disc in intermediate position between full open and full close position without creeping or fluttering.
- q) Adjustable mechanical stops shall be provided to prevent over travel in either direction.
- r) Hydraulic Operator with all associated items for successful operation of B.F. Valves to be procured from reputed vendors (e.g. M/s BOSCO REXROTH (India) Ltd. / Hydac (India) Pvt. Ltd. / Parker Hanifin India Pvt. Ltd. / Yuken India Ltd.) / etc. These are for reference purpose only. Butterfly Valve supplier to confirm regarding having MAHAGENCO approval from whom the Hydraulic Operator shall be procured and same is required to be submitted along-with the enquiry documents.

4) Material of Construction (Butterfly valves)

Material of construction (MOC) for major components of butterfly valve shall be as mentioned below. MOC for the remaining parts shall be as per relevant standard governing the valves and to suit the service condition. Material used in manufacturing shall be of tested quality and suitable for the operating fluid as mentioned herein.

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 4 of 8

Items	Material description
Butterfly Valve Body & Disc	Fab. IS 2062 Gr B
Valve Shaft	SS 316 (ASTM A 479)
Seat ring (Seat Ring Integral to body is not acceptable)	SS 316 (ASTM A 240)
Valve Seal	Nitrile Rubber
Seal Retaining Ring SS	SS 316 (ASTM A 240)
Bearing	Self-Lubricating type (SS backed PTFE / Bronze backed PTFE are acceptable)
External / Internal Hardware including the hardware for counter flange	Carbon Steel to IS 1367 CL P8.8
Counter Flanges	Carbon Steel to IS 2062 Gr B

Note Above mentioned requirements are the bare minimum requirement for butterfly valves and no deviation to above be acceptable in any case to BHEL Bhopal. However better or equivalent material can be used subjected to prior approval from BHEL.

5) **Quality Assurance Plan (QAP)**

QAP shall be complete in all respect and including of all stage inspections from raw material, BOIs, in process, assembly & testing, painting, packing & dispatch. Wherever mentioned is the minimum requirement, however, bidder to take due care for relevant checks & testing requirement while submitting the QAP & test procedure with offer. It is to be mentioned that the QAP shall be submitted to customer for approval. Comment (if any) shall be incorporated without any price implication.

6) **Proof of Design Test (Type test) for Butterfly valves & Valve Operators**

- All valves that are designed and manufactured as per AWWA C-504 / **C-516** shall be governed by the relevant clauses of POD test in AWWA C504 / **C516**. For Butterfly Valves designed and manufactured to EN-593, the POD test methods and procedures generally follow the guidelines of AWWA C504 / **C516** in all respect except that Body, seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593.
- Proof of design (POD) test certificates as per AWWA standard for each size group and class of offered butterfly valves with offered seat design & MOC (duly certified by third party) along with test report consisting of test procedure etc. shall require to be done and to be furnished after award of contract (before delivery of the item).**

Note In case POD test to be conducted as new, same is required to be done successfully preferably within maximum 03 months from the date of document / drawing approval from BHEL.

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 5 of 8

- c) No separate charges shall be payable by BHEL against any such testing to be carried out by bidder to the offered valves.
- d) Valve operator shall also be designed & tested in accordance with latest edition of AWWA C504 / **C516**. Actuators shall also meet the requirements of POD test of AWWA C504 / **C516**. POD test reports & certificates for valve operators shall also to be submitted along with offer for verification.

7) **Inspection and testing**

All inspection and testing for valve and valve operators shall be as per approved QAP. However, in case of award of contract, final inspection and testing shall be carried out by customer (end user) / customer appointed inspection agency / BHEL appointed inspection agency / Jointly by Customer & BHEL/BHEL appointed TPA - as per approved quality plan, drawings and other approved documents without any price implication. In case of inspection by both BHEL and customer, joint inspection can be carried out at bidder's works.

Bidder to give minimum 15 (Fifteen) days prior intimation for joint inspection.

Operation test (at the works of valve manufacturer) :

The complete valve assy. along-with the actuator shall be shop operated keeping the door in horizontal position and under no pressure condition. The valve to be operated for 25 cycles from fully closed to fully opened and vice versa. Checks shall be for free movement of valve door, open / close timings, operation of limit / torque switches and operation of position indicator.

General points related to inspection:

- i. Material test certificates, shop test reports & certificates along with other inspection reports as per QAP (duly approved by BHEL) shall be furnished before dispatch.
- ii. Soft Copy of As built drawing and O&M Instruction Manuals are also required to be furnished before dispatch.
- iii. Heat Treatment to be carried out in furnace duly calibrated by NABL approved agency.
- iv. After Heat Treatment, proper surface cleaning / machining, items need to be DPT by ISNT / ASNT approved Level-II NDT Person only.
- v. Any kind of weld repair is not permitted without prior permission from BHEL.
- vi. Chemical / Mechanical testing need to be carried out at lab having accreditation by NABL. In house instruments / machine can also be used for such testing subject to having valid calibration record (calibration done by any NABL approved agency). Own Spectrometer (duly calibrated using master calibration block in presence of BHEL-IA) can also be used for chemical testing.

8) **Performance Guarantee**

The bidder shall guarantee the material & workmanship of all the components as well as operation of equipment as per the requirements of this specification. The valves and all accessories shall be designed so as to guarantee an easy disassembling and maintenance. All valve components and accessories shall be interchangeable.

Supplier should give performance guarantee of the complete BF Valve Assembly for 36 months from the date of supply or 24 months from the date of commissioning whichever is earlier.

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 6 of 8

9) Protection & Paint

- Machined surface – Temp. rust preventive coat
- External Surface – 2 Coats each of Epoxy primer & Epoxy finish paint (Total DFT – 150 microns, colour – Grey)
- Internal Surface - 2 Coats each of Epoxy primer & Coal tar pitch Epoxy paint (Total DFT – 175 microns, colour – Black)

10) Packing & Dispatch

- After testing, each valve shall be drained, cleaned, dried completely and suitably protected in sturdy wooden box so as to avoid damage during transit and storage.

Following details shall be mentioned on each box as bare minimum.

- Name of the manufacturer.
 - BHEL P.O. No. – on box and valve both.
 - Month and year of manufacture – on box only.
 - Valve size with Tag No. – on box and valve both.
- BF Valve is to be dispatched as per the shipping schedule (already furnished to BHEL) in assembled condition with sec. gearbox / Actuator with Gear Box without any risk of damage to disc, seat, mating surfaces, and painting. Accessories such as companion flanges, gasket (cut-proof condition), elec. actuators and loose hardware (in rustproof condition) can be dispatched separately.

11) Deviation

Deviation from our requirement (if any), needs to be clearly mentioned & listed in separate sheet during enquiry stage only. It is BHEL's prerogative to accept such deviation during offer evaluation.

12) Drawing/Documents to be submitted along with the bid

- Complete cross-sectional arrangement of valve showing MOC of major parts, hydraulic operator assembly (power pack unit, hyd. Cylinder) & all accessories with dimensions, valve weight, actuator assembly weight, O/C timing, design & test pressure and other technical details.
- Actuator sizing calculation, torque & shaft sizing calculation, valve characteristic & pressure drop curves applicable for offered valves.
- List of sub-vendors for BOIs.
- Deviation (if any) to be mentioned in separate deviation sheet in totality. Else to be mentioned as "Nil".
- This specification duly signed and stamped as acceptance of all technical parameters.

 BHOPAL	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 7 of 8

13) Drawing/Documents to be submitted for approval after award of contract

- a) GA drawing of Valve (including companion flange details) & Hydraulic operator assembly including civil foundation details of valve & EHA components
- b) BF Valve datasheet.
- c) Detail QAP & Test Procedure.
- d) Datasheet, drawing (power pack with foundation details, servomotor, control panel, etc.), schematic & hydraulic control diagram, control logic diagram, etc. (as applicable).
- e) POD test procedure and test set-up for valve testing
- f) Test Certificates (test results) of POD test for offered valve as per AWWA C504 / C516
- g) POD test reports & certificates for valve operators
- h) Shipping/Packing schedule for dispatch of valve and accessories.
- i) O&M Instruction Manuals
- j) **For power Pack Unit :**
 - i. Calculation of oil for each BFV EHA assembly & make of the oil along with applicable properties
 - ii. A quality plan covering Type test & routine test for electric motors, Performance test for power pack unit and Hydraulic pressure test for inert gas accumulator & other hydro mechanical devices used in the assembly and other tests normally carried out by the supplier. Test certificates for these tests shall be furnished.
 - iii. Material test for components for all the devices mounted on the power pack unit.

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	Condenser & Heat Exchanger Engg. Division <u>Technical Specification of</u> Butterfly Valves with Electro Hydraulic Actuator	Document No.	
		CDE - 20 – 3490	
		Rev. No. 00	Page: 8 of 8

DEVIATION SHEET

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