MPI MCWANE PLANT & INDUSTRIAL

SEAT ON BODY BUTTERFLY VALVE

3”-36” AWWA C504

INSTALLATION & OPERATION MANUAL

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INTRODUCTION

Butterfly Valves are commonly used in water transmission and distribution. This manual will provide you with the information needed to properly install, operate, and maintain the valve and to provide long service life.
The rubber seat provides a drip-tight alternative to metal-seated valves. BFVs offer flow control advantages and economy vs. gate valves, which become increasingly more significant with larger sizes.

For pump station and treatment plant applications, BFVs offer flow control advantages (such as throttling) over gate valves. BFVs are manufactured in accordance with the current version of the American Water Works Association (AWWA) C504 standard. BFVs are constructed of ductile iron, stainless steel, rubber seats & seals. The strength of ductile iron along with stainless steel components provide corrosion resistance for buried service applications.

RECEIVING & STORAGE

Inspect valves upon receipt to ensure correct material, quantity, and any optional equipment has been received. Also inspect all received equipment for any damage which may have occurred during shipment. Contact the McWane Plant & Industrial sales team to report any issues with materials received.

Unload all valves safely to protect both the materials and workers. For valves 36" and larger, use forklifts or slings under skids. Do not lift valves with slings or chains around the operating shaft, operator, or through waterway. Lift smaller valves with eyebolts or rods through the flange holes.

Protect the valve and operators from weather and the accumulation of dirt, rocks, and debris. For long term storage, valves should be kept indoors with the valve disc slightly open (4-6 degrees). When valves fitted with power operators and controls are stored, energize electric operators or otherwise protect electrical control equipment to prevent corrosion of electrical contacts due to condensation resulting from temperature variation. If outdoor storage is required valves need to be protected from weather and foreign materials.

INSTALLATION

WARNING: Installation of valves should be performed by experienced installers. Valves should never be used as structural supports and movement into place. Valves are heavy and may include accessories or bolt on pieces which should be handled with caution.

NOTE: BEFORE INSTALLING THE VALVE:

1. Prior to installation check that the valve and end joints are clean. Check for damage to the valve.

2. Open and close the valve to ensure proper operation.

3. The inside diameter (ID) of the mating of the piping system should be considered BEFORE installing the valve. When BFVs open, the vane will extend into the mating piping system.

It is recommended for valves to be installed into piping system in accordance with AWWA M-11 to prevent any undue piping stress, deflection or bending that may affect the performance of the valve.

1. Place valve into position carefully to avoid impact with trench walls or vault walls.

2. When connecting pipe to the BFV, do not deflect the pipe to connect the valve. Do not use the valve as a jack to pull into alignment. As much as reasonably possible, the BFV should be in an "unconstrained" position with the weight of the valve being supported independently of the pipe connection. Pipe connections can put undue stress on the valve pulling the valve body out of shape and causing it not to seal properly. This becomes increasingly important as the piping size gets larger.

MECHANICAL JOINT INSTALLATION:
When connecting BFV mechanical joints (MJs) bolting torques should not exceed the recommended torque limits in the appendix of AWWA C-111.

A. The use of an NSF 61 approved pipe grade lubricant is recommended to minimize gasket to pipe binding.

B. The most important factor is pulling the gland down uniformly so that the face of the gland follower remains parallel to the face of the valve flange throughout the tightening cycle. The torque on the nuts should be uniform, utilizing an alternating star pattern with as many as five repetitions of tightening to assure even torque stress.

C. The MJ bolts should be torqued in accordance with the AWWA C111 specification. See the chart below for a quick reference. Torques in excess of the recommendations below may damage the BFV, the mechanical joint gland or both.

Valve Size	Bolt Size		Range of Torque	
	in.	mm.	lbf-ft	N-m
3"	5/8	15.9	45-60	61-81
4"-24"	3/4	19.1	75-90	102-122
30"-36"	1	25.4	100-120	136-163
42"-54"	1-1/4	31.8	120-150	163-203

*AWWA C111-17, Table A.1, Mechanical-joint torque loads

FLANGED ENDS INSTALLATION:
1. The weight of the valve should be supported independent of the pipe connection. Provisions for thrust restraint must be adequate to absorb closing thrust.

2. Prior to assembly, flange faces must be cleaned to remove rust, paint runs, or other impediments to smooth surfaces.

3. All bolting patterns are in accordance with ANSI B16.1. Bolt torques for flanged valves should be based on the yield strength of the bolt. Due to size and casting restrictions, BFV sizes 18" and larger for ANSI Class 125# and 10" and larger for ANSI Class 250# have some tapped holes (instead of thru holes) in the flanges. These are located around the operator or thrust ends. The charts below shows thread depth / flange thickness, thread size, and # of threaded holes per flange. NOTE: To determine the total required length of the stud, add this dimension to the thickness of the adjoining flange plus the thickness of the appropriate nut.

ANSI CLASS 125# FLANGES

Valve Size	Thread Depth / Flange Thickness	Thread Size	# of Threaded Holes per Flange
18″	1-9/16″	1-1/8″-7 UNC	4
20″	1-11/16″	1-1/8″-7 UNC	4
24"	1-7/8"	1 1/4"-7 UNC	4
30"	2-1/8"	1 1/4"-7 UNC	4
36"	2-3/8"	1 1/2"-6 UNC	4

ANSI CLASS 250# FLANGES

Valve Size	Thread Depth / Flange Thickness	Thread Size	# of Threaded Holes per Flange
10″	1-7/8″	1″-8 UNC	4
12″	2″	1-1/8″-7 UNC	4
14"	2-1/8"	1-1/8″-7 UNC	4
16"	2-1/4"	1-1/4"-7 UNC	4
18"	2-3/8"	1-1/4"-7 UNC	4
20"	2-1/2"	1-1/4"-7 UNC	4
24"	2-3/4"	1-1/2" -6 UNC	4
30"	2-3/4"	1-3/4" -5 UNC	4
36	2-15/16"	2"-4.5 UNC	4

4. If it is determined to use a bolt rather than a stud, add the tapped bore dimension plus the adjoining flange dimension to acquire the required bolt length.(Bolt length as measured from the base of the bearing surface - or head - to the end of threads). Check the adjoining fitting and flange clearances to confirm there is enough room to swing the bolt into place.

NOTE: Butterfly valves should not be installed at a dead end or near a bend in a pipeline without proper & adequate restraint to support the valve and prevent it from blowing off the end of the line. It is good engineering practice to consider whether thrust blocks, restrained joints, or other means of restraint are needed on or adjacent to valves on pipelines and/or where unusual conditions exist, such as high internal pressures, adjacent fittings, or unsuitable soils. Buried valves installed with valve boxes shall be installed so that the valve box does not transmit shock or stress to the valve operator as a result of shifting soil or traffic load.

OPERATION

Operational criteria for rubber seated BFV are covered in the appendix section of AWWA C504. DO NOT operate any valve at pressures above the rated pressure of the valve. DO NOT exceed 300 ft-lbs input torque on operation with wrench nuts and do not exceed 200 lb. rim pull for hand-wheel or chainwheels against the open or closed stops.

Do not remove a BFV operator while under flow and pressure. Without an operator in place holding the vane, a BFV will try to close in the presence of flow and can create a hazardous water hammer situation. BFVs can be operated manually by rotating the handwheel, chainwheel, or nut. Do not force the handwheel, chainwheel, or nut to close faster. This can cause damage to the gearing.

BFV traveling nut operators are designed to open and close the valve at LESS THAN 150ft-lbs. of input torque. Torque in excess of these limits may damage the valve or operator or both. Maintenance personnel should be aware of the type of operators being used before actuating the valves.

Cylinder operators are base mounted and operated automatically by pneumatic or hydraulic pressure to either side of the power cylinder. Cylinder operators use solenoid valves to direct fluid to the cylinder ports based on electrical power signals.

Motor actuators are designed to open and close the valve through its ¼ turn of rotation. They contain gearing that slowly moves the valve from open to close position. Electrical controls are included in the motor actuator for local electrical control. The positioning of the valve disc will be done by limit switches in the motor actuator. Instructions for adjustment of limit switches or mechanical stops can be found in the motor manual.

BFVs can be automated to suit virtually all control even those with very specific design criteria.

MAINTENANCE

Before any maintenance or service work is conducted on a BFV, whether above or below ground, all potential safety issues should be considered. Prior to maintenance, properly identify the BFV model and its operator then obtain the correct service information.

Annual maintenance of the BFV includes the following:

1. Cycle the valve to verify operation and no interference in line.
2. Close the valve and check for any leaks.

PACKING ADJUSTMENTS:
On valves with adjustable packing, if leakage past the packing occurs, tighten the packing nuts just enough to stop the

leakage. Over-tightening will cause excessive operating torques and premature packing wear. If packing leakage cannot be stopped by tightening the packing nuts, the packing must be replaced.

PACKING REPLACEMENT:
To replace the packing you will need:
- New packing rings
- NSF 61 approved lubricant

1. Close the valve, relieve pipeline pressure and drain portion of the system where valve is located.

!!! Warning: Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.

3. Remove the actuator from the valve.

4. Remove the gear stand from the top of the valve. (Gear stand not present on buried service valves.)

5. Remove the gland off the valve.

6. Pull all of the packing rings from the packing chamber with a hooked tool.

7. Apply a paint-like coat of an NSF 61 approved lubricant to the inside and outside diameters of the new packing rings, then install the new packing rings one ring at a time.
Note: Push the packing firmly into place, but do not use a sharp or pointed tool.

8. Install gland.

9. Install the gear stand on top of the valve. (Gear stand not present on buried service valves.)

10. Install the actuator on the valve.

DISASSEMBLING VALVE
Before disassembly, remove the valve from the pipe line, open the valve and remove actuator (and adapter, if included) from the valve.

For valve reassembly you will need:
-New packing rings
-New bottom cover seals (V-rings 10"-24"", O-ring 3"-8", 30" and larger)
-New valve seat (30" and larger)
-New shaft pins, nuts, washers, o-rings
-NSF 61 approved lubricant.
-Loctite 680
!!! Warning: Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

Removing the Disc/Shaft from Body
1. If the valve has packing gland, remove the screws, the washers and the gland.

2. Pull all the packing out using hooked tool.

3. Remove bottom cover and seal (V-rings 10"-24", O-ring 3"-8", 30"and larger)

4. Remove pins holding the disc to shaft with a hammer. Caution- Secure the disc before moving to the next step of removing the shaft.

5. Remove shaft (single-piece shaft up to 24", upper and lower shaft 30" and larger.

6. Remove the disc.

7. For 30" and larger, remove retaining segments and valve seat.

8. Remove bearings.

VALVE CLEANING RECOMMENDATIONS
1. Remove all dirt and chips from all parts.
2. Remove all grease and oil from all surfaces of seat.
3. Remove all rust from the seat groove in body.

LUBRICATION
1. Apply a paint-like coat of an NSF 61 approved lubricant to the following surfaces:
a. The inside and outside diameters of each rubber packing ring
b. The O-ring(s)
c. All surfaces of the keyseat in the shaft
d. The disc sealing surface on the seat
e. For 30" valves and larger apply grease to the disc seat.

2. Apply a light coat of an anti-seize compound to the inside diameter of the bushings, and all surfaces of the key.

REASSEMBLING THE VALVE
1. Block the body in a horizontal position with the seat facing down.

2. For 30" and larger valves, insert seat retaining segments into the valve. Insert seat into seat groove, and tighten the retaining segments to hold the seat in place utilizing a cross over pattern.

3. Apply the Loctite 680 on the outside surface of the bushings. Insert the bushings into the shaft bores

4. Holding the disc in a horizontal position with the shaft connection toward the top of body. Insert the disc into the seat opening and align the shaft holes in the disc with the shaft holes in the body.

5. Insert the shaft through the top of the body and into the top of the disc. Align the holes in the disc with the pin

holes in the stem.

a. Note: Insert the shaft carefully so that the upper bearing is not damaged or moved out of position.

6. For 30" valves and larger, insert the lower shaft through the bottom of the body and into the bottom of the disc. Align the holes in the disc with the pin holes in the stem.

a. Note: Insert the shaft carefully so that the lower bearing is not damaged, or moved out of position.

7. Assemble the pins to connect the disc to the valve shaft(s).

8. Insert the packing rings into the top of the valve, and reinstall the gland.

9. Assemble the bottom cover. For 8" valves and smaller insert the o-ring, 10"-24" valves and larger insert the v-ring seals. For valves 30" and larger install the thrust plate and o-ring. Assemble the bottom cover.

10. Mount the actuator to the valve.

11. Turn the disc to the full close position.

a. Ensure the same depth measurement on the disc to flange face on both sides of the disc to set the close limit on the actuator.

b. Turn the disc to the full open position, set the open limit for the actuator.

b. Cycle the valve full open and full close 5 times, and recheck the depth measurements.

VALVE REMOVAL:

To remove the entire valve assembly from the pipeline, follow these steps carefully.

1. Relieve pipeline pressure and drain portion of the system where valve is located.

!!! Warning: Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

2. Close the valve.

3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.

4. Support the valve assembly, then remove the flange bolts or mechanical joint connector.

5. Remove the valve from the pipeline.

a. Note: Failure to lift the valve properly may cause damage. Lift the valve with slings fastened around the valve body, or attach them to bolts or rods run through the bolt holes for the pipeline flanges. Do not fasten lifting devices to the actuator or disc, or through the seat opening in the body.

SEAT ADJUSTMENTS:

Seat adjustments on 30" and larger are possible by adjusting the tightness of the retaining segments in areas that experience leakage in the valve.

SEAT REPLACEMENT:

For seat replacements please contact the MPI Service department

TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
Valve leaks when closed	*Disc not fully closed or past fully closed*	*Adjust actuator closed position stop*
	Disc edge wear or damage	*Clean and/or replace disc edge*
	Rubber seat wear or damage	*Adjust or replace valve seat*
Chainwheel jam	*Poorly fitting chain*	*Replace with correct chain*
Valve hard to operate	*Foreign material in valve*	*Remove obstructions*
	Corroded actuator parts	*Clean and grease actuator*
	Loose Actuator	*Apply locking compound and tighten bolts*
Internal operator obstruction	*Debris in threaded components*	*Work Input shaft in the open or closed direction several times until full travel is permitted*
Internal to the Valve Obstruction	*Vane interference*	*Remove valve from line to modify mating pipe ID*
	Internal obstruction	*Access vane and physically remove obstruction*
External Obstruction	*Op. nut interference*	*Check Op. Nut clearances in buried service valve boxes*
	Binding of operational accessories	*Adjust as needed to resolve binding*
	Thrust plate not mounted securely	*Fully thread the input shaft into the operator housing and tighten*
Packing Leaks	*Packing is loose* *Packing is worn*	*Adjust Packing* *Replace Packing*

**Inspection for the above should be done semi annually at a minimum.

PARTS & SERVICE

Parts and service are available from your local representative or the factory. For availability and pricing of spare parts please contact the MPI sales team:

MCWANE PLANT & INDUSTRIAL
866.924.8674 • sales@mcwanepi.com • mcwanepi.com