

# TTR Group Inc.

The Engineered Valve  
& Speciality Products Company



## Suggested Specifications

Meeting and Exceeding AWWA Guidelines

**AWWA C 504 Latest Revision Butterfly Valves**

**AWWA C 508 Latest Revision Check Valves**

**AWWA C 517 Latest Revision Plug Valves**

**AWWA C 512 Latest Revision Air Valves**

**AWWA C 530 Latest Revision Pressure Reducing Valves**

**TTR Engineered Pedestals • Brackets • Extensions • Torque Tubes**

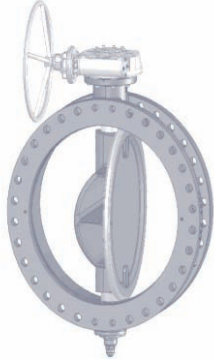
### MARKETS

Water • Waste Water • Buried • In-Plant • Power • Industrial



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Valve & Application Solutions for the Municipal, Industrial, Mining and Power Industries

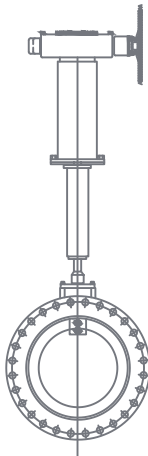


Specializing in Air Release, Check, Butterfly and Plug Valves, Crispin Valve has served the international valve industry since 1905.

Crispin's products are used in almost every application where water or liquid is moved from one place to another—from pipeworks in the municipal water industry to a wide range of applications across a variety of markets.



With its rugged piston-style design, a Ross Valve offers unparalleled long-term value and customizability for any application. There is no “off the shelf” valve that will perform optimally in every application, so every Ross Valve is designed with at least 10 separate criteria to ensure the best performance possible. Ross Valve's staff of engineers has the company's 130 years of experience and tools like fluid modeling at its disposal to assist with all your product and application requests.



- Specialty Products for Water and Wastewater Applications
- Engineered Specialty Check Valves
- Engineered Low Pressure Butterfly Valves
- Rod Extensions for Buried and Submerged Service
- Shaft Extensions and Pedestals
- Free Standing Torque Tubes
- Mud Valves
- Site Training, Field Service and Commissioning



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**General**

All butterfly valves shall be of the tight-closing, rubber-seated type, conforming to the design standards of ANSI/AWWA C504 latest revision, except where noted herein. Valves shall be bubble-tight at the rated pressure in either direction and shall be suitable for throttling service and/or operation after long periods of inactivity. Maximum operating non-shock shut-off pressure and maximum operating non-shock line pressure is 150 psi. Each valve shall be performance and leak tested as specified in AWWA C504 revised as follows: In addition to the testing requirements of AWWA C504, each butterfly valve shall be thoroughly cleaned and opened at least three (3) times prior to testing. The manufacturer shall certify that the butterfly valves are capable of operating in continuous duty service under the specified pressures and flow conditions.

**Bodies**

Butterfly valves shall be AWWA C504 latest revision, Class 150B, unless otherwise indicated and of the flanged short body design. The valve bodies shall be constructed of Cast Iron ASTM A-126, Class B or Ductile Iron in accordance with ASTM A-536 with ANSI B16.1 flange drilling or for mechanical joint ends shall conform to ANSI/AWWA C111/A21.11 standard. Flanges shall conform to AWWA Class D standards.

**Disc**

Discs for valve sizes 75mm-500mm shall be of the concentric design. Valve discs shall be constructed of 316 stainless steel for sizes 75mm to 200mm and epoxy coated Ductile Iron ASTM-A536 for sizes 250mm to 500mm. Valve disc shall have a 316 stainless steel seating edge. Valve discs shall seat at 90 degrees to the access of the pipe and shall require no torque to hold it in the closed position.

**Seats**

The resilient seat shall be Buna-N for valves 75mm-500mm and shall be simultaneously bonded and vulcanized to body of the valve. All interior surfaces in contact with water, excluding stainless steel and disc, shall be completely rubber lined. Seats for valves 75mm-500mm shall be designed so that they will require no internal adjustment or maintenance to seat against a pressure differential of 150 psi on either side of the valve. Field replaceable, or adjustable in sizes 75mm-500mm and will not be considered. Valves with seat designs that are located on the disc will not be considered.

**Bearings**

All bearings shall be of the self-lubricating, corrosion-resistant, sleeve type. Bearings shall be designed for horizontal and/or vertical shaft loading. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times.

**Shafts**

Valves 75mm-500mm shall have a one piece through shaft constructed of Stainless Steel ASTM A-276, Grade 304, corresponding to the requirements of AWWA C504, latest revision. The shaft shall be fastened to the disc by means of a threaded disc pin providing a positive leak proof connection of the shaft to the disc. The use of taper pins for the shaft/disc connection allowing for potential leak paths across the disc will not be considered.

**Shaft Packing**

Shaft packing shall be of the V-type, self-adjusting type and suitable for pressure and vacuum service. The packing shall be PTFE, interlocking braid, self-compensating type. Stuffing boxes for pull down packing shall have a depth sufficient to accept at least four (4) rings of self-compensating type packing specifically selected for the operating pressure to be encountered.

**Coatings**

The interior of valves 75mm-500mm shall be completely rubber lined. The valve disc shall either be entirely 316 stainless steel or be ductile iron with epoxy coating from an AWWA NSF 61 coating system. The lining material shall be in compliance with ANSI/NSF Standard 61, for contact with potable water. The lining material shall be "Pota-Pox" as manufactured by Tnemec, or equal. The interior lining shall be applied in a minimum of two coats, at 4-5 mils per coat; the total dry thickness shall be 8-10 mils.

The exterior surfaces shall be cleaned and sandblasted. Coating shall be applied in accordance with manufacturer's instructions. Surface face cleanliness shall be inspected and any contaminants on the surface shall be removed prior to the coating operations. The coating material shall be "Pota-Pox" as manufactured by Tnemec, or equal. The coating material shall be applied in a minimum of two coats, at 4-5 mils per coat; the total dry thickness shall be 8-10 mils.

**Valve Identification**

All items shall have the name or symbol of the maker, nominal size, date of manufacture, and the working pressure for which they are designed, cast, stamped, or permanently marked on the body.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Experience and Requirements**

The manufacturer shall have had a successful experience in manufacturing tight closing Buna-N or other acceptable synthetic rubber seated butterfly valves for this type service in the size indicated. The manufacturer shall have at least 8 years' experience in the manufacture of valves. All butterfly valves of the same type shall be the product of one manufacturer. All materials used shall be new, of high grade, and with properties best suited to the working environment and media.

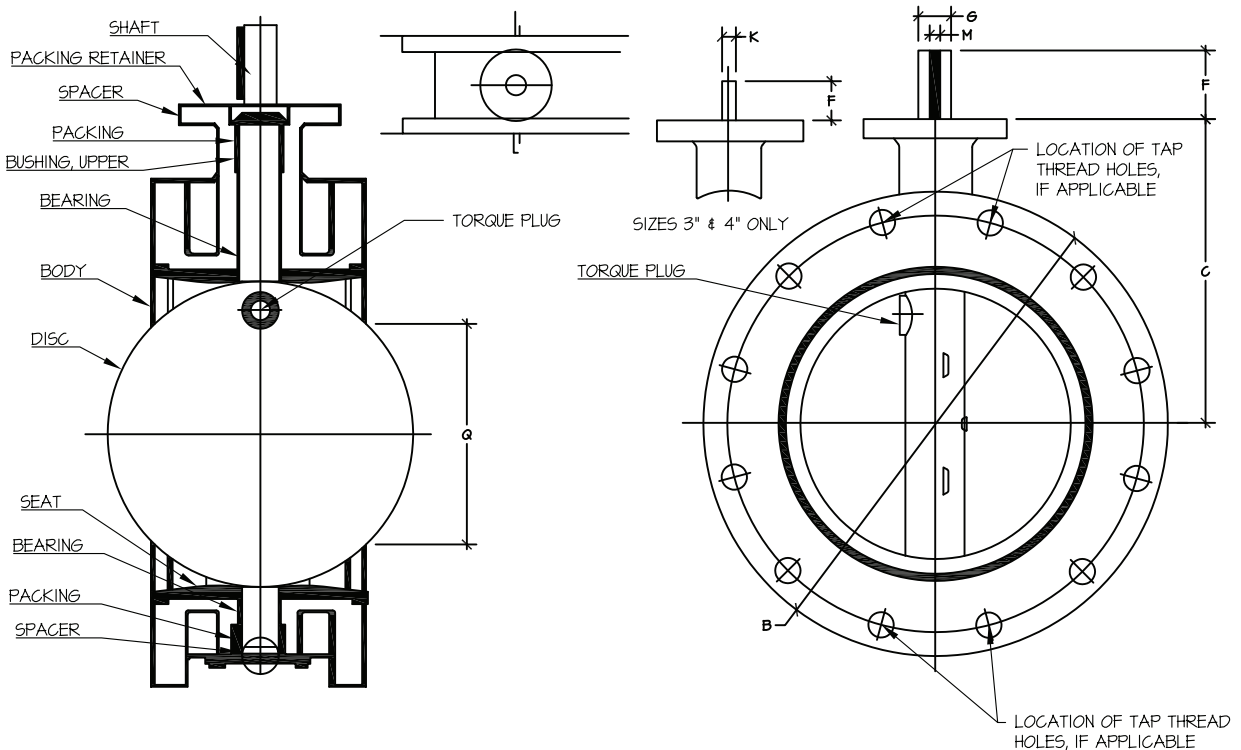
**Acceptable Manufacturers**


The valve shall be Crispin K-FLO series "500", as manufactured by Crispin-Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B, Optional Ductile Iron ASTM A536 Grade 65-45-12
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12 316 Stainless Steel Edge
<b>Seat</b>	Synthetic Rubber Bonded to Cast Iron Body Buna-N Standard, EPDM Optional
<b>Shaft</b>	Stainless Steel ASTM A276 Grade 304 Standard, Grade 316 Optional
<b>Bearings</b>	316 Stainless Steel TFE Lined Upper Stem Bushing Polyester

PART	MATERIAL
BODY:	CAST IRON (ASTM A126, CLASS B); DUCTILE IRON (OPTIONAL); (ASTM A536 GRADE 65/45/12)
SEAT:	SEATING OF SYNTHETIC RUBBER BONDED TO CAST IRON BODY. BUNA-N STANDARD; EPDM OPTIONAL (TESTED IN ACCORDANCE WITH ASTM D429 METHOD B)
UPPER STEM BUSHING:	POLYESTER
SHAFT:	STAINLESS STEEL (ASTM A276); GRADE 304 STANDARD, GRADE 316 OPTIONAL; IT-4PH ON CLASS 250B
DISC:	DUCTILE IRON (ASTM A536, GRADE 65-45-12) WITH A 316 STAINLESS STEEL EDGE. ALL DISCS ARE COATED WITH A FUSION BOND EPOXY FOR EXTRA LONG PRODUCT LIFE.
BEARINGS:	316 STAINLESS STEEL; TFE LINED.



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	<b>CRISPIN K-FLO BUTTERFLY VALVE</b>			
2			APPROVED BY:	FINISH	<b>SERIES 500</b>			
1			DATE:	FILLETS & RADII .031	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
RFP			DATE:	BREAK SHARP EDGES	PO #	SCALE: NTS		
No.	ERN	DATE			SO #			
REVISIONS								

**General**

The butterfly valves shall conform to the latest edition of AWWA C504 Standard for Rubber Seated Flange AWWA Butterfly Valves. The valves and actuators shall conform to any supplementary requirements of the City. The valves shall be Zero Leakage at rated pressures for the bi-directional flow conditions, and shall be satisfactory for applications involving on-service and valve operation after long periods of inactivity. The valves shall be designed for the velocities and pressure set out in the identified sections of these specifications and shall have Class B velocity designation. If it is not identified all valves shall be Class 150B.

**Bodies**

The valve body shall be Cast Iron ASTM A-126 Class B or Ductile Iron ASTM 536 65-45-12, narrow body design. Body thickness shall be in strict accordance with AWWA C504 latest revision where applicable. The valve shall have a clear inside diameter.

**Disc**

The valve disc shall be constructed of Ductile Iron ASTM A-536 with 316 stainless steel disc edge. The disc shall be free of hollow chambers. All surfaces shall be capable of visual inspection. Disc and shaft connections shall be made with stainless steel pins that do not generate a leak path across the disc. Cast iron discs or alloy cast iron are not acceptable. Head loss analysis and Cv values shall be provided with the tender submission and will be taken into consideration by the city or appointed engineers during the tender analysis. All valves must be shipped with valve discs 3-2 degrees open.

**Seats**

All seats shall be of natural or synthetic rubber. Rubber seats shall be clamped, mechanically secured or bonded to the valve body. Valve seats shall be field adjustable around the full 360 degree circumference under full pressure without removal of the valve. Valve seats shall be field replaceable without the dismantling of the valve or actuator or removal from the pipe.

**Bearings**

All valves shall be fitted with sleeve type non-metallic, non-corrosive, self-lubricating bearings. Bearing loads shall not exceed 1/5 (one fifth) of the compressive strength of the bearing or shaft material.

**Shafts**

All valve shafts shall be one piece of two piece stub-shaft type 304 or 316 ground and polished stainless steel. The shaft diameter shall meet the latest requirements of AWWA C504. Carbon steel shafts with stainless steel journals are not acceptable. The lower valve shaft shall incorporate a dual thrust bearing to permit valve positioning in a 360 degree circumference. The valve shaft shall be capable of horizontal mounting.

**Shaft Packing**

All shaft seals shall be of the self-adjusting chevron "V" type shaft seals. The shaft seals or packing shall be retained with an external adjustable packing gland. The packing shall be field replaceable and adjustable. Removal of the actuator will not cause the packing to leak and the packing shall remain retained. Leakage of the upper packing will not pressurize the base of the actuator. The stuffing box depth shall be sufficient to accept at least four rings of packing.

**Coatings**

All valves shall be coated with minimum 8 mils DFT externally with NSF 61 epoxy coating and minimum 8 mils DFT internally coated with NSF 61. Fusion bonded NSF certified coatings are acceptable. Color and coating manufacture is to be specified on the drawings.

**Lifting Lugs**

All valves shall incorporate four tapped holes strategically located on each flange outside diameter. Two hoist rings shall be supplied with each valve. The hoist rings shall be capable of lifting the valve together with the actuator as a single unit.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Experience and Requirements**

The manufacturer shall have previously manufactured rubber-seated AWWA butterfly valves for a minimum period of five years.

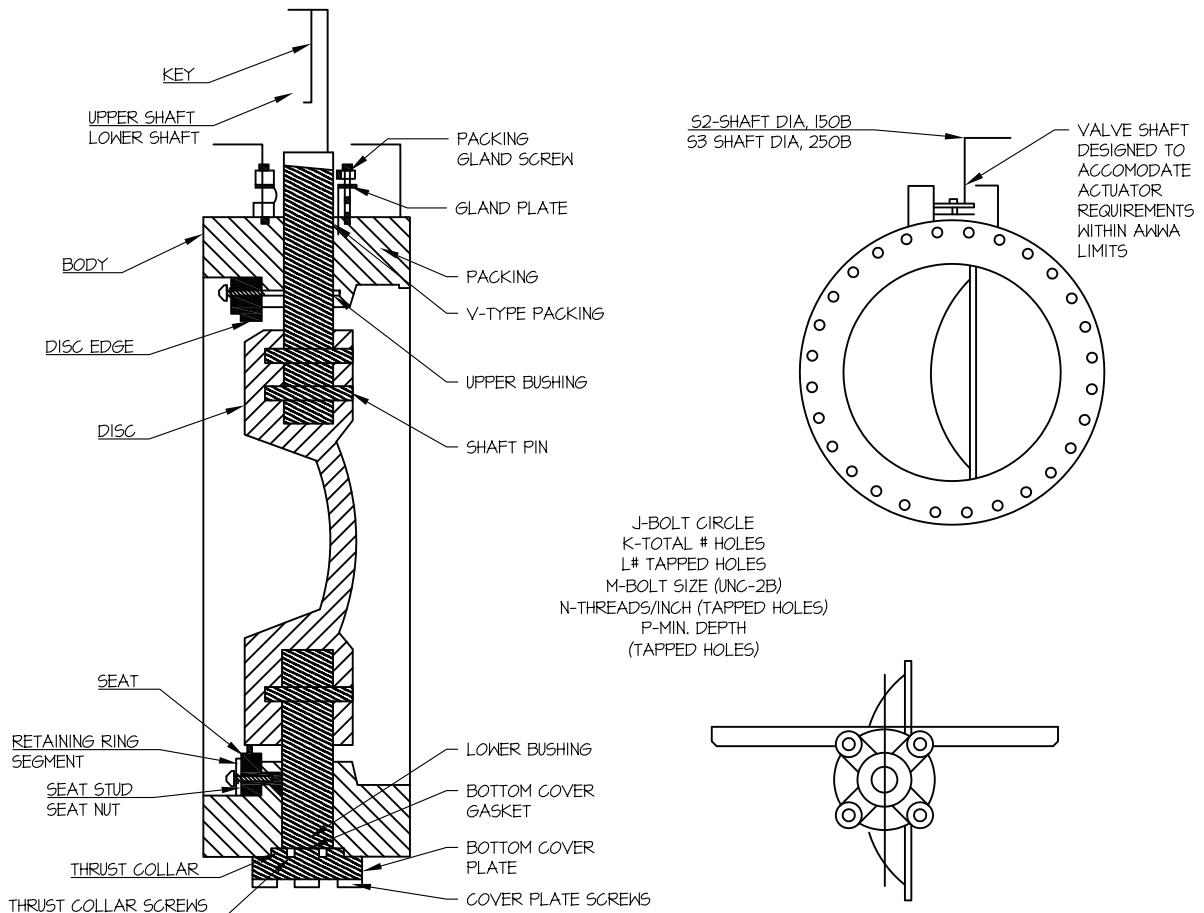
**Acceptable Manufacturers**


The valve shall be Crispin K-FLO series "47", as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B, Optional Ductile Iron ASTM A536 Grade 65-45-12
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12 316 Stainless Steel Edge
<b>Seat</b>	Buna-N Standard, EPDM Optional
<b>Shaft</b>	Stainless Steel ASTM A276 Grade 304 or 316 Monel Optional: 17-4pH Stainless Steel
<b>Bearings</b>	316 Stainless Steel TFE Lined

PART	MATERIAL
BODY:	CAST IRON (ASTM A126, CLASS B); DUCTILE IRON; (ASTM A536 GRADE 65/45/12)
SEAT:	BUNA-N STANDARD. EPDM OPTIONAL.
SHAFT:	STAINLESS STEEL (ASTM A276); GRADES 304 OR 316 MONEL OPTIONAL; 17-4PH STAINLESS STEEL
DISC:	DUCTILE IRON (ASTM A536, GRADE 65-45-12) WITH A 316 STAINLESS STEEL EDGE.
BEARINGS:	316 STAINLESS STEEL; TFE LINED.



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	CRISPIN K-FLO BUTTERFLY VALVE SERIES 47			
2			APPROVED BY:	FINISH	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1			DATE:	FILLET & RADII .031		SCALE:		
RFP			DATE:	BREAK SHARP EDGES	PO #	NTS		
No.	ERN	DATE			SO #			
REVISIONS								

**General**

The butterfly valves shall conform to the latest edition of AWWA C504 Standard for Rubber Seated Flange AWWA Butterfly Valves. The valves and actuators shall conform to any supplementary requirements of the City. The valves shall be Zero Leakage at rated pressures for the bi-directional flow conditions, and shall be satisfactory for applications involving on-service and valve operation after long periods of inactivity. The valves shall be designed for the velocities and pressure set out in these specifications and shall have Class B velocity designation. If the pressure is not specified all valves shall be to AWWA Class 150B.

**Bodies**

The valve body shall be Cast Iron ASTM A-126 Class B or Ductile Iron ASTM 536 65-45-12, narrow body design. Body thickness shall be in strict accordance with AWWA C504 latest revision where applicable. The valve shall have a clear inside diameter. The valve body flanges shall be back spot faced.

**Disc**

The valve disc shall be constructed of Ductile Iron ASTM A-536 with 316 stainless steel disc edge. The disc shall be free of hollow chambers and be of the flow through design in 600mm and larger. All surfaces shall be capable of visual inspection. Disc and shaft connections shall be made with stainless steel pins. Cast iron discs or alloy cast iron are not acceptable. Head loss analysis and Cv values shall be provided with the tender submission and will be taken into consideration by the city or appointed engineers during the tender analysis. All valves must be shipped with valve discs 3-2 degrees open.

The disc edge shall be 316 stainless steel on the full circumferences of the disc. The disc edge shall be a single piece U shaped rolled band with seal welds on both sides. All discs shall be independently tested for band leaks. The stainless steel band shall be welded to the disc on both sides and leak tested. The disc edge shall be field repairable without the full replacement of the disc edge.

**Seats**

All seats shall be of natural or synthetic rubber. Rubber seats shall be clamped, mechanically secured and recessed in the valve body supported on three sides in the valve body. Valve seats shall be bi-directionally adjustable and field adjustable around the full 360 degree circumference under full pressure without removal of the valve. Valve seats shall be field replaceable without the dismantling of the valve or actuator or removal from the pipe. Seat material shall be peroxide cured elastomer.

**Bearings**

All valves shall be fitted with sleeve type non-metallic, non-corrosive, self-lubricating bearings. Bearing loads shall not exceed 1/5 (one fifth) of the compressive strength of the bearing or shaft material.

**Shafts**

All valve shafts shall be one piece of two piece stub-shaft type 304 or 316 ground and polished stainless steel. The shaft diameter shall meet the latest requirements of AWWA C504. Carbon steel shafts with stainless steel journals are not acceptable. The lower valve shaft shall incorporate a dual thrust bearing to permit valve positioning in a 360 degree circumference. The valve shaft shall be capable of horizontal mounting.

**Shaft Packing**

All shaft seals shall be of the self-adjusting chevron "V" type shaft seals. The shaft seals or packing shall be retained by means of an independent secured recessed packing retainer plate in the valve trunion beneath the valve actuator mounting flange. The packing shall be field replaceable and self-adjusting. Removal of the actuator will not cause the packing to leak and the packing shall remain retained. Relief grooves shall be incorporated in the valve flange or actuator mounting flange. Leakage of the upper packing shall not cause the base of the actuator to become pressurized. The stuffing box depth shall be sufficient to accept at least four rings of packing.

**Coatings**

All valves shall be coated with minimum 8 mils DFT externally with NSF 61 epoxy coating and minimum 8 mils DFT internally coated with NSF 61. Fusion bonded NSF certified coatings are acceptable. Color and coating manufacture is to be specified on the drawings.

**Lifting Lugs**

All valves shall incorporate four tapped holes strategically located. Two hoist rings shall be supplied with each valve. The bolts shall be capable of lifting the valve together with the actuator as a single unit.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Experience and Requirements**

Manufacturer shall have previously manufactured rubber-seated AWWA butterfly valves for a minimum period of five years. All valve manufacturers shall be in compliance with ANSI/NSF Standard 61 for potable water.

**Acceptable Manufacturers**

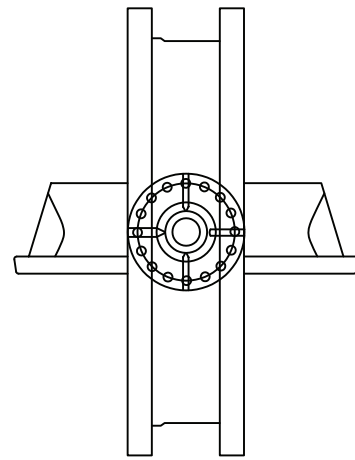
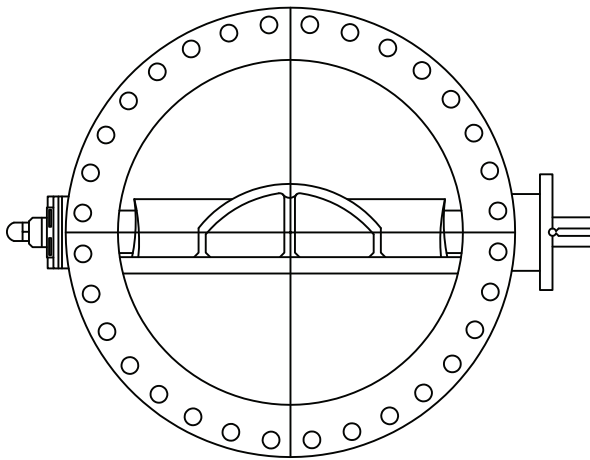
The valve shall be CrispinK-FLO "L2" series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.


**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B, Optional Ductile Iron ASTM A536 Grade 65-45-12
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12 316 Stainless Steel Edge
<b>Seat</b>	Buna-N EPDM Optional
<b>Shaft</b>	Stainless Steel ASTM A276 Grade 304 or 316
<b>Bearings</b>	TFE Lined with Fiberglass Backing



PART	MATERIAL
BODY:	CAST IRON (ASTM A126, CLASS B) DUCTILE IRON (ATM A536, GRADE 65-45-12)
SEAT:	BUNA-N; EPDM OPTIONAL
SHAFT:	ASTM A276, GRADE 304 OR 316 STAINLESS STEEL. OPTIONAL: 17-4PH STAINLESS STEEL ON CLASS 250B
DISC:	DUCTILE IRON (ASTM A536, GRADE 65-45-12) W/316 STAINLESS STEEL EDGE
BEARINGS:	TFE LINED WITH FIBERGLASS BACKING.



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3			DATE:	ANGULAR ± 1/2°	CRISPIN K-FLO BUTTERFLY VALVE L2 SERIES			
2			APPROVED BY:	FINISH	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1				FILLETS & RADII .031				
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No.	ERN	DATE			SO #			
REVISIONS								

**General**

Check valves shall be designed, manufactured and tested in accordance with American Water Works Association Standards AWWA C-508. Check valves shall be suitable for cold working pressures of 150 psig. The check valve shall be of the full body type, with an access cover constructed of ductile iron.

**Bodies**

The valve body and cover shall be constructed of ductile iron. Swing check valves shall be furnished with ANSI 150 pound flat-faced flanges. The valve body shall be full flow equal to nominal pipe diameter at all points through the valve. The seating surface shall be on a 45 degree angle to minimize disc travel.

The top access port shall be full size, allowing removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc for operating in lines containing high solids content.

**Disc**

The valve disc shall absolutely prevent the return of water or sewage back through the valve when the inlet pressure decreases below the delivery pressure, on pump shutoff or power failure. The valve shall be tight-seating. The disc shall be precision molded Buna-N (NBR), ASTM D2000-B. The disc shall be of one-piece construction, precision molded with an integral o-ring type sealing surface, and contain alloy steel and nylon reinforcement in the flexible hinge area. The flex portion of the disc shall be warranted for twenty-five years. Non-Slam closing characteristics shall be provided through a short 35 degree disc stroke.

The valve disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures. The test results shall be independently certified.

**Coatings**

Shop-primed exterior; epoxy coating optional. A variety of materials and coatings are available to suit most municipal and industrial applications.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Experience and Requirements**

The manufacturer shall have had successful experience in manufacturing valves of this type service in the sizes indicated. The manufacturer shall have at least 10 years' experience in the manufacture of rubber flapper check valves.

All valves shall be hydrostatically tested and seat tested to demonstrate zero leakage. When requested, the manufacturer shall provide test certification and required documentation.

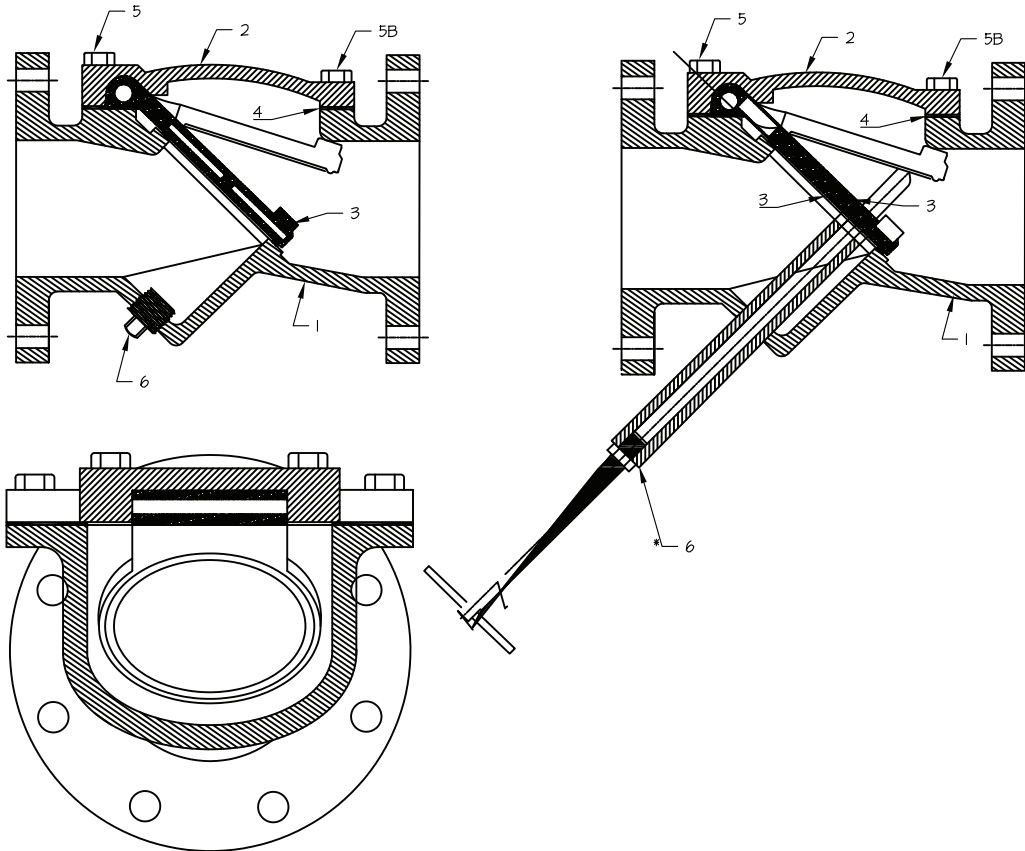
**Acceptable Manufacturers**


The valve shall be Crispin "RF" series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Ductile Iron ASTM A536 Grade 65-45-12
<b>Disc</b>	Buna-N Rubber Steel and Nylon
<b>Plug</b>	Cast Iron A126 CL. B Steel-reinforced Buna-N Rubber Flapper Optional Viton and EPDM

ITEM	DESCRIPTION	MATERIAL	ASTM
1	BODY	DUCTILE IRON	A536 GR. 65-45-12
2	COVER	DUCTILE IRON	A536 GR. 65-45-12
3	DISC	BUNA-N RUBBER, STEEL & NYLON	D2000, A240
4	GASKET	ARMSTRONG N-8092	N/A
5	BOLT	STEEL	A307 GR. B
5B	BOLT	STEEL	A307 GR. B
6	PLUG	CAST IRON	A126 CL. B
*6	BACKFLOW	STAINLESS STEEL/ACTUATOR	A582, B505 BRASS



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	CRISPIN RUBBER FLAPPER CHECK VALVE			
2			APPROVED BY:	FINISH	RF SERIES			
1			DATE:	FILLETS & RADII (.03)	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
RFP			DATE:	BREAK SHARP EDGES	PO #	SCALE:		
No.	ERN	DATE			SO #	NTS		
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**General**

The Tilting Disc Check Valve shall be designed to allow media flow forward and downstream of the pump, but disallow flow reversal. The valve shall consist of two body halves bolted together at 55 degree angle, forming a center flange. Inspection ports are to be located in each body half. A body seat ring shall be clamped between the inlet and outlet body halves at the center flange and must be beveled on the seating surface. The outlet body half will contain a disc. The seat ring shall be bolted to the disc.

**Bodies**

The body shall be designed with a 55 degree angle to accommodate the disc and seating surface. Body bolts connecting the two body halves shall be stainless steel.

**Disc**

The disc seat ring will be beveled to meet the seating surface of the body seat ring. The disc shall be held in place by two pivot pins that insert through both sides of the outlet body half. The pins will hold the disc in place at bushings on the disc. The bushings are to be located such that approximately 2/3 (two thirds) of the disc weight is below the pivot pins on seating. The disc is to be designed so that, at the fully opened position, the media will flow over both the top and bottom sides due to its "aerofoil" shape. The disc will pivot away from the body seat in a manner that allows no contact of the two seat rings except at the end of the sealing stroke.

The entire flow area through the valve will meet or exceed the nominal pipe diameter. The body halves will be designed to gradually enlarge to achieve at least a 40% increase over the nominal pipe diameter at the seat area to minimize valve head loss.

**Seats**

All seats shall be field replaceable without special tools.

**External Visual Indication**

The indicator shall be directly attached to the disc through one pivot shaft. The indicator shall provide positive reference for determining whether the valve is open or closed for the full travel of the disc. Positioning decals will not be considered.

**Dual Inspection Ports**

All valves shall incorporate upper and lower inspection ports by means of removable gasketed bolted covers. These covers shall also provide future mounting capabilities for upper or lower dashpots should they be required in the future.

**Coatings**

All valves shall be coated with minimum 8 mils DFT externally with NSF 61 epoxy coating and minimum 8 mils DFT internally coated with NSF 61. Fusion bonded NSF certified coatings are acceptable. Color and coating manufacture is to be specified on the drawings. Coatings shall be in accordance with AWWA C550.

**Testing**

The valve shall be tested to the operating characteristics of AWWA specification C508 latest revision. Test certificates shall be shipped with the valves and provided with the operation manuals. Certificates of compliance shall be provided with the valves. The customer reserves the right to witness test the valves prior to shipment and must be notified prior to shipment the testing schedule.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

The local supplier shall provide onsite field commissioning for either dry or wet commissioning of the valves. The supplier shall maintain WHIMIS, confined space and lock out tag out training and certificates through Quantum Murray. The supplier shall provide proof of competency and documents from the manufacturer stating the site contact is factory trained and authorized to complete the installation inspection and commissioning documentation.

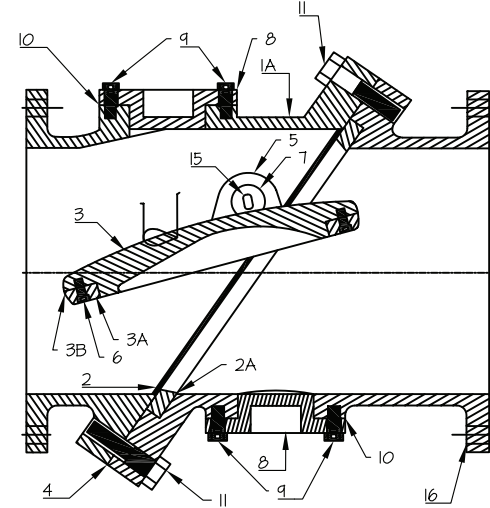
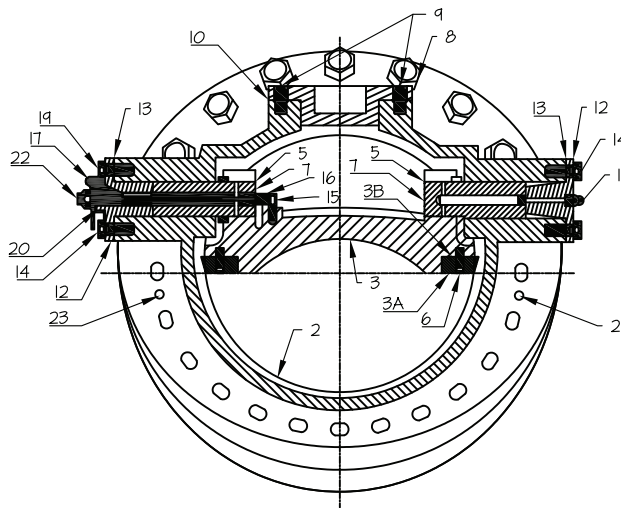
**Acceptable Manufacturers**

The valve shall be Crispin "TD" series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12
<b>O-Ring</b>	Buna-N Rubber
<b>Seat Ring</b>	Stainless Steel
<b>Pivot Pin</b>	Stainless Steel
<b>Indicator Pin</b>	Stainless Steel

ITEM	DESCRIPTION	MATERIAL	ASTM	ITEM	DESCRIPTION	MATERIAL	ASTM
1A	PIVOT BODY	CAST IRON	A126 CL.B	11	BODY FLANGE BOLT	STEEL	A444 GR. 5
1B	DISC BODY	CAST IRON	A126 CL.B	12	PIVOT PIN COVER	CAST IRON	A126 CL. B
2	SEAT RING	STAINLESS STEEL	T304, A144, CFB	13	PIVOT PIN COVER GASKET	ARMSTRONGS N-8092	N/A
2A	SEAT RING GASKET	ARMSTRONGS N-8092	N/A	14	PIVOT PIN COVER BOLT	STEEL	A444 GR. 5
3	DISC	DUCTILE IRON	A536, GR65-45-12	15	INDICATOR PIN	STAINLESS STEEL	A276, 304
3A	DISC RING	STAINLESS STEEL	17-4PH, A141, H1025	16	INDICATOR SHAFT ASSEMBLY	STAINLESS STEEL	A276, 304
3B	DISC RING GASKET	ARMSTRONGS N-8092	N/A	17	WASHER	STAINLESS STEEL	A240, 304
4	BODY GASKET	ARMSTRONGS N-8092	N/A	18	INDICATOR	LOW CARBON STEEL	N/A
5	PIVOT PIN BUSHING	STAINLESS STEEL	T304, A264	19	GREASE FITTING	STAINLESS STEEL	A276, 304
6	DISC RING SCREW	STAINLESS STEEL	A193-B8	20	O-RING	BUNA-N RUBBER	N/A
7	PIVOT PIN	STAINLESS STEEL	17-4PH, A141, H1025	21	LOCK WASHER	STAINLESS STEEL	A240, 304
8	INSPECTION HOLE COVER	CAST IRON	A126 CL. B	22	JAM NUT	STAINLESS STEEL	A194-B
9	INSPECTION HOLE BOLT	STEEL	A444 GR. 5	23	LOCATING PIN	ZINC PLATED STEEL	N/A
10	INSPECTION HOLE GASKET	ARMSTRONGS N-8092	N/A				



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5			DATE:	(EXCEPT AS NOTED)				
4			25/03/14	DECIMAL	<b>CRISPIN TILTING DISC CHECK VALVE</b> <b>TD SERIES</b>			
3			CHECKED BY:	± .005				
2			DATE:	FRACTIONAL	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1			APPROVED BY:	± .015				
RFP			DATE:	ANGULAR	PO #	SCALE:		
No.	ERN	DATE	DATE:	± 1/2°	SO #	NTS		
REVISIONS				FINISH				
				FILLETs & RADII				
				.031				
				BREAK SHARP EDGES				

**General**

The Tilting Disc Check Valve fitted with a Top Mounted Dashpot shall be designed to allow media flow forward and downstream of the pump, but disallow flow reversal. The valve shall consist of two body halves bolted together at 55 degree angle, forming a center flange. Inspection ports are to be located in each body half. A body seat ring shall be clamped between the inlet and outlet body halves at the center flange and must be beveled on the seating surface. The outlet body half will contain a disc. The seat ring shall be bolted to the disc.

**Bodies**

The body shall be designed with a 55 degree angle to accommodate the disc and seating surface. Body bolts connecting the two body halves shall be stainless steel.

**Disc**

The disc seat ring will be beveled to meet the seating surface of the body seat ring. The disc shall be held in place by two pivot pins that insert through both sides of the outlet body half. The pins will hold the disc in place at bushings on the disc. The bushings are to be located such that approximately 2/3 (two thirds) of the disc weight is below the pivot pins on seating. The disc is to be designed so that, at the fully opened position, the media will flow over both the top and bottom sides due to its "aerofoil" shape. The disc will pivot away from the body seat in a manner that allows no contact of the two seat rings except at the end of the sealing stroke.

The entire flow area through the valve will meet or exceed the nominal pipe diameter. The body halves will be designed to gradually enlarge to achieve at least a 40% increase over the nominal pipe diameter at the seat area to minimize valve head loss.

**Seats**

All seats shall be field replaceable without special tools.

**External Visual Indication**

The indicator shall be directly attached to the disc through one pivot shaft. The indicator shall provide positive reference for determining whether the valve is open or closed for the full travel of the disc. Positioning decals will not be considered.

**Dual Inspection Ports**

All valves shall incorporate upper and lower inspection ports by means of removable gasketed bolted covers. These covers shall also provide future mounting capabilities for upper or lower dashpots should they be required in the future.

**Upper Dashpot**

The top mounted oil dashpot will be installed through the top inspection port. The device is to be directly connected the valve disc. The dashpot will provide controlled opening of the valve, while also allowing two stage control of the disc closure. Both functions are to be fully adjustable in the field in order to meet diverse system requirements and reduce the effects of surges and water hammer. The dashpot shall consist of a 5000 psi hydraulic cylinder, two external oil reservoirs (one pressurized), two adjustable flow control valves, and piping. The cylinder shall have an internal flow control and the unit will have two external flow controls. The dashpot will be connected to the valve by means of a spacer containing an air gap, so that hydraulic fluid does not enter the system. The spacer will also contain o-rings serving as "wipers" for the same result. A rod connected to the cylinder will extend down through the spacer bushing and be attached directly to the valve disc by heavy gauge links and pin.

**Coatings**

All valves shall be coated with minimum 8 mils DFT externally with NSF 61 epoxy coating and minimum 8 mils DFT internally coated with NSF 61. Fusion bonded NSF certified coatings are acceptable. Color and coating manufacture is to be specified on the drawings. Coatings shall be in accordance with AWWA C550.

**Testing**

The valve shall be tested to the operating characteristics of AWWA specification C508 latest revision. Test certificates shall be shipped with the valves and provided with the operation manuals. Certificates of compliance shall be provided with the valves. The customer reserves the right to witness test the valves prior to shipment and must be notified prior to shipment the testing schedule.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

The local supplier shall provide onsite field commissioning either dry or wet commissioning of the valves. The supplier shall maintain WHIMIS, confined space and lock out tag out training and certificates through Quantum Murray. The supplier shall provide proof of competency and documents from the manufacturer stating the site contact is factory trained and authorized to complete the installation inspection and commissioning documentation.

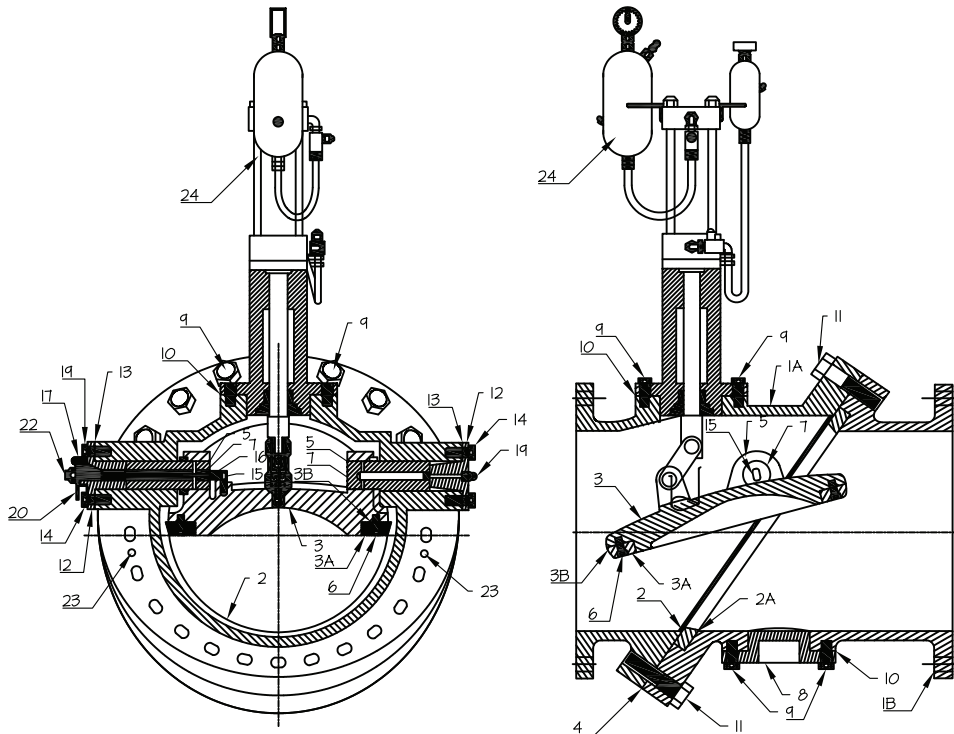
**Acceptable Manufacturers**


The valve shall be Crispin "TD" series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12
<b>O-Ring</b>	Buna-N Rubber
<b>Seat Ring</b>	Stainless Steel
<b>Pivot Pin</b>	Stainless Steel
<b>Indicator Pin</b>	Stainless Steel

ITEM	DESCRIPTION	MATERIAL	ASTM	ITEM	DESCRIPTION	MATERIAL	ASTM
1A	PIVOT BODY	CAST IRON	A126 CL.B	11	BODY FLANGE BOLT	STEEL	A449 GR. 5
1B	DISC BODY	CAST IRON	A126 CL.B	12	PIVOT PIN COVER	CAST IRON	A126 CL. B
2	SEAT RING	STAINLESS STEEL	T304, A144, CFB	13	PIVOT PIN COVER GASKET	ARMSTRONG N-8092	N/A
2A	SEAT RING GASKET	ARMSTRONG N-8092	N/A	14	PIVOT PIN COVER BOLT	STEEL	A449 GR. 5
3	DISC	DUCTILE IRON	A536, GR65-45-12	15	INDICATOR PIN	STAINLESS STEEL	A276, 304
3A	DISC RING	STAINLESS STEEL	17-4PH, A141, H1025	16	INDICATOR SHAFT ASSEMBLY	STAINLESS STEEL	A276, 304
3B	DISC RING GASKET	ARMSTRONG N-8092	N/A	17	WASHER	STAINLESS STEEL	A240, 304
4	BODY GASKET	ARMSTRONG N-8092	N/A	18	INDICATOR	LOW CARBON STEEL	N/A
5	PIVOT PIN BUSHING	STAINLESS STEEL	T304, A269	19	GREASE FITTING	STAINLESS STEEL	A276, 304
6	DISC RING SCREW	STAINLESS STEEL	A193-B8	20	O-RING	BUNA-N RUBBER	N/A
7	PIVOT PIN	STAINLESS STEEL	17-4PH, A141, H1025	21	LOCK WASHER	STAINLESS STEEL	A240, 304
8	INSPECTION HOLE COVER	CAST IRON	A126 CL. B	22	JAM NUT	STAINLESS STEEL	A194-B
9	INSPECTION HOLE BOLT	STEEL	A449 GR. 5	23	LOCATING PIN	ZINC PLATED STEEL	N/A
10	INSPECTION HOLE GASKET	ARMSTRONG N-8092	N/A				



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2			APPROVED BY:	FINISH		SCALE:	REV
1				FILLETS & RADII .031		NTS	
RFP			DATE:	BREAK SHARP EDGES	PO #		
No.	ERN	DATE			SO #		
REVISIONS							

### General

The Tilting Disc Check Valve shall be designed to allow media flow forward and downstream of the pump, but disallow flow reversal. The valve shall consist of two body halves bolted together at 55 degree angle, forming a center flange. Inspection ports are to be located in each body half. A body seat ring shall be clamped between the inlet and outlet body halves at the center flange and must be beveled on the seating surface. The outlet body half will contain a disc. The seat ring shall be bolted to the disc.

### Bodies

The body shall be designed with a 55 degree angle to accommodate the disc and seating surface. Body bolts connecting the two body halves shall be stainless steel.

### Disc

The disc seat ring will be beveled to meet the seating surface of the body seat ring. The disc shall be held in place by two pivot pins that insert through both sides of the outlet body half. The pins will hold the disc in place at bushings on the disc. The bushings are to be located such that approximately 2/3 (two thirds) of the disc weight is below the pivot pins on seating. The disc is to be designed so that, at the fully opened position, the media will flow over both the top and bottom sides due to its "aerofoil" shape. The disc will pivot away from the body seat in a manner that allows no contact of the two seat rings except at the end of the sealing stroke.

The entire flow area through the valve will meet or exceed the nominal pipe diameter. The body halves will be designed to gradually enlarge to achieve at least a 40% increase over the nominal pipe diameter at the seat area to minimize valve head loss.

### Seats

All seats shall be field replaceable without special tools.

### External Visual Indication

The indicator shall be directly attached to the disc through one pivot shaft. The indicator shall provide positive reference for determining whether the valve is open or closed for the full travel of the disc. Positioning decals will not be considered.

### Dual Inspection Ports

All valves shall incorporate upper and lower inspection ports by means of removable gasketed bolted covers. These covers shall also provide future mounting capabilities for upper or lower dashpots should they be required in the future.

### Bottom Dash Pot

The bottom mounted oil dashpot will be installed through the bottom inspection port. The device is not to be connected to the valve disc. The dashpot will provide controlled closure of the valve during the last 10% of the valve stroke. This function is to be fully adjustable in the field in order to meet diverse system requirements and reduce the effects of surges and water hammer. The dashpot shall consist of a 5000 psi hydraulic cylinder, an external pressurized oil reservoir, an adjustable flow control valve on closing, and piping. The dashpot will be connected to the valve by means of a spacer containing an air gap so that hydraulic fluid does not enter the system. The spacer will also contain o-rings serving as "wipers" for the same result. A snubber-rod connected to the cylinder will extend up through the spacer bushing and directly into the valve seating area. Upon closure, the disc will strike the snubber-rod and it travel will be cushioned by the oil cylinder.

### Coatings

All valves shall be coated with minimum 8 mils DFT externally with NSF 61 epoxy coating and minimum 8 mils DFT internally coated with NSF 61. Fusion bonded NSF certified coatings are acceptable. Color and coating manufacture is to be specified on the drawings. Coatings shall be in accordance with AWWA C550.

### Testing

The valve shall be tested to the operating characteristics of AWWA specification C508 latest revision. Test certificates shall be shipped with the valves and provided with the operation manuals. Certificates of compliance shall be provided with the valves. The customer reserves the right to witness test the valves prior to shipment and must be notified prior to shipment the testing schedule.

### Pre-Installation Training

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

### Site Commissioning

The local supplier shall provide onsite field commissioning for either dry or wet commissioning of the valves. The supplier shall maintain WHIMIS, confined space and lock out tag out training and certificates through Quantum Murray. The supplier shall provide proof of competency and documents from the manufacturer stating the site contact is factory trained and authorized to complete the installation inspection and commissioning documentation.

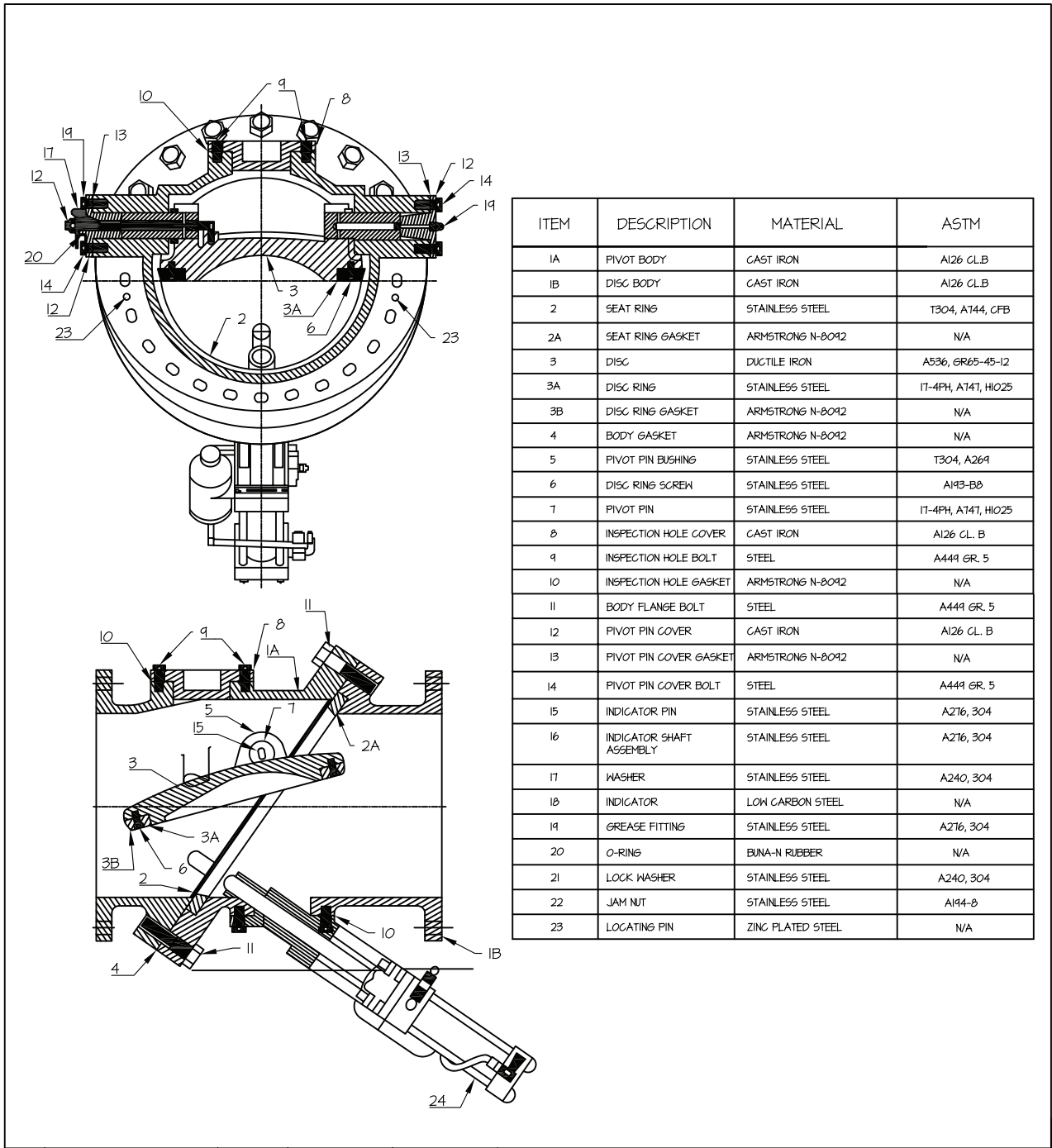
### Acceptable Manufacturers

The valve shall be Crispin "TD" series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.


### Materials of Construction

<b>Body</b>	Cast Iron ASTM A126, Class B
<b>Disc</b>	Ductile Iron ASTM A536, Grade 65-45-12
<b>O-Ring</b>	Buna-N Rubber
<b>Seat Ring</b>	Stainless Steel
<b>Pivot Pin</b>	Stainless Steel
<b>Indicator Pin</b>	Stainless Steel





ITEM	DESCRIPTION	MATERIAL	ASTM
1A	PIVOT BODY	CAST IRON	A126 CL.B
1B	DISC BODY	CAST IRON	A126 CL.B
2	SEAT RING	STAINLESS STEEL	T304, A144, CFB
2A	SEAT RING GASKET	ARMSTRONG N-8092	N/A
3	DISC	DUCTILE IRON	A536, GR65-45-12
3A	DISC RING	STAINLESS STEEL	IT-4FH, A141, H1025
3B	DISC RING GASKET	ARMSTRONG N-8092	N/A
4	BODY GASKET	ARMSTRONG N-8092	N/A
5	PIVOT PIN BUSHING	STAINLESS STEEL	T304, A269
6	DISC RING SCREW	STAINLESS STEEL	A193-B8
7	PIVOT PIN	STAINLESS STEEL	IT-4FH, A141, H1025
8	INSPECTION HOLE COVER	CAST IRON	A126 CL. B
9	INSPECTION HOLE BOLT	STEEL	A449 GR. 5
10	INSPECTION HOLE GASKET	ARMSTRONG N-8092	N/A
11	BODY FLANGE BOLT	STEEL	A449 GR. 5
12	PIVOT PIN COVER	CAST IRON	A126 CL. B
13	PIVOT PIN COVER GASKET	ARMSTRONG N-8092	N/A
14	PIVOT PIN COVER BOLT	STEEL	A449 GR. 5
15	INDICATOR PIN	STAINLESS STEEL	A276, 304
16	INDICATOR SHAFT ASSEMBLY	STAINLESS STEEL	A276, 304
17	WASHER	STAINLESS STEEL	A240, 304
18	INDICATOR	LOW CARBON STEEL	N/A
19	GREASE FITTING	STAINLESS STEEL	A276, 304
20	O-RING	BUNA-N RUBBER	N/A
21	LOCK WASHER	STAINLESS STEEL	A240, 304
22	JAM NUT	STAINLESS STEEL	A194-B
23	LOCATING PIN	ZINC PLATED STEEL	N/A

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5			DATE: 28/03/14	DECIMAL ± .005			
4			CHECKED BY:	FRACTIONAL ± .015			
3			DATE:	ANGULAR ± 1/2°			
2			APPROVED BY:	FINISH			
1			DATE:	FILLETS & RADII .031			
RFP			DATE:	BREAK SHARP EDGES	CUSTOMER:		
No.	ERN	DATE			DO NOT SCALE	DRAWING No.	REV
REVISIONS					SCALE: NTS		

**General**

Plug Valves shall be of the non-lubricated eccentric type with an elastomer covering the entire plug seating surfaces, both front and back. The elastomeric material, EPDM or Buna-N shall be selected for the service intended. Flanged valves shall be manufactured in accordance with ANSI B16.1 Class125/150 including facing drilling and flange thickness. Mechanical joint ends shall be in compliance with AWWA/ANSI C-111-92. Ports shall be round on sizes 65mm-300mm and rectangular port design on valves 350mm and larger. All valves shall be capable of being "pigged" with a soft pig when required.

**Bodies**

Valve bodies shall be of ASTM A-126 Class B cast iron in accordance with AWWA C-517 latest revision. Valves 75mm and larger shall be furnished with a welded-in overlay seat of 1/8" thick of not less than 99% nickel in accordance with AWWA C-517-09, Section 4.3.3.4. Sprayed, plated or screwed-in seats will not be considered.

**Plug**

Plugs shall be of ASTM A-536 Grade 65-45-12 for sizes 500mm and smaller and ASTM A126 Class B cast iron for sizes 600mm and larger in compliance with AWWA C-517. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

**Bearings**

Valves shall be furnished with replaceable stainless steel, sintered sleeve type bearings conforming to AWWA C-517. Bearings shall be of sintered, oil impregnated type 316 Stainless Steel ASTM A-743 Grade CF-8M.

**Packing**

Upper valve shaft packing shall be of the "V" type in accordance with AWWA C-517. The packing shall be fully adjustable and replaceable without removing the actuator from the valve.

**Coatings**

All valves are to be coated internally and externally with 8 mils (+/-4) of Ameron Amerlok 400 2-Part liquid epoxy.

**Testing**

Each valve shall be given a hydrostatic and seat test in accordance with AWWA C-517. The test results shall be furnished with the valve and included in the operation and installation manuals certified copies of Proof of Design test reports shall be furnished as outlined in AWWA C-517 when requested.

**Actuation**

Wrench operated valves 65mm-200mm shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removable levers or extended "T" handles. Worm gear operators, where required, shall be constructed with a ductile iron quadrant, a one-piece input worm shaft, and axial needle roller bearings. The one-piece worm shaft shall be manufactured of corrosion resistant Ni tempered steel.

**Rating**

Valves shall be designed and manufactured to shut off drip tight at 175 psi for valves 65mm-300mm and 150 psi for valves 350mm and larger.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

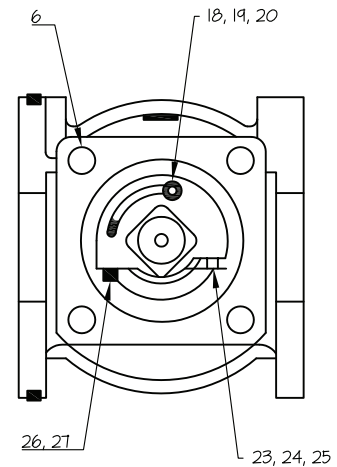
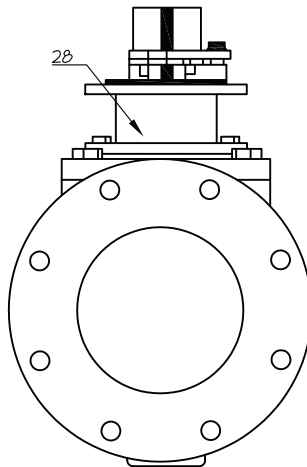
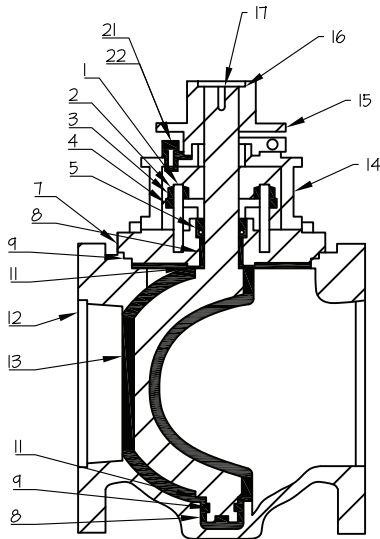
**Acceptable Manufacturers**


The valve shall be Crispin series "800", as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B, Optional Ductile Iron ASTM A536 Grade 65-45-12
<b>Seat</b>	99% Welded Nickel
<b>Port</b>	Round Port Full Flow thru 300mm
<b>Plug</b>	Ductile Iron ASTM A536 Grade 65-4512 Fully Molded Buna-N Optional EPDM
<b>Bearings</b>	ASTM A276, Grade 316 Stainless Steel Bolts and Nuts 304 Stainless Steel

ITEM	DESCRIPTION	MATERIAL	ITEM	DESCRIPTION	MATERIAL
1	GLAND STUD	STAINLESS STEEL	15	TORQUE COLLAR	A536 GR 65-45-12
2	HEX NUT	STAINLESS STEEL	16	FLAT WASHER	Q235-A ZINC PLATED
3	FLAT WASHER	STAINLESS STEEL	17	SOCKET HEAD CAPSCREW	STAINLESS STEEL
4	GLAND	ASTM A126 CL B	18	HEX HEAD CAPSCREW	STAINLESS STEEL
5	V-RING SET	NBR	19	HEX NUT	STAINLESS STEEL
6	HEX HEAD CAPSCREW	STAINLESS STEEL	20	FLAT WASHER	STAINLESS STEEL
7	COVER	ASTM A126 CL B	21	SOCKET HEAD CAPSCREW	STAINLESS STEEL
8	BEARING	S5T, SINTERED	22	LOCK WASHER	STAINLESS STEEL
9	O-RING	NBR	23	SOCKET HEAD CAPSCREW	STAINLESS STEEL
10	O-RING	NBR	24	HEX NUT	STAINLESS STEEL
11	THRUST WASHER	PTFE	25	FLAT WASHER	STAINLESS STEEL
12	BODY	ASTM A126 CL B	26	HEX HEAD CAPSCREW	STAINLESS STEEL
13	PLUG MOLDED	A536 GR 65-45-12 + NBR	27	HEX NUT	STAINLESS STEEL
14	TORQUE COLLAR ADAPTER (BURIED)	ASTM A126 CL B	28	HEX HEAD CAPSCREW	STAINLESS STEEL



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2			CHECKED BY:	FRACTIONAL	CRISPIN PLUG VALVE SERIES 800			
1				± .015				
RFP			DATE:	ANGULAR	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
No.	ERN	DATE	APPROVED BY:	± 1/2°	PO #	SCALE:		
	REVISIONS		DATE:	FINISH	SO #	NTS		
				FILLET & RADII				
				.031				
				BREAK SHARP EDGES				

**General**

Plug valves shall be of the non-lubricated eccentric type with an elastomer covering the entire plug seating surfaces, both front and back. The elastomeric material, EPDM or Buna-N shall be selected for the service intended. Flanged valves shall be manufactured in accordance with ANSI B16.1 Class 125/150 including facing drilling and flange thickness. Mechanical joint ends shall be in compliance with AWWA/ANSI C-111-92. Ports shall be round on sizes 65mm-300mm and rectangular port design on valves 350mm and larger. All valves shall be capable of being "pigged" with a soft pig when required.

**Bodies**

Valve bodies shall be of ASTM A-126 Class B cast iron in accordance with AWWA C-517. Valves 75mm and larger shall be furnished with a welded-in overlay seat of 1/8" thick of not less than 99% nickel in accordance with AWWA C-517- latest revision, Section 4.3.3.4. Sprayed, plated or screwed-in seats will not be considered.

**Plug**

Plugs shall be of ASTM A-536 Grade 65-45-12 for sizes 500mm and smaller and ASTM A126 Class B cast iron for sizes 600mm and larger in compliance with AWWA C-517. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

**Bearings**

Valves shall be furnished with replaceable stainless steel, sintered sleeve type bearings conforming to AWWA C-517. Bearings shall be of sintered, oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M.

**Packing**

Upper valve shaft packing shall be of the "V" type in accordance with AWWA C-517. The packing shall be fully adjustable and replaceable without removing the actuator from the valve.

**Coatings**

All valves are to be coated internally and externally with 8mils (+/-4) of Ameron Amerlok 400 2-Part liquid epoxy.

**Testing**

Each valve shall be given a hydrostatic and seat test in accordance with AWWA C-517. The test results shall be furnished with the valve and included in the operation and installation manuals certified copies of Proof-of-Design test reports shall be furnished as outlined in AWWA C-517 when requested.

**Actuation**

Wrench operated valves 65mm-200mm shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removable levers or extended "T" handles. Worm gear operators, where required, shall be constructed with a ductile iron quadrant, a one-piece input worm shaft, and axial needle roller bearings. The one-piece worm shaft shall be manufactured of corrosion resistant Ni tempered Steel.

**Rating**

Valves shall be designed and manufactured to shut off drip tight at 175 psi for valves 65mm-300mm and 150 psi for valves 350mm and larger.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

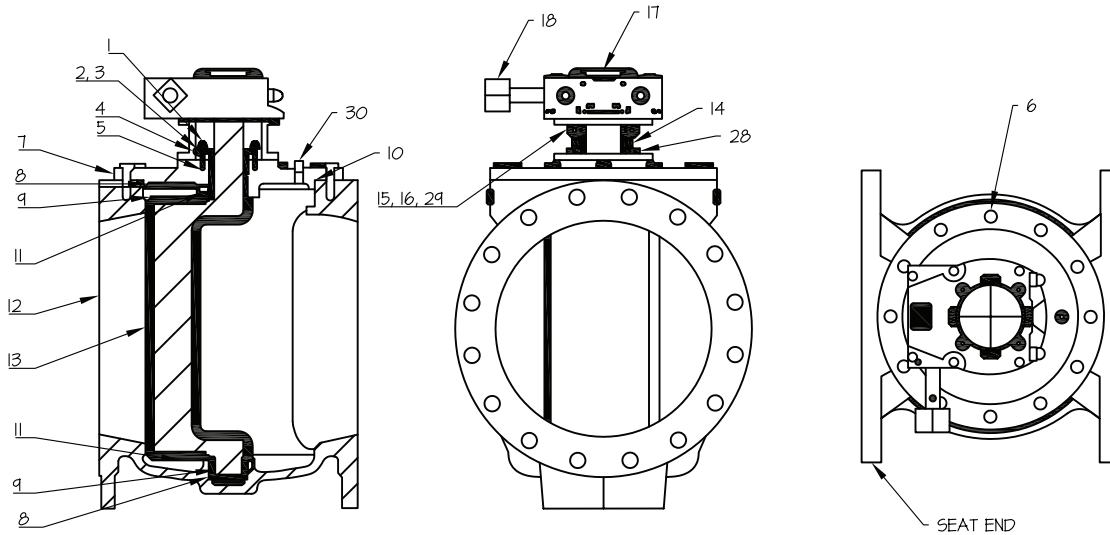
**Acceptable Manufacturers**


The valve shall be Crispin series "900", as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	Cast Iron ASTM A126, Class B, Optional Ductile Iron ASTM A536 Grade 65-45-12
<b>Seat</b>	99% Welded Nickel
<b>Port</b>	Rectangular
<b>Plug</b>	Ductile Iron ASTM A536 Grade 65-4512 Fully Molded Buna-N Optional EPDM
<b>Bearings</b>	ASTM A276, Grade 316 Stainless Steel Bolts and Nuts 304 Stainless Steel

ITEM	DESCRIPTION	MATERIAL	11	THRUST WASHER	PTFE
1	GLAND STUD	STAINLESS STEEL	12	BODY	ASTM A126 CL. B
2	HEX NUT	STAINLESS STEEL	13	PLUG MOLDED	A536 GR. 65-45-12+NBR
3	FLAT WASHER	STAINLESS STEEL	14	GEARBOX ADAPTER	ASTM A126 CL. B
4	GLAND	ASTM A126 CL. B	15	LOCK WASHER	STAINLESS STEEL
5	V-RING SET	NBR	16	HEX NUT	STAINLESS STEEL
6	HEX HEAD CAPSCREW	STAINLESS STEEL	17	MASTERGEAR W6	PURCHASED
7	COVER	ASTM A126 CL. B	18	2" AWWA NUT	CARBON STEEL
8	BEARING	SS1, SINTERED	28	HEX HEAD CAPSCREW	STAINLESS STEEL
9	O-RING	NBR	29	STUD	STAINLESS STEEL
10	O-RING	NBR	30	PIPE PLUG	STAINLESS STEEL



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	CRISPIN PLUG VALVE			
2			APPROVED BY:	FINISH	SERIES 900			
1			REVISIONS	FILLETS & RADII .031	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
No.	ERN	DATE	DATE:	BREAK SHARP EDGES	PO #	SCALE: NTS		
					SO #			

**General**

Combination air valves shall be heavy-duty “Universal” style single body units incorporating the functions of an air and vacuum valve with an air release valve in a single housing. Combination air valves shall release accumulations of air at high points within a pipeline by exhausting large volumes of air as the pipeline is being filled, and then by releasing accumulated pockets of air while the pipeline is in operation and under pressure. Combination air valves shall also be designed to permit large volumes of air to enter the pipe-line during pipeline drainage. All valves shall meet or exceed AWWA C512.

**Bodies**

The valve body and cover flange shall be cast or fabricated 316 stainless steel and shall incorporate a “sanitary clamp” to attach the flange to the body at the outlet. Valves that use traditional bolting to attach the cover flange to the body are not acceptable. The flange clamp must be located at the outlet of the body for ease of cleaning and maintenance. Other clamping locations are not acceptable.

All non-sealing internal metal components shall be 316 stainless steel. No plastic, nylon, or fiberglass components will be acceptable.

**Orifice**

The valve shall incorporate an Air Release orifice of 3/16” for use at 200 psig. No deviation from this orifice size will be allowed. This orifice will be located in the outlet of the valve and shall be drilled in a 316 stainless steel orifice plate that seals against a Buna-N rubber seat. Valves with seals that flex or “roll” will not be acceptable.

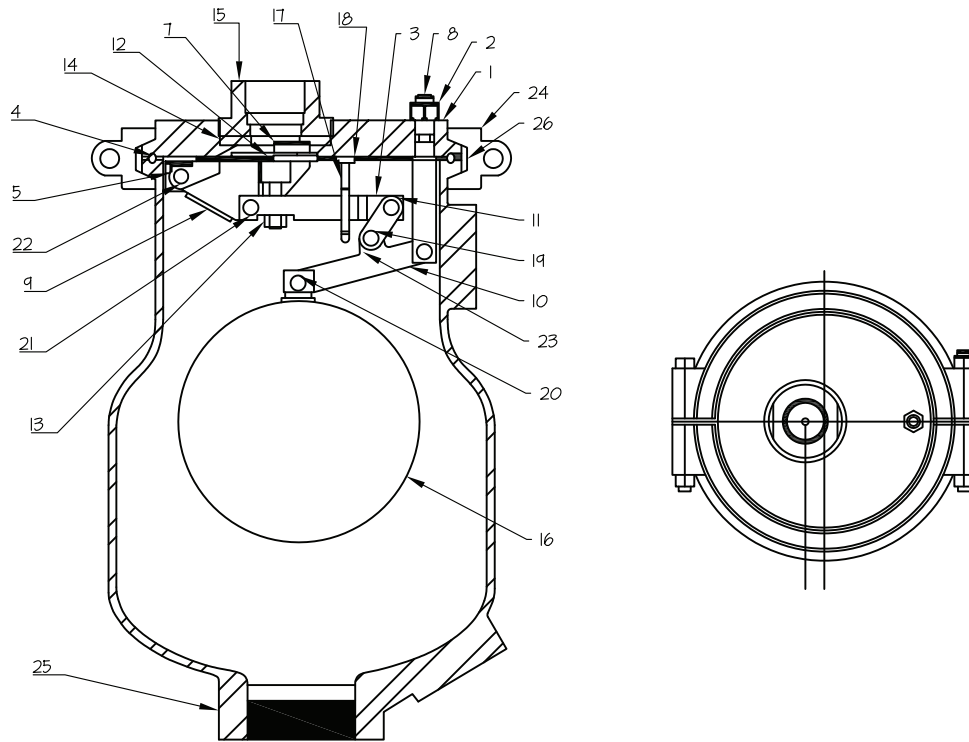
**Acceptable Manufacturers**


The valve shall be Crispin “X” series, as manufactured by Crispin Multiplex Manufacturing Co., Berwick PA, or approved equal.

**Materials of Construction**

<b>Body</b>	A351 CF8M, Type 316 Stainless Steel
<b>Seat</b>	Buna-N Rubber
<b>Float</b>	A240 Type 316 Stainless Steel

ITEM	DESCRIPTION	MATERIAL	ITEM	DESCRIPTION	MATERIAL
1	TOP	316 STAINLESS STEEL	9	FLOAT	316 STAINLESS STEEL
2	COVER FLANGE	316 STAINLESS STEEL	10	CLAMP ASSEMBLY	304 STAINLESS STEEL
3	BODY	316 STAINLESS STEEL	11	JAM NUT	316 STAINLESS STEEL
4	O-RING	BUNA-N RUBBER	12	.25-20NC X .50 HEX NUT	316 STAINLESS STEEL
5	SEAT	BUNA-N RUBBER	13	STAND ROD	316 STAINLESS STEEL
6	VALVE ROD	316 STAINLESS STEEL	14	.25 PLUG	316 STAINLESS STEEL
7	STAND	316 STAINLESS STEEL	15	RED I.D. DOT	ALUMINUM
8	ROD GUIDE	NYLATROL	16	TAG	ALUMINUM



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	<b>CRISPIN AIR VALVE</b> <b>"X" SERIES</b>			
2			APPROVED BY:	FINISH				
1			DATE:	FILLET & RADII .031	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
RFP			DATE:	BREAK SHARP EDGES	PO #	SCALE:		
No.	ERN	DATE			SO #	NTS		
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**General**

The pilot operated pressure reducing valve shall automatically throttle to reduce a high incoming pressure to a lower, constant discharge pressure regardless of variations in upstream pressure or flow rate.

**Design**

The pressure reducing valve shall be globe (inline) or angle (90 degree) body with flanged end connections, be fully mounted, external pilot operated, with free floating piston (operated without springs, diaphragm or levers). It shall contain a single full-ported seat, with seat bore equal to size of valve.

The minimum travel of the piston shall be equal to 25% of the diameter of the seat. For true alignment (to correct lateral thrust and stem binding), the piston shall be guided above and below the seat a distance equal to no less than 75% of the diameter of the seat. The piston shall be cushioned and so designed as to insure positive closure.

The main valve shall be packed with leather (or other soft material) to insure tight closure and prevent metal-to-metal friction and seating. The valve shall be furnished with an indicator rod to show position of piston opening, and pet-cocks for attachment to valve body for receiving gauges for testing purposes. The design shall be such that repairs and dismantling internally of main valve may be made without its removal from the line.

The pilot valve, controlling operation of the main valve, shall have a range of adjustment, be easily accessible, and arranged to allow for easy removal from the main valve while the main valve is under pressure. The pilot valve, speed control valve, external strainer with blow-off, isolation valves, and all associated rigid brass piping and fittings (with the exception of a separate static pressure sensing line, if required) shall be factory assembled and furnished with the valve.

**Bodies**

Valve body and cap(s) shall be constructed of gray iron castings that conform to ASTM Specification A 126 Class B. Internal bronze components shall conform to ASTM Specification B-584. Internal Stainless Steel components shall conform to ASTM Specification A-743 Grade CF-8 or CF-8M. The control piping shall be rigid red brass, no less than 0.5” in diameter.

Optional upgrades featuring Stainless Steel shall conform to ASTM Specification A-743 Grade CF-8 or CF-8M. Optional upgrades featuring Teflon-Coated Bronze shall consist of a Teflon coating applied in two parts: Part 1 shall be a primer Teflon coating with a minimum thickness of 5 mils. Part 2 shall be a finish coat of Teflon TFE with a minimum thickness of 5 mils, for a final minimum coat thickness of 10 mils.

The flanged assemblies shall conform to ANSI standards for wall thickness of body and caps, and flange thickness and drilling, subject to other specified standards.

**Coatings**

Ferrous surfaces of the valve shall be coated with NSF Certified Epoxy (Tnemec Series FC20) in accordance with ANSI/NSF Std. 61, and conforming to AWWA D102 Inside System No. 1.

**Testing**

A trio of tests shall be performed on the completely assembled valve prior to shipment. These shall include a hydrostatic test of up to two (2) times the working pressure (maximum 500 psi testing pressure), a tight seating test, and a performance test for simulated field conditions. The tests may be witnessed by the customer/engineer or representative.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer’s recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

Valve vendor or manufacturer’s representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Acceptable Manufacturers**

The valve shall be equal in all respects to the Model 40WR as manufactured by Ross Valve Mfg. Co., Inc, 6 Oakwood Ave, Troy, NY 12180.

*Note: The Ross Valve Mfg. Co., Inc. reserves the right to modify valve construction which will result in equal or superior performance to existing designs. These modifications may be made at any time and at the sole discretion of the manufacturer.*

**Materials of Construction**

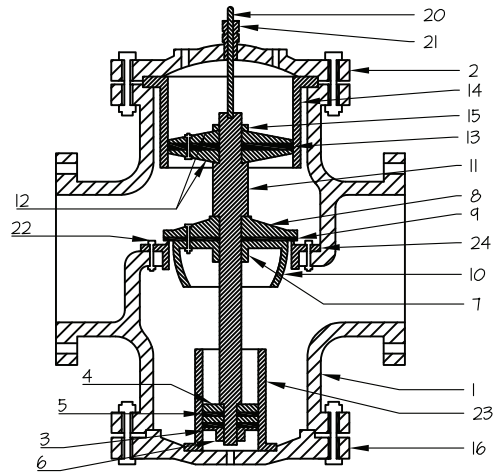
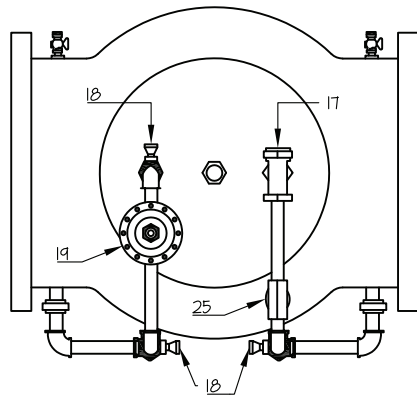
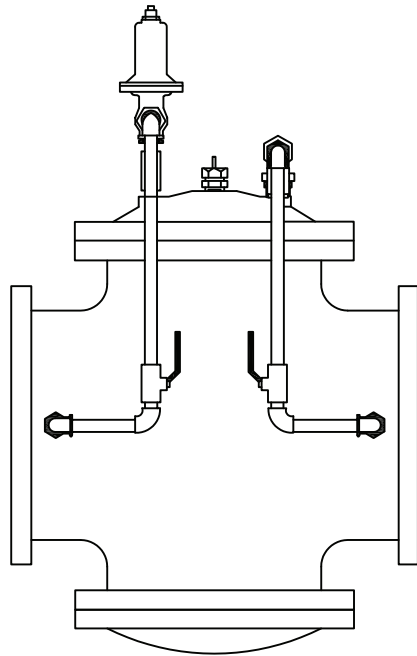
**Body**

**Shell** 100-900mm Cast Iron (Semi-steel) with bronze trim  
 1000-1200mm Ductile Iron with bronze/stainless trim

**Stem** Bronze

**Seals** Polyurethane





PART	DESCRIPTION	QTY.
1	VALVE SHELL	1
2	TOP CAP	1
3	BOTTOM STEM GUIDE NUT	1
4	BOTTOM CUP FOLLOWERS (SET OF 2)	1
5	PISTON CUP PACKING	2
6	BOTTOM STEM LOCK NUT	1
7	STEM NUT	1
8	SEAT DISC	1
9	SEAT PACKING	1
10	SEAT PACKING SUPPORT	1
11	STEM	1
12	MAIN CUP PLATES (SET OF 2)	1
13	MAIN CUP PACKING	2
14	MAIN BUSHING	1
15	TOP STEM NUT	1
16	BOTTOM CAP	1
17	NEEDLE VALVE	1
18	ISOLATION VALVE	3
19	PILOT VALVE - PRESSURE REDUCING	1
20	INDICATOR ROD	1
21	INDICATION STUFFING BOX	1
22	BOLTS & NUTS (SEAT RING)	VARY
23	BOTTOM CAP CYLINDER	1
24	SEAT RING	1
25	STRAINER	1

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5			DATE: 02/04/14	DECIMAL ± .005				
4			CHECKED BY:	FRACTIONAL ± .015	<b>ROSS MODEL 40WR PRESSURE REDUCING VALVE</b>			
3			DATE:	ANGULAR ± 1/2°				
2			APPROVED BY:	FINISH	PO #	SCALE:		
1			DATE:	FILLET & RADII .031	SO #	NTS		
RFP			DATE:	BREAK SHARP EDGES				
No.	ERN	DATE						
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**General**

The wastewater relief valve is a combination direct acting and hydraulically operated control valve using a hydraulic self-contained oil cylinder as a dampening device. The valve shall be normally closed and shall open quickly when the inlet pressure exceeds the spring setting. The valve will modulate between 0% and 100% open in order to assure the valve's inlet pressure remains below the set point. The valve shall close at a slow and controlled speed, which is field adjustable, via the self-contained hydraulic oil cushioned cylinder.

**Design**

The relief valve shall be globe (inline) or angle (90 degree) body with flanged end connections. It shall contain a single full-ported seat, with seat bore equal to size of valve. The minimum travel of the piston shall be equal to 25% of the diameter of the seat. For true alignment (to correct lateral thrust and stem binding), the piston shall be guided above the seat a distance equal to no less than 75% of the diameter of the seat. The piston shall be cushioned and so designed as to insure positive closure. The main valve shall be packed with a resilient seat packing and Buna o-ring seals to insure tight closure and prevent metal to metal friction and seating. The design shall be such that repairs and dismantling internally of main valve may be made without its removal from the line.

The springs shall be enclosed in a protective chamber and shall be concentric to the valve piston to insure proper alignment. A mechanical scraper ring shall be utilized to protect the internal seals. The valve shall be furnished with an inlet side gauge-cock for receiving gauges and testing purposes. The external controls and all associated rigid brass piping and fittings necessary for proper operation (except the oil for the hydraulic chamber) shall be factory assembled and furnished with the pressure relief valve.

**Bodies**

Valve body and cap(s) shall be constructed of gray iron castings that conform to ASTM Specification A 126 Class B. Internal bronze components shall conform to ASTM Specification B-584. Internal Stainless Steel components shall conform to ASTM Specification A-743 Grade CF-8 or CF-8M. The control piping shall be rigid red brass, no less than 0.5" in diameter.

The flanged assemblies shall conform to ANSI standards for wall thickness of body and caps, and flange thickness and drilling, subject to other specified standards.

**Seats**

The seat ring shall be grade 300 series stainless steel and shall be held in place via grade 300 series stainless steel fasteners. The seat support assembly shall be grade 300 series stainless steel.

**Coatings**

Ferrous surfaces of the valve shall be coated with NSF Certified Epoxy (Tnemec Series FC20) in accordance with ANSI/NSF Std. 61, and conforming to AWWA D102 Inside System No. 1.

**Testing**

A trio of tests shall be performed on the completely assembled valve prior to shipment. These shall include a hydrostatic test of up to two (2) times the working pressure (maximum 500 psi testing pressure), a tight seating test, and a performance test for simulated field conditions. The tests may be witnessed by the customer/engineer or representative.

**Pre-Installation Training**

The supplier or manufacturer shall include and provide pre-installation training for the supplied valves in accordance with the manufacturer's recommended training manual. The pre-installation training manual shall be included with the shop drawing submittals as part of the review process.

**Site Commissioning**

Valve vendor or manufacturer's representative shall provide the services of a factory trained and authorized representative for a sufficient period of time as required to ensure proper adjustment, installation, and operation of the valve. Pre-installation shall be required prior to the delivery of the valves to the selected installers.

**Acceptable Manufacturers**

The valve shall be equal in all respects to the Model 70SWR as manufactured by Ross Valve Mfg. Co., Inc, 6 Oakwood Ave, Troy, NY 12180.

*Note: The Ross Valve Mfg. Co., Inc. reserves the right to modify valve construction which will result in equal or superior performance to existing designs. These modifications may be made at any time and at the sole discretion of the manufacturer.*

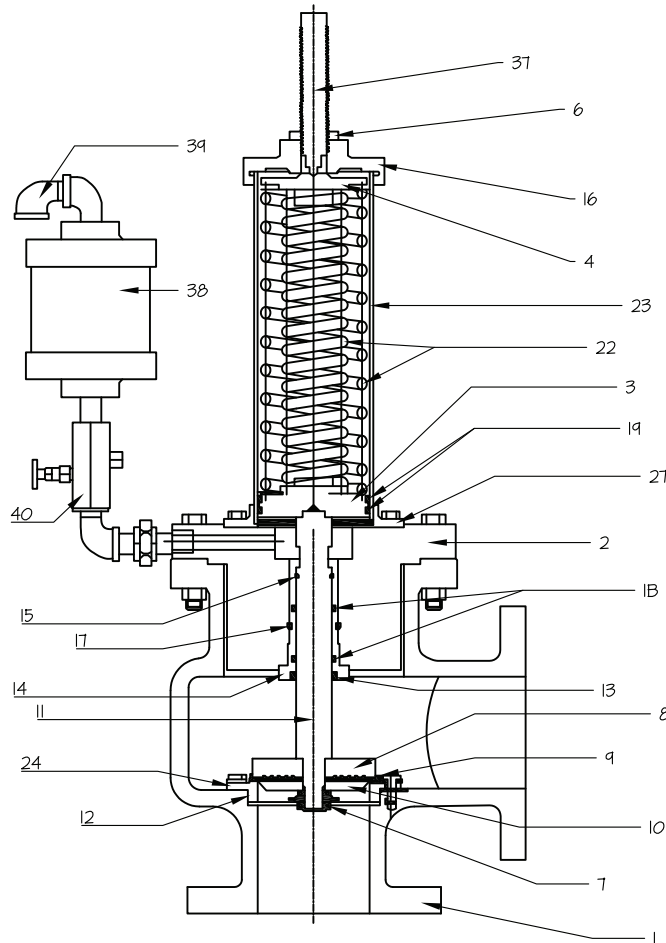
**Materials of Construction**

<b>Body</b>	
<b>Shell</b>	Epoxy-Coated Cast Iron
<b>Stem</b>	Stainless Steel
<b>Seals</b>	Buna-N, Poly
<b>Seat Ring</b>	Stainless Steel

Type: Throttling  
 Primarily Controlled By: Hydraulic pressure to open, spring forces to close, and oil dashpot to dampen operation  
 Located: In tee connection  
 Purpose: To prevent excessive pressure in wastewater lines  
 Inlet Pressure: Maximum: 300 psi Minimum: 0 psi  
 Construction: Cast iron (semi-steel) body with bronze and stainless steel trim  
 Reservoir: Oil Filled  
 Valves: Quick Open Needle (Controlled closing speed control)

- Options:  
 1. Cast steel or ductile iron body and all stainless steel  
 2. Pneumatic operated valve

Ross engineers customize the basic TOSWR to accommodate individual needs.



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3			DATE:	ANGULAR ± 1/2°	ROSS PRESSURE RELIEF VALVE MODEL TOSWR			
2			APPROVED BY:	FINISH	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1			DATE:	FILLETES & RADII .031	PO #	SCALE: NTS		
RFP				BREAK SHARP EDGES	50 #			
No.	ERN	DATE						
REVISIONS								



## Suggested Specification TTR Engineered Free Standing Torque Tubes All Rotary Valves

### General

All torque tubes shall be fabricated preventing the weight of the inner and outer tube from being transmitted to the valve shaft. All inner and outer tubes shall be manufactured in a steady rest and machined finished and faced with all mounting flanges suitable for gasket sealing. Designs causing stagnant water are unacceptable. Torsional deflection calculations shall be submitted with all bids. All welds shall be continuous and full penetration. All torque tubes shall incorporate a permanent stainless steel tag with the maximum allowable torque to be applied to the assembly. All inner shafts shall be supported and designed for removal from the valve shaft while under static pressure. Valve packing retaining plates shall be incorporated in all designs.

### Inner Torque Tubes

All inner torque tubes shall be designed for a maximum allowable torsional deflection of .50 degrees over the total required length. Both male and female hubs shall be 316 Stainless Steel, machined on the O.D., and inserted into the inner pipe a minimum of 75mm (3 inches). All hubs shall be shouldered and fitted to the pipe prior to welding. The male hub shoulder O.D. shall be recessed below the outer tube mounting flange. The female hub length shall be equivalent to the valve shaft height in all cases. The female hub shall be bored through and double keyed at 90 degrees and engage the entire length of the valve shaft. Blind or capped hubs are not acceptable. When acceptable, all inner torque tubes requiring HDG shall be drilled to prevent explosion. Stainless steel inner torque tubes do not require HDG.

### Outer Torque Tubes

All outer torque tubes shall be designed for a maximum allowable torsional deflection of .50 degrees over the total required length. Both mounting flanges shall be aligned to suit the Valve and Actuator bolt patterns on the same axis. Both flanges shall be machined stepped to accommodate the pipe O.D. prior to welding. The upper mounting flange shall be designed to guide the inner male hub with a maximum clearance of 3.2mm (.125 inches). All outer housing flanges shall be machined faced after assembly. Based on the valve design and mounting trunion, the upper or lower flange shall incorporate an additional load bearing thrust flange or recess to accommodate the pre assembly of the inner torque tube. The thrust flange shall be 316 Stainless Steel and incorporate 316 stainless recessed steel mounting hardware. All length's exceeding 6.5 meters shall be coupled using flanges at each length and bolted as an assembly in the field. The internal drive between the connections shall be single key male and female hubs. The flange connection will not serve as the positive drive.

### Acceptable Manufacturers

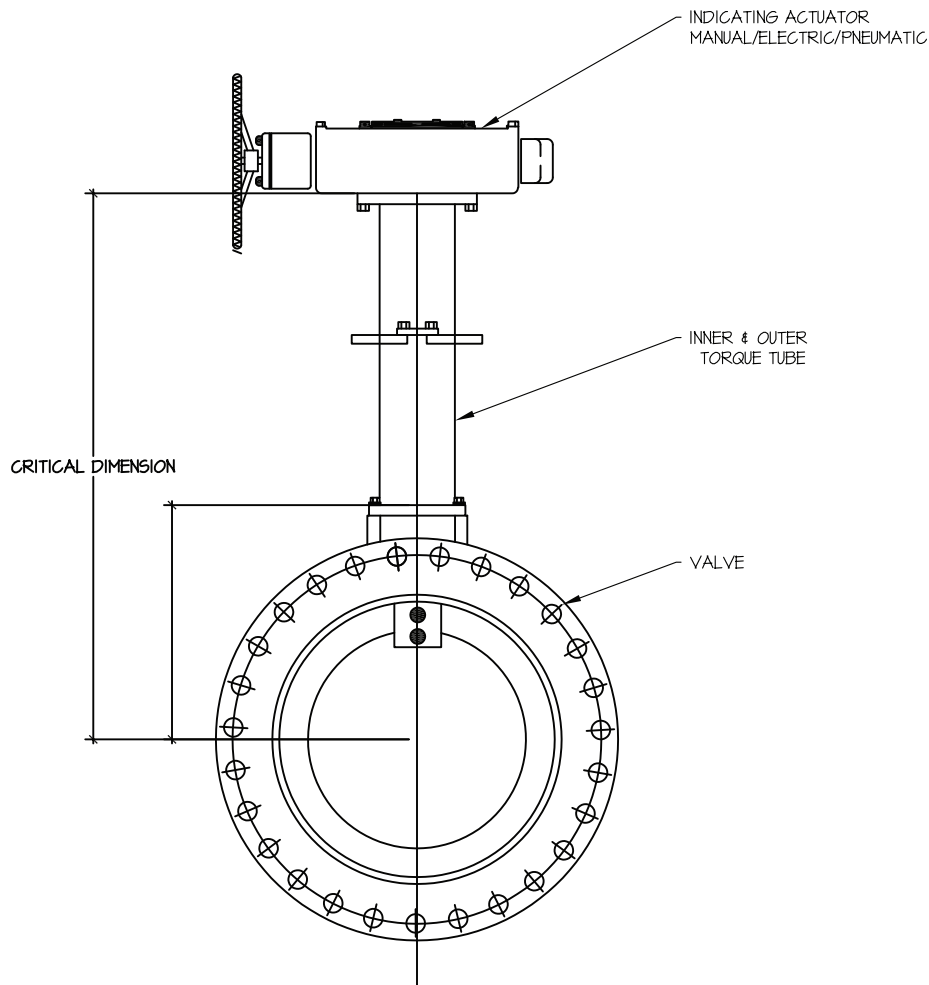
All torque tubes shall be as manufactured by TTR Group Inc., 2011 Markle Drive, Oakville, ON, L6H 3N6 or reviewed equivalent.



# Suggested Specification TTR Engineered Free Standing Torque Tubes All Rotary Valves

## TTR ENGINEERED FREE STANDING TORQUE TUBE

- Used to extend the actuator from the valve in situations when there may be space constraints or it is not desirable to mount the actuator directly on the valve.
- Can be used for submerged service (such as reservoir inlet) and buried service applications.



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	TTR ENGINEERED FREE STANDING TORQUE TUBE			
2			APPROVED BY:	FINISH	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1			DATE:	FILLETES & RADII .031	PO #	SCALE: NTS		
RFP			DATE:	BREAK SHARP EDGES	50 #			
No.	ERN	DATE						
REVISIONS								



## Suggested Specification TTR Engineered Shaft Extension and Pedestal All Rotary Valves

### General

The pedestal shall support all shaft extensions. All shaft extensions shall be designed for removal from the valve shaft while under non-flowing pressure. Packing retaining plates shall be incorporated in all designs. Inner tubes shall be manufactured in a steady rest and machined finished and faced. Designs causing stagnant water are unacceptable. Torsional deflection calculations shall be submitted with all bids. All welds shall be continuous and full penetration. All torque tubes shall incorporate a permanent stainless steel tag with the maximum allowable torque to be applied to the assembly. Single keyways in the upper and lower hubs only.

### Inner Torque Tubes

All inner torque tubes shall be designed for a maximum allowable torsional deflection of .50 degrees over the total required length. Both male and female hubs shall be 316 Stainless Steel, machined on the O.D., and inserted into the inner pipe a minimum of 75mm (3-inches). All hubs shall be shouldered and fitted to the pipe prior to welding. The male hub shoulder O.D. shall be recessed below the outer tube mounting flange.

The female hub length shall be equivalent to the valve shaft height in all cases. The female hub shall be bored through and double keyed at 90 degrees and engage the entire length of the valve shaft. Blind or capped hubs are not acceptable. When acceptable, all inner torque tubes requiring HDG shall be drilled to prevent explosion. All inner torque tubes requiring HDG shall be tapped and plugged with stainless steel plugs prior to assembly. Shaft extensions shall be 316 stainless steel unless otherwise noted. Stainless steel extensions do not require plugs. HDG shaft extensions when specified shall incorporate sealing plugs. All lengths exceeding 6.5 meters shall be coupled using flanges at each length and bolted as an assembly in the field. The internal drive between the connections shall be single key male and female hubs. The flange connection will not serve as the positive drive.

### Shaft Extension Pedestals

All pedestals shall be designed to withstand the maximum output torque of the actuator with a maximum torsional deflection of .5 degrees with 450 lbs./ft. of torque on the input shaft of the actuator. All pedestals shall be indicating with vertical or horizontal indicators. Pedestals shall be carbon steel nylon coated in accordance with NSF 61 inside and out or 316 Stainless steel. Pedestal bases shall be square and designed for a minimum of 4 mounting bolts. Mounting plate bolts shall be designed for one bolt to accommodate the total shear force based on the total torsional deflection at maximum output torque of the actuator.

### Acceptable Manufacturers

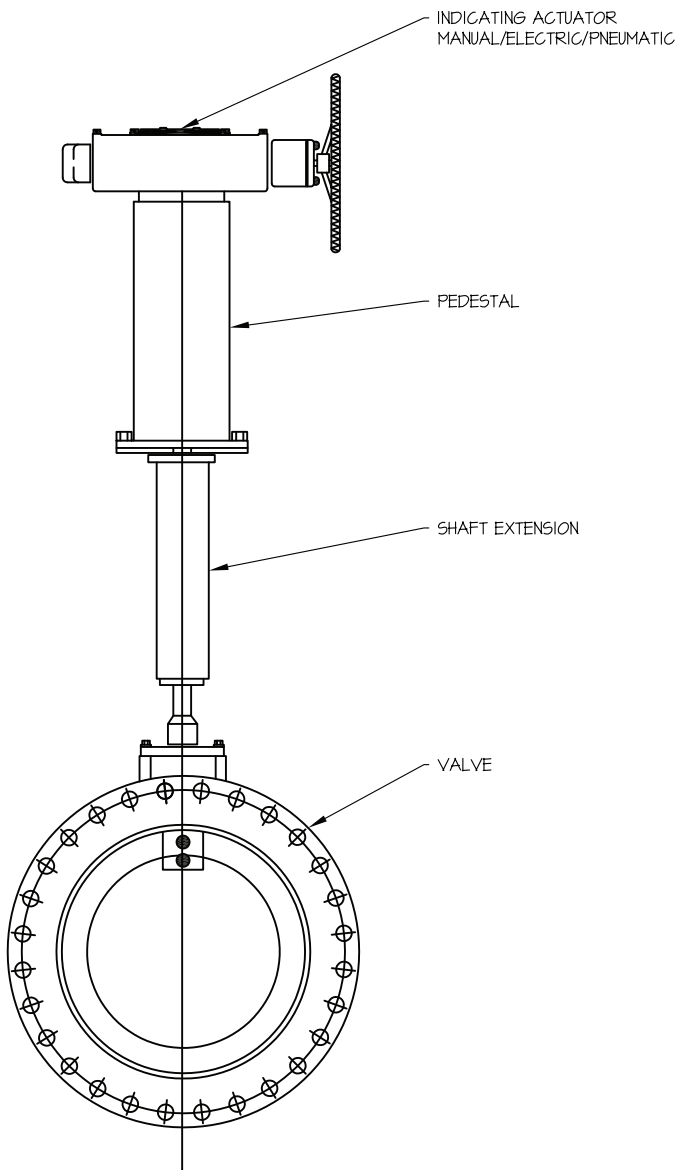
All extensions and pedestal assemblies shall be as manufactured by TTR Group Inc., 2011 Markle Drive, Oakville, ON, L6H 3N6 or reviewed equivalent.



# Suggested Specification TTR Engineered Shaft Extension and Pedestal All Rotary Valves

TTR ENGINEERED SHAFT EXTENSION AND PEDESTAL

- Shaft extension and pedestal is determined by the need for valve position indication and angular alignment.



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4			CHECKED BY:	FRACTIONAL ± .015				
3			DATE:	ANGULAR ± 1/2°	TTR ENGINEERED SHAFT EXTENSION AND PEDESTAL			
2			APPROVED BY:	FINISH	CUSTOMER:	DO NOT SCALE	DRAWING No.	REV
1			DATE:	FILLET & RADII .031	PO #	SCALE:		
RFP			DATE:	BREAK SHARP EDGES	SO #	NTS		
REVISIONS		ERN	DATE					



## Suggested Specification TTR Engineered Actuator Brackets & Mounting Adaption All Rotary Valves

### Brackets

All brackets shall be designed to suit the existing valve trunion bolt circle while maintaining the specified pre-load to the packing if applicable. All brackets shall be designed for field assembly to existing valves while under pressure or flowing conditions. Brackets and adapters shall be carbon steel powder coated with Byers Bush grade 101BK to minimum 3 mil dry film thickness (DFT).

All adapters shall be designed to withstand the maximum output torque of the actuator with zero torsional deflection to the bracket or adapter. All brackets and adapters shall be manufactured in a steady rest with milled mating surfaces to eliminate premature wear to the packing, seals and bearings. All mounting holes on twin plate designs shall incorporate anti-rotational devices, two per unit part TTR1018-12 to prevent rotation between plates. All double plate brackets as required shall be designed for clog and corrosion-free operation and to prevent actuator pressurization from possible valve packing failure for the life of the valve. All mounting hardware shall be stainless steel per ASTM F593, or carbon steel per SAE J429 Grade 8. All brackets and adapters shall carry a lifetime warranty from the manufacturer. Deflection calculations of the bracket and adapter shall be supplied with the bid.

### Shaft Adapters

All shaft adapters shall be carbon steel powder coated with Byers Bush grade 101BK to minimum 3 mil thick (no exception) and designed for zero deflection at the maximum output torque of the actuator. Both the male and female ends shall fully engage the existing valve shaft and actuator bore for maximum engagement and zero hysteresis. A set screw shall engage the valve shaft on the flat or keyway. The adapter shall be single piece designed to eliminate pre-load to the disc and shaft assembly at both the valve shaft and actuator bore and designed to prevent preload on the valve shaft in the design. All bores and male drives shall be double keyed to accommodate varying orientation. All adapters and keys shall be designed and manufactured as one piece. Deflection calculations shall be supplied with the bid.

### Actuators (Pneumatic - Rack and Pinion)

All actuators shall be designed to direct mount to the brackets and single piece adapters.

All actuators shall be sized for the maximum valve torque based on 415 KPA (60 PSIG) maximum supply pressure to the actuator. Valve torque calculations shall be based on maximum dynamic plus bearing friction torque or seating/unseating plus hydrostatic plus bearing friction torque, whichever is greater. A 40 percent safety factor shall be applied to all valve torques for actuator sizing. All actuators shall incorporate mini filters at the inlet. All actuators shall incorporate two keyways to incorporate installation orientations as required without field modifications. All actuators shall be designed for thermal fluctuations from -40° C to 66° C (40° F to 150° F) without adverse effects to the actuator or performance of the operation. The successful bidder shall warranty the assembly and performance of the actuator for a period of three full years from the commissioning date. An actuator user list will be supplied based on the design criteria and shall be submitted with the tender. All actuators shall incorporate internal bi-directional adjustable travel stops for the open and closed positions. All actuators shall be pre-drilled in the appropriate location to facilitate mounting of limit switches and accessories. No field modifications will be required. Any requirements will be at the supplier's expense.

A detailed assembly drawing shall be supplied with the submission.

### Actuator Design Criteria

All actuators shall be sized for 552 KPA (80 PSIG) supply and capable of operating at 1034 KPA (150 PSIG). Actuators containing brass or bronze components are unacceptable over 20337 N-m (15,000 lb/in). All actuators shall be of the scotch yoke double piston design with tie rod construction and cast aluminum drive case for maintenance free operation. All actuator cylinders shall be of spiral filament capable of operating with air or water hydraulics. All dynamic seals shall be nitrile. All actuators shall be lubricated for life and require no further lubrication. All actuators shall be capable of -40° C to 66° C (-40° F to 150° F). All top and bottom mounting holes shall incorporate the same mounting pattern. All actuators shall be coated with all color 03-2010 minimum thickness 3-4 mil.

Any exceptions to this specification must be indicated in the submission and drawing.

### Acceptable Manufacturers

All brackets and adapters shall be as manufactured by TTR Group Inc., 2011 Markle Drive, Oakville, ON, L6H 3N6 or reviewed equivalent.





## Typical Requirements for Proper Valve & Actuator Selection For Specification Preparation and Bidding Purposes

### Media

The liquid that's flowing through the pipe (ex. water, air, beer). AWWA butterfly valves are typically designed for water use only NSF (AWWA = American Water Works Association).

### Flow Rate

How much media is flowing through the pipe in a specific time period?

### Volumetric Flow Rate

Expressed using volume (ex. gallons per minute, gpm or cubic meters per second, m<sup>3</sup>/s "cumecs"). *Flow rates will vary on in line and end of line (free discharge) applications.*

### Mass Flow Rate

Expressed using mass (ex. pounds per hour, lb/hr or kilograms per minute kg/min). Commonly, volume is used for liquids and mass is used for gases or steam, although you can convert from one to the other.

### Velocity

What is the average speed of the media in the pipe? Velocity is determined from the flow rate using the size of the pipe (ex. the flow rate through 2" and 6" pipe can be the same, but the velocities will be different). Common units for velocity are feet per second (ft/s, fps) for US imperial or meters per second (m/s) for metric. *Determine max rates at all angles above 24 inch (500mm) for proper actuator sizing due to DYNAMIC torques and unidirectional or bidirectional.*

### Pressure

To make the media flow through the pipe you have to push it. How hard is the media being pushed through the pipe? This is important because when the valve is closed, the media is now pushing against the disc. The atmosphere around us is pushing on us with a certain pressure (called ambient or atmospheric pressure).

### Gauge Pressure

The reading that you would get from a pressure gauge (does not include atmospheric pressure).

**Absolute Pressure** = Gauge Pressure + Atmospheric Pressure

Common units for pressure are pounds per square inch (psi) for US imperial or kilopascals (kPa) for metric. To denote between gauge and absolute pressure the units are followed by a letter (ex. psig or psia). Determine the maximum delta P across the disc, ie know P1 and P2.

### Temperature

How "hot" or "cold" is the media or surrounding environment and in contact with the valve components? Temperature should always be given as a range stating the lowest and highest temperatures that the valve will be exposed to as components vary in expansion and contraction (this also affects extension design considerations).

### Maximum Bore Capability

The largest bore with a keyway that can be bored into the actuator to accept the valve shaft. Most actuators have a removable HUB that fits over the shaft and inside the actuator/gearbox. This piece is referred to as the drive coupling or drive nut.

### Maximum Shaft Turndown

The minimum allowable valve shaft diameter for actuator mounting, either the shaft diameter can be reduced (turndown) or the drive coupling hole (bore) can be increased. Both have a maximum limit. Be cautious of actuator mounting BCD and valve mounting pad BCDs.

### Internal Paint

This is the paint that will be exposed to the media, therefore might have certain requirements testing (ex. NSF, holiday free, min DFT).

### External Paint

This is the paint that will be exposed to the surrounding environment and might have certain requirements if the valve is submerged or buried. Colors are normally specified.

### Torques

Force on the valve shaft end to open or close the valve? Valve shaft height is critical for actuator engagement and should not be altered. When the valve disc is somewhere between open and closed, the media flowing past the disc will try to close the valve further. To keep the disc in this intermediate position, a certain torque is required to balance the torque exerted from the flowing media (called the dynamic torque). All discs want to close under flowing conditions and should use actuation as a mechanical locking device.





## COMMITMENT TO OUR CUSTOMERS & INDUSTRY

TTR has combined quality products manufactured in North America selecting originators of these products as early as 1879 that exist today as leaders and role models in the Markets and Industry today. TTR has combined these products as a package with our speciality Engineered Products Division to meet the requirements of many applications within the same project culminating the advantages of established proven quality engineered products with over 70 years of combined field service and site commissioning experience.

### Products & Services – AWWA Compliant and NSF



#### Products

Valve and Full Electric / Pneumatic / Hydraulic and Electro Hydraulic Automation \ Packages for In-Plant and Submerged Service

#### Engineered Speciality Products

- Energy Dissipating Valves and Systems / AWWA Knife Gate Valves
- Counterweighted Turbine Isolation
- Torque Tubes / Shaft Extensions / Rod Extensions

#### AWWA Valves

Butterfly /Resilient Seated Wedge Gate /Knife Gate / Air and Sewage Relief Globe, Silent, Tilting Check Self Piloted Control / Slide / Plug / Ball

#### Services - 35 Years Experience

Speciality Engineered Products / Design and Manufacturing Capabilities / FEA and CFD modelling Support / Unbiased Specification Assistance / Field Service Analysis and Support / Site Commissioning / 3rd Party Inspection / Confined Space Certified

#### Continuing Education Courses

OWWCO - Director Approved Training Course

TTR Training Course Name - AWWA C504 Butterfly Valves & Actuators

Follow <http://www.owwco.ca> Course ID 8733. Page 228

## CONTACT

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Established 2009

## ASSOCIATIONS

