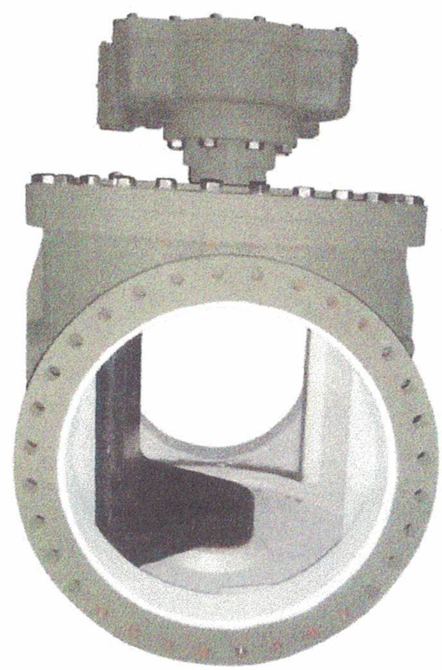
WTR Water Technology Resources

COMPANY CERTIFICATE

ISO 9001 · CE · UL · FM · NSF · ACS · OHMSE

API Q1 · API-6D · API-600 · API-609 · API-607 · EVS

AWWA C517 ECCENTRIC PLUG VALVES



WTR/Tianjin Water Valve Partnership

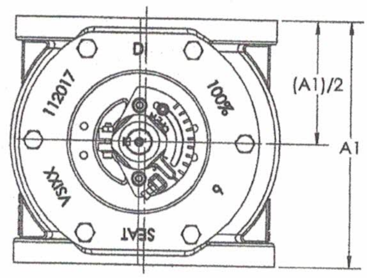
VERSION: 2014-09-EPV

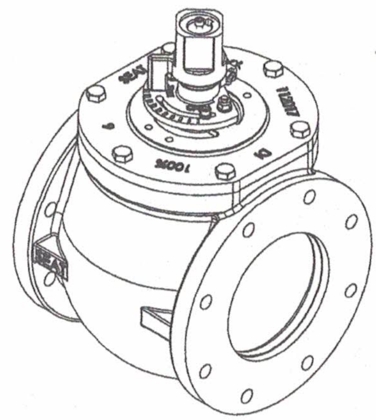
PVI/PVIF Plug Valves (AWWA C517)

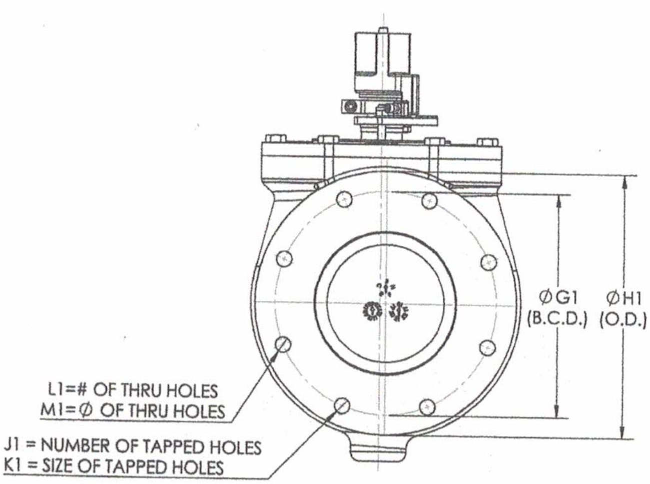
PVI/PVIF(1)(2)-(3)(4)(5)-(6) (7)(8)/(9)(10)-(11)

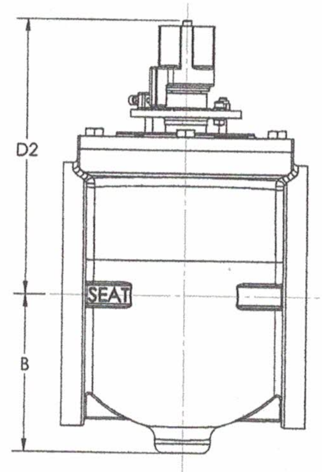
1. 2 Digit Size 02-24
2. Connection
    - F-Flanged CL125
    - 2-Flanged CL250
    - M-Mechanical Joint
    - N-Female NPT
3. Body Material
    - C-Cast Iron
    - D-Ductile Iron
4. Plug Material
    - D-Ductile Iron
    - C-Cast Iron
5. Plug Encapsulation Material (Seat)
    - E-EPDM
    - N-NBR
    - V-Viton
6. Bearing Material
    - P-PTFE
    - B-Bronze
    - S-Stainless 304
7. Hardware Material
    - S-Stainless 304
    - 3-Stainless 316
    - Z-Zinc Plated
8. Coatings
    - 1-FBE
    - 2-Tnemec N140
    - A-AWWA C550
9. Gearbox
    - W-Standard Worm Gear
    - 2-Two Stage Worm Gear (Special on small sizes)
    - T-Traveling Nut
    - B-Barestem
    - Blank – Lever Operated
10. Operator
    - H-Handwheel (Standard on FL Valves)
    - N-2" Nut (Standard on MJ Valves)
    - C-Chainwheel
11. Identifier

SIZE	A1	B	D2	G1	H1	J1	K1	L1	M1
3	8.00	4.3	9.46	6.00	7.9	4	0.625-11UNC	-	-
4	9.00	5.2	10.19	7.50	9.1	2	0.625-11UNC	6	0.752
6	10.50	6.7	11.73	9.50	11.2	8	0.75-10UNC	-	-
8	11.50	8.2	13.87	11.75	13.6	8	0.75-10UNC	-	-









CAST EMBOSSED ON VALVE BODY
VSI
SIZE
250 PSI
DI
CASTING YEAR
SEAT END
POUR IDENTIFIER

TECHNICAL NOTES:

1. FLANGES PER ASME/ ANSI B16.1 CL125 AND B16.5 CL150
2. ACTUATOR MOUNT PER MSS SP-101
3. VALVE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA C517 LATEST REVISION
4. PLUG FULLY ENCAPSULATED
5. 6-INCH VALVE ILLUSTRATED, IN CLOSED POSITION

7/10/2018 CJK DWG. No.: PVII-1023
PART #: PVIIxxF-xxx-xxx/MN
DRAWING FILE: PVII-1023 Flanged with Direct Nut Op

3"-8" FLANGED PVII FULL PORT PLUG VALVE
DIRECT 2-INCH NUT OPERATOR

REVISIONS

REV.	ZONE	DESCRIPTION	DATE	APPROVED
0		INITIAL RELEASE	7/10/18	CJK

SHEET SCALE: 1:4
*SEE DRAWING/DETAIL SCALES

MATERIAL: ASSEMBLY
FINISH: VARIES

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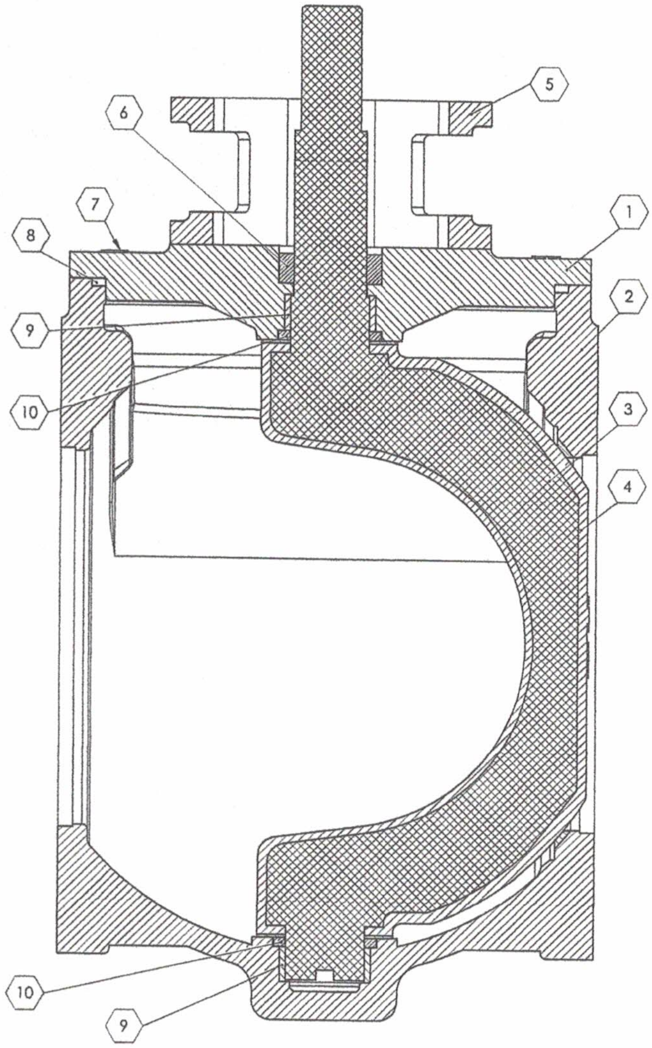
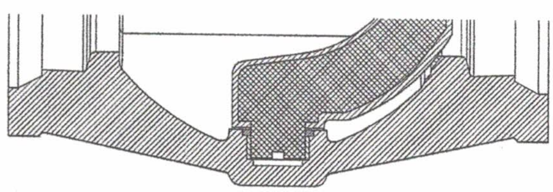


FLANGED BY FLANGED



MECHANICAL JOINT BY MECHANICAL JOINT

ITEM	DESCRIPTION	MATERIALS
1	COVER	DUCTILE IRON ASTM A536 65-45-12
		CAST IRON ASTM A126 CLASS B
		STAINLESS ASTM A351 CF8
		STAINLESS ASTM A351 CF8M
		CARBON STEEL ASTM A216 WCB
2	BODY	DUCTILE IRON ASTM A536 65-45-12
		CAST IRON ASTM A126 CLASS B
		STAINLESS ASTM A351 CF8
		STAINLESS ASTM A351 CF8M
		CARBON STEEL ASTM A216 WCB
3	PLUG	DUCTILE IRON ASTM A536 65-45-12
		CAST IRON ASTM A126 CLASS B
		STAINLESS ASTM A351 CF8
		STAINLESS ASTM A351 CF8M
		CARBON STEEL ASTM A216 WCB
4	ENCAPSULATION	EPDM
		BUNA-N (NBR)
		VITON (FPM)
5	BONNET	DUCTILE IRON ASTM A536 65-45-12
		CAST IRON ASTM A126 CLASS B
		STAINLESS ASTM A351 CF8
		STAINLESS ASTM A351 CF8M
		CARBON STEEL ASTM A216 WCB
6	PACKING	EPDM
		BUNA-N (NBR)
7	EXTERIOR HARDWARE	STAINLESS ASTM F593 GROUP 1
		STAINLESS ASTM F593 GROUP 2
		STEEL ASTM A325 TYPE 1
8	SEAL	EPDM
		BUNA-N (NBR)
9	BEARING	SS316 REINFORCED PTFE
		BRONZE ASTM B584
10	GRIT SEAL	REINFORCED PTFE
		BRONZE ASTM B584

NOTES:
1) VAVLE ASSEMBLED WITH NSF61 APPROVED LUBRICANT
2) IRON AND STEEL COMPONENTS COATED WITHAWWA C550 EPOXY
3) SOLID SS316 SEATING SURFACE WELDED TO VALVE BODY

TEMPERATURE RESTRICTIONS		
SEAT	MIN	MAX
EPDM	-40F	300F
NBR	-30F	250F
FPM	-10F	400F
PTFE	-100F	450F

6/7/2018 DK DWG. No.: PVII
PART #: PVII
DRAWING FILE: 3-8 inch parts and materials list

CROSS SECTION PARTS AND MATERIALS LIST
3"-8" SERIES PVII ROUND PORT AWWA C517 PLUG VALVE

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Difference Between Ductile Iron and Cast Iron

Posted on March 5, 2011 by Clarisse

Ductile Iron vs Cast Iron

Ductile iron and cast iron are used in the metal industry on an everyday basis. However, the two alloys have different characteristics which results in them being used for various purposes.

Ductile Iron

Ductile iron was firstly created during the mid 1940's by Keith Millis through incorporating the ferrous alloy with magnesium treatment. This shows the structural alteration of graphite, since in the development of this material, the graphite creates spherical nodules which restricts the development of fissures thereby resulting in increased malleability. It is usually utilized as a water main pipe due to its durability and resistance to corrosion.

Cast Iron

Cast iron has a vast range of properties that are being cast into shape as opposed to being formed. Its production consists of re-melting pig iron and steel scrap and adding different alloys in it during the procedure. Some of those that are added are carbon and silicon. It usually contains high amount of silicon in addition to the already high carbon content. Sulfur and manganese are also added to provide strength and solidity to the metal.

Difference between Ductile Iron and Cast Iron

Cast iron is usually used for engineering and construction structures because of its stability, while ductile iron is utilized for water pipes due to its durability. Ductile iron is a newer material which is more favored, not just in terms for a water pipe fixture but also for engine parts such as crankshafts and connecting rods, plus various brakes and steering components due to its strength, reliability and flexibility. Their main difference lies in the presence of graphite, since it causes cracks, which softens the alloy, it is an important component for ductile iron but in the case of cast iron, it is eliminated.

We see these materials each day, though a regular person might not know the difference. The important thing is that they are made for a purpose and that they provide the needed support that they are developed for in the first place.

In brief:

- Cast iron is usually used for engineering and construction structures because of its stability, while ductile iron is utilized for water pipes due to its durability.

- Ductile iron is a newer material which is more favored, not just in terms for a water pipe fixture but also for engine parts such as crankshafts and connecting rods, plus various brakes and steering components due to its strength, reliability and flexibility.

Related posts:

ductile iron vs cast iron

Ductile iron can be bent without breaking, whereas cast iron is brittle and breaks when bent.

As ductile iron can be bent, it can be made into different shapes and forms. But one cannot make out different shapes and forms using cast iron. While ductile iron is flexible, cast iron is not.

When comparing the two, cast iron corrodes more quickly than ductile iron.

Ductile iron consists of iron, carbon, silicon, manganese, magnesium, phosphorous and sulphur. Tin and copper are also sometimes found. Ductile iron also consists of nodular graphite, which gives it flexibility. Cast iron mainly consists of carbon and silicon. With regard to practical uses, ductile iron pipes are used in sewer and water lines. This is because they are much stronger than cast iron. Moreover, ductile iron is better than cast iron in difficult terrains. Ductile iron is mainly used in the automobile industry such as trucks, tractors and oil pumps. Cast iron is mainly seen in the construction industry.

It was Keith Millis who discovered ductile iron in 1943. Cast iron has been in use for many centuries. China is credited with the invention of cast iron in the 4th century BC. It was used first for making weapons, pots, ploughshares and pagodas. The western people knew cast iron only in the late 14th century.

Summary

WATER TECHNOLOGY RESOURCES - WTR VALVES

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Notations

A) We prefer Ductile Iron in lieu of Cast Iron for the valve body.

Cast Iron Specification ASTM A126 Class B

- Physical Properties
  - Minimum tensile strength — 31,000 psi
  - Minimum traverse strength — 3,300 lbs
  - Minimum deflection (12" Centers) — .12 in
- Chemical Analysis (percent)
  - Phosphorus (maximum) — .75
  - Sulfur (maximum) — .15

Ductile Iron ASTM A536

- Minimum tensile strength — 65,000 psi
- Minimum yield strength — 45,000 psi
- Elongation — 10-12%

1. Ductile Iron (DI) is a stronger material and its strength is rated at approximately double the strength of Cast Iron.
2. DI is a more flexible material, less brittle, and less subject to cracking.
3. DI is also easier to machine and is more corrosion resistant.

A key principle of design engineering is the selection of the proper material for an engineered product. Cost and durability are strong factors in selecting the material. Two materials with a long service history in the waterworks industry are gray and ductile iron. These two alloys are similar in chemical analysis but are quite different in mechanical properties. In gray iron, the graphite exists in an interconnected flake structure with the iron. Gray iron will fracture more readily along this continuous graphite iron flake structure. In ductile iron the graphite exists as discrete graphite nodules with more substantial areas of iron in between, forming a more stronger alloy than gray iron. These differences in the microstructure are reflected in the mechanical properties of the two irons. Ductile iron has superior mechanical properties and behaves more like steel in an engineering sense than does gray iron. By observing a few mechanical tests such as those defined in the American Society for Testing Materials (ASTM) E-8 standard test procedures, you can easily see the difference in the superior mechanical properties of ductile iron.

Tensile Test

Using a common tensile test with specimens of 11/32" diameter, you should see differences in the elongation of gray iron versus ductile iron. It is apparent that ductile has a certain amount of elongation and plasticity before fracture. In contrast, gray iron is a brittle material with plastic elongation so close to zero that it is not reported on a tensile test.

Charpy V-Notch Test

The Charpy V-Notch Test (ANSI/AWWA C151/A21.51) is another engineering test used to characterize the toughness of a material. The test is an impact test that measures the amount of energy required to fracture a standard 10mm x 10mm notched specimen. The greater the energy requirements, the tougher the material. Charpy tests are not routinely performed on gray iron as the results are always near zero, which indicates very low resistance to cracking. Ductile iron Charpy impact values range from 5 to 15 ft-lbs. The real value of ductile iron is its toughness and resistance to rough handling.

After considering the mechanical properties of a particular material, our design engineers are able to apply design rules to determine the section thickness and reinforcing scheme to meet the intended service conditions. AMERICAN engineers have used the superior mechanical properties of ductile iron to design a more rugged valve than required under the ANSI/AWWA C-509 standard. To demonstrate this point we tested 2 12 in. AMERICAN Flow Control gate valves - one made of gray iron and one made of ductile iron, to see how the mechanical properties we have discussed apply to the effectiveness of a completed product.

Pressure Test

The predecessor to the Series 2500 gate valve was the Series 500 gate valve. A test comparison of the two valves found significant differences in the performance of the valve designs. The 12 in. Series 500 gray iron resilient wedge gate valve is manufactured according to ANSI/AWWA C-509 Resilient Seated Gate Valve Standard. The valve is rated at 200 psig and has a safety factor to withstand significant pressure surges. This pressure test results in fracture of the bonnet flange at a pressure of 850 psig.

The 12 in. Series 2500 Ductile Iron resilient wedge gate valve is manufactured to conform to the requirements of the new reduced wall resilient wedge gate valve standard ANSI/AWWA C-515. It is rated at 250 psig with sufficient safety factor to withstand significant pressure surges. Pressure testing of the valve shell to failure generally results in "dishing" of the bonnet and body flange connection such that the bonnet gasket is blown out past the flange. The test case blew the bonnet gasket at 1500 psig without failure due to fracture of the shell. Although lighter in weight, the ductile iron valve is a more rugged design with the ability to withstand abuse during installation and possible extreme surge pressures.

Beam Load Test

Flanged end valve and piping components are not designed to bear a substantial beam load. We recommend that valve installations be executed in such a way that all beam loads on flanged components be eliminated. Unfortunately, settling of structures, slight misalignment, vibration, etc. can often result in induced beam loads, thus placing undue stress on flanged systems. To simulate an induced beam load, we connected two lengths of flanged ductile iron pipe to a 12 in. flange x flange gray iron valve with the valve closed and one end of the piping system pressurized to 100 psig. A vertical press was used to apply the load to the valve bonnet while supporting the ends of the pipe. This resulted in both hydrostatic and beam loads on the flanges of the valve and piping system. The vertical load on the valve was increased until the flange fractured. Failure occurred by fracture of the pipe flange at a beam load of 78,000 ft-lbs with a vertical deflection of 7/8 in.

Similar testing was performed on a 12 in. flange by flange reduced wall ductile iron valve with the valve closed and one end of the piping system pressurized to 100 psig. The vertical load was applied incrementally until fracture. Failure occurred by fracture of the pipe flange at a beam load of 135,000 ft-lbs. with a vertical displacement of 2 inches.

Gray iron or ductile iron? Ductile iron has the strength, durability and reliability to meet and exceed the requirements of the waterworks industry. Our ductile iron valves have the ability to resist high stress from internal and external loads.

Check Valve so outstanding?

✱APPROVED

APCO Silent Check Valves have been thoroughly tested by Factory Mutual Research Corp. As a result, the 300 Series and 600 Series Valves can be used on hazardous fire fighting equipment and fire protection systems with assurance of performance. For such applications, insist on the Factory Mutual Guarantee Label of Approval on your Silent Check Valve. Available on sizes as indicated.

Materials of Construction

All the materials used in APCO valves are clearly referred to by their appropriate ASTM numbers.

APCO offers Ductile Iron as an alternate to the conventional cast iron.

A brief technical explanation of the qualities is given below.

The Advantages of Ductile Iron

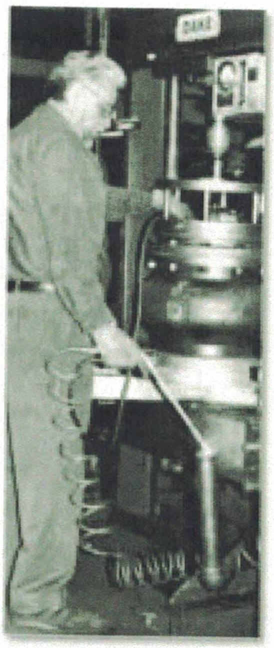
Ductile Iron, contrary to its name, is not really a cast iron at all but an alloy developed by the International Nickel Company.

Cast Iron has graphite present in lenticular flakes which causes it to be brittle and have a relatively low tensile strength.

The graphite in Ductile Iron is present in spheroidal shape making it ductile with a much higher tensile strength.

Various types of Ductile Iron are available and we use the one especially recommended for valves. This is Type 65-45-12 Ductile Iron ASTM A536 strength of 65 to 80,000 psi and a yield strength of 45 to 60,000 psi, equivalent to carbon steels, yet retaining the anti-corrosion properties of iron.

5" APCO SERIES 600 SILENT CHECK VALVE WITH MINIMUM 10% GREATER FLOW AREA.



ALL APCO SILENT CHECK VALVES 100% HYDROSTATICALLY TESTED TO **ANSI** STANDARDS

COMPARE FLOW AREA OF PIPE BELOW WITH THOSE SHOWN AT DIFFERENT SECTIONS OF THE VALVE
Area of 5" Pipe = 20.1 Sq. In.