I-300

FIELD INSTALLATION HANDBOOK

AWWA Products

- **GASKET INFORMATION**
- **PIPE PREPARATION**
- **PRODUCT INSTALLATION**
- **PRODUCT DATA**

⚠ WARNING

- Read and understand all instructions before attempting to install, remove, adjust, or maintain any Victaulic products.
- Depressurize and drain piping systems before attempting to install, remove, adjust, or maintain any Victaulic products.
- Wear safety glasses, hardhat, foot protection, and hearing protection.

Failure to follow instructions and warnings could cause system failure, resulting in serious personal injury and/or property damage.

If you need additional copies of any instructions, or if you have questions about the safe and proper installation or operation of Victaulic products, contact Victaulic.
P.O. Box 31, Easton, PA USA 18044-0031, Phone: 1-800-PICK VIC,
email: pickvic@victaulic.com

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The following table provides a listing of products and installation information. If you need additional copies of any installation information, contact Victaulic at 1-800-PICK VIC. **NOTE:** If two sources of instructions are referenced in this index, Victaulic recommends the use of both to ensure proper installation.

Product	Where to Find Instructions
Series 782 TA Bypass	Instructions Shipped with Valve
Series 785 TA TBVS Sweated-End Mini Circuit Balancing Valve	Instructions Shipped with Valve
Series 786 TA STAS Soldered-End Circuit Balancing Valve	Instructions Shipped with Valve
Series 787 TA STAD NPT Female Threaded Circuit Balancing Valve	Instructions Shipped with Valve
Series 788 TA STAF Flanged-End Circuit Balancing Valve	Instructions Shipped with Valve
Series 789 TA STAG Grooved-End Circuit Balancing Valve	Instructions Shipped with Valve
Series 793 Knife Gate Valve	I-793/797
Series 797 Knife Gate Valve	I-793/797
Vic-300 Butterfly Valve	I-100
Style 005 FireLock Rigid Coupling	I-100
Style 07 Zero-Flex Rigid Coupling (1 – 12"/25 – 300 mm)	I-100
Style 07 Zero-Flex Rigid Coupling (14 – 24"/350 – 600 mm)	I-100 and IT-07
Style 22 Coupling for Vic-Ring Adapters and Shouldered-end Pipe	I-6000
Style 31 Coupling for AWWA Ductile Iron	I-300
Style 31 Coupling for Vic-Ring Adapters and Shouldered-end Pipe	I-6000
Style 41 Coupling for Vic-Ring Adapters and Shouldered-end Pipe	I-6000
Style 44 Coupling for Vic-Ring Adapters and Shouldered-end Pipe	I-6000
Style 72 Outlet Coupling	I-100
Style 74 OD Flexible Coupling	I-100
Style 75 Flexible Coupling	I-100
Style 77 Flexible Coupling	I-100
Style 78 Snap-Joint Coupling	I-100
Style 89 Rigid Coupling for Stainless Steel	I-100 and IT-89
Style 99 Roust-A-Bout Coupling for Plain-end Steel	I-100 and IT-99
Style 150 Mover Expansion Joint	I-100
Style 155 Expansion Joint	I-100
Style 307 Coupling for Grooved IPS Steel to Grooved AWWA Ductile Iron	I-300
Style 341 Vic-Flange Adapter for AWWA Ductile Iron	I-300
Style 397 V-Grip Coupling for Plain X Grooved Ductile Iron	I-300 and I-397

Product	Where to Find Instructions
Style 399 V-Grip Coupling for Plain-end Ductile Iron	I-300 and I-399
Style 441 Vic-Flange for Stainless Steel	I-100 and I-441
Style 475 Lightweight, Flexible Stainless Steel Coupling	I-100
Style 489 Rigid Coupling for Stainless Steel ($1^1/_4$ – 4"/40 – 100 mm)	I-100 and IT-489.2-4
Style 489 Rigid Coupling for Stainless Steel (6 – 12" and 139,7 – 318,5 Metric and JIS Sizes)	I-100 and IT-489
Style 606 Rigid Coupling for Copper Tubing	I-600
Style 641 Vic-Flange Adapter for Copper Tubing	I-600
Style 707-IJ Transition Coupling for NPS to JIS	I-100
Style 720 TestMaster II Alarm Test Module	I-720
Style 720 TestMaster II Alarm Test Module with Pressure Relief Option	I-720PR
Style 730 Vic-Strainer Tee-Type	I-730/732
Style 731-G Suction Diffuser	I-731G
Style 732 Wye-Type Vic-Strainer	I-730/732
Style 733 Venturi Flow Metering Sensor	I-100
Style 734/734S Orifice/Indicator Flow Metering System	I-100
Style 735 Fire Pump Test Meter	I-100
Style 738 TA Portable Differential Meter	Instructions Shipped with Meter
Style 739 Portable Master Meter	Instructions Shipped with Meter
Style 740 TA CBI Meter	Instructions Shipped with Meter
Style 741 IPS and Metric Vic-Flange Adapter	I-100
Style 743 Vic-Flange Adapter	I-100
Style 744 FireLock Flange Adapter	I-100
Style 750 Reducing Coupling	I-100
Style 770 Large-diameter Coupling	I-100 and IT-770
Style 775 Coupling for PVC	I-100
Style 791 Vic-Boltless Coupling	I-100
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Style 920 and 920N Mechanical-T Outlets	I-100 and I-920N
Style 922 FireLock Outlet-T	I-100 and I-922
Style 923 Vic-Let Strapless Outlet	I-100 and I-923
Style 924 Vic-O-Well Strapless Thermometer Outlet	I-100
Style 926 Mechanical-T Spigot Assembly	I-100 and I-926
Style 931 Vic-Tap II Mechanical-T	VT-II

Product	Where to Find Instructions
Style 994 Vic-Flange Adapter for HDPE	I-900 and IT-994
Style 995 Coupling for Plain-end IPS and Metric HDPE	I-900 and IT-995
Style 997 Transition Coupling for HDPE to Steel	I-900 and IT-997
Style 2970 Aquamine Coupling for Plain-end IPS PVC	IT-2970
Style 2971 Aquamine Transition Coupling for Plain-End IPS PVC to Plain-End HDPE	IT-2971
Style 2972 Aquamine Transition Coupling for Plain-End IPS PVC to Grooved IPS Steel	IT-2972
Style HP-70 Rigid Coupling (2 – 12"/50 – 300 mm)	I-100
Style HP-70 Rigid Coupling (14 – 16"/350 – 400 mm)	I-100 and IT-70
Style HP-70ES Rigid Coupling with EndSeal or Fire-R Gaskets (2 – 12"/50 – 300 mm)	I-100

General Information

HAZARD IDENTIFICATION

Definitions for identifying various hazard levels are provided below.

This safety alert symbol indicates important safety messages. When you see this symbol, be alert to the possibility of personal injury. Carefully read and fully understand the message that follows.

⚠ DANGER

- **The use of the word "DANGER" identifies an immediate hazard with a likelihood of death or serious personal injury if instructions, including recommended precautions, are not followed.**

⚠ WARNING

- **The use of the word "WARNING" identifies the presence of hazards or unsafe practices that could result in death or serious personal injury if instructions, including recommended precautions, are not followed.**

⚠ CAUTION

- **The use of the word "CAUTION" identifies possible hazards or unsafe practices that could result in personal injury and product or property damage if instructions, including recommended precautions, are not followed.**

NOTICE

- **The use of the word "NOTICE" identifies special instructions that are important but not related to hazards.**

INTRODUCTION

This field assembly and installation handbook is a basic field reference guide for Victaulic mechanical piping products for AWWA sized pipe. This handbook provides easy reference to proper installation information. In addition to this handbook, Victaulic offers the following handbooks for other products/materials:

- I-100 – Installation Instructions for IPS and Metric Carbon Steel, Stainless Steel, and Aluminum Products
- I-500 – Installation Instructions for Pressfit Products
- I-600 – Installation Instructions for Copper Connection Products
- I-800 – Installation Instructions for FireLock CPVC Sprinkler System Products
- I-900 – Installation Instructions for HDPE Products

Additional copies of installation information are available from Victaulic, or Victaulic stocking distributors, upon request.

Always follow good piping practices. Specified pressures, temperatures, external loads, internal loads, performance standards, and tolerances must never be exceeded.

Many applications require recognition of special conditions, code requirements, and the use of safety factors. Qualified engineers should reference Section 26 of the Victaulic General Catalog (G-100) and Victaulic publication 05.01, "Gasket Selection Guide," when determining requirements for special applications.

NOTICE

- **Victaulic Company maintains a continual policy of product improvement. Therefore, Victaulic reserves the right to change product specifications, designs, and standard equipment without notice and without incurring obligation.**
- **VICTAULIC COMPANY IS NOT RESPONSIBLE FOR SYSTEM DESIGN, NOR DOES THE COMPANY ASSUME ANY RESPONSIBILITY FOR SYSTEMS THAT ARE DESIGNED IMPROPERLY.**
- **This handbook is not intended to be a substitute for competent, professional assistance, which is a prerequisite for any product application.**
- **The information published in this handbook and other Victaulic literature supersedes all previously published information.**
- **Drawings and/or pictures in this manual may be exaggerated for clarity.**
- **The field assembly handbook contains trademarks, copyrights, and products with patented features that are the exclusive property of Victaulic Company.**
- **WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE ITS ACCURACY, VICTAULIC, ITS SUBSIDIARIES, AND ITS AFFILIATED COMPANIES MAKE NO EXPRESSED OR IMPLIED WARRANTY OF ANY KIND REGARDING THE INFORMATION CONTAINED OR REFERENCED IN THIS HANDBOOK. ANYONE WHO USES THE INFORMATION CONTAINED HEREIN DOES SO AT THEIR RISK AND ASSUMES ANY LIABILITY THAT RESULTS FROM SUCH USE.**

IMPORTANT INFORMATION

Victaulic AWWA grooved pipe couplings are designed for use only with ductile iron pipe that is grooved to meet Victaulic specifications. In addition, Victaulic grooved pipe couplings are for use only with Victaulic grooved-end fittings, valves, and related grooved-end components. Victaulic grooved pipe couplings are not intended for use with plain-end pipe and/or fittings.

Victaulic AWWA plain-end pipe couplings are designed for use only with plain-end ductile iron pipe. Victaulic AWWA size plain-end pipe couplings must not be used with grooved-end pipe and/or fittings, threaded-end pipe and/or fittings, or IPS size pipe.

Gaskets for Victaulic AWWA size grooved and plain-end pipe couplings must be lubricated for proper assembly. Lubrication prevents gasket pinching and assists installation. A thin coat of Vic-Lube™ or another compatible material, such as silicone or soap based lubricants, is required.

Victaulic gaskets are designed to perform in a wide range of temperatures and operating conditions. As with all installations, there is a direct relationship between temperature, continuity of service, and gasket life. Victaulic publication 05.01, “Gasket Selection Guide,” must be referenced to determine gasket grade recommendations for each application.

OPERATOR SAFETY GUIDELINES FOR TOOLS

NOTICE

- **Although Victaulic pipe preparation tools are manufactured for safe, dependable operation, it is impossible to anticipate the combinations of circumstances that could result in an accident. The following instructions are recommended for safe operation of Victaulic pipe preparation tools. Always refer to the specific operating and maintenance instructions manual for complete safety guidelines.**

1. Read and understand the operating and maintenance instruction manual for the tool. Read the supplied manual carefully before operating or performing maintenance on any tool. Become familiar with the tool's features, operations, applications, and limitations. Be particularly aware of its specific hazards. Store the operator's manual in a readily available location. If you require additional copies of any literature, contact Victaulic.

2. Secure the tool, power drive, and equipment. Make sure that the tool and power drive are fastened securely to the floor.

3. Prevent accidental start-ups. Place any power switches in the "OFF" position before plugging the tool into the electrical system. Always use a foot pedal control for the power source.

4. Ground the power source. Make sure the power source is connected to an internally grounded electrical system.

5. Operating environment. Do not operate tools in damp locations. Wear hearing protection in noisy shop operations. Ensure that the work area is well lit.

6. Wear proper clothing. Do not wear unbuttoned jackets, loose sleeve cuffs, neckties, or anything else that can become tangled in moving parts. Always wear safety glasses and foot protection.

7. Stay alert. Do not operate tools if you are drowsy from medication or fatigue. Avoid horseplay around the equipment, and keep bystanders a safe distance away from the equipment.

8. Inspect the equipment. Before starting the tool, check all moveable parts for any obstructions. Make sure the guards and tool parts are installed and secured properly.

9. Keep work areas clean. Keep the work area around the tool clear of obstructions that could limit the movement of the operator. Clean up all oil and coolant spills. Remove shavings from the tool to maintain proper operation.

10. Use pipe supports. For long sections of pipe and heavier work, use floor-mounted pipe stands. Make sure that the work is secured properly in a pipe vise that is fastened securely to the floor.

11. Operate the tool on the switch side only. Operate tools with a foot pedal control located at an easily accessible area. Never reach across moving parts or material being worked on. The switch must always be accessible to the operator.

12. Do not misuse tools. Perform only the functions for which the tool was designed. Do not force the tool. Do not operate the tool at speeds exceeding those specified in the operating and maintenance instructions manual.

13. Disconnect the power cord before servicing tool. Only authorized personnel should attempt to service tools. Always disconnect the power source before servicing or making any adjustments.

14. Always maintain tools. Keep tools clean and cutting tools sharp for safe, dependable operation. Follow all lubricating instructions. Report any unsafe conditions to authorized personnel for immediate correction.

PIPE PREPARATION

The grooved piping method is based upon the proper preparation of grooves to receive the housings' keys. The groove serves as a recess in the pipe, which allows ample depth for secure engagement of the housings, yet ample wall thickness for full pressure rating.

⚠ WARNING

- **Before setting up and operating any Victaulic pipe preparation tools, read and understand the operating and maintenance instructions manual for the tool.**
- **Learn the operation, applications, and potential hazards peculiar to the tool.**

Failure to follow these instructions could result in serious personal injury, property damage, product damage, and improper product installation.

Ductile iron pipe must be prepared to Victaulic specifications outlined for each product style. Preparation may vary according to pipe wall thickness, outside dimensions, and other factors. Victaulic recommends square-cut pipe for use with grooved-end AWWA products.

The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).

TOOL RATINGS

The following table contains general information about tool ratings. Certain tools are designed for high use shop fabrication, while others are designed for field fabrication. For detailed information on tools, refer to Victaulic publication 24.01. For information about maintenance and operation of tools, refer to the applicable operating and maintenance instructions manual for the tool. Victaulic cut grooving tools are designed for use on AWWA ductile iron pipe as well as IPS steel and other IPS materials. **Requirements for AWWA size ductile iron pipe must be specified at the time of order. In addition, Victaulic tools cut either rigid-radius or flexible-radius grooves. This requirement must be specified at the time of order.**

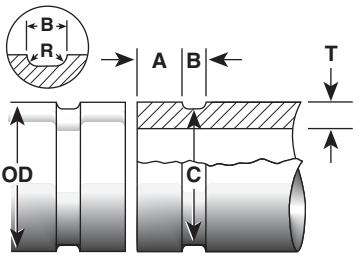
Tool Model	Pipe Material	Pipe Size										
		3	4	6	8	10	12	14	16	18	20	24
VG28GD	Ductile Iron	Class 53 – 56										
Vic-Groover	Ductile Iron	Class 53 – 56										
VG824	Ductile Iron				Class 53 – 56							
VG412	Ductile Iron		Class 53 – 56									

EXPLANATION OF CRITICAL RADIUS CUT GROOVE DIMENSIONS

⚠ WARNING

- **AWWA pipe dimensions and groove dimensions must be within the tolerances specified in the charts on the following pages to ensure proper joint performance.**

Failure to follow these specifications could result in serious personal injury, property damage, joint leakage, and/or joint failure.



(Exaggerated for clarity)

Radius Cut Groove

"A" Dimension – The "A" dimension, or the distance from the pipe end to the groove, identifies the gasket seating area. This area must be free from indentations, projections, deep pits, and swells from the pipe end to the groove to provide a leak-tight seal for the gasket.

"B" Dimension – The "B" dimension, or groove width, controls expansion and angular deflection by the distance it is located from the pipe and its width in relation to the housings' "key" width.

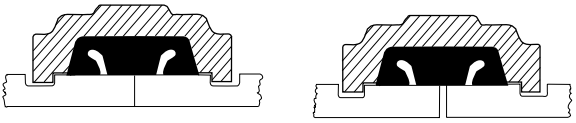
"C" Dimension – The "C" dimension is the proper diameter at the base of the groove. This dimension must be within the diameter's tolerance and concentric with the OD for proper coupling fit. The groove must be of uniform depth for the entire pipe circumference.

"R" Dimension – The "R" dimension is the radius necessary at the bottom of the groove to eliminate a point of stress concentration for cast pipe (gray and ductile).

"T" Dimension – The "T" dimension is the minimum wall thickness that can be cut grooved. The tolerances must conform to Class 53 ANSI/AWWA C151/A21.51. Class 53 ductile iron pipe in sizes 18 – 36 inches (450 – 900 mm) can be cut grooved. Contact Victaulic for details.

NOTICE

- **Coatings that are applied to the interior surfaces of Victaulic grooved and plain-end pipe couplings must not exceed 0.010 inch (0,25 mm). This includes the bolt pad mating surfaces.**
- **In addition, the coating thickness applied to the gasket-sealing surface and within the groove on the pipe exterior must not exceed 0.010 inch (0,25 mm).**



Rigid Radius Cut Groove Flexible Radius Cut Groove

Exaggerated for Clarity

Victaulic groove specifications for cast pipe (gray and ductile) conform to the requirements of ANSI/AWWA Standard C-606 and CSA B242.

For cast pipe, the groove is cut with a radius (“R” dimension) at the corners of the groove base to reduce stress concentration. Grooving dimensions are the same for any pipe OD, regardless of pipe class and pressure.

Standard preparation is with a rigid radius groove. Flexible radius groove dimensions may be used to provide expansion/contraction or angular movement allowance at the joint.

Rigid Radius-Cut Groove Specifications – Ductile Iron Pipe

Nom. Dia. inches (mm)	Actual Outside Dia. inches (mm)	Dimensions – inches (millimeters)										
		Pipe Outside Diameter		Gasket Seat "A"		Groove Width "B"			Groove Diameter "C"		Radius "R"	Minimum Allowable Wall Thickness "T"	
		Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.		Cast Iron	Ductile Iron
3 (80)	3.960 (100,6)	4.005 (101,7)	3.915 (99,4)	0.840 (21,3)	0.820 (20,8)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	3.723 (94,6)	3.703 (94,1)	0.120 (3,1)	0.320 (8,1)	0.310 (7,9)
4 (100)	4.800 (121,9)	4.845 (123,1)	4.755 (120,8)	0.840 (21,3)	0.820 (20,8)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	4.563 (115,9)	4.543 (115,4)	0.120 (3,1)	0.350 (8,9)	0.320 (8,1)
6 (150)	6.900 (175,3)	6.960 (176,7)	6.840 (173,7)	0.840 (21,3)	0.820 (20,8)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	6.656 (169,1)	6.636 (168,6)	0.120 (3,1)	0.380 (9,7)	0.340 (8,6)
8 (200)	9.050 (229,9)	9.110 (231,4)	8.990 (228,3)	0.950 (24,1)	0.930 (23,6)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	8.781 (223,0)	8.756 (222,4)	0.145 (3,7)	0.410 (10,4)	0.360 (9,1)
10 (250)	11.100 (281,9)	11.160 (283,5)	11.040 (280,4)	1.015 (25,8)	0.995 (25,3)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	10.813 (274,7)	10.788 (274,0)	0.145 (3,7)	0.440 (11,2)	0.380 (9,7)
12 (300)	13.200 (335,3)	13.260 (336,8)	13.140 (333,8)	1.015 (25,8)	0.995 (25,3)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	12.906 (327,8)	12.876 (327,1)	0.145 (3,7)	0.480 (12,2)	0.400 (10,2)
14 (350)	15.300 (388,6)	15.350 (389,9)	15.220 (386,6)	1.015 (25,8)	0.995 (25,3)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	14.969 (380,2)	14.939 (379,5)	0.165 (4,2)	0.550 (14,0)	0.420 (10,7)
16 (400)	17.400 (442,0)	17.450 (443,2)	17.320 (439,9)	1.340 (34,0)	1.320 (33,5)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	17.063 (433,4)	17.033 (432,6)	0.165 (4.2)	0.580 (14,7)	0.430 (10,9)
18 (450)	19.500 (495,3)	19.550 (496,6)	19.420 (493,3)	1.340 (34,0)	1.320 (33,5)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	19.125 (485,8)	19.095 (485,0)	0.185 (4,7)	0.630 (16,0)	0.440 (11,2)
20 (500)	21.600 (548,6)	21.650 (549,9)	21.520 (546,6)	1.340 (34,0)	1.320 (33,5)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	21.219 (539,0)	21.189 (538,2)	0.185 (4,7)	0.670 (17,0)	0.450 (11,4)
24 (600)	25.800 (655,3)	25.850 (656,6)	25.720 (653,3)	1.340 (34,0)	1.320 (33,5)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	25.406 (645,3)	25.376 (644,6)	0.185 (4,7)	0.730 (18,5)	0.470 (11,9)
30 (750)	32.000 (762,0)	32.080 (814,8)	31.940 (811,3)	1.625 (41,3)	1.605 (40,8)	0.750 (19,1)	0.781 (19,8)	0.734 (18,6)	31.550 (801,4)	31.515 (800,5)	0.215 (5,5)	0.920 (23,4)	0.510 (13,0)
36 (900)	38.300 (914,4)	38.380 (974,9)	38.240 (971,3)	1.625 (41,3)	1.605 (40,8)	0.750 (19,1)	0.781 (19,8)	0.734 (18,6)	37.850 (961,4)	37.815 (960,5)	0.215 (5,5)	1.020 (25,9)	0.580 (14,7)

Flexible Radius-Cut Groove Specifications – Ductile Iron Pipe

Nom. Dia. inches (mm)	Actual Outside Dia. inches (mm)	Dimensions – inches (millimeters)											
		Pipe Outside Diameter		Gasket Seat "A"		Groove Width "B"			Groove Diameter "C"		Radius "R"	Minimum Allowable Wall Thickness "T"	
		Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.		Cast Iron	Ductile Iron
3 (80)	3.960 (100,6)	4.005 (101,7)	3.915 (99,4)	0.750 (19,1)	0.730 (18,5)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	3.723 (94,6)	3.703 (94,1)	0.120 (3,1)	0.320 (8,1)	0.310 (7,9)
4 (100)	4.800 (121,9)	4.845 (123,1)	4.755 (120,8)	0.750 (19,1)	0.730 (18,5)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	4.563 (115,9)	4.543 (115,4)	0.120 (3,1)	0.350 (8,9)	0.320 (8,1)
6 (150)	6.900 (175,3)	6.960 (176,7)	6.840 (173,7)	0.750 (19,1)	0.730 (18,5)	0.375 (9,5)	0.406 (10,3)	0.359 (9,1)	6.656 (169,1)	6.636 (168,6)	0.120 (3,1)	0.380 (9,7)	0.340 (8,6)
8 (200)	9.050 (229,9)	9.110 (231,4)	8.990 (228,3)	0.875 (22,2)	0.855 (21,7)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	8.781 (223,0)	8.756 (222,4)	0.145 (3,7)	0.410 (10,4)	0.360 (9,1)
10 (250)	11.100 (281,9)	11.160 (283,5)	11.040 (280,4)	0.938 (23,8)	0.918 (23,3)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	10.813 (274,7)	10.788 (274,0)	0.145 (3,7)	0.440 (11,2)	0.380 (9,7)
12 (300)	13.200 (335,3)	13.260 (336,8)	13.140 (333,8)	0.938 (23,8)	0.918 (23,3)	0.500 (12,7)	0.531 (13,5)	0.484 (12,3)	12.906 (327,8)	12.876 (327,1)	0.145 (3,7)	0.480 (12,2)	0.400 (10,2)
14 (350)	15.300 (388,6)	15.350 (389,9)	15.220 (386,6)	0.938 (23,8)	0.918 (23,3)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	14.969 (380,2)	14.939 (379,5)	0.165 (4,2)	0.550 (14,0)	0.420 (10,7)
16 (400)	17.400 (442,0)	17.450 (443,2)	17.320 (439,9)	1.188 (30,2)	1.168 (29,7)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	17.063 (433,4)	17.033 (432,6)	0.165 (4.2)	0.580 (14,7)	0.430 (10,9)
18 (450)	19.500 (495,3)	19.550 (496,6)	19.420 (493,3)	1.188 (30,2)	1.168 (29,7)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	19.125 (485,8)	19.095 (485,0)	0.185 (4,7)	0.630 (16,0)	0.440 (11,2)
20 (500)	21.600 (548,6)	21.650 (549,9)	21.520 (546,6)	1.188 (30,2)	1.168 (29,7)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	21.219 (539,0)	21.189 (538,2)	0.185 (4,7)	0.670 (17,0)	0.450 (11,4)
24 (600)	25.800 (655,3)	25.850 (656,6)	25.720 (653,3)	1.188 (30,2)	1.168 (29,7)	0.625 (15,9)	0.656 (16,7)	0.609 (15,5)	25.406 (645,3)	25.376 (644,6)	0.185 (4,7)	0.730 (18,5)	0.470 (11,9)
30 (750)	32.000 (762,0)	32.080 (814,8)	31.940 (811,3)	1.375 (34,9)	1.355 (34,4)	0.750 (19,1)	0.781 (19,8)	0.734 (18,6)	31.550 (801,4)	31.515 (800,5)	0.215 (5,5)	0.920 (23,4)	0.510 (13,0)
36 (900)	38.300 (914,4)	38.380 (974,9)	38.240 (971,3)	1.375 (34,9)	1.355 (34,4)	0.750 (19,1)	0.781 (19,8)	0.734 (18,6)	37.850 (961,4)	37.815 (960,5)	0.215 (5,5)	1.020 (25,9)	0.580 (14,7)

GASKET SELECTION

⚠ CAUTION

- **To ensure maximum gasket performance, always specify the proper gasket grade for the intended service.**

Failure to select the proper gasket for the service may cause joint failure, resulting in property damage.

Many factors must be considered for optimum gasket performance. Do not subject gaskets to temperatures beyond the recommended limits, since excessive temperatures will degrade gasket life and performance.

The services listed below are general service recommendations, and they apply only to Victaulic gaskets. Recommendations for a particular service do not necessarily imply compatibility of the coupling housings, related fittings, or other components for the same service. Always refer to the latest Victaulic Gasket Selection Guide (05.01) for gasket service recommendations.

NOTE: These recommendations do not apply to rubber-lined valves or other rubber-lined products. Refer to the applicable product literature, or contact Victaulic for recommendations.

Standard Gaskets for AWWA Size Products

Grade	Temp. Range	Compound	Color Code	General Service Recommendations
S	–20°F (–29°C) to +180°F (+82°C)	Nitrile	Red Stripe	Specially compounded to conform to ductile iron pipe surfaces. Recommended for petroleum products, air with oil vapors, vegetable oil, and mineral oil, within the specified temperature range. Not recommended for HOT WATER services OVER +150°F (+66°C) OR HOT, DRY AIR OVER +140°F (+60°C).
M	–20°F (–29°C) to +200°F (+93°C)	Halogenated Butyl	Brown Stripe	Recommended for water service, within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Readily conforms to ductile iron pipe surfaces. UL classified in accordance with ANSI/NSF 61 for cold +86°F (+30°C) potable water service. NOT RECOMMENDED FOR PETROLEUM SERVICES.

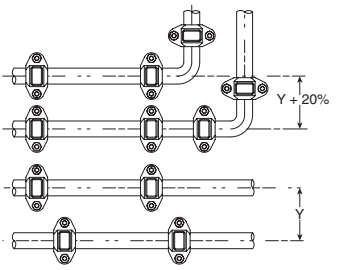
LUBRICATION

Lubrication of the gasket exterior/gasket sealing lips or the housings' interiors/pipe ends is essential to prevent gasket pinching. Lubrication also eases installation of the gasket onto the pipe end. Use Vic-Lube™ or another compatible material, such as silicone or a soap-based lubricant. Refer to Victaulic publication 05.02 for the Vic-Lube MSDS sheet.

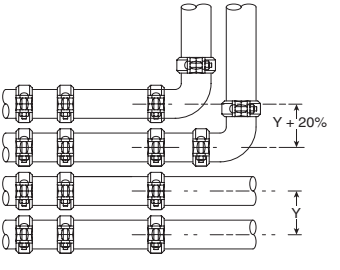
SPACING REQUIREMENTS FOR GROOVED PIPING SYSTEMS

Since the grooved piping method incorporates externally mounted housings, consideration must be given to external dimensions beyond the pipe OD.
NOTE: Allowance for insulation, when necessary, is not included in the following examples.

Recommended Minimum Pipe Spacing



Example with Bolt Pads Facing Each Other

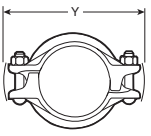


Example with Bolt Pads Facing Out

Illustrations are exaggerated for clarity

To allow for easy installation, insulation, and maintenance, consideration must be given to proper spacing between pipelines. Since Victaulic grooved pipe couplings are externally mounted housings that contain bolt pads, allow enough access space to tighten the nuts. In addition, provide enough space to prevent interference between piping and adjacent couplings.

The pipe centerline must be spaced with the width of the coupling housings ("Y" dimension) for systems where couplings are staggered. Add an additional 20% to the width (Y) when couplings are inline, as shown above.



NOTE: The "Y" dimension is the maximum dimension across the coupling. Bolt pads can be positioned in any orientation to provide adequate clearance if the orientation shown causes interference with other system components.

External Clearance Allowance

When installing grooved piping systems in confined areas, such as a pipe shaft, a tunnel, a narrow trench, or when joining riser pipe and dropping it through riser holes, consideration must be given to the external clearance of the housings. This clearance must be slightly greater than the "Y" dimension of the widest point. The necessary clearance will vary depending upon installation procedures, the proximity of other pipes, and other factors.

INSTALLATION TO ACHIEVE MAXIMUM LINEAR MOVEMENT CAPABILITIES OF FLEXIBLE SYSTEMS

To achieve maximum expansion/contraction allowance, flexible pipe joints must be created by cutting flexible radius grooves into the ductile iron pipe. Pipe joints must be installed with proper spacing between the pipe ends. The following is a brief overview of methods to accommodate expansion/contraction. Refer to Section 26, Design Data, of the G-100 General Catalog for complete details.

For maximum expansion, pipe ends must be at their maximum gap within the coupling.

1. Vertical systems can be installed as the pipe is lowered by assembling the couplings and using the weight of the pipe to pull the pipe ends open.

2. Anchor the system at one end, and install the couplings and proper guides. Cap the system, pressurize it to fully open the pipe ends, then anchor the other end with the pipe ends fully gapped.

3. Install the joints using a “come-along” to pull the pipe for full end separation, then secure the pipe to maintain the opening.

For maximum contraction, pipe ends must be butted within the coupling.

1. In vertical systems, stack the pipe by using the weight to butt the pipe ends, then anchor the pipe to maintain the position.

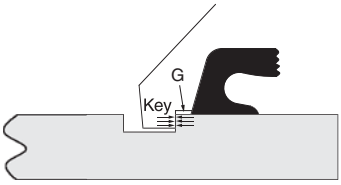
2. In horizontal systems, install the joints with the pipe ends butted by using a “come-along” to draw the pipe ends together, if necessary, then secure the pipe in position.

For Expansion and Contraction

1. Alternate the above procedures in proportion to the need for expansion and contraction.

Groove/Coupling Gapping

For expansion, visible gaps at either side of the coupling (between the housings and the rear edge of the groove) can be used to ensure proper installation of most couplings for maximum movement. These gaps are approximately equal to half the linear movement capability.



PROPER INSTALLATION
(Exaggerated for clarity)

For pipe contraction, virtually no gaps should be visible at the outside of the couplings. The pipe must be secured to maintain these positions.

PIPING SUPPORT FOR RIGID AND FLEXIBLE SYSTEMS

Similar to other piping systems, aboveground ductile iron piping that is joined with grooved pipe mechanical couplings requires support to carry the weight of pipes and equipment. The support or hanging method must eliminate stress on joints, piping, and other components. In addition, the method of support must allow pipeline movement, where required, along with other design requirements, such as drainage. The designer must also consider the special requirements of flexible systems while designing a support system.

The tables below list the suggested maximum span between pipe supports for horizontal, straight runs of grooved AWWA ductile iron pipe that carries water or similar liquids.

NOTICE

- **These values are not intended to be used as specifications for all installations, and they DO NOT apply where critical calculations are made or where there are concentrated loads between supports.**
- **Victaulic Company is not responsible for system design, nor does the Company assume any responsibility for systems that are designed improperly.**

Rigid Systems

Style 31 Couplings on ductile iron pipe that is rigid-radius grooved use the same support spacing as flanged, ductile-iron piping systems installed in accordance with standard industry practice (i.e. MSS SP-69).

Ductile iron pipe that conveys water or similar liquids may have supports spaced up to 15 feet (4,6 m) maximum between supports for 3 – 4 inch (80 – 100 mm) sizes. For 6 – 36 inch (150 – 900 mm) sizes, supports can be spaced up to 20 feet (6,1 m) maximum between supports.
NOTE: Piping systems must have at least one support per pipe length.

The spacing mentioned above is not intended as a specification for all installations, and it does not apply where critical calculations are made or where concentrated loads between supports exist.

Flexible Systems

For Victaulic Style 31 Couplings on ductile iron pipe that is flexible-radius grooved, refer to the chart below for maximum support spacing.

Pipe Size Nominal Diameter inches (mm)	Suggested Maximum Span Between Supports* feet (meters)
3 – 4 (80 – 100)	12 (3,7)
6 – 8 (150 – 200)	14 (4,3)
10 – 12 (250 – 300)	16 (4,9)
14 – 16 (350 – 400)	18 (5,5)
18 – 36 (450 – 900)	20 (6,1)

* Must have at least one support per pipe length

GROOVED PRODUCT INSTALLATION GUIDELINES

⚠ WARNING

- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**

Failure to follow this instruction could result in serious personal injury, property damage, product damage, joint leakage, and/or joint failure.

The following instructions are a general guideline for the installation of Victaulic piping products. These instructions must be followed to ensure proper joint assembly.

1. Always check the supplied gasket to ensure it is suitable for the intended service. Refer to page 13 for details.

2. Valve bodies, discs, and other wetted components must be compatible with the material flowing through the system. Refer to the most current Victaulic literature, or contact Victaulic for details.

3. Always read the operating and maintenance instructions manuals for the pipe preparation tools.

4. The outside diameter and grooving dimensions of pipe must be within published tolerances; these tolerances are subject to specific standards for acceptability. Refer to pipe preparation specifications on pages 7 - 12 for details.

5. Rigid, angle-pad couplings must have nuts tightened evenly by alternating sides until metal-to-metal contact at the bolt pads is achieved. In addition, there must be equal offset at the bolt pads.

6. Couplings with flat bolt pads must have nuts tightened evenly by alternating sides until metal-to-metal contact occurs at the bolt pads.

7. Couplings that contain a tongue-and-recess feature must be mated properly, tongue-to-recess.

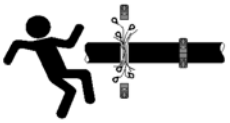
8. When a torque value is specified for coupling installation, this torque **MUST** be applied to the nuts in order to achieve proper installation. However, torque beyond specified values will not improve sealing. Exceeding the specified torque by more than 25% may cause damage to the product, resulting in pipe-joint failure.

9. Placement of check valves too close to sources of unstable flow will shorten the life of the valve and may potentially damage the system. To extend valve life, valves should be installed a reasonable distance away from pumps, elbows, expanders, reducers, or other similar devices. Piping practices dictate a minimum distance of five times the pipe diameter for general use. Distances between three and five diameters are allowable, provided the flow velocity is less than 8 feet per second (2.4 meters per second). Distances of less than three diameters are not recommended.

10. Victaulic female threaded products are designed to accommodate standard ANSI male pipe threads only. Use of male threaded products with special features, such as probes, dry-pendent sprinkler heads, etc., must be checked for suitability with the Victaulic piping product being installed. Failure to verify suitability in advance may result in difficult installation or joint failure.

INSTALLATION INSPECTION

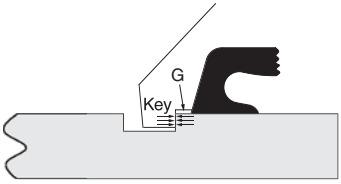
⚠ WARNING



- **Always inspect each joint to ensure that the product was properly installed.**
- **Undersized or oversized AWWA pipe/fittings, shallow grooves, eccentric grooves, bolt pad gaps, etc. are unacceptable. Any of these conditions must be corrected before attempting to pressurize the system.**

Failure to follow these instructions could result in serious personal injury, property damage, joint leakage, and/or joint failure.

Proper Installation



PROPER INSTALLATION
(Exaggerated for clarity)

Proper pipe preparation and coupling installation is essential for maximum joint performance. **THE FOLLOWING CONDITIONS MUST BE PRESENT TO ENSURE PROPER JOINT ASSEMBLY.**

1. The pipe OD and groove dimensions must be within the tolerance published in current Victaulic grooving specifications.

2. Unless stated otherwise in specific product instructions, Victaulic grooved pipe couplings **MUST** be properly assembled with the bolts pads in firm, metal-to-metal contact.

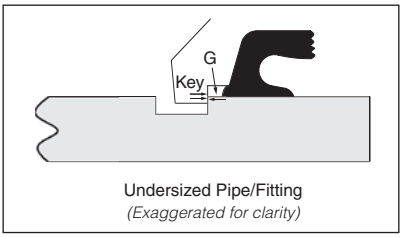
3. The housings' keys must not rest on or grip the bottom of the groove (with the exception of Victaulic rigid couplings).

4. The housings' keys must be fully engaged against the face of the groove.

5. The gasket must be slightly compressed, which adds to the strength of the seal.

Installations with Undersized Pipes/Fittings – NOT ACCEPTABLE

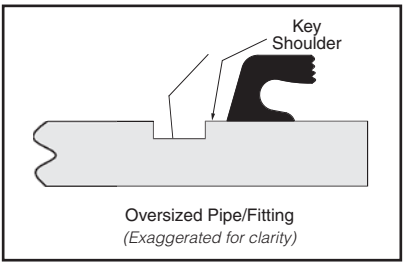
When the OD of the pipe or fitting is below tolerance, engagement of the housings' key sections is considerably lowered. **THIS RESULTS IN REDUCED WORKING PRESSURE FOR THE JOINT.**



Undersized Pipe/Fitting
(Exaggerated for clarity)

Additionally, there is little or no added compression of the gasket. The increased gap "G" between the pipe and the housing may also result in gasket extrusion. These factors can contribute to reduced gasket life and joint leakage.

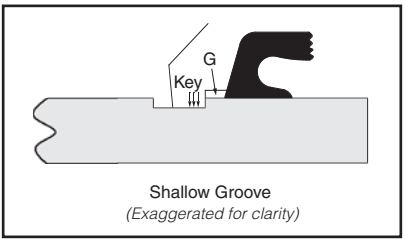
Installations with Oversized Pipes/Fittings – NOT ACCEPTABLE



Oversized Pipe/Fitting
(Exaggerated for clarity)

When the OD of the pipe or fitting exceeds the allowable tolerance, engagement of the housings' key sections is increased to the point that the shoulder can grip onto the pipe. This can result in reduced linear or angular movement. Under these conditions, the bolt pads cannot join with metal-to-metal contact, the gasket can possibly extrude, the working pressure of the joint can be reduced, and the life of the gasket can be reduced.

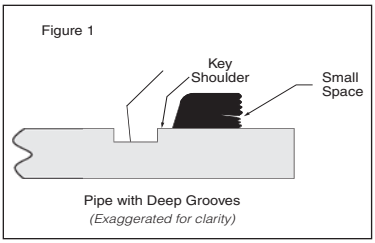
Installations on Pipe with Shallow Grooves – NOT ACCEPTABLE

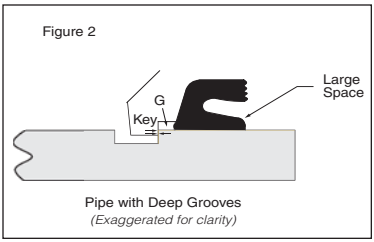


Shallow Groove
(Exaggerated for clarity)

A groove that is not deep enough will have the same effect as the conditions described in the previous "Installations with Undersized Pipes/Fittings" section.

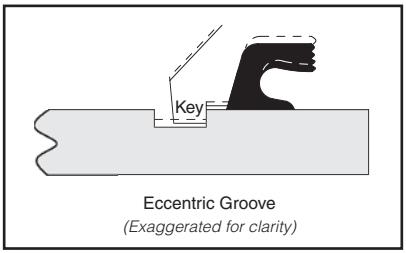
Installations on Pipe with Deep Grooves – NOT ACCEPTABLE





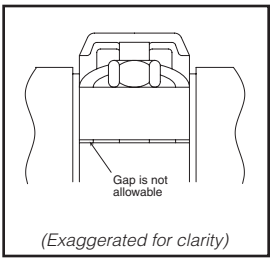
A groove that is too deep will allow the coupling to shift so that one housing will have full key engagement (Figure 1 above) and the other housing will have significantly reduced key engagement (Figure 2 above). This will have the same effect as the conditions described in the previous "Installations with Undersized Pipe/ Fittings" section. Additionally, cut grooving pipe to an undersized dimension will result in insufficient wall thickness under the groove.

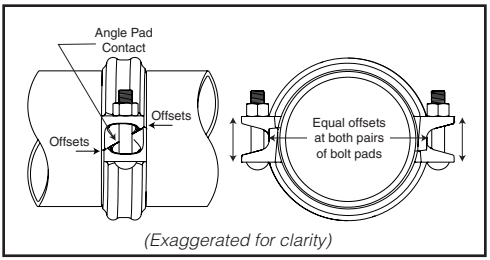
Installations on Pipe with Eccentric Grooves – NOT ACCEPTABLE



Eccentric grooves generally occur because of out-of-round pipe that is grooved with a stationary tool bit (such as a lathe). Tools that rotate the pipe, rather than rotate around the pipe, may affect this condition. An eccentric groove means that the groove is too shallow on one side and too deep on the other. This may lead to a combination of the conditions outlined in the previous "Installations with Oversized Pipes/Fittings" section and the "Installations on Pipes with Shallow Grooves" section.

Bolt Pad Gaps – NOT ACCEPTABLE





Unless stated otherwise in specific product instructions, Victaulic grooved pipe couplings **MUST** be properly assembled with the bolt pads in firm, metal-to-

metal contact. The only exceptions are couplings that have torque values specified. These torque values must be achieved, but it does not necessarily mean that the bolt pads will have full metal-to-metal contact. If you have any questions concerning an installation, contact Victaulic.

If the bolt pads are not in full metal-to-metal contact:

1. Make sure coupling keys are engaged in the grooves. Coupling keys must not rest on the outside surface of the pipe.

2. Make sure the bolts have been tightened fully.

3. Make sure the gasket is not pinched. If the gasket is pinched, replace it immediately.

4. Make sure an oversized pipe or fitting was not used.

5. Make sure the groove conforms to Victaulic specifications. If the groove is shallow, groove the pipe to Victaulic specifications. If the groove is too deep, discard that section of pipe, and groove another section to Victaulic specifications.

Always re-inspect joints before and after the field test to identify points of possible failure. Look for gaps at the bolt pads and/or keys that ride up on the shoulders. If any of these conditions exist, depressurize the system, and replace any questionable joints.

NOTICE

- **A SUCCESSFUL INITIAL SYSTEM PRESSURE TEST DOES NOT VALIDATE PROPER INSTALLATION AND IS NOT A GUARANTEE OF LONG-TERM PERFORMANCE.**
- **Victaulic will not assume any liability for pipe joint leakage or failure that may result from an installer's failure to follow Victaulic Company's installation instructions.**
- **As with any pipe joining method, success is determined by close attention to details. Careful adherence to the instructions found in this handbook is critical to ensure maximum system reliability.**

Couplings for Grooved and Plain-End Ductile Iron Pipe

Installation Instructions

Style 31 Coupling

Style 307 Transition Coupling

Style 397 and 399 V-Grip Couplings

Style 31

Coupling 3 – 12 inch (80 – 300 mm) Sizes

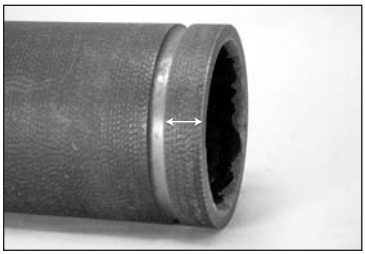
⚠ WARNING





- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.



1. CHECK PIPE ENDS: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).

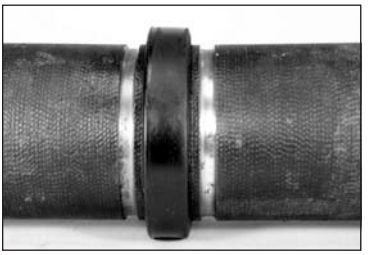
2. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior.

⚠ CAUTION

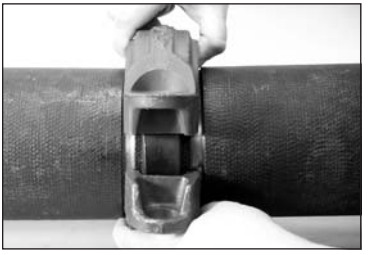
- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.

3. INSTALL GASKET: Install the gasket over the pipe end. Make sure the gasket does not overhang the pipe end.



4. JOIN PIPE ENDS: Align and bring the two pipe ends together. Slide the gasket into position, and make sure it is centered between the grooves. Make sure no portion of the gasket extends into the groove on either pipe.



5. INSTALL HOUSINGS: Install the housings over the gasket. Make sure the housings' keys engage the grooves properly on both pipes.

⚠CAUTION

- **Make sure the gasket does not become rolled or pinched while installing the housings.**

Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.

6. INSTALL BOLTS AND NUTS: Insert the bolts, and thread the nuts finger-tight onto the bolts. Make sure the oval neck of the bolts seat properly in the bolt holes.

7. TIGHTEN NUTS: Tighten all nuts evenly by alternating sides until metal-to-metal contact occurs at the flat bolt pads. **NOTE:** It is important to tighten all nuts evenly to prevent gasket pinching.

Allowable Pipe-End Separation and Joint Deflection for Style 31 Couplings Flexible, Radius-Cut Grooved, Cast (Gray/Ductile) Iron Pipe

Pipe Size	Allowable Pipe-End Separation * inches (mm)	Deflection From Centerline	
Nominal Diameter inches (mm)		Degrees Per Coupling *	inches/one foot of Pipe (mm/one meter of Pipe) *
3 80	0 – 0.094 0 – 2,4	1° - 21’	0.280 7,1
4 100	0 – 0.094 0 – 2,4	1° - 8’	0.210 5,3
6 150	0 – 0.094 0 – 2,4	0° - 47’	0.140 3,6
8 200	0 – 0.094 0 – 2,4	0° - 36’	0.110 2,8
10 250	0 – 0.156 0 – 4,0	0° - 48’	0.150 3,8
12 300	0 – 0.156 0 – 4,0	0° - 41’	0.130 3,3

* Standard, rigid radius-cut grooves provide no deflection or movement.

Style 31 Helpful Information

Pipe Size	
Nominal Diameter inches (mm)	Socket Size inches
3 (80)	$^{7}/_{8}$
4 (100)	$1^{1}/_{16}$
6 (150)	$1^{1}/_{16}$
8 (200)	$1^{1}/_{4}$
10 (250)	$1^{1}/_{4}$
12 (300)	$1^{7}/_{16}$

Style 31

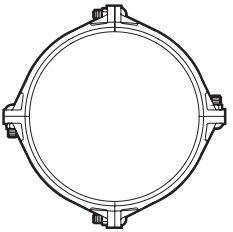
Coupling 14 – 36 inch (350 – 900 mm) Sizes

⚠ WARNING

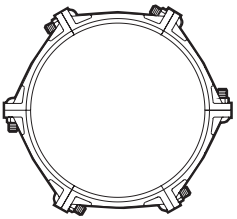
- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.

Style 31 Couplings, in sizes 14 – 36 inches (388,6 – 972,8 mm), are cast in segments to ease handling and ensure coupling concentricity.

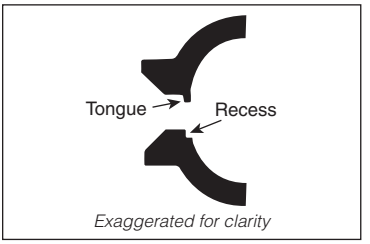


14 – 20 inch (388,6 – 548,6 mm) Sizes



24 – 36 inch (655,3 – 972,8 mm) Sizes;

1. CHECK PIPE ENDS: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).



Exaggerated for clarity

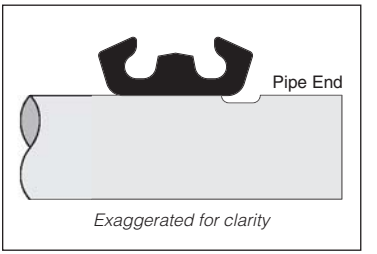
2. ASSEMBLE SEGMENTS: Assemble the segments loosely into two equal halves, as shown above. Make sure the tongue and recess features mate properly (tongue-to-recess). Allow slight clearance between the segments to ease assembly onto the pipe.

3. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior.

⚠CAUTION

- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.



Exaggerated for clarity

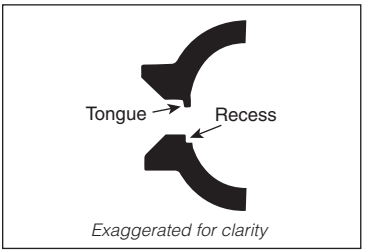
4. INSTALL GASKET: For larger-size couplings, it may be easier to turn the gasket inside out, then slide it over the pipe end. Make sure the gasket does not overhang the pipe end.

5. JOIN PIPE ENDS: Align and bring the two pipe ends together. If the gasket was turned inside out in step 4, roll the gasket into position, and make sure it is centered between the grooves. Make sure no portion of the gasket extends into the groove on either pipe.

⚠CAUTION

- **Make sure the gasket does not become rolled or pinched while installing the housings.**

Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.



Exaggerated for clarity

6. INSTALL FIRST SEGMENT ASSEMBLY: Install one of the pre-assembled halves over the gasket. Make sure the housings' keys engage the grooves properly on both pipes.

6a. INSTALL REMAINING SEGMENT ASSEMBLY: Install the second segment assembly over the gasket, making sure the tongue and recess features mate properly (tongue-to-recess). Make sure the housings' keys engage the grooves properly on both pipes. While supporting the weight of the assemblies, insert the remaining bolts, and thread the nuts finger-tight onto the bolts. **NOTE:** Make sure the oval neck of all bolts seat properly in the bolt holes.

7. TIGHTEN NUTS: Tighten all nuts evenly by alternating sides until metal-to-metal contact occurs at the bolt pads. Make sure the housings' keys completely engage the grooves. **NOTE:** It is important to tighten all nuts evenly to prevent gasket pinching.

Allowable Pipe-End Separation and Joint Deflection for Style 31 Couplings; Flexible, Radius-Cut Grooved, Cast (Gray/Ductile) Iron Pipe

Pipe Size		Deflection From Centerline	
Nominal Diameter inches (mm)	Allowable Pipe-End Separation* inches (mm)	Degrees Per Coupling*	inches/one foot of Pipe (mm/one meter of Pipe) *
14 350	0 – 0.156 0 – 4,0	0° - 35'	0.110 2,8
16 400	0 – 0.250 0 – 6,4	0° - 49'	0.160 4,1
18 450	0 – 0.250 0 – 6,4	0° - 44'	0.140 3,6
20 500	0 – 0.250 0 – 6,4	0° - 40'	0.120 3,0
24 600	0 – 0.250 0 – 6,4	0° - 33'	0.110 2,8
30 750	0 – 0.469 0 – 11,9	0° - 51'	0.170 4,3
36 900	0 – 0.469 0 – 11,9	0° - 47'	0.150 3,8

* Standard, rigid radius-cut grooves provide no deflection or movement.

Style 31 Helpful Information

Pipe Size Nominal Diameter inches (mm)	Socket Size inches
14 (350)	$1\frac{5}{8}$
16 (400)	$1\frac{5}{8}$
18 (450)	$1\frac{5}{8}$
20 (500)	$1\frac{13}{16}$
24 (600)	$1\frac{13}{16}$
30 (750)	$1\frac{13}{16}$
36 (900)	$1\frac{13}{16}$

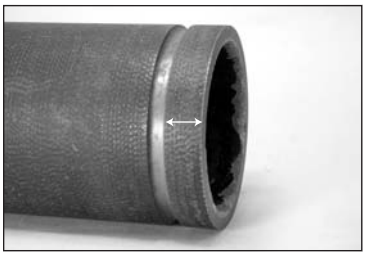
Style 307

Coupling for Transitions from Grooved IPS Steel to Grooved AWWA Ductile Iron Pipe 3 – 12 inch (80 – 300 mm) Sizes

⚠ WARNING

- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.



1. CHECK PIPE ENDS: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).

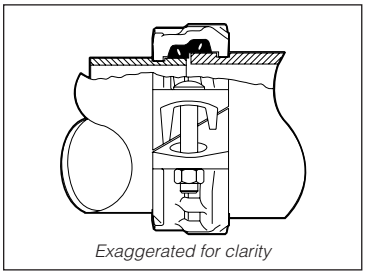
2. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior.

⚠ CAUTION

- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

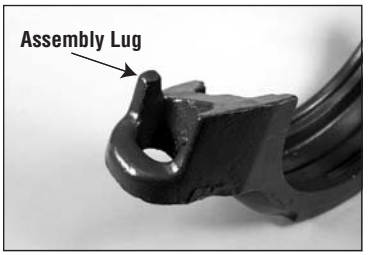
Failure to follow this instruction could result in joint leakage.

3. INSTALL GASKET: Install the larger side of the gasket onto the AWWA pipe end (refer to markings on gasket) until the inner, FlushSeal™ portion of the gasket contacts the pipe end.



Exaggerated for clarity

4. JOIN PIPE ENDS: Align and bring the AWWA and IPS steel pipe ends together. **NOTE:** Make sure no portion of the gasket extends into the groove on either pipe.



The Style 307 Transition Coupling is designed with assembly lugs to aid in proper installation. The assembly lug must engage with the side of the other housing that does not contain a lug. Refer to the markings on the housings to make sure the AWWA side faces the AWWA pipe and the IPS steel side faces the IPS steel pipe.

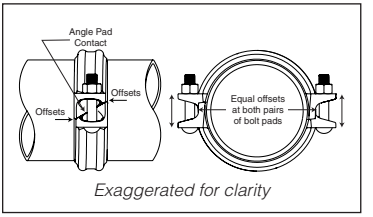
5. INSTALL HOUSINGS: Install the housings over the gasket. Make sure the AWWA markings on the housings face the AWWA pipe. Make sure the housings' keys engage the grooves properly on both pipes.

⚠ CAUTION

- **Make sure the gasket does not become rolled or pinched while installing the housings.**

Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.

6. INSTALL BOLTS AND NUTS: Insert the bolts, and thread the nuts finger-tight onto the bolts. Make sure the oval neck of the bolts seat properly in the bolt holes.



Exaggerated for clarity

7. TIGHTEN NUTS: Tighten all nuts evenly by alternating sides until metal-to-metal contact occurs at the angle bolt pads. **NOTE:** It is important to tighten all nuts evenly to prevent gasket pinching. Make sure there is equal offset at each bolt pad, as shown above.

⚠ WARNING

- **Victaulic rigid, angle-pad couplings must have the nuts tightened evenly to obtain metal-to-metal contact at the bolt pads with equal offset at each housing segment.**

Failure to follow this instruction could cause joint separation, resulting in serious personal injury and/or property damage.

Fixed Pipe-End Separation for Style 307 Transition Couplings

Pipe Size	
Nominal Diameter inches (mm)	Fixed Pipe-End Separation inches (mm)
3 80	0.031 0,8
4 100	0.063 1,6
6 150	0.063 1,6
8 200	0.031 0,8
10 250	0.031 0,8
12 300	0.031 0,8

* For field installation only. Style 307 Transition Couplings are essentially rigid and do not permit expansion/contraction.

Style 307 Helpful Information

Pipe Size	
Nominal Diameter inches (mm)	Socket Size inches
3 (80)	$^{7}/_{8}$
4 (100)	$^{7}/_{8}$
6 (150)	$1^{1}/_{16}$
8 (200)	$1^{1}/_{4}$
10 (250)	$1^{7}/_{16}$
12 (300)	$1^{7}/_{16}$

Style 397

VGrip™ Coupling for Plain-End by Grooved-End Ductile Iron Pipe
4 – 8 inch (100 – 200 mm) Sizes

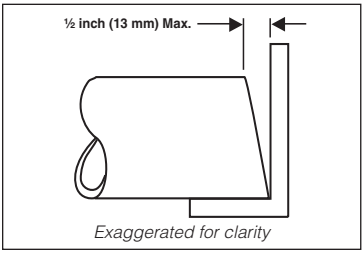
⚠ WARNING

- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.

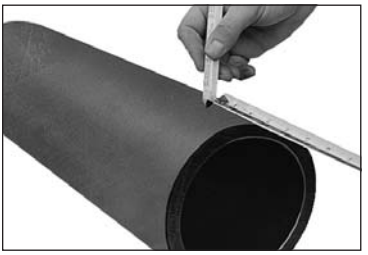
The Style 397 VGrip™ Coupling is designed for use on plain-end x grooved-end ductile iron pipe. DO NOT use this style coupling on plain-end cast iron, C900 PVC, HDPE, or cement pipe.

1. PREPARE GROOVED-END PIPE: Pipe must be prepared in accordance with the specifications on pages 9 - 12. The outside surface of the grooved pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).



Exaggerated for clarity

2. PREPARE PLAIN-END PIPE: Plain-end pipe must be square cut within a $^1/_2$ inch (13 mm), as shown above. The outside surface of the plain-end pipe must be smooth and free from deep pits and swells within $1^1/_4$ inches (32 mm) from the ends to ensure a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).



3. MARK PLAIN-END PIPE: Using a measuring tape and a bright-colored marker or paint stick, place a mark $2^1/_8$ inches (54 mm) from the pipe end. Make at least four of these marks equally-spaced around the circumference of each pipe.

4. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior.

⚠ CAUTION

- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.

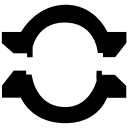
5. INSTALL GASKET: Install the gasket onto the plain-end pipe until the pipe end contacts the center leg of the gasket. Insert the grooved pipe end into the gasket until the leading edge of the groove aligns with the outside edge of the gasket.

⚠ WARNING

- **Wear protective gloves when handling the coupling housings. These housings contain sharp teeth on the interior surfaces.**

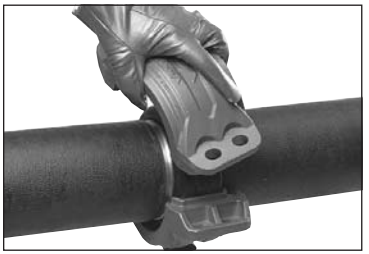
Failure to follow this instruction could result in personal injury.

⚠ WARNING



- **Victaulic Style 397 Couplings have a tongue and recess feature that must be mated properly (tongue-to-recess).**
- **Avoid damage to the housings' teeth. Teeth must be free from dirt and debris for proper installation.**

Failure to follow these instructions could result in joint failure, serious personal injury, and/or property damage.



6. INSTALL HOUSINGS: Install the housings over the gasket. **NOTE:** The housings are clearly marked "Grooved End" and "Plain End." Make sure the housings' keys engage the groove and that the plain end aligns with the pipe marks. Make sure the gasket remains in position and that the tongue and recess features of the housings mate properly (tongue-to-recess).

⚠ WARNING

- **Make sure the gasket does not become rolled or pinched while installing the housings.**
- **Collapsible washers MUST be used for assembly of all Style 397 Couplings.**

Failure to follow these instructions could cause joint failure, resulting in serious personal injury and/or property damage.

7. LUBRICATE BOLT THREADS, NUTS, AND WASHERS: When using **new** collapsible washers, lubricant can be used on the bolt threads, nuts, and washers to reduce the torque required to fully collapse the washers.

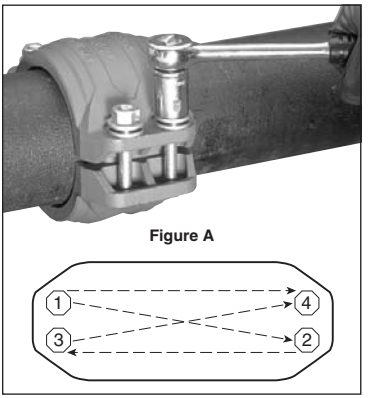
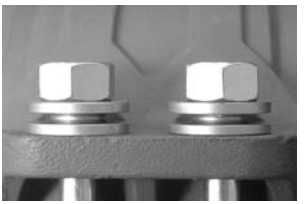


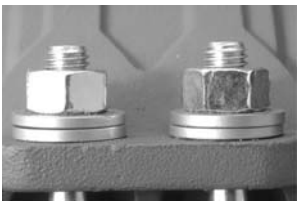
Figure A

8. Install the bolts and collapsible washers. Thread the nuts finger-tight onto the bolts. To ensure an even gap between the housings and to prevent gasket pinching, tighten the nuts evenly by alternating sides, as shown in "Figure A" above. Tighten the nuts until the collapsible washers are fully collapsed. Refer to "Figure B" below for examples of non-collapsed and fully collapsed washers.

Figure B — COLLAPSIBLE WASHERS



NON-COLLAPSED



FULLY COLLAPSED

Collapsible washers are supplied to ensure proper penetration of the teeth into the pipe. The collapsible washer is designed to collapse under a predetermined load, which provides the required compression for full joint performance. The collapsible washer provides a visual check for proper tightening of nuts.

Allowable Pipe-End Separation for Style 397 VGrip Couplings

Pipe Size Nominal Diameter inches (mm)	Allowable Pipe-End Separation * inches (mm)
4 100	0.660 – 0.800 16,8 – 20,3
6 150	0.720 – 0.800 18,3 – 20,3
8 200	0.550 – 0.680 14,0 – 17,3

* AWWA plain-end couplings, when pressurized, will allow the pipe to separate slightly as the grips set into the pipe. For properly assembled and torqued couplings, this separation should not exceed 1/4 inch (6,4 mm). This should be considered for installations in tightly confined areas.

Style 397 VGrip Couplings are not designed to provide linear or angular movement.

Style 397 Helpful Information

Pipe Size Nominal Diameter inches (mm)	Socket Size inches
4 (100)	7/8
6 (150)	1 1/16
8 (200)	1 1/4

Re-Use Instructions for Style 397 VGrip Couplings

⚠ WARNING

- **Depressurize and drain the piping system before attempting to disassemble and reuse Victaulic Style 397 VGrip Couplings.**
- **Victaulic Style 397 Couplings may be disassembled and reused only one time after the original installation. Additional assemblies of couplings will dull and deform teeth and cause a loss of gripping strength.**

Failure to follow this instruction could result in joint failure, serious personal injury, and/or property damage.

1. Check the condition of the teeth. The teeth must be in good condition for proper assembly. Teeth must be sharp. DO NOT use couplings that have bent, loose, or deformed teeth. **Couplings may be disassembled and reused only one time after the original installation.**

2. Follow steps 1 – 6 of the instructions starting on page 33.

3. New collapsible washers are recommended for ease of installation. Previously installed collapsible washers can be used, provided the nuts are torqued to the specifications shown in the "Style 397 Torque Requirements for Re-Use" table below. **DO NOT use lubricant on bolt threads, nuts, or washers when using previously installed collapsible washers.**

4. Follow the nut tightening sequence in step 8 on page 35.

Style 397 Torque Requirements for Re-Use

Pipe Size Nominal Diameter inches (mm)	Required Torque ft-lbs (N•m)
4 (100)	100 – 110 (136 – 149)
6 (150)	175 – 195 (237 – 264)
8 (200)	250 – 275 (339 – 373)

Style 399

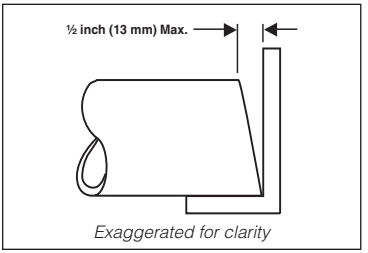
VGrip™ Coupling for Plain-End by Plain-End Ductile Iron Pipe 4 – 8 inch (100 – 200 mm) Sizes

⚠ WARNING

- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

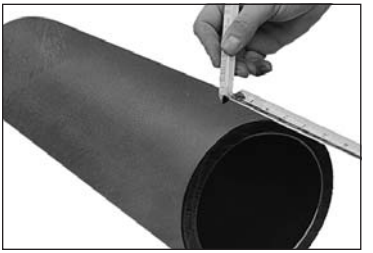
Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.

The Style 399 VGrip™ Coupling is designed for use on plain-end x plain-end ductile iron pipe. DO NOT use this style coupling on plain-end cast iron, C900 PVC, HDPE, and cement pipe.



Exaggerated for clarity

1. PREPARE PLAIN-END PIPE: Plain-end pipe must be square cut within a 1/2 inch (13 mm), as shown above. The outside surface of the plain-end pipe must be smooth and free from deep pits and swells within 1 1/4 inches (32 mm) from the ends to ensure a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).



2. MARK PLAIN-END PIPE: Using a measuring tape and a bright-colored marker or paint stick, place a mark 2 1/8 inches (54 mm) from the pipe end. Make at least four of these marks equally-spaced around the circumference of each pipe.

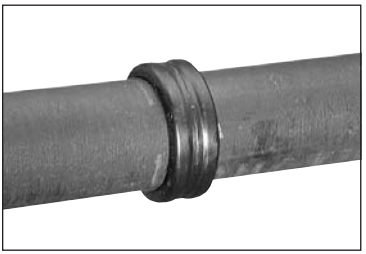
3. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic

Lubricant or silicone lubricant to the gasket lips and exterior.

⚠ CAUTION

- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.



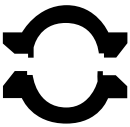
4. INSTALL GASKET: Install the gasket onto the pipe until the pipe end contacts the center leg of the gasket. Insert the other pipe into the gasket until the pipe end contacts the center leg of the gasket.

⚠ WARNING

- **Wear protective gloves when handling the coupling housings. These housings contain sharp teeth on the interior surfaces.**

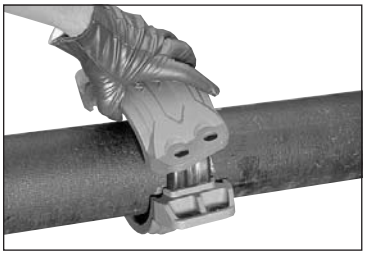
Failure to follow this instruction could result in personal injury.

⚠ WARNING



- **Victaulic Style 399 Couplings have a tongue and recess feature that must be mated properly (tongue-to-recess).**
- **Avoid damage to the housings' teeth. Teeth must be free from dirt and debris for proper installation.**

Failure to follow these instructions could result in joint failure, serious personal injury, and/or property damage.



5. INSTALL HOUSINGS: Install the housings over the gasket. The housings must align with the depth markings on the pipe. Make sure the gasket remains in position and that the tongue and recess features of the housings mate properly (tongue-to-recess).

⚠ WARNING

- **Make sure the gasket does not become rolled or pinched while installing the housings.**
- **Collapsible washers MUST be used for assembly of all Style 399 Couplings.**

Failure to follow these instructions could cause joint failure, resulting in serious personal injury and/or property damage.

6. LUBRICATE BOLT THREADS, NUTS, AND WASHERS: When using **new** collapsible washers, lubricant can be used on the bolt threads, nuts, and washers to reduce the torque required to fully collapse the washers.

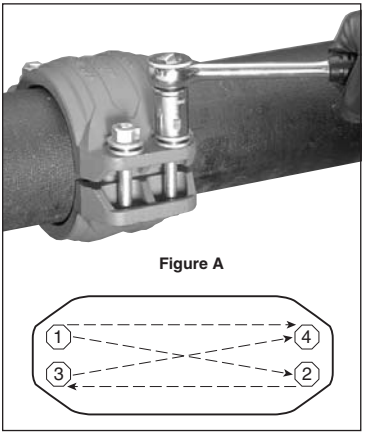
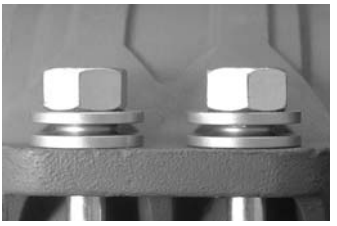


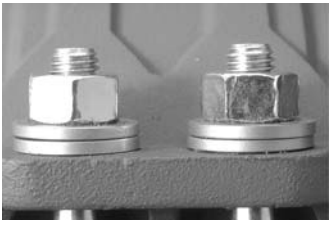
Figure A

7. Install the bolts and collapsible washers. Thread the nuts finger-tight onto the bolts. To ensure an even gap between the housings and to prevent gasket pinching, tighten the nuts evenly by alternating sides, as shown in "Figure A" above. Tighten the nuts until the collapsible washers are fully collapsed. Refer to "Figure B" for examples of non-collapsed and fully collapsed washers.

Figure B — COLLAPSIBLE WASHERS



NON-COLLAPSED



FULLY COLLAPSED

Collapsible washers are supplied to ensure proper penetration of the teeth into the pipe. The collapsible washer is designed to collapse under a predetermined load, which provides the required compression for full joint performance. The collapsible washer provides a visual check for proper tightening of nuts.

Allowable Pipe-End Separation for Style 399 VGrip Couplings

Pipe Size Nominal Diameter inches (mm)	Allowable Pipe-End Separation* inches (mm)
4 100	0.190 – 0.250 4,8 – 6,4
6 150	0.190 – 0.250 4,8 – 6,4
8 200	0.190 – 0.250 4,8 – 6,4

* AWWA plain-end couplings, when pressurized, will allow the pipe to separate slightly as the grips set into the pipe. For properly assembled and torqued couplings, this separation should not exceed 1/4 inch (6,4 mm). This should be considered for installations in tightly confined areas.

Style 399 VGrip Couplings are not designed to provide linear or angular movement.

Style 399 Helpful Information

Pipe Size Nominal Diameter inches (mm)	Socket Size inches
4 (100)	7/8
6 (150)	1 1/16
8 (200)	1 1/4

Re-Use Instructions for Style 399 VGrip Couplings

⚠ WARNING

- **Depressurize and drain the piping system before attempting to disassemble and reuse Victaulic Style 399 VGrip Couplings.**
- **Victaulic Style 399 Couplings may be disassembled and reused only one time after the original installation. Additional assemblies of couplings will dull and deform teeth and cause a loss of gripping strength.**

Failure to follow this instruction could result in joint failure, serious personal injury, and/or property damage.

1. Check the condition of the teeth. The teeth must be in good condition for proper assembly. Teeth must be sharp. DO NOT use couplings that have bent, loose, or deformed teeth. **Couplings may be disassembled and reused only one time after the original installation.**

2. Follow steps 1 – 6 of the instructions starting on page 38.

3. New collapsible washers are recommended for ease of installation. Previously installed collapsible washers can be used, provided the nuts are torqued to the specifications shown in the "Style 399 Torque Requirements for Re-Use" chart below. **DO NOT use lubricant on bolt threads, nuts, or washers when using previously installed collapsible washers.**

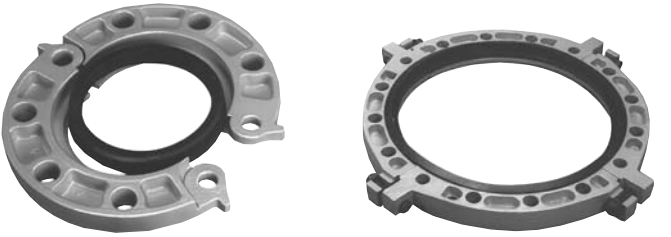
4. Follow the nut tightening sequence in step 7 on page 40.

Style 399 Torque Requirements for Re-Use

Pipe Size Nominal Diameter inches (mm)	Required Torque ft-lbs (N•m)
4 (100)	100 – 110 (136 – 149)
6 (150)	175 – 195 (237 – 264)
8 (200)	250 – 275 (339 – 373)

Flange Adapters for Grooved-End Ductile Iron Pipe

Installation Instructions



Style 341 Vic-Flange Adapter

FLANGE WASHER NOTES FOR 3 – 24 INCH (80 – 600 MM) SIZES

Style 341 Vic-Flange Adapter

Style 341 Vic-Flange Adapters require a smooth, hard surface at the mating flange face for proper sealing. Some applications, for which the Vic-Flange Adapter is otherwise well suited, do not provide an adequate mating surface. In such cases, it is recommended that a metal Vic-Flange washer be inserted between the Vic-Flange Adapter and the mating flange to provide the necessary sealing surface.

A. When mating to a serrated flange – a flange gasket should be used against the serrated flange. The Vic-Flange washer should then be inserted between the Vic-Flange Adapter and the flange gasket.

B. When mating to a rubber-faced, wafer-type valve – the Vic-Flange washer should be placed between the valve and the Vic-Flange Adapter.

C. When mating to a rubber-faced flange – the Vic-Flange washer should be placed between the Vic-Flange Adapter and the rubber-faced flange.

D. When mating AWWA cast flanges to IPS flanges – the Vic-Flange washer should be placed between two Vic-Flange Adapters. If one flange is not a Vic-Flange Adapter (i.e. flanged valve), a flange gasket must be placed against that flange. The Vic-Flange washer must then be inserted between the flange gasket and the Vic-Flange Adapter.

- Transition rings, rather than Vic-Flange washers, must be used when mating Style 741 to Style 341 Vic-Flange Adapters in sizes 14 – 24 inches (350 – 600 mm). The lap joints of the Style 341 must be staggered to the lap joints of the Style 741 when mating these larger sizes.

E. When mating to components (valves, strainers, etc.) where the component flange face has an insert – follow the same arrangement as if the Vic-Flange Adapter was being mated to a serrated flange. Refer to application “A” above.

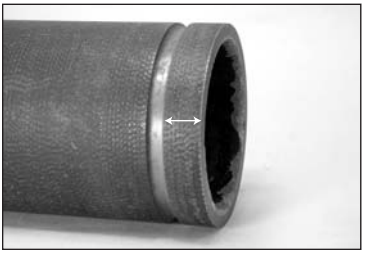
Style 341

Vic-Flange Adapter 3 – 12 inch (80 – 300 mm) Sizes

⚠ WARNING

- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.



1. CHECK PIPE ENDS: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).

NOTICE

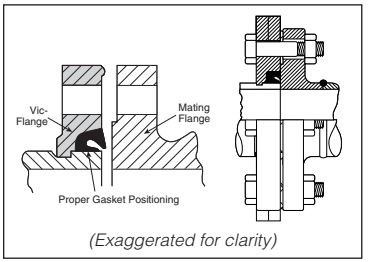
- **Make sure there is sufficient clearance behind the pipe groove to permit proper assembly of the Vic-Flange Adapter.**

2. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior. **NOTE:** This gasket is designed to provide the primary seal. Refer to page 43 for special applications.

⚠ CAUTION

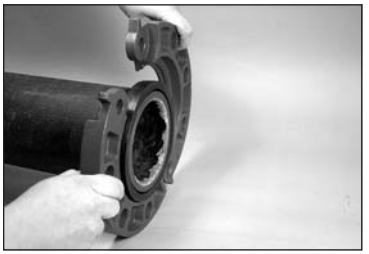
- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.



(Exaggerated for clarity)

3. INSTALL GASKET: Install the gasket over the pipe end. Make sure the gasket is positioned properly, as shown above. **NOTE:** The lettering on the outside of the gasket must face the gasket pocket of the Style 341 Vic-Flange Adapter. When installed correctly, the lettering on the gasket will not be visible.



4. INSTALL VIC-FLANGE ADAPTER: Open the hinged Vic-Flange Adapter fully, and install the flange over the gasket. Make sure the key section of the flange adapter engages the pipe groove properly.

Closure lugs are provided for ease of installation. If necessary, use an adjustable wrench to align the mating holes.

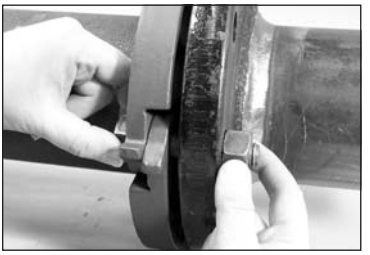
5. While squeezing the closure lugs together, insert a standard flange bolt through each of the two mating holes in the Vic-Flange Adapter; this will maintain the position of the flange in the groove.

5a. Make sure the gasket is still seated properly in the flange adapter.

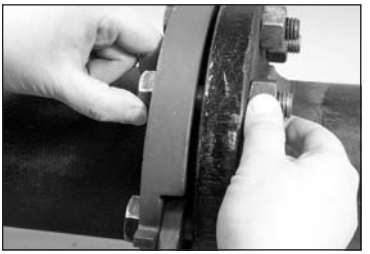
⚠ WARNING

- **Bolt sizes specified in this section must be used to ensure proper assembly of Vic-Flange Adapters.**

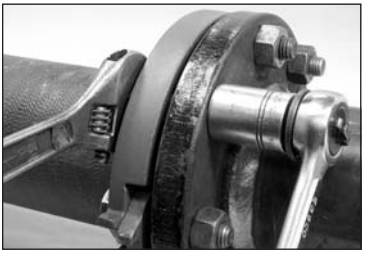
Failure to follow this instruction could cause joint failure, resulting in serious personal injury and/or property damage.



6. MATE VIC-FLANGE ADAPTER AND MATING FLANGE: Join the Vic-Flange Adapter with the mating flange by aligning the bolt holes. Thread standard flange nuts finger-tight onto the two mating bolts.



7. INSTALL REMAINING BOLTS/ NUTS: Insert a standard flange bolt through each remaining hole in the Vic-Flange Adapter/mating flange. Thread a standard flange nut finger-tight onto all bolts.



8. TIGHTEN NUTS: Tighten the nuts evenly, as with a regular flange assembly. Continue tightening until the flange faces come into metal-to-metal contact or the bolts reach the standard flange-joint torque requirement.

Allowable Pipe-End Separation and Joint Deflection for Style 341 Vic-Flange Adapters Flexible, Radius-Cut Grooved, Cast (Gray/Ductile) Iron Pipe

Pipe Size	Allowable Pipe-End Separation * inches (mm)	Deflection From Centerline	
Nominal Diameter inches (mm)		Degrees Per Coupling *	Inches/one foot of Pipe (mm/one meter of Pipe) *
3 (80)	0 – 3/32	1° - 21'	0.280 7,1
4 (100)	0 – 3/32	1° - 8'	0.210 5,3
6 (150)	0 – 3/32	0° - 47'	0.140 3,6
8 (200)	0 – 3/32	0° - 36'	0.110 2,8
10 (250)	0 – 5/32	0° - 48'	0.150 3,8
12 (300)	0 – 5/32	0° - 41'	0.130 3,3

* Pipe movement is accommodated with flexible radius-cut grooves only. Standard, rigid-radius cut grooves provide no deflection or movement.

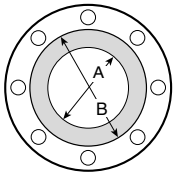
Style 341 Helpful Information

Pipe Size			Required Mating Face Sealing Surface inches/millimeters	
Nominal Diameter inches (mm)	Number of Bolts Required †	Bolt Size inches	"A" Maximum	"B" Minimum
3 (80)	4	5/8 x 3	3.960 (100,6)	4.940 (125,5)
4 (100)	8	5/8 x 3	4.800 (121,9)	5.880 (149,4)
6 (150)	8	3/4 x 3 1/2	6.900 (175,3)	8.000 (203,2)
8 (200)	8	3/4 x 3 1/2	9.050 (229,9)	10.130 (257,3)
10 (250)	12	7/8 x 4	11.100 (281,9)	12.500 (317,5)
12 (300)	12	7/8 x 4	13.200 (335,3)	14.750 (374,7)

† Total bolts required are to be supplied by the installer. Bolt sizes are for conventional flange-to-flange connections. Longer bolts are required when Vic-Flange Adapters are used with wafer-type valves.

NOTE: Style 341 Vic-Flange Adapters for AWWA ductile iron pipe provide rigid joints when used on ductile iron pipe that is grooved to Victaulic specifications. Consequently, no linear or angular movement is allowed at the joint.

The shaded area of the mating face (shown at right) must be free from gouges, undulations, or deformities of any type for proper sealing.



Style 341

Vic-Flange Adapter 14 – 24 inch (350 – 600 mm) Sizes

⚠ WARNING

- **Read and understand all instructions before attempting to install any Victaulic piping products.**
- **Depressurize and drain the piping system before attempting to install, remove, or adjust any Victaulic piping products.**
- **Wear safety glasses, hardhat, and foot protection.**

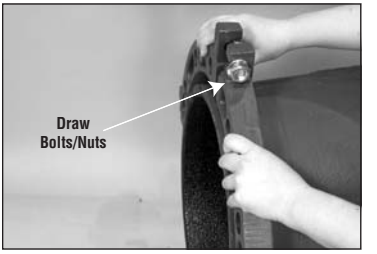
Failure to follow these instructions could result in serious personal injury, improper product installation, and/or property damage.

1. CHECK PIPE ENDS: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from deep pits and swells to provide a leak-tight seal for the gasket. All rust, loose scale, oil, grease, dirt, and cutting particles must be removed. Peened surfaces may require rework to provide a leak-tight seal for the gasket (refer to ANSI/AWWA C-606 or CSA B242).

NOTICE

- **Make sure there is sufficient clearance behind the pipe groove to permit proper assembly of the Vic-Flange Adapter.**

2. ADD FIRST SEGMENT: Place the first segment onto the pipe, making sure the key engages in the groove properly. **NOTE:** On vertical pipe, the segments must be held in place until all segments are fastened together. For horizontal pipe, the segments can be balanced on top of the pipe, as shown.



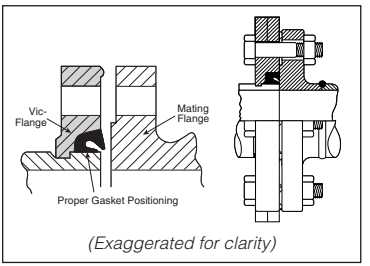
3. ADD ADDITIONAL SEGMENTS: Add each segment by inserting the draw bolts (provided) into the flange adapter with the nuts (provided) loosely and uniformly tightened. This will permit the flange adapter to be rotated for bolt hole alignment in later steps.

4. CHECK GASKET AND LUBRICATE: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior. **NOTE:** This gasket is designed to provide the primary seal. Refer to page 43 for special applications.

⚠ CAUTION

- **Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.**

Failure to follow this instruction could result in joint leakage.



(Exaggerated for clarity)

5. INSTALL GASKET: Install the gasket into the cavity between the pipe OD and the flange recess. Make sure the gasket is positioned properly, as shown above. **NOTE:** The lettering on the outside of the gasket must face the gasket pocket of the Style 341 Vic-Flange Adapter. When installed correctly, the lettering on the gasket will not be visible.

6. ALIGN VIC-FLANGE AND MATING FLANGE: Rotate the Vic-Flange on the pipe end, as required, to align the holes with the mating flange.

7. INSERT FLANGE BOLTS AT LAP JOINTS: Insert a standard flange bolt into each of the four lap joint holes. **NOTE:** It may be necessary to tighten the draw bolts to line up the lap joint bolt holes for insertion of the bolts.

⚠ WARNING

- **Bolt sizes specified in this section must be used to ensure proper assembly of Vic-Flange Adapters.**

Failure to follow this instruction could cause joint failure, resulting in serious personal injury and/or property damage.

8. TIGHTEN DRAW BOLTS: After all four bolts are inserted into the lap-joint bolt holes, torque the draw bolts to approximately 150 ft-lbs (203 N•m). **NOTE:** It is normal to have a small amount of shift as these bolts are being torqued.

9. JOIN VIC-FLANGE ADAPTER AND MATING FLANGE: Guide the four flange bolts, installed in step 7, into the mating flange holes. To prevent the bolts from pulling out, thread a nut finger-tight onto each of the four flange bolts.

10. ADD REMAINING BOLTS/ NUTS: Add the remaining standard-flange bolts. Thread nuts finger-tight onto the bolts.

11. TORQUE FLANGE BOLTS: Tighten all flange bolts evenly until the required torque value is achieved. Refer to the "Style 341 Torque Requirements" table below for the required torque value.

Style 341 Torque Requirements

Pipe Size Nominal Diameter inches (mm)	Torque Requirement ft-lbs (N•m)
14 (350)	250 – 300 (339 – 407)
16 (400)	250 – 300 (339 – 407)
18 (450)	300 – 350 (407 – 475)
20 (500)	300 – 350 (407 – 475)
24 (600)	350 – 400 (475 – 542)

Allowable Pipe-End Separation and Joint Deflection for Style 341 Vic-Flange Adapters
Flexible, Radius-Cut Grooved, Cast (Gray/Ductile) Iron Pipe

Pipe Size		Deflection From Centerline	
Nominal Diameter inches (mm)	Allowable Pipe-End Separation * inches (mm)	Degrees Per Coupling *	Inches/one foot of Pipe (mm/one meter of Pipe) *
14 350	0 – 5/32	0° - 35'	0.110 2,8
16 400	0 – 1/4	0° - 49'	0.160 4,1
18 450	0 – 1/4	0° - 44'	0.140 3,6
20 500	0 – 1/4	0° - 40'	0.120 3,0
24 600	0 – 1/4	0° - 33'	0.110 2,8

* Pipe movement is accommodated with flexible radius-cut grooves only. Standard, rigid-radius cut grooves provide no deflection or movement.

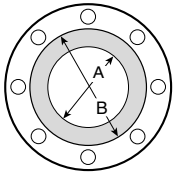
Style 341 Helpful Information

Pipe Size	Assembly Bolts		Draw Bolts		Required Mating Face Sealing Surface inches/mm	
Nominal Diameter inches (mm)	Number of Bolts Required	Bolt Size inches	Number of Bolts Required	Bolt Size inches	"A" Maximum	"B" Minimum
14 (350)	12	1 x 4 1/4	4	5/8 x 3 1/2	15.300 (388,6)	16.380 (416,1)
16 (400)	16	1 x 4 3/4	4	5/8 x 3 1/2	17.400 (442,0)	18.380 (466,9)
18 (450)	16	1-1/8 x 5 1/2	4	3/4 x 4 1/4	19.500 (495,3)	20.000 (508,0)
20 (500)	16	1-1/8 x 5 3/4	4	3/4 x 4 1/4	21.600 (548,6)	22.500 (571,5)
24 (600)	20	1 1/4 x 6 1/4	4	3/4 x 5	25.800 (655,3)	27.750 (704,9)

† Total bolts required are to be supplied by the installer. Bolt sizes are for conventional flange-to-flange connections. Longer bolts are required when Vic-Flange Adapters are used with wafer-type valves.

NOTE: Style 341 Vic-Flange Adapters for AWWA ductile iron pipe provide rigid joints when used on ductile iron pipe that is grooved to Victaulic specifications. Consequently, no linear or angular movement is allowed at the joint.

The shaded area of the mating face (shown at right) must be free from gouges, undulations, or deformities of any type for proper sealing.



Valve Installation and Operation

Check Valves
Plug Valves

Series 317 Check Valve

Series 365 Vic-Plug Valve

Series 366 Vic-Plug Valve

CHECK VALVE INSTALLATION AND OPERATION

Series 317 Check Valve

- The Series 317 Check Valve is a grooved-end valve that conforms to AWWA C-508 requirements for water and wastewater treatment services.
- Style 31 Couplings can directly connect the Series 317 Check Valve to pipe that is grooved to ANSI/AWWA C-606 rigid or flexible radius groove specifications.
- Style 341 Vic-Flange Adapters can be used to connect the Series 317 Check Valve to pipe that is grooved to ANSI/AWWA C-606 rigid or flexible radius groove specifications.
- Style 307 Transition Couplings can be used only when connecting a Series 317 Check Valve to IPS pipe.
- For installing Series 317 Check Valves into a piping system using Style 31 Couplings, Style 341 Vic-Flange Adapters, or Style 307 Transition Couplings, follow the instructions supplied with the product.
- Refer to the “Series 317 AWWA Check Valve Installation and Maintenance Instructions” (I-317) manual for information regarding valve adjustment, cleaning, accessory kit installation, etc.

PLUG VALVE INSTALLATION AND OPERATION

When directly connecting an end cap to a ball valve, use only a tapped end cap for pressure relief. If the ball valve is opened then closed unknowingly while the end cap is attached, the space between the ball and end cap will be filled and pressurized. A sudden release of energy can occur if the end cap is removed while the space behind it is pressurized. **PRESSURE MUST BE VENTED THROUGH THE TAP BEFORE ATTEMPTING TO REMOVE THE CAP.**

⚠ DANGER

- **When directly connecting an end cap to a ball valve, use only a tapped end cap for pressure relief.**
- **Pressure must be vented through the tap before attempting to remove the cap.**

Failure to follow these instructions could result in death or serious personal injury.

Series 365 Vic-Plug Valve (Ductile Iron Ends)

- The Series 365 Vic-Plug Valve is an eccentric plug valve designed to ANSI/AWWA standards and is used primarily for water and wastewater treatment services.
- Style 31 Couplings can directly connect the Series 365 Vic-Plug Valve to pipe that is grooved to ANSI/AWWA C-606 rigid or flexible radius groove specifications.
- Style 341 Vic-Flange Adapters can be used to connect the Series 365 Vic-Plug Valve to pipe that is grooved to ANSI/AWWA C-606 rigid or flexible radius groove specifications.
- Style 307 Transition Couplings can be used only when connecting a Series 365 Vic-Plug Valve to IPS pipe.
- For installing a Series 365 Vic-Plug Valve into a piping system using Style 31 Couplings, Style 341 Vic-Flange Adapters, or Style 307 Transition Couplings, follow the instructions supplied with the product.
- Refer to the “Series 365, 366, and 377 Vic-Plug Valves Operation and Maintenance Manual” for information regarding valve adjustment, cleaning, accessory kit installation, etc.

Series 366 Vic-Plug Valve (IPS Ends)

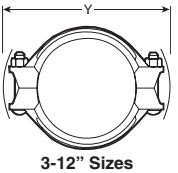
- The Series 366 Vic-Plug Valve is a grooved-end, eccentric plug valve designed to ANSI/AWWA standards and is used primarily for water and wastewater treatment services.
- The 14 – 18 inch (350 – 450 mm) Series 366 Vic-Plug Valve has IPS ends that are suitable for use with Victaulic Style 07 Zero-Flex couplings, Style 77 flexible couplings, and Style 741 Vic-Flange Adapters. For installing these sizes of Vic-Plug valves into a piping system, follow the instructions supplied with the coupling or Vic-Flange Adapter.
- Refer to the “Series 365, 366, and 377 Vic-Plug Valves Operation and Maintenance Manual” for information regarding valve adjustment, cleaning, accessory kit installation, etc.

Product Data

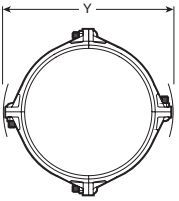
The following information contains center-to-end, end-to-end, take-out, and similar overall dimensions for couplings, flange adapters, and fittings. Refer to the current Victaulic publication for complete dimensional information and for products not shown.

Style 31 Coupling

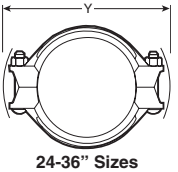
Pipe Size		
Nominal Diameter inches (mm)	Actual Outside Diameter inches (mm)	"Y" Dimension inches (mm)
3 80	3.960 100,6	7.63 193,8
4 100	4.800 121,9	9.20 233,7
6 150	6.900 175,3	11.19 284,2
8 200	9.050 229,9	14.33 364,0
10 250	11.100 281,9	16.44 417,6
12 300	13.200 335,3	19.16 486,7
14 350	15.300 388,6	21.96 557,8
16 400	17.400 442,0	23.96 608,6
18 450	19.500 495,3	26.33 668,8
20 500	21.600 548,6	28.69 728,7
24 600	25.800 655,3	33.06 839,7
30 750	32.000 762,0	39.39 1000,5
36 900	38.300 914,4	46.04 1169,4



3-12" Sizes



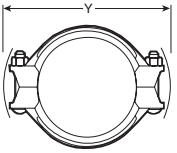
14-20" Sizes



24-36" Sizes

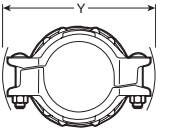
Style 31-BS Coupling

Pipe Size		
Nominal Diameter mm (inches)	Actual Outside Diameter mm (inches)	"Y" Dimension mm (inches)
80 3	98 3.860	187,5 7.38
100 4	118 4.640	225,6 8.88
150 6	170 6.690	289,1 11.38



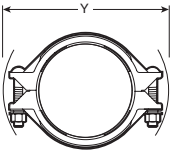
Style 307 Transition Coupling

Pipe Size		
Nominal Diameter inches	Actual Outside Diameter inches (mm)	"Y" Dimension inches (mm)
3 80	3.960 100,6	7.38 187,5
4 100	4.800 121,9	9.00 228,6
6 150	6.900 175,3	11.13 282,7
8 200	9.050 229,9	11.13 352,6
10 250	11.100 281,9	16.50 419,1
12 300	13.200 335,3	18.94 481,1



Style 397 Grooved-End x Plain-End Coupling
Style 399 Plain-End x Plain-End Coupling

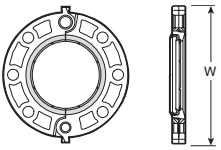
Pipe Size		
Nominal Diameter inches	Actual Outside Diameter inches (mm)	"Y" Dimension inches (mm)
4 100	4.800 121,9	9.67 245,6
6 150	6.900 175,3	12.44 316,0
8 200	9.050 229,9	15.10 383,5



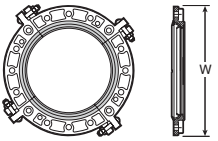
VIC-FLANGE ADAPTERS

Style 341 Vic-Flange Adapter

Pipe Size		
Nominal Diameter inches	**Actual Outside Diameter inches (mm)**	**"A" Dimension inches (mm)**
3 80	3.960 100,6	8.44 214,4
4 100	4.800 121,9	9.94 252,5
6 150	6.900 175,3	12.00 304,8
8 200	9.050 229,9	14.63 371,6
10 250	11.100 281,9	17.13 435,1
12 300	13.200 335,3	20.13 511,3
14 350	15.300 388,6	24.63 625,6
16 400	17.400 442,0	27.25 692,2
18 450	19.500 495,3	29.13 739,9
20 500	21.600 548,6	31.63 803,4
24 600	25.800 655,3	36.13 917,7



3-12" Sizes

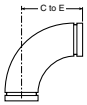


14-24" Sizes

FITTINGS

No. 100-C – 90° Long Radius Elbow
No. 10-C – 90° Elbow
No. 11-C – 45° Elbow
No. 12-C – 22½° Elbow
No. 13-C – 11¼° Elbow

Pipe Size		No. 100-C 90° Long Radius Elbow	No. 10-C 90° Elbow	No. 11-C 45° Elbow	No. 12-C 22½° Elbow	No. 13-C 11¼° Elbow
Nominal Dia. inches (mm)	Actual Outside Dia. inches (mm)	C to E inches (mm)	C to E inches (mm)	C to E inches (mm)	C to E inches (mm)	C to E inches (mm)
3 80	3.960 100,6	7.75 196,9	5.50 139,7	3.00 76,2	3.00 76,2	3.00 76,2
4 100	4.800 121,9	9.00 228,6	6.50 165,1	4.00 101,6	4.00 101,6	4.00 101,6
6 150	6.900 175,3	11.50 292,1	8.00 203,2	5.00 127,0	5.00 127,0	5.00 127,0
8 200	9.050 229,9	14.00 355,6	9.00 228,6	5.50 139,7	5.50 139,7	5.50 139,7
10 250	11.100 281,9	16.50 419,1	11.00 279,4	6.50 165,1	6.50 165,1	6.50 165,1
12 300	13.200 335,3	19.00 482,6	12.00 304,8	7.50 190,5	7.50 190,5	7.50 190,5
14 350	15.300 388,6	21.50 546,1	14.00 355,6	7.50 190,5	7.50 190,5	7.50 190,5
16 400	17.400 442,0	24.00 609,6	15.00 381,0	8.00 203,2	8.00 203,2	8.00 203,2
18 450	19.500 495,3	26.50 673,1	16.50 419,1	8.50 215,9	8.50 215,9	8.50 215,9
20 500	21.600 548,6	29.00 736,6	18.00 457,2	9.50 241,3	9.50 241,3	9.50 241,3
24 600	25.800 655,3	34.00 863,6	22.00 558,8	11.00 279,4	11.00 279,4	11.00 279,4
30 750	32.000 762,0	41.50 1054,1	25.00 635,0	15.00 381,0	15.00 381,0	15.00 381,0
36 900	38.300 914,4	49.00 1244,6	28.00 711,2	18.00 457,2	18.00 457,2	18.00 457,2



No. 100-C

No. 10-C

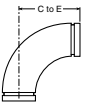
No. 11-C

No. 12-C

No. 13-C

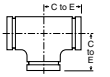
No. 10-BS – 90° Elbow
No. 11-BS – 45° Elbow
No. 20-BS – Tee

Pipe Size		No. 10-BS 90° Elbow	No. 11-BS 45° Elbow	No. 20-BS Tee
Nominal Dia. mm (inches)	Actual OutsideDia. mm (inches)	C to E mm (inches)	C to E mm (inches)	C to E mm (inches)
80 3	98 3.860	165,1 6.50	130,0 5.12	165,1 6.50
100 4	118 4.640	179,8 7.08	140,0 5.51	179,8 7.08
150 6	170 6.690	220,0 8.66	160,0 6.30	220,0 8.66



No. 10-BS

No. 11-BS

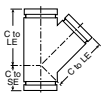


No. 20-BS

No. 20-C

No. 60-C

No. 20-C – Tee
No. 33-C – Wye
No. 35-C – Cross
No. 30-C – 45° Lateral
No. 60-C – Cap



No. 30-C

No. 33-C

No. 35-C

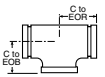
Pipe Size		No. 20-C Tee	No. 33-C Wye		No. 35-C Cross	No. 30-C 45° Lateral		No. 60-C Cap †
Nominal Dia. inches (mm)	Actual Outside Dia. inches (mm)	C to E inches (mm)	C to LE inches (mm)	C to SE inches (mm)	C to E inches (mm)	C to LE inches (mm)	C to SE inches (mm)	Thickness "T" inches (mm)
3 80	3.960 100,6	5.50 139,7	5.50 139,7	5.50 139,7	5.50 139,7	10.00 254,0	3.00 76,2	1.23 31,2
4 100	4.800 121,9	6.50 165,1	6.50 165,1	3.00 76,2	6.50 165,1	12.00 304,8	3.00 76,2	1.16 29,5
6 150	6.900 175,3	8.00 203,2	8.00 203,2	3.50 88,9	8.00 203,2	14.50 368,3	3.50 88,9	1.16 29,5
8 200	9.050 229,9	9.00 228,6	9.00 228,6	4.50 114,3	9.00 228,6	17.50 444,5	4.50 114,3	1.34 34,0
10 250	11.100 281,9	11.00 279,4	11.00 279,4	5.00 127,0	11.00 279,4	20.50 520,7	5.00 127,0	1.53 38,9
12 300	13.200 335,3	12.00 304,8	12.00 304,8	5.50 139,7	12.00 304,8	24.50 622,3	5.50 139,7	1.53 38,9
14 350	15.300 388,6	14.00 355,6	14.00 355,6	6.00 152,4	14.00 355,6	27.00 685,8	6.00 152,4	3.32* 84,3
16 400	17.400 442,0	15.00 381,0	15.00 381,0	6.50 165,1	15.00 381,0	30.00 762,0	6.50 165,1	3.35* 85,1
18 450	19.500 495,3	16.50 419,1	16.50 419,1	7.00 177,8	16.50 419,1	32.00 812,8	7.00 177,8	3.39* 86,1
20 500	21.600 548,6	18.00 457,2	18.00 457,2	8.00 203,2	18.00 457,2	35.00 889,0	8.00 203,2	3.45* 87,6
24 600	25.800 655,3	22.00 558,8	22.00 558,8	9.00 228,6	22.00 558,8	40.50 1028,7	9.00 228,6	3.57* 90,7
30 750	32.000 762,0	25.00 635,0	25.00 635,0	10.00 254,0	25.00 635,0	49.00 1244,6	10.00 254,0	4.00* 101,6
36 900	38.300 914,4	28.00 711,2	28.00 711,2	15.25 387,4	28.00 711,2	56.00 1422,4	15.25 387,4	4.00* 101,6

* Dish Caps

† Caps available for 1 – 4 inch (25,4 – 101,6 mm) tap sizes

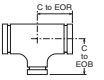
No. 21-C – Bullhead Tee

SIZE Nominal Diameter inches (mm)					C to EOR inches (mm)	C to EOB inches (mm)
4	X	4	X	6	+	+
100	X	100	X	150	+	+
6	X	6	X	8	8.00	8.00
150	X	150	X	200	203,2	203,2
8	X	8	X	10	11.00	11.00
200	X	200	X	250	279,4	279,4
10	X	10	X	12	+	+
250	X	250	X	300	+	+

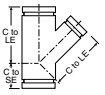


Bullhead Tee
No. 21-C

No. 25-C – Reducing Tee
No. 30-CR – 45° Reducing Lateral
No. 35-CR Reducing Cross



No. 25-C

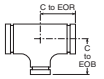


No. 30-CR

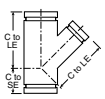
No. 35-CR

Size Nominal Diameter inches (mm)			No. 25-C Red. Tee		No. 30-CR 45° Red. Lat.		No. 35-CR Red. Cross	
			C to EOR inches (mm)	C to EOB inches (mm)	C to LE inches (mm)	C to SE inches (mm)	H inches (mm)	J inches (mm)
4	X	3	6.50	6.50	12.00	3.00	6.50	6.50
100	X	80	165,1	165,1	304,8	76,2	165,1	165,1
6	X	3	8.00	8.00	14.50	3.50	8.00	8.00
150	X	80	203,2	203,2	368,3	88,9	203,2	203,2
	X	4	8.00	8.00	14.50	3.50	8.00	8.00
	X	100	203,2	203,2	368,3	88,9	203,2	203,2
8	X	3	9.00	9.00	-	-	-	-
200	X	80	228,6	228,6	-	-	-	-
	X	4	9.00	9.00	17.50	4.50	9.00	9.00
	X	100	228,6	228,6	444,5	114,3	228,6	228,6
	X	6	9.00	9.00	17.50	4.50	9.00	9.00
	X	150	228,6	228,6	444,5	114,3	228,6	228,6
10	X	4	11.00	11.00	20.50	5.00	11.00	11.00
250	X	100	279,4	279,4	520,7	127,0	279,4	279,4
	X	6	11.00	11.00	20.50	5.00	11.00	11.00
	X	150	279,4	279,4	520,7	127,0	279,4	279,4
	X	8	11.00	11.00	20.50	5.00	11.00	11.00
	X	200	279,4	279,4	520,7	127,0	279,4	279,4
12	X	4	12.00	12.00	24.50	5.50	12.00	12.00
300	X	100	304,8	304,8	622,3	139,7	304,8	304,8
	X	6	12.00	12.00	24.50	5.50	12.00	12.00
	X	150	304,8	304,8	622,3	139,7	304,8	304,8
	X	8	12.00	12.00	24.50	5.50	12.00	12.00
	X	200	304,8	304,8	622,3	139,7	304,8	304,8
	X	10	12.00	12.00	24.50	5.50	12.00	12.00
	X	250	304,8	304,8	622,3	139,7	304,8	304,8
14	X	6	14.00	14.00	27.00	6.00	14.00	14.00
350	X	150	355,6	355,6	685,8	152,4	355,6	355,6
	X	8	14.00	14.00	27.00	6.00	14.00	14.00
	X	200	355,6	355,6	685,8	152,4	355,6	355,6
	X	10	14.00	14.00	27.00	6.00	14.00	14.00
	X	250	355,6	355,6	685,8	152,4	355,6	355,6
	X	12	14.00	14.00	27.00	6.00	14.00	14.00
	X	300	355,6	355,6	685,8	152,4	355,6	355,6

No. 25-C – Reducing Tee
No. 30-CR – 45° Reducing Lateral
No. 35-CR Reducing Cross



No. 25-C



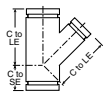
No. 30-CR

No. 35-CR

Size Nominal Diameter inches (mm)			No. 25-C Red. Tee		No. 30-CR 45° Red. Lat.		No. 35-CR Red. Cross	
			C to EOR inches (mm)	C to EOB inches (mm)	C to LE inches (mm)	C to SE inches (mm)	H inches (mm)	J inches (mm)
16	X	6	15.00	15.00	30.00	6.50	15.00	15.00
400	X	150	381,0	381,0	762,0	165,1	381,0	381,0
	X	8	15.00	15.00	30.00	6.50	15.00	15.00
	X	200	381,0	381,0	762,0	165,1	381,0	381,0
	X	10	15.00	15.00	30.00	6.50	15.00	15.00
	X	250	381,0	381,0	762,0	165,1	381,0	381,0
	X	12	15.00	15.00	30.00	6.50	15.00	15.00
	X	300	381,0	381,0	762,0	165,1	381,0	381,0
	X	14	15.00	15.00	30.00	6.50	15.00	15.00
	X	350	381,0	381,0	762,0	165,1	381,0	381,0
18	X	8	13.00	15.50	+	+	15.50	13.00
450	X	200	330,2	393,7	+	+	393,7	330,2
	X	10	13.00	15.50	32.00	7.00	15.50	13.00
	X	250	330,2	393,7	812,8	177,8	393,7	330,2
	X	12	13.00	15.50	32.00	7.00	15.50	13.00
	X	300	330,2	393,7	812,8	177,8	393,7	330,2
	X	14	16.50	16.50	32.00	7.00	16.50	16.50
	X	350	419,1	419,1	812,8	177,8	419,1	419,1
	X	16	16.50	16.50	32.00	7.00	16.50	16.50
	X	400	419,1	419,1	812,8	177,8	419,1	419,1
20	X	6	14.00	17.00	-	-	-	-
500	X	150	355,6	431,8	-	-	-	-
	X	8	14.00	17.00	-	-	17.00	14.00
	X	200	355,6	431,8	-	-	431,8	355,6
	X	10	14.00	17.00	+	+	17.00	14.00
	X	250	355,6	431,8	+	+	431,8	355,6
	X	12	14.00	17.00	35.00	8.00	17.00	14.00
	X	300	355,6	431,8	889,0	203,2	431,8	355,6
	X	14	14.00	17.00	35.00	8.00	17.00	14.00
	X	350	355,6	431,8	889,0	203,2	431,8	355,6
	X	16	18.00	18.00	35.00	8.00	18.00	18.00
	X	400	457,2	457,2	889,0	203,2	457,2	457,2
	X	18	18.00	18.00	35.00	8.00	18.00	18.00
	X	450	457,2	457,2	889,0	203,2	457,2	457,2
24	X	6	15.00	19.00	-	-	-	-
600	X	150	381,0	482,6	-	-	-	-
	X	8	15.00	19.00	+	+	+	+
	X	200	381,0	482,6	+	+	+	+
	X	10	15.00	19.00	+	+	+	+
	X	250	381,0	482,6	+	+	+	+
24	X	12	15.00	19.00	+	+	15.00	19.00
600	X	300	381,0	482,6	+	+	381,0	482,6
	X	14	15.00	19.00	40.50	9.00	15.00	19.00
	X	350	381,0	482,6	1028,7	228,6	381,0	482,6
	X	16	15.00	19.00	40.50	9.00	15.00	19.00
	X	400	381,0	482,6	1028,7	228,6	381,0	482,6
	X	18	22.00	22.00	40.50	9.00	22.00	22.00
	X	450	558,8	558,8	1028,7	228,6	558,8	558,8
	X	20	22.00	22.00	40.50	9.00	22.00	22.00
	X	500	558,8	558,8	1028,7	228,6	558,8	558,8

No. 25-C – Reducing Tee
No. 30-CR – 45° Reducing Lateral
No. 35-CR Reducing Cross

No. 25-C



No. 30-CR

No. 35-CR

Size Nominal Diameter inches (mm)			No. 25-C Red. Tee		No. 30-CR 45° Red. Lat.		No. 35-CR Red. Cross	
			C to EOR inches (mm)	C to EOB inches (mm)	C to LE inches (mm)	C to SE inches (mm)	H inches (mm)	J inches (mm)
30	X	6	18.00	23.00	-	-	-	-
750	X	150	457,2	584,2	-	-	-	-
	X	8	18.00	23.00	+	+	+	+
	X	200	457,2	584,2	+	+	+	+
	X	10	18.00	23.00	+	+	+	+
	X	250	457,2	584,2	+	+	+	+
	X	12	18.00	23.00	49.00	10.00	18.00	23.00
	X	300	457,2	584,2	1244,6	254,0	457,2	584,2
	X	14	18.00	23.00	49.00	10.00	18.00	23.00
	X	350	457,2	584,2	1244,6	254,0	457,2	584,2
	X	16	18.00	23.00	49.00	10.00	18.00	23.00
	X	400	457,2	584,2	1244,6	254,0	457,2	584,2
	X	18	18.00	23.00	49.00	10.00	18.00	23.00
	X	450	457,2	584,2	1244,6	254,0	457,2	584,2
	X	20	18.00	23.00	49.00	10.00	18.00	23.00
	X	500	457,2	584,2	1244,6	254,0	457,2	584,2
	X	24	25.00	25.00	49.00	10.00	25.00	25.00
	X	600	635,0	635,0	1244,6	254,0	635,0	635,0
36	X	8	20.00	26.00	+	+	+	+
900	X	200	508,0	660,4	+	+	+	+
	X	10	20.00	26.00	+	+	+	+
	X	250	508,0	660,4	+	+	+	+
	X	12	20.00	26.00	+	+	20.00	26.00
	X	300	508,0	660,4	+	+	508,0	660,4
	X	14	20.00	26.00	54.00	15.25	20.00	26.00
	X	350	508,0	660,4	1371,6	387,4	508,0	660,4
	X	16	20.00	26.00	54.00	15.25	20.00	26.00
	X	400	508,0	660,4	1371,6	387,4	508,0	660,4
	X	18	20.00	26.00	54.00	15.25	20.00	26.00
	X	450	508,0	660,4	1371,6	387,4	508,0	660,4
	X	20	20.00	26.00	54.00	15.25	20.00	26.00
	X	500	508,0	660,4	1371,6	387,4	508,0	660,4
	X	24	20.00	26.00	54.00	15.25	20.00	26.00
	X	600	508,0	660,4	1371,6	387,4	508,0	660,4
	X	30	28.00	28.00	56.00	15.25	28.00	28.00
	X	750	711,2	711,2	1422,4	387,4	711,2	711,2

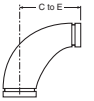
+ Contact Victaulic for details.

No. 50-C

No. 51-CR

No. 50-C – Concentric Reducer
No. 51-C – Eccentric Reducer
No. 10-CR – 90° Reducing Elbow
No. 100-CR – 90° Long Radius Reducing Elbow

No. 10-CR



No. 100-CR

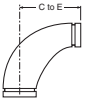
Size Nominal Diameter inches (mm)			No. 50-C Conc. Red. E to E inches (mm)	No. 51-C Ecc. Red. E to E inches (mm)	No. 10-CR 90° Red. El. C to E inches (mm)	No. 100-CR 90° Long Radius Red. Elbow C to E inches (mm)
4	X	3	7.00	7.00	6.50	9.00
100	X	80	177,8	177,8	165,1	228,6
6	X	3	9.00	9.00	8.00	11.50
150	X	80	228,6	228,6	203,2	292,1
	X	4	9.00	9.00	8.00	11.50
	X	100	228,6	228,6	203,2	292,1
8	X	3	11.00	11.00	-	-
200	X	80	279,4	279,4	-	-
	X	4	11.00	11.00	9.00	14.00
	X	100	279,4	279,4	228,6	355,6
	X	6	11.00	11.00	9.00	14.00
	X	150	279,4	279,4	228,6	355,6
10	X	4	12.00	12.00	11.00	16.50
250	X	100	304,8	304,8	279,4	419,1
	X	6	12.00	12.00	11.00	16.50
	X	150	304,8	304,8	279,4	419,1
	X	8	12.00	12.00	11.00	16.50
	X	200	304,8	304,8	279,4	419,1
12	X	4	14.00	14.00	12.00	+
300	X	100	355,6	355,6	304,8	+
	X	6	14.00	14.00	12.00	19.00
	X	150	355,6	355,6	304,8	482,6
	X	8	14.00	14.00	12.00	19.00
	X	200	355,6	355,6	304,8	482,6
	X	10	14.00	14.00	12.00	19.00
	X	250	355,6	355,6	304,8	482,6
14	X	6	16.00	16.00	14.00	+
350	X	150	406,4	406,4	355,6	+
	X	8	16.00	16.00	14.00	21.50
	X	200	406,4	406,4	355,6	546,1
	X	10	16.00	16.00	14.00	21.50
	X	250	406,4	406,4	355,6	546,1
	X	12	16.00	16.00	14.00	21.50
	X	300	406,4	406,4	355,6	546,1
16	X	6	18.00	18.00	-	+
400	X	150	457,2	457,2	-	+
	X	8	18.00	18.00	15.00	24.00
	X	200	457,2	457,2	381,0	609,6
	X	10	18.00	18.00	15.00	24.00
	X	250	457,2	457,2	381,0	609,6
	X	12	18.00	18.00	15.00	24.00
	X	300	457,2	457,2	381,0	609,6
	X	14	18.00	18.00	15.00	24.00
	X	350	457,2	457,2	381,0	609,6

No. 50-C

No. 51-CR

No. 50-C – Concentric Reducer
No. 51-C – Eccentric Reducer
No. 10-CR – 90° Reducing Elbow
No. 100-CR – 90° Long Radius Reducing Elbow

No. 10-CR



No. 100-CR

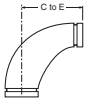
Size Nominal Diameter inches (mm)			No. 50-C Conc. Red. E to E inches (mm)	No. 51-C Ecc. Red. E to E inches (mm)	No. 10-CR 90° Red. El. C to E inches (mm)	No. 100-CR 90° Long Radius Red. Elbow C to E inches (mm)
18	X	8	19.00	19.00	16.50	-
450	X	200	482,6	482,6	419,1	-
	X	10	19.00	19.00	16.50	26.50
	X	250	482,6	482,6	419,1	673,1
	X	12	19.00	19.00	16.50	26.50
	X	300	482,6	482,6	419,1	673,1
	X	14	19.00	19.00	16.50	26.50
	X	350	482,6	482,6	419,1	673,1
	X	16	19.00	19.00	16.50	26.50
	X	400	482,6	482,6	419,1	673,1
20	X	8	20.00	20.00	-	-
500	X	200	508,0	508,0	-	-
	X	10	20.00	20.00	18.00	29.00
	X	250	508,0	508,0	457,2	736,6
	X	12	20.00	20.00	18.00	29.00
	X	300	508,0	508,0	457,2	736,6
	X	14	20.00	20.00	18.00	29.00
	X	350	508,0	508,0	457,2	736,6
	X	16	20.00	20.00	18.00	29.00
	X	400	508,0	508,0	457,2	736,6
	X	18	20.00	20.00	18.00	29.00
	X	450	508,0	508,0	457,2	736,6
24	X	8	+	+	+	+
600	X	200	+	+	+	+
	X	10	+	+	+	+
	X	250	+	+	+	+
	X	12	24.00	24.00	22.00	34.00
	X	300	609,6	609,6	558,8	863,6
	X	14	24.00	24.00	22.00	34.00
	X	350	609,6	609,6	558,8	863,6
	X	16	24.00	24.00	22.00	34.00
	X	400	609,6	609,6	558,8	863,6
	X	18	24.00	24.00	22.00	34.00
	X	450	609,6	609,6	558,8	863,6
	X	20	24.00	24.00	22.00	34.00
	X	500	609,6	609,6	558,8	863,6

No. 50-C

No. 51-CR

No. 50-C – Concentric Reducer
No. 51-C – Eccentric Reducer
No. 10-CR – 90° Reducing Elbow
No. 100-CR – 90° Long Radius Reducing Elbow

No. 10-CR



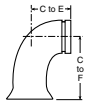
No. 100-CR

Size Nominal Diameter inches (mm)			No. 50-C Conc. Red. E to E inches (mm)	No. 51-C Ecc. Red. E to E inches (mm)	No. 10-CR 90° Red. El. C to E inches (mm)	No. 100-CR 90° Long Radius Red. Elbow C to E inches (mm)
30	X	6	-	-	-	-
750	X	150	-	-	-	-
	X	8	+	+	+	-
	X	200	+	+	+	-
	X	10	+	+	+	-
	X	250	+	+	+	-
	X	12	+	+	+	-
	X	300	+	+	+	-
	X	14	+	+	25.00	-
	X	350	+	+	635,0	-
	X	16	+	30.00	25.00	41.50
	X	400	+	762,0	635,0	1054,1
	X	18	+	30.00	25.00	41.50
	X	450	+	762,0	635,0	1054,1
	X	20	30.00	30.00	25.00	41.50
	X	500	762,0	762,0	635,0	1054,1
	X	24	30.00	30.00	25.00	41.50
	X	600	762,0	762,0	635,0	1054,1
36	X	8	+	+	+	-
900	X	200	+	+	+	-
	X	10	+	+	+	-
	X	250	+	+	+	-
	X	12	+	+	+	-
	X	300	+	+	+	-
	X	14	+	+	+	-
	X	350	+	+	+	-
	X	16	+	+	+	-
	X	400	+	+	+	-
	X	18	+	+	+	-
	X	450	+	+	+	-
	X	20	36.00	36.00	+	49.00
	X	500	914,4	914,4	+	1244,6
	X	24	36.00	36.00	+	49.00
	X	600	914,4	914,4	+	1244,6
	X	30	36.00	36.00	+	49.00
	X	750	914,4	914,4	+	1244,6

+ Contact Victaulic for details.

No. 10-CF – 90° Flare
No. 100-CF – 90° Long Radius Flare
No. 43-CF – Straight Flare
No. 10-CS – 90° Side Outlet
No. 20-CS Tee Side Outlet

No. 10-CF



No. 100-CF

No. 43-CF

No. 10-CS

No. 20-CS

Pipe Size		No. 10-CF 90º Flare		No. 100-CF 90º Long Radius Flare		No. 43-CF Straight Flare	No. 10-CS* 90º Side Outlet	No. 20-CS* Tee Side Outlet
Nominal Dia. inches (mm)	Actual Outside Dia. inches (mm)	C to E inches (mm)	C to F inches (mm)	C to E inches (mm)	C to F inches (mm)	E to E inches (mm)	C to E inches (mm)	C to E inches (mm)
3 80	3.960 100,6	5.50 139,7	9.00 228,6	7.75 196,9	11.25 285,8	8.00 203,2	5.50 139,7	5.50 139,7
4 100	4.800 121,9	6.50 165,1	10.00 254,0	9.00 228,6	12.50 317,5	8.00 203,2	6.50 165,1	6.50 165,1
6 150	6.900 175,3	8.00 203,2	11.50 292,1	11.50 292,1	15.00 381,0	8.00 203,2	8.00 203,2	8.00 203,2
8 200	9.050 229,9	9.00 228,6	13.50 342,9	14.00 355,6	18.50 469,9	10.00 254,0	9.00 228,6	9.00 228,6
10 250	11.100 281,9	11.00 279,4	16.50 419,1	16.50 419,1	22.50 571,5	10.00 254,0	11.00 279,4	11.00 279,4
12 300	13.200 335,3	12.00 304,8	18.50 469,9	19.00 482,6	25.50 647,7	12.00 304,8	12.00 304,8	12.00 304,8
14 350	15.300 388,6	14.00 355,6	21.50 546,1	21.50 546,1	29.00 736,6	12.00 304,8	14.00 355,6	14.00 355,6
16 400	17.400 442,0	15.00 381,0	23.00 584,2	24.00 609,6	32.00 812,8	16.00 406,4	15.00 381,0	15.00 381,0
18 450	19.500 495,3	16.50 419,1	25.00 635,0	26.50 673,1	35.00 889,0	16.00 406,4	16.50 419,1	16.50 419,1
20 500	21.600 548,6	18.00 457,2	27.00 685,8	29.00 736,6	38.00 965,2	18.00 457,2	18.00 457,2	18.00 457,2
24 600	25.800 655,3	22.00 558,8	32.50 825,5	34.00 863,6	44.50 1130,3	18.00 457,2	22.00 558,8	22.00 558,8
30 750	32.000 762,0	+ +	+ +	+ +	+ +	24.00 609,6	+ +	+ +
36 900	38.300 914,4	+ +	+ +	+ +	+ +	24.00 609,6	+ +	+ +

+ Contact Victaulic for details.

* Reducing side outlet 90° elbows, tees, and crosses are available. Contact Victaulic for details.

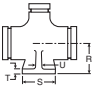
No. 10-CB – Base Elbow
No. 20-CB – Base Tee
No. 100-CB – Long Radius Base Elbow
No. 25-CB – Reducing Base tee

Pipe Size		Base Dimensions inches (mm)				
Nominal Dia. inches (mm)	Actual Outside Dia. inches (mm)	R	U	T	S	W
3 80	3.960 100,6	4.88 124,0	0.50 12,7	0.56 14,2	5.00 12,7	3.88 98,6
4 100	4.800 121,9	5.50 139,7	0.50 12,7	0.62 15,7	6.00 152,4	4.75 120,7
6 150	6.900 175,3	7.00 177,8	0.62 15,7	0.69 17,5	7.00 177,8	5.50 139,7
8 200	9.050 229,9	8.38 212,9	0.88 22,4	0.94 23,9	9.00 228,6	7.50 190,5
10 250	11.100 281,9	9.75 247,7	0.88 22,4	0.94 23,9	9.00 228,6	7.50 190,5
12 300	13.200 335,3	11.25 285,8	1.00 25,4	1.00 25,4	11.00 279,4	9.50 241,3
14 350	15.300 388,6	12.50 317,5	1.00 25,4	1.00 25,4	11.00 279,4	9.50 241,3
16 400	17.400 442,0	13.75 349,3	1.00 25,4	1.00 25,4	11.00 279,4	9.50 241,3
18 450	19.500 495,3	15.00 381,0	1.12 28,4	1.12 28,4	13.50 342,9	11.75 298,5
20 500	21.600 548,6	16.00 406,4	1.12 28,4	1.12 28,4	13.50 342,9	11.75 298,5
24 600	25.800 655,3	18.50 469,9	1.12 28,4	1.12 28,4	13.50 342,9	11.75 298,5

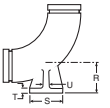
No. 10-CB

No. 20-CB

Round Base



No. 25-CB

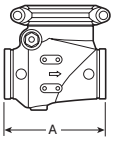


No. 100-CB

The bolt hole template, shown for the round base, is the same for the flange of the supporting pipe size. The only exception is that the round base contains only four holes that are placed to straddle the centerline. The bases of these fittings are intended for support in compression. The bases of these fittings must not be used as anchors or supports in tension or shear conditions.

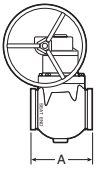
Series 317 Check Valve

Pipe Size		"A" End-to-End Dimension inches (mm)
Nominal Diameter inches	Actual Outside Diameter inches (mm)	
3 80	3.960 100,6	9.50 241,3
4 100	4.800 121,9	11.50 292,1
6 150	6.900 175,3	14.00 355,6
8 200	9.050 229,9	19.50 495,3
10 250	11.100 281,9	22.00 558,8
12 300	13.200 335,3	26.00 660,4



Series 365 Vic-Plug Valve (DI Ends)
Series 366 Vic-Plug Valve (IPS Ends)

Pipe Size		"A" End-to-End Dimension inches (mm)	
Nominal Diameter inches	Actual Outside Diameter inches (mm)	Series 365	Series 366
3 80	3.960 100,6	8.00 203,2	- -
4 100	4.800 121,9	9.00 228,6	- -
6 150	6.900 175,3	10.50 266,7	- -
8 200	9.050 229,9	11.50 292,1	- -
10 250	11.100 281,9	13.00 330,2	- -
12 300	13.200 335,3	14.00 355,6	- -
14 350	15.300 388,6	17.00 431,8	19.00 482,6
16 400	17.400 442,0	17.75 450,9	19.75 501,7
18 450	19.500 495,3	21.50 546,1	23.50 596,9



Helpful Information

English and Metric Conversion Chart

Commercial AWWA Pipe Sizes & Wall Thicknesses (ANSI/AWWA C-150)

Approximate Weights of Commercial AWWA Pipe (ANSI/AWWA C-150)

Decimal Equivalents of Fractions

Minutes Converted to Decimals of a Degree

Water Pressure to Feet-of-Head

Feet-of-Head of Water to Pressure

ENGLISH AND METRIC CONVERSION CHART

Convert US to Metric				Convert Metric to US		
25.4	X	inches (in)	=	millimeters (mm)	X	0.03937
0.3048	X	feet (ft)	=	meters (m)	X	3.281
0.4536	X	pounds (lbs)	=	kilograms (kg)	X	2.205
28.35	X	ounces (oz)	=	grams (g)	X	0.03527
6.894	X	pressure (psi)	=	kilopascals (kPa)	X	0.145
.069	X	pressure	=	Bar	X	14.5
4.45	X	end load (lbs)	=	Newtons (N)	X	0.2248
1.356	X	torque (ft-lbs)	=	Newton meters (N•m)	X	0.738
F – 32 ÷ 1.8		temperature (°F)	=	Celsius (°C)		C ÷ 17.78 X 1.8
745.7	X	horsepower (hp)	=	watts (W)	X	1.341×10^{-3}
3.785	X	gallons per minute (gpm)	=	liters per minute (l/m)	X	0.2642
3.7865	X	10^{-3} gallons per minute (gpm)	=	cubic meters per minute (m^3/m)	X	264.2

COMMERCIAL AWWA PIPE SIZES AND WALL THICKNESSES (ANSI/AWWA C-150)

Pipe Size		Thickness Class inches (millimeters)						
Nominal Diameter inches (mm)	Actual Outside Diameter inches (mm)	50	51	52	53	54	55	56
3 (80)	3.96 (100,6)	- -	0.25 (6,4)	0.28 (7,1)	0.31 (7,9)	0.34 (8,6)	0.37 (9,4)	0.40 (10,2)
4 (100)	4.80 (121,9)	- -	0.26 (6,6)	0.29 (7,4)	0.32 (8,1)	0.35 (8,9)	0.38 (9,7)	0.41 (10,4)
6 (150)	6.90 (175,3)	0.25 (6,4)	0.28 (7,1)	0.31 (7,9)	0.34 (8,6)	0.37 (9,4)	0.40 (10,2)	0.43 (10,9)
8 (200)	9.05 (229,9)	0.27 (6,9)	0.30 (7,6)	0.33 (8,4)	0.36 (9,1)	0.39 (9,9)	0.42 (10,7)	0.45 (11,4)
10 (250)	11.10 (281,9)	0.29 (7,4)	0.32 (8,1)	0.35 (8,9)	0.38 (9,7)	0.41 (10,4)	0.44 (11,2)	0.47 (11,9)
12 (300)	13.20 (335,3)	0.31 (7,9)	0.34 (8,6)	0.37 (9,4)	0.40 (10,2)	0.43 (10,9)	0.46 (11,7)	0.49 (12,4)
14 (350)	15.30 (388,6)	0.33 (8,4)	0.36 (9,1)	0.39 (9,9)	0.42 (10,7)	0.45 (11,4)	0.48 (12,2)	0.51 (13,0)
16 (400)	17.40 (442,0)	0.34 (8,6)	0.37 (9,4)	0.40 (10,2)	0.43 (10,9)	0.46 (11,7)	0.49 (12,4)	0.52 (13,2)
18 (450)	19.50 (495,3)	0.35 (8,9)	0.38 (9,7)	0.41 (10,4)	0.44 (11,2)	0.47 (11,9)	0.50 (12,7)	0.53 (13,5)
20 (500)	21.60 (548,6)	0.36 (9,1)	0.39 (9,9)	0.42 (10,7)	0.45 (11,4)	0.48 (12,2)	0.51 (13,0)	0.54 (13,7)
24 (600)	25.80 (655,3)	0.38 (9,7)	0.41 (10,4)	0.44 (11,2)	0.47 (11,9)	0.50 (12,7)	0.53 (13,5)	0.56 (14,2)
30 (750)	32.00 (762,0)	0.39 (9,9)	0.43 (10,9)	0.47 (11,9)	0.51 (13,0)	0.55 (14,0)	0.59 (15,0)	0.63 (16,0)
36 (900)	38.30 (914,4)	0.43 (10,9)	0.48 (12,2)	0.53 (13,5)	0.58 (14,7)	0.63 (16,0)	0.68 (17,3)	0.73 (18,5)
42* (1000)	44.50 (1130,3)	0.47 (11,9)	0.53 (13,5)	0.59 (15,0)	0.65 (16,5)	0.71 (18,0)	0.77 (19,6)	0.83 (21,1)
48* (1200)	50.80 (1290,3)	0.51 (13,0)	0.58 (14,7)	0.65 (16,5)	0.72 (18,3)	0.79 (20,1)	0.86 (21,8)	0.93 (23,6)
54* (1350)	57.56 (1462,0)	0.57 (14,5)	0.65 (16,5)	0.73 (18,5)	0.81 (20,6)	0.89 (22,6)	0.97 (24,6)	1.05 (26,7)

Shaded areas denote thickness classes that are too thin to be grooved.

* Pipe in sizes 42 inches (1000 mm) and larger cannot be directly grooved for use with Victaulic couplings. These dimensions are for information only.

APPROXIMATE WEIGHTS OF COMMERCIAL AWWA PIPE (ANSI/AWWA C-150)

Pipe Size		Weight of Pipe Per Foot Pounds/kg				Weight of Pipe Per Foot with Standard Thickness Cement Lining* pounds/kg			
Nominal Dia. inches (mm)	Actual Outside Dia. inches (mm)	CL. 53	CL. 54	CL. 55	CL. 56	CL. 53	CL. 54	CL. 55	CL. 56
3 (11,9)	3.960 (100,6)	10.9 (4,9)	11.8 (5,4)	12.8 (5,8)	13.7 (6,2)	11.5 (5,2)	12.4 (5,6)	13.4 (6,1)	14.3 (6,5)
4 (100)	4.800 (121,9)	13.8 (6,3)	15.0 (6,8)	16.1 (7,3)	17.3 (7,8)	14.7 (6,7)	15.9 (7,2)	17.0 (7,7)	18.2 (8,3)
6 (150)	6.900 (175,3)	21.4 (9,7)	23.2 (10,5)	25.0 (11,3)	26.7 (12,1)	23.6 (10,7)	24.5 (11,1)	26.3 (11,9)	28.0 (12,7)
8 (200)	9.050 (229,9)	30.1 (13,7)	32.5 (14,7)	34.8 (15,8)	37.2 (16,9)	33.1 (15,0)	34.2 (15,5)	36.5 (16,6)	38.9 (17,6)
10 (250)	11.100 (281,9)	39.2 (17,8)	42.1 (19,1)	45.1 (20,5)	48.0 (21,8)	41.4 (18,8)	44.3 (20,1)	47.3 (21,5)	50.2 (22,8)
12 (300)	13.200 (335,3)	49.2 (22,3)	52.8 (24,0)	56.3 (25,5)	59.9 (27,2)	51.8 (23,5)	55.4 (25,1)	58.9 (26,7)	62.5 (28,4)
14 (350)	15.300 (388,6)	60.1 (27,3)	64.2 (29,1)	68.4 (31,0)	72.5 (32,9)	64.6 (29,3)	68.7 (31,2)	72.9 (33,1)	77.0 (34,9)
16 (400)	17.400 (442,0)	70.1 (31,8)	74.9 (34,0)	79.7 (36,2)	84.4 (38,3)	75.2 (34,1)	80.0 (26,3)	84.8 (38,5)	89.5 (40,6)
18 (450)	19.500 (495,3)	80.8 (36,7)	86.0 (39,0)	91.3 (41,4)	96.7 (43,9)	86.6 (39,3)	91.8 (41,6)	97.1 (44,0)	102.5 (46,5)
20 (500)	21.600 (548,6)	91.5 (41,5)	97.5 (44,2)	103.4 (46,9)	109.3 (49,6)	97.9 (44,4)	103.9 (47,1)	109.8 (49,8)	115.7 (52,5)
24 (600)	25.800 (655,3)	114.4 (51,9)	121.6 (55,2)	128.8 (58,4)	135.9 (61,6)	122.1 (55,4)	129.3 (58,7)	136.5 (61,9)	143.6 (65,1)
30 (750)	32.000 (762,0)	154.4 (70,0)	166.3 (75,4)	178.2 (80,8)	190.0 (86,2)	167.2 (75,8)	179.1 (81,2)	191.0 (86,6)	202.8 (92,0)
36 (900)	38.300 (914,4)	210.3 (95,4)	228.1 (103,5)	245.9 (111,5)	263.7 (119,6)	225.6 (102,3)	243.4 (110,4)	261.2 (118,5)	279.0 (126,6)

* Standard cement lining thickness, per ANSI/AWWA C-104

DECIMAL EQUIVALENTS OF FRACTIONS

Fraction in Inches	Decimal Equivalent inches	Decimal Equivalent millimeters
1/64	0.016	0,397
1/32	0.031	0,794
3/64	0.047	1,191
1/16	0.063	1,588
5/64	0.781	1,984
3/32	0.094	2,381
7/64	0.109	2,778
1/8	0.125	3,175
9/64	0.141	3,572
5/32	0.156	3,969
11/64	0.172	4,366
3/16	0.188	4,763
13/64	0.203	5,159
7/32	0.219	5,556
15/64	0.234	5,953
1/4	0.250	6,350
17/64	0.266	6,747
9/32	0.281	7,144
19/64	0.297	7,541
5/16	0.313	7,938
21/64	0.328	8,334
1/3	0.333	8,467
11/32	0.344	8,731
23/64	0.359	9,128
3/8	0.375	9,525
25/64	0.391	9,922
13/32	0.406	10,319
27/64	0.422	10,716
7/16	0.438	11,113
29/64	0.453	11,509
15/32	0.469	11,906
1/2	0.500	12,700

Fraction in Inches	Decimal Equivalent inches	Decimal Equivalent millimeters
33/64	0.516	13,097
17/32	0.531	13,494
35/64	0.547	13,891
9/16	0.563	14,288
37/64	0.578	14,684
19/32	0.594	15,081
39/64	0.609	15,478
5/8	0.625	15,875
41/64	0.641	16,272
21/32	0.656	16,669
43/64	0.672	17,066
11/16	0.688	17,463
45/64	0.703	17,859
23/32	0.719	18,256
47/64	0.734	18,653
3/4	0.750	19,050
49/64	0.766	19,447
25/32	0.781	19,844
51/64	0.797	20,241
13/16	0.813	20,638
53/64	0.828	21,034
27/32	0.844	21,431
55/64	0.859	21,828
7/8	0.875	22,225
57/64	0.891	22,622
29/32	0.906	23,019
59/64	0.922	23,416
15/16	0.938	23,813
61/64	0.953	24,209
31/32	0.969	24,606
63/64	0.984	25,003
1	1.000	25,400

MINUTES CONVERTED TO DECIMALS OF A DEGREE

Min.	Deg.
1	.0166
2	.0333
3	.0500
4	.0666
5	.0833
6	.1000
7	.1166
8	.1333
9	.1500
10	.1666
11	.1833
12	.2000
13	.2166
14	.2333
15	.2500
16	.2666
17	.2833
18	.3000
19	.3166
20	.3333

Min.	Deg.
21	.3500
22	.3666
23	.3833
24	.4000
25	.4166
26	.4333
27	.4500
28	.4666
29	.4833
30	.5000
31	.5166
32	.5333
33	.5500
34	.5666
35	.5833
36	.6000
37	.6166
38	.6333
39	.6500
40	.6666

Min.	Deg.
41	.6833
42	.7000
43	.7166
44	.7333
45	.7500
46	.7666
47	.7833
48	.8000
49	.8166
50	.8333
51	.8500
52	.8666
53	.8833
54	.9000
55	.9166
56	.9333
57	.9500
58	.9666
59	.9833
60	1.0000

WATER PRESSURE TO FEET-OF-HEAD

Pounds Per Square Inch	Feet of Head
1	2.31
2	4.62
3	6.93
4	9.24
5	11.54
6	13.85
7	16.16
8	18.47
9	20.78
10	23.09
15	34.63
20	46.18
25	57.72
30	69.27
40	92.36
50	115.45
60	138.54
70	161.63
80	184.72
90	207.81

Pounds Per Square Inch	Feet of Head
100	230.90
110	253.93
120	277.07
130	300.16
140	323.25
150	346.34
160	369.43
170	392.52
180	415.61
200	461.78
250	577.24
300	692.69
350	808.13
400	922.58
500	1154.48
600	1385.39
700	1616.30
800	1847.20
900	2078.10
1000	2309.00

FEET-OF-HEAD OF WATER TO PRESSURE

Feet of Head	Pounds Per Square Inch
1	0.43
2	0.87
3	1.30
4	1.73
5	2.17
6	2.60
7	3.03
8	3.46
9	3.90
10	4.33
15	6.50
20	8.66
25	10.83
30	12.99
40	17.32
50	21.65
60	25.99
70	30.32
80	34.65
90	38.98

Feet of Head	Pounds Per Square Inch
100	43.31
110	47.64
120	51.97
130	56.30
140	60.63
150	64.96
160	69.29
170	73.63
180	77.96
200	86.62
250	108.27
300	129.93
350	151.58
400	173.24
500	216.55
600	259.85
700	303.16
800	346.47
900	389.78
1000	433.00

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I-300 3699 Rev. A 3/04 Z000300PHB