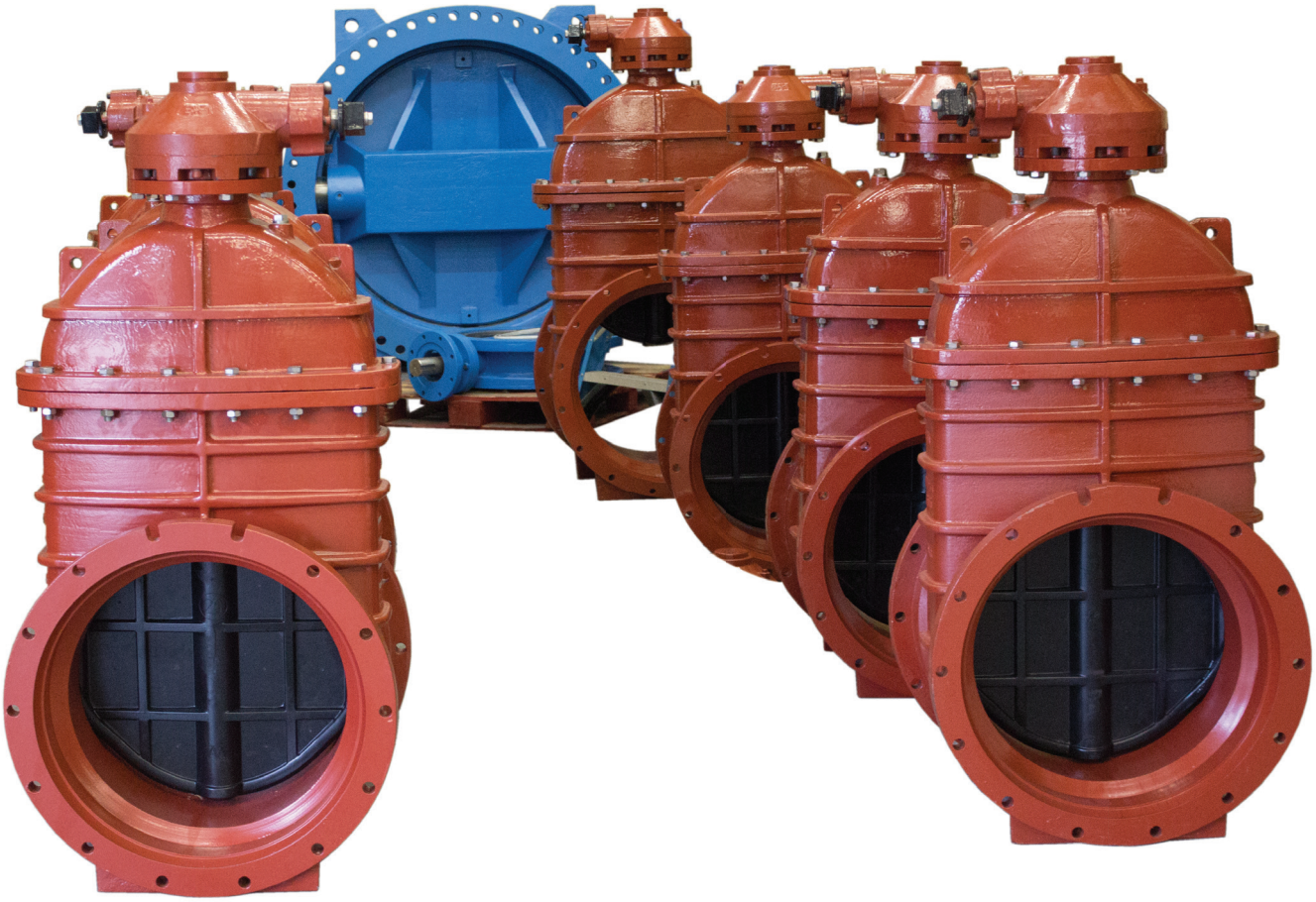
VSI Waterworks

2″ - 48″ AWWA C509 & C515 RESILIENT SEATED GATE VALVES

INSTALLATION, OPERATION AND MAINTENANCE MANUAL



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SCOPE:

This installation, operation, and maintenance manual covers VSI AWWA C509 and C515 resilient seated gate valves and should be read and understood thoroughly by all parties responsible for installation and continued use/maintenance.

WARNINGS:

The critical safety messages within this manual are labeled with an exclamation symbol within a red triangle flag. Care should be taken to thoroughly read and understand these warnings before proceeding to ensure no damage to equipment occurs. Failure to follow all warnings could result in injury or death.

WARNING!

All parties that take part in any installation or continued use/maintenance are cautioned to be vigilant in the possible exposure to media that is contained within the valve and its pipeline. Because of the vast range of media that could be within the valve, protection from pipeline media is not within the scope of this manual. All personnel should be aware of the media within the valve and take appropriate precautions when exposure is possible while installing or servicing the valve.

RECEIVING:

VSI AWWA C509 and C515 resilient seated gate valves are rugged and will be packaged to provide protection during most shipping incidents, however care should be taken to inspect the valve on receipt for any possible shipping damage. Inspection should be performed as soon as practical. Failure to promptly notify VSI of any shipping damage may invalidate any claim for shipping damage. Most shipments from VSI will be made FOB Origin, unless noted on the sales documents, the purchaser will own the freight while in transit, assumes all risk while in transit, and will be responsible for reporting shipping damage promptly to the carrier.

PARTS:

Order parts from your Valve Solutions Inc. sales representative. Please include the serial number, located on the valve tag, when ordering parts.

WARNING!

Read all applicable instructions and directions prior to any maintenance, installation or troubleshooting.

SECTION 1 - GENERAL

Resilient-seated gate valves form a significant component part of many firefighting or water-distribution systems. Failure of a resilient-seated gate valve in such systems, either caused by faulty installation or improper maintenance, could result in extensive damage and costly repairs. In addition, many resilient-seated gate valves are installed in buried-service or underground applications. Problems with or malfunctions of the valves caused by faulty installation or improper maintenance can result in extensive and costly unearthing operations to effectively correct or eliminate the problem. Many resilient-seated gate-valve problems and failures can be traced back to improper handling, storage, installation, operation, or maintenance procedures.

SECTION 2 - UNLOADING

All valves should be unloaded carefully; a soft sling around the body is recommended to prevent damage to the valve and its protective coating. Each valve should be carefully lowered from the truck to the ground; it should not be dropped. Valves should not be lifted or unloaded using chains, slings, or forklift fork(s) engaging the valve actuator or handwheel, or passing through the valve waterway. In the case of larger valves, forklifts or slings around the body of the valve or under the skids should be used for unloading. Only hoists and slings with adequate load capacity to handle the weight of the valve or valves should be used. Hoists should not be hooked into or chains fastened around yokes, gearing, motors, cylinders, or handwheels. Failure to carefully follow these recommendations is likely to result in damage to the valve.

SECTION 3 - INSPECTION PRIOR TO INSTALLATION

Resilient-seated gate valves should be inspected at the time of receipt for damage in shipment. The initial inspection should verify compliance with specifications, direction of opening, size and shape of operating nut, number of turns to open or close, and type of end connections. A visual inspection of the seating surfaces should be performed to detect any damage in shipment or scoring of the seating surfaces. Inspection personnel should look for bent stems, broken handwheels, cracked parts, loose bolts, missing parts and accessories, and any other evidence of mishandling during shipment. Each valve should be operated through one complete opening-and-closing cycle in the position in which it is to be installed.

SECTION 4 - STORAGE

Whenever practical, valves should be stored indoors. If outside storage is required, valves should be protected from the weather, sunlight, ozone, and foreign materials. In colder climates where valves may be subject to freezing temperatures, it is absolutely essential to prevent water from collecting in the valves. Failure to do so may result in a cracked valve casting or deterioration of the resilient seat material.

SECTION 5 - INSTALLATION

Instructions supplied by manufacturers should be reviewed in detail before valves are installed. At the jobsite prior to installation, each valve should be visually inspected and any foreign material in the interior portion of the valve should be removed. A detailed inspection of the valve as outlined in Sec. 3 should be performed prior to installation.

Sec. 5.1 Bolts

All bolts should be checked for proper tightness and protected by the installer to prevent corrosion, either with a suitable paint, by polyethylene wrapping, or other suitable means of corrosion protection.

Sec. 5.2 Underground Installation

All buried valves should be fully tested before backfilling. In no instance will VSI be held responsible for the excavation costs of valves that were not line-tested before backfilling. Valves in water-distribution lines shall, where practical, be located in easily accessible areas.

5.2.1 During installation, there is the possibility of foreign materials inadvertently entering the valve. Foreign material can damage internal working parts during operation of the gate valve. For this reason, gate valves should be installed in the closed position. Each valve should be placed on firm footing in the trench to prevent settling and excessive strain on the connection to the pipe. Piping systems should be supported and aligned to avoid damage to the valve.

5.2.2 A valve box or vault should be provided for each valve used in a buried service application. The valve box should be installed so as not to transmit shock loads or stress to the valve. The valve box should be centered over the operating nut of the valve with the box cover flush with the surface of the finished area or such other level as directed by the owner. Valve boxes should be designed so that a traffic load on the top of the box is not transmitted to the valve.

5.2.3 Valves buried in unusually deep trenches should have special provisions for operating the valve. Either a riser on the stem to permit use of a normal key or a notation on valve records that a long key will be required.

5.2.4 When valves with exposed gearing or operating mechanisms are installed belowground, a vault designed to allow pipe clearance and prevent settling on the pipe should be provided. The operating nut should be accessible from the top opening of the vault with a valve key. The size of the vault should provide for easy removal of the valve bonnet and internal parts of the valve for purposes of repair. Consideration should be given to the possible entry of groundwater or surface water and to the need to provide for the disposal thereof.

Sec. 5.3 Aboveground Installations

Valves installed aboveground or in a plant piping system should be supported and aligned to avoid damage to the valves. Valves should not be used to correct the misalignment of piping.

Sec. 5.4 Inspection

After installation and before pressurization of the valve, all pressure-containing bolting (bonnet, seal plate, packing gland, and end connections) should be inspected for adequate tightness to prevent leakage. In addition, an inspection should be made for adequate tightness of all tapped and plugged openings to the valve interior. Proper inspection at this time will minimize the possibility of leaks after pressurization of the piping system.

Sec. 5.5 Hydrostatic testing

To prevent time lost searching for leaks, it is required that valve excavations not be backfilled until after pressure tests have been made. After installation, it is desirable to hydrostatically test newly installed piping sections, including valves, at some pressure above the system design pressure. The test pressure should not exceed the rated working pressure of the valve. After the test, steps should be taken to relieve any trapped pressure in the body of the valve. The resilient-seated gate valve should not be operated in either the opening or closing direction at differential pressures above the rated working pressure. It should be noted that valves seat better at or near the rated working pressure of the valve. It is also recognized that wear or foreign material may damage valve seating surfaces and may cause leakage (Ref. AWWA C600).

Sec. 5.6 Records

Upon completion of the installation, valve location, size, make, type, date of installation, number of turns to

open, direction of opening, and other information deemed pertinent should be entered on permanent records.

Sec. 5.7 Application Hazards

Resilient-seated gate valves should not be installed in applications or for service other than those recommended by the manufacturer. The following subsections for precautions are not all inclusive but will help avoid some application hazards.

1. Resilient-seated gate valves should not be installed in lines where service pressure will exceed the rated working pressure of the valve.
2. Resilient-seated gate valves should not be used for throttling service unless the design is specifically recommended for that purpose or approved in advance by the manufacturer.
3. Resilient-seated gate valves should not be used in applications that are exposed to freezing temperatures.
4. Pipe, fittings, and valves installed in underground pipelines are generally joined with push-on or mechanical joints. These joints are considered unrestrained-type joints because no significant restraint against longitudinal separation is provided.
5. Gate valves should not be installed at a dead end or near a bend in a pipeline without proper and adequate restraint to support the valve and prevent it from blowing off the end of the line. Rigid piping systems incorporating flanged valves are not recommended for buried service.
6. Thrust blocks, restrained joints, or other means of restraint are needed on or adjacent to valves on pipelines or where unusual conditions exist, such as high internal pressures, adjacent fittings, or unstable soils.
7. To prevent damage, 3in. (75mm) and 4in. (100mm) NPS resilientseated gate valves should not be operated with input torques greater than 200 ft-lb (270 Nm). Gate valves 6in. (150mm) NPS to 12in. (300mm) NPS should not be operated with input torques greater than 300 ft-lb (406 Nm). For sizes larger than 12 in., consult your sales represenative.
8. For tapping applications, tapping valves are recommended.

Sec. 5.8 Valve Start Up

1. Start up procedures should be carried out only by qualified personnel.
2. Ensure that valve is installed in its correct position.
3. Use operator or actuator to fully open valve.
4. If possible do a pressure test on the system using compressed air to locate any leaks.
5. If compressed air testing is not practical, subject the system to nominal line pressure and do a thorough inspection for leaks including the flange area of the valve and the stem seal. It may be necessary to remove the operator depending on type.
6. Exercise the valve to fully closed and back to fully open several times.
7. Inspect the stem seal area for leaks.
8. Remove temporary valve tags and note start up date on applicable documents.

SECTION 6: INSPECTION AND MAINTENANCE

Sec. 6.1 Valve Exercising

Each valve should be operated through a full cycle and returned to its normal position on a time schedule designed to prevent a buildup of tuberculation or other deposits that could render the valve inoperable or prevent a tight shutoff. The interval of time between operations of valves in critical locations, or valves subjected to severe operating conditions, should be shorter than that for less important installations, but can be whatever time period is found to be satisfactory based on local experience. The number of turns required to complete the operation cycle should be recorded and compared with permanent installation records to verify full gate travel. When using portable auxiliary power actuators with input torque capacities exceeding the maximum operating torques recommended in Sec. 5.7.7, extreme care should be taken to avoid the application of excessive torque to the valve stem. If the actuator has a torque-limiting device, it should be set below the values in Sec. 5.7.7. If there is no torque-limiting device, the recommended practice is to stop the power actuator three or four turns before the valve is fully opened or fully closed and complete the operation manually. Maintenance should be performed at the time a malfunction is discovered. A recording system should be adopted that provides a written record of valve location, condition, maintenance, and each subsequent inspection of the valve.

Sec. 6.2 Inspection

Each valve should be operated through one complete operating cycle. If the stem action is tight, the operation should be repeated several times until proper operation is achieved. With the gate in the partially open position, a visual inspection should be performed, where practical, to check for leakage at all joints, connections, and areas of packing or seals. If leakage is observed, all defective O-rings, seals, gaskets, or end connection sealing members should be replaced. If the leakage cannot be corrected immediately, the nature of the leakage should be reported promptly to those who are responsible for repairs. If the valve is inoperable or irreparable, its location should be clearly established to save time for repair crews. The condition of the valve and, if possible, the gate position, should be reported to personnel responsible for repairs. In addition, fire departments and other appropriate municipal departments should be informed that the valve is out of service.

Sec. 6.3 Record Keeping

To carry out a meaningful inspection and maintenance program, it is essential that the location, make, type, size, and date of installation of each valve be recorded. Depending on the type of record-keeping system used, other information may be entered in the permanent record. When a resilient-seated gate valve is inspected, an entry should be made in the permanent record indicating the date of inspection and condition of the valve. If repair work is necessary, it should be indicated, and on completion of the work, the nature of the repairs and date completed should be recorded.

SECTION 7: OPERATION

Resilient seated gate valves need less torque to seat than traditional double disc gate valves. This should be considered when manually closing valves or setting stops on actuators. To operate a gate valve turn the stem operator nut in the direction desired. Open and close directions will be marked on the valve and may be different in different locations. If a valve with manual operator is stuck or takes excessive force to exercise trouble-shooting is necessary. If the valve has a power acuator and is experiencing malfunctions the actuator should be inspected as well.

SECTION 8: TROUBLESHOOTING

Problem	Cause	Correction
The operator or stem will not turn	Interference between valve box and shaft key	Reposition valve box if necessary
	Uneven tightening of bonnet or seal plate bolts	Loosen then retighten bolts and nuts evenly
	Corrosion or debris between the stem and stuffing or stem nut	Follow instructions for disassembly and clean stem, stuffing, and stem nut
	Debris under disc or in bonnet	Follow instructions for disassembly and clean out debris
Leakage between the body and bonnet of valve	Bolts and nuts may be loose or tightened irregularly	Loosen then retighten bolts and nuts evenly
	Bonnet o-ring may be damaged	Follow instructions for disassembly and replace o-ring
	RARE: Crack in body or bonnet	Inspect and replace if necessary
Leakage between the bonnet and stuffing plate	Bolts and nuts may be loose or tightened irregularly	Loosen then retighten bolts and nuts evenly
	Stuffing plate o-ring may be damaged	Follow instructions for disassembly and replace o-ring
Leakage at the stem	Damaged stuffing	Follow instructions for disassembly and replace damaged parts
	Damaged o-rings	
	RARE: Warped stem	Follow instructions for disassembly and check straightness of stem
Valve fails pressure test	Valve is not completely closed	Close valve completely
	Debris trapped under gate	Throttle valve from fully closed to approximately 25% open several times under line flow to clear debris. If unsuccessful follow instructions for disassembly and remove debris
	Disc coating or seat is damaged	Follow disassembly instructions and inspect for damage. If present replace damaged parts.

SECTION 9: REPAIRS

Leakage, broken parts, hard operation, and other major defects should be corrected by a repair crew as soon as possible after the defect has been reported. If repairs are to be performed in the field, the repair crews should take a full complement of spare parts to the jobsite. Provisions should be made to isolate the defective valve from water pressure and relieve internal trapped pressure prior to performing any corrective maintenance. Disassembly of the valve should be performed in accordance with the procedure supplied by the manufacturer. After repair of the valve, the operating mechanism should be cycled through one complete operating cycle. With full line pressure applied to the valve in the open position, an inspection should be made to detect leakage in the areas around the seal plate, bonnet, packing gland, and body-end connections. A record should be made to indicate that the valve has been repaired and is in working condition. Any markings indicating that the valve is inoperable should be removed. In addition, fire departments and other appropriate municipal departments should be informed of the satisfactory repair of the valve.

SECTION 10: DISASSEMBLY AND REASSEMBLY

ATTENTION: DO NOT WORK ON ANY VALVE UNDER PRESSURE

[Please Refer to Drawing on Page 10]

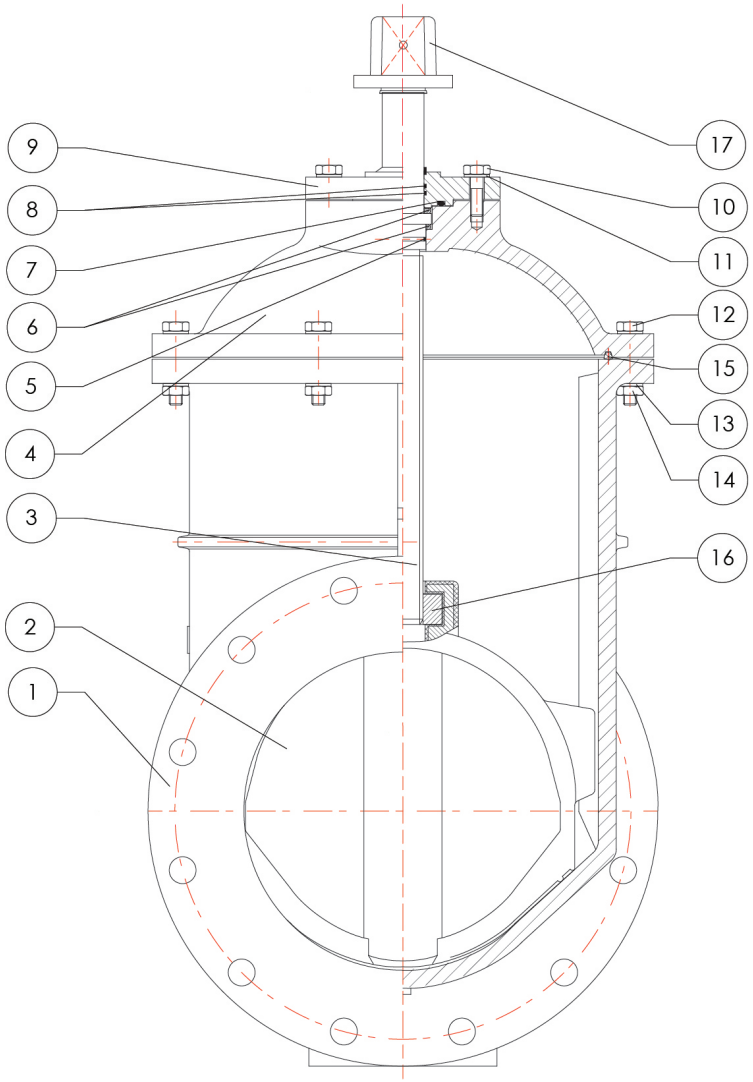
Sec. 10.1 Stem Seal and O-Ring Disassembly and Reassembly

1. Shut off line flow then close valve fully.
2. Remove actuator or operator.
3. Remove bonnet cover(9) bolts(10) and washers(11).
4. Use a wrench to turn the operator nut(17) in the closing direction until the stem(3) is free from the stem nut(16) located in the gate(2). Lift the stem and bonnet cover assembly from its seat in the bonnet.
5. Remove the operator nut from the stem then slide the bonnet cover from the stem.
6. Inspect and replace any o-rings(5,7,and 8) that are damaged. The friction bearings(6) should be inspected for wear and replaced when damage is visible. All materials used for replacement parts should be carefully matched with original shop drawings for each valve.
7. Clean all seating and mating surfaces before beginning reassembly.
8. After the o-rings and friction bearings have been inspected or replaced slide the bonnet cover back onto the stem.
9. Reinstall the operator nut onto the stem then guide the lower end of the stem into the lower stem nut.
10. Tighten the stem using the operator nut in the opening direction of valve, taking care not to cross thread the assembly.
11. When the bonnet cover is tight against the bonnet(4) reinstall the bolts and washers. Torque bolts according to Bolt Torque Chart.

10. Lower the assembly into the valve body taking care not the damage the seating surface or gate coating.
11. Turn the operator nut in the closing direction until the valve is full closed.
12. Reinstall the bolts, washers, and nuts. Torque bolts according to Bolt Torque Chart.

Sec. 10.2 Gate Disassembly and Reassembly

1. Shut off line flow then open valve fully.
2. Remove actuator or operator.
3. Remove bonnet(4) bolts(12), nuts(14), and washers(13).
4. Lift the bonnet, stem(3), and gate(2) assembly from the body(1) of the valve.
5. Inspect the gate and gate seal on the body for damage.
6. If it is necessary to remove the gate turn the operator nut(17) in the closing direction until the stem is free of the stem nut(16)
7. Inspect and replace the bonnet o-ring(15) for wear or damage and replaced if necessary. All materials used for replacement parts should be carefully matched with original shop drawings for each valve.
8. Clean all seating and mating surfaces before beginning reassembly.
9. If the gate was removed from the stem guide the stem back into the lower stem nut and tighten in the valve opening direction until the valve is tight against the bonnet.



Bolt Torque Chart

Bolt Size	Torque(ft-lbs)
<=1/2”	45
5/8”	90
3/4”	150
1”	200