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## Installation, Operation and Maintenance of AWWA C509 & C515 Resilient-Seated Gate Valves

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### **1. GENERAL**

Resilient-seated gate valves forms a significant component of many fire-fighting water-distribution systems. Failure of a resilient-seated gate valve in such systems, either due to 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 mal-functions of the valves due to faulty installation or improper maintenance can result in extensive and costly unearthing operation to effectively correct or eliminate the problem. Many resilient-seated gate-valve problems and failures can be traced back to improper installation, operation, or maintenance procedures.

### **2. UNLOADING**

All valves should be unloaded carefully. Each valve should be carefully lowered from the truck to the ground; it should not be dropped. 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.

### **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 be 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.

### **4. STORAGE**

Valves should be stored in fully closed position to prevent the entry of foreign material that could cause damage to the seating surface. Whenever practical, valves should be stored indoors. If outside storage is required, means should be provided to protect the operating mechanism from weather elements. During outside storage, 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 remove the water from the valve interior and close the valve before storage. Failure to do so may result in a cracked valve casting and or deterioration of the resilient seat material.

### **5. INSTALLATION**

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 detail inspection of the valve as outlined in Sec. 3 should be performed prior to installation.

**5.1 Bolts all** bolts should be checked for proper tightness and protected by the installer to prevent corrosion, either with a suitable paint or by polyethylene wrapping.

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**5.2 Underground Installation** 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. Pipe 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 of such design that a traffic load on the top of 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 the 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 remove of the valve bonnet and internal parts of the valve for purpose of repair. Consideration should be given to the possible entry of groundwater and /or surface water and to the need to provide for the disposal of such water.

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

**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 to the valve interior. Proper inspection at this time will minimize the possibility of leaks after pressurization of the piping system.

**5.5 Testing** In order to prevent time lost searching for leaks, it is recommended that the Valve excavations not be backfilled until after pressure test have been made. After installation, it is desirable to 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 tapped pressure in the body of the valve. The resilient-seated gate valve should not be operated in either the opening or closing direction at different pressures above the rated working pressure. It is also recognized that wear or foreign material may damage valve seating surfaces and may cause leakage.

**5.6 Records On** 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.

**5.7 Application Hazards Resilient**-seated gate valves should not be installed in applications Or for service other than those recommended by the manufacturer.

5.7.1 Resilient-seated gate valves should not be installed in lines where service pressure will exceed the rated working pressure of the valve.

5.7.2 Resilient-seated gate valve should not be used for throttling service unless the design is specifically recommended for that purpose of approved in advance by the manufacture.

5.7.3 Resilient-seated gate valves should not be used in applications that are exposed to freezing temperature unless sufficient flow is maintained through the valve or other protection is provided to prevent freezing.

5.7.4 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.

5.7.5 To prevent damage, 4" and below size NPS resilient-seated gate valves should not be operated with input torques greater than 200 ft-lb (270N.m). Gate valves 6" to 12" NPS should not be operated with input torques greater than 300ft-lb (406N.m).

## **6. INSPECTION AND MAINTENANCE**

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 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 ensure full gate travel.

When using portable auxiliary power actuators with input torque capacities exceeding the maximum operating torques recommended in Sec. 5.7.5, 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. 5.7.5. 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 then complete the operation manually.

Maintenance should be performed at the time a malfunction is discovered to avoid a return trip to the same valve and to prevent forgetting about it altogether. Recording system should be adopted that provides a written record of valve location, condition, maintenance, and each subsequent inspection of the valve.

**6.1 Inspection Each** valve should be operated through one complete operating cycle. If the stem action is tight as a result of "hard-water" buildup on the stem threads, the operation should be repeated several times until the opening and closing actions are smooth and free. 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 leakage can not be corrected immediately, the nature of the leakage should be report 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.

**6.2 Record Keeping** In order 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. On completion of the work, the nature of the repairs and date completed should be recorded.

## **7. 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 accomplished in accordance with the procedure supplied by the manufacturer. After repairing 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.

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