Instructions for Installation, Operation & Maintenance:

Resilient seated Gate Valves

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Section 1: Background

R&D Multiples was established in early 1980's and we were one of the pioneering manufacturers to develop gate valves in India. A gate valve, also known as a sluice valve, opens by lifting the barrier out of the path of the fluid. Gate valves require more space in comparison to butterfly valves, however, once fully opened, it does not restrict the flow of the fluid.

Our gate valves have been very commonly used in various applications in multiples countries around the world. We are one of the few manufacturers in the world to have >100,000 installations of these types of gate valves. This product type needs to be installed, operated & maintained by qualified & trained technicians as per the instructions & precautions given in this manual, using proper tools & tackles. Unauthorised / unskilled persons should not be allowed near the equipment unless under proper supervision. Alterations to the product or any of its components are also not permitted. In case if the same are not followed, we reserve the right to decline warranty responsibilities.

Disclaimer: R&D Multiples reserves the right to change this manual without prior notice, please refer to our website www.rdmultiples.com for the latest version.

Section 2: Introduction

We welcome you to a family of quality conscious & discerning customers of R&D Multiples' products. We thank you for the trust in our company & products & we assure you that we will spare no effort in establishing a rewarding long-term mutual relationship. Resilient seated gate valves are increasingly being used in waterworks applications due to its long life & low maintenance costs. Each of these valves is coated with a fusion bonded epoxy process and a minimum paint thickness of 250 microns is assured from the factory. In this case, the wedge takes seat directly on the painted inner surface of the valve body casting. Hence the seating forces such as shear & tension are imposed on the paint in the seat contact areas. The weaker paint as in case of the ordinary paint process is prone to fail much earlier, resulting in damage to the rubber seating surface on the wedge & rendering the valve leaky. Therefore, FBE coating in the case of this type of valves is an absolute must.

This manual covers the gate valves of following types with design standards of IS 14846, BS 5163, AWWA C509, AWWA C515:

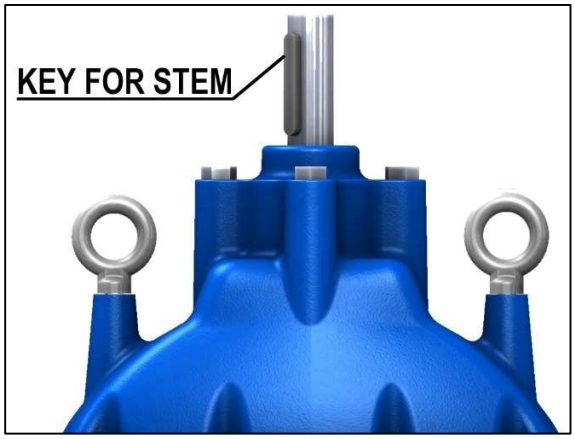
- Rising spindle resilient seated gate valves
- Non-rising spindle resilient seated gate valves

NON RISING RISING

Section 3: Site activities prior to installation

Inspection after material receipt:

- Transit damages: Inspect the valve visually for any transit damages on receipt at the site. Please check the flange surfaces, rubber gaskets, actuator, gearbox components etc. If you observe any such damages, please get a report signed by the transporter
- Completeness: Please check the receipt of the components / sub-assemblies as per the packing list. If you find any shortages, please record the same & get a report signed by the transporter
- The hand-wheel for the gear-box / actuator is packed separately & the keys are fixed on the shaft by tape. Check the bolting attaching to the actuator / gearbox to the valve for loosening in transit, and if loose, tighten firmly



- In case of companion flanges supplied with the valve, please check the correctness & quantity of the fasteners & gaskets as well
- Use the general arrangement drawing to check the overall dimensions of the valve: F-F dimension, flange dimensions, overall width, use the drawing to also identify the various components of the valve which are visually accessible. You may also cross-check basic data like valve size, pressure rating etc with the as-cast markings (typically like the following)

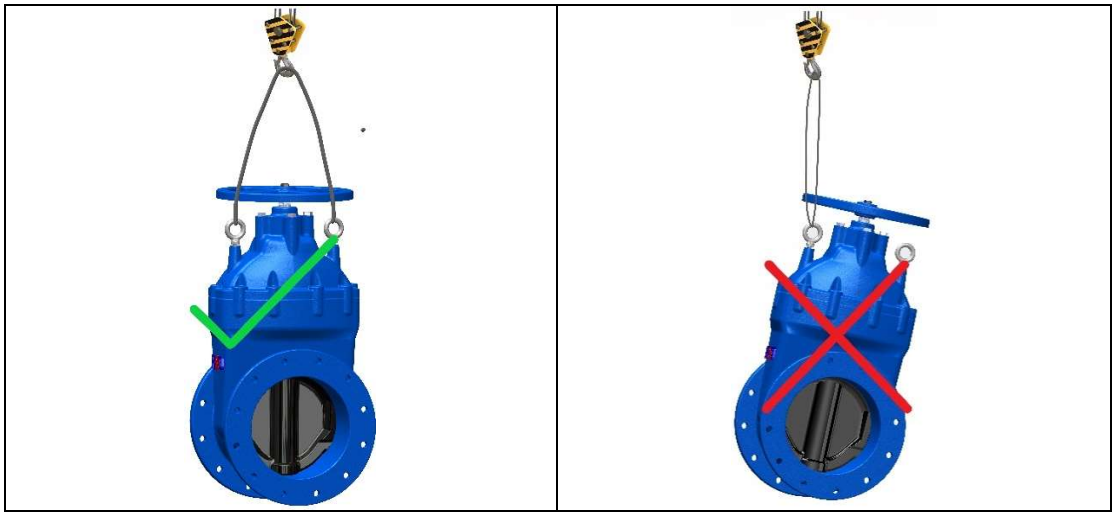
- Before you operate the valve for open & close, make sure to clean the valve with air or water, so that it operates properly.

Storage:

- If the valves have to be stored at site for some duration, ensure that the same are kept on raised platforms / pallets so that ground rain water does not wet the same. Store the valves in the shade & not exposed to direct sun-light / ozone
- Keep the valves covered by tarpaulin so that atmospheric dust does not accumulate on the valve components
- The valves are despatched with the wedge in slightly open position so that the wedge does not stick onto the metallic body
- If the valves are supposed to be stored for a long period, they should be manually cycled once in a month from closed position (as despatched from our plant) to open & back to original position manually
- Wherever valves with power actuators are stored, ensure to protect electrical control equipment to prevent corrosion of electrical contacts caused by condensation due to temperature variations

Handling procedures:

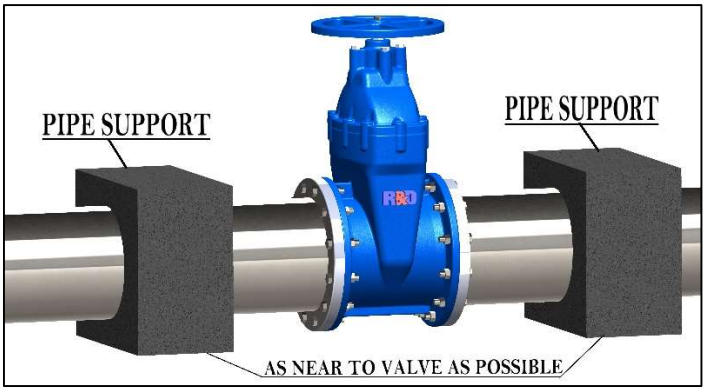
- On receipt from our plant, please unload the valves from vehicle carefully without allowing it to drop / impact etc. Please use non-metallic slings to avoid damage to painted surfaces. Rig the load before lifting so that it does not move / slide / turn / topple / sway during unloading & carrying to the storage location
- Take the valves to the location of installation only at the time it has to be installed. While lowering the same into the trench / vault please ensure that the valve does not impact on the trench / vault wall or on the adjoining equipment
- Always ensure that the equipment for lifting the valves has sufficient capacity to lift & carry the valve comfortably
- Never drag the valve along the ground. Do not carry the same hanging over when workmen are working below. Wherever possible use soft pallet for valve movement
- Lift the valve by hanging / slinging at the lifting lugs / eye-bolts / D-shackles / rods passed in flange holes only. Give due consideration to the centre of gravity of the assembly



- Never pass the slings through the valve body bore. Do not lift the valve by hanging from actuators/ gearboxes etc. This may result in damages to the valve assembly

Section 4: Procedures for Installation

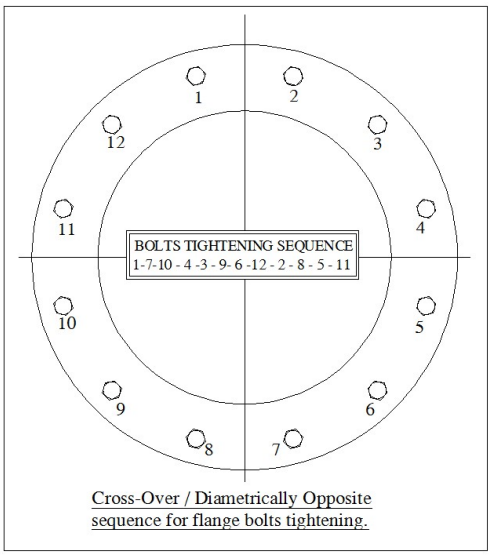
- Ensure that the pipeline bore is fully cleaned & there are no foreign material, debris, particles, welding residue in the pipeline. Such matter, if present, can create serious damage to valve components. It is recommended to flush the pipe line for easy removal of foreign particles. The flange faces also have to be perfectly clean & devoid of any foreign particles / oil / grease or rust preventer
- Also ensure that the duty parameters of the valve & the application requirements are matching; such as: fluid handled, temperature, pressure & velocity of flow. It is recommended that the pipe line velocity should not exceed 4 m/sec. Confirm the suitability of the materials of construction of the valve components for the duty parameters
- There is a chance that the fasteners might have got loosened during transportation & handling. Check the same & re-tighten as required
- Check & ensure that the rubber encapsulation on the wedge is fully intact & there are no dents, cracks, swells, bulges etc. on them
- This type of valve can be installed in any position, either in vertical or horizontal position
- These valves are bi-directional, hence there is no preferred direction.
- The pipeline on either side of the valve has to be independently supported. Ensure that no pipeline load due to any of the following parameters gets transmitted to the valve:
    - Pipeline weight
    - Weight of water in the pipeline
    - Loads, forces & moments due to thermal expansion & contraction of the pipeline
    - Loads due to settlement / wash-out of the soil-bed below the pipeline
    - Loads due to hydrodynamic reaction forces, thrusts of the flow due to grade & direction changes
    - Weight of the landfill above the pipeline in a trench after installation
    - Loads due to the traffic over the buried pipeline
    - Avoid any stress induced due to welding in the pipeline, up to a distance of 4D on either side of the valve
- The valve should be isolated from all these forces & moments by providing flexible joints immediately in the vicinity of the valve on either side if required. The valve weight should be supported by a suitable foundation in case of large valves. If the valve is supported directly below & the adjoining pipes on either side are not supported, the valve may end-up as a fulcrum for all the unsupported pipeline lengths. The valve body gets subjected to severe tensile & bending loads & may fail. Hence, avoid this situation



- Any worker entering a trench / pit for valve installation has to be properly protected by sloping / shoring of the banks as per OSHA CFR 1926: Sub-part 'P': Excavation
- Ensure that there are good measures to release & admit air into the pipeline system. Entrapped air can cause catastrophe for the system & valves also
- Ensure that the surge alleviation measures as envisaged in pipeline system design are provided & are effectively available
- Ensure that the valve is perfectly centred along the pipeline centre-line. The valve & pipes on either side must be concentric
- Never apply grease to any of the rubber parts
- Gradually tighten the nuts / screws so that gasket gets evenly & equally compressed
- Follow cross-over sequence (diametrically opposite) of tightening of the bolts / screws. While tightening the mounting bolts / studs & nuts, ensure that the valve is supported from below
- Tighten the bolts / nuts securely, use a thread lubricant while tightening the bolts & nuts Refer the table below for tightening torque values

Thread Size (mm)	**Tightening torque (Nm)**	
	Class 4.6	**Class 8.8**
M6	4	11
M8	10	26
M10	19	51
M12	33	89
M16	80	215
M20	156	420
M24	270	725
M27	398	1070
M30	540	1450
M33	740	1970
M36	950	2530
M39	1230	3290

- The installation precautions & guidelines as outlined in AWWA C500, AWWA C509 & AWWA C515 are to be strictly followed
- The actuators should not be powered / charged before installation of the valve in the pipeline
- The gasket between the valve & pipeline flanges as provided by us (if ordered in our scope) or as per AWWA C-207 should be provided
- It should be ensured that the flange bolts are tightened evenly & by following the cross-over sequence so that the gap between the valve flange & companion flange is always constant.
- A sample illustration with 12 flange bolts is shown in the schematic drawing below. Same principle applies to other sizes having different number of flange bolts.



Cross-Over / Diametrically Opposite sequence for flange bolts tightening.

- Effectiveness of the performance of the valve depends on the nature of the pipeline flow. If the flow is turbulent, the performance & longevity of the valve get affected. Moreover, turbulent flow can lead to undesired hydro-mechanical forces on the valve. Hence, it is advisable to provide 6-8D straight length of the pipeline on the upstream side & 4-6D straight length of the pipeline on the downstream side without any flow disturbances like bends, T's, flowmeters etc. (D = nominal size of the valve)
- In case of pipeline pressure tests, never subject the valve seat to pressure beyond its recommended pressure in the respective valve position
- As a part of installation process, manually operate the valve from the given position to full-open position gradually. The movement should be smooth & without any jerks / locking-braking effects

Section 5: Commissioning

- Once the valve installation is done, install the actuator (electrical / pneumatic / hydraulic) on the provided mounting arrangement. Ensure that the valve is in full closed position & also that the position indicator on the actuator shows the position accordingly. Ensure that the valve / gearbox input shaft engages smoothly into the actuator bore
- Provide an earthing connection to the electrical actuator
- Connect the pneumatic / hydraulic piping to the actuator (as required)
- Operate the valve by power / medium (air / oil) for once complete cycle: C-O-C
- Follow all the installation, commissioning & maintenance instructions as given by the actuator manufacturer thoroughly

Operation:

- Start the flow inside the pipeline only after the operating mechanism (gearbox / actuator) are duly installed & set
- Start the flow in the pipeline & open the valve as desired. An attempt at a quick opening / closing of the valve may result in pressure transients & surges. Hence this should be avoided. Please refer to our technical team if you require recommended opening / closing times for each valve size
- If you encounter air in the flow, keep the valve at a steady state & allow the air to be purged through the system
- Forcing the hand-wheel once the wedge has reached its extremity does not help to incrementally close / open further. It only puts extra forces on the gearbox components
- Improperly set limit switches (torque / travel) can lead to malfunction of the valve & operating mechanism. Hence set the switches properly. The torque switches are to be set by referring the max torque value (calculated as per valve rated pressure) given in valve data sheet
- Do not use any extra leverage, bar, pulley, large hand-wheel to forcefully close or open the valve. This may damage the operator and the valve components

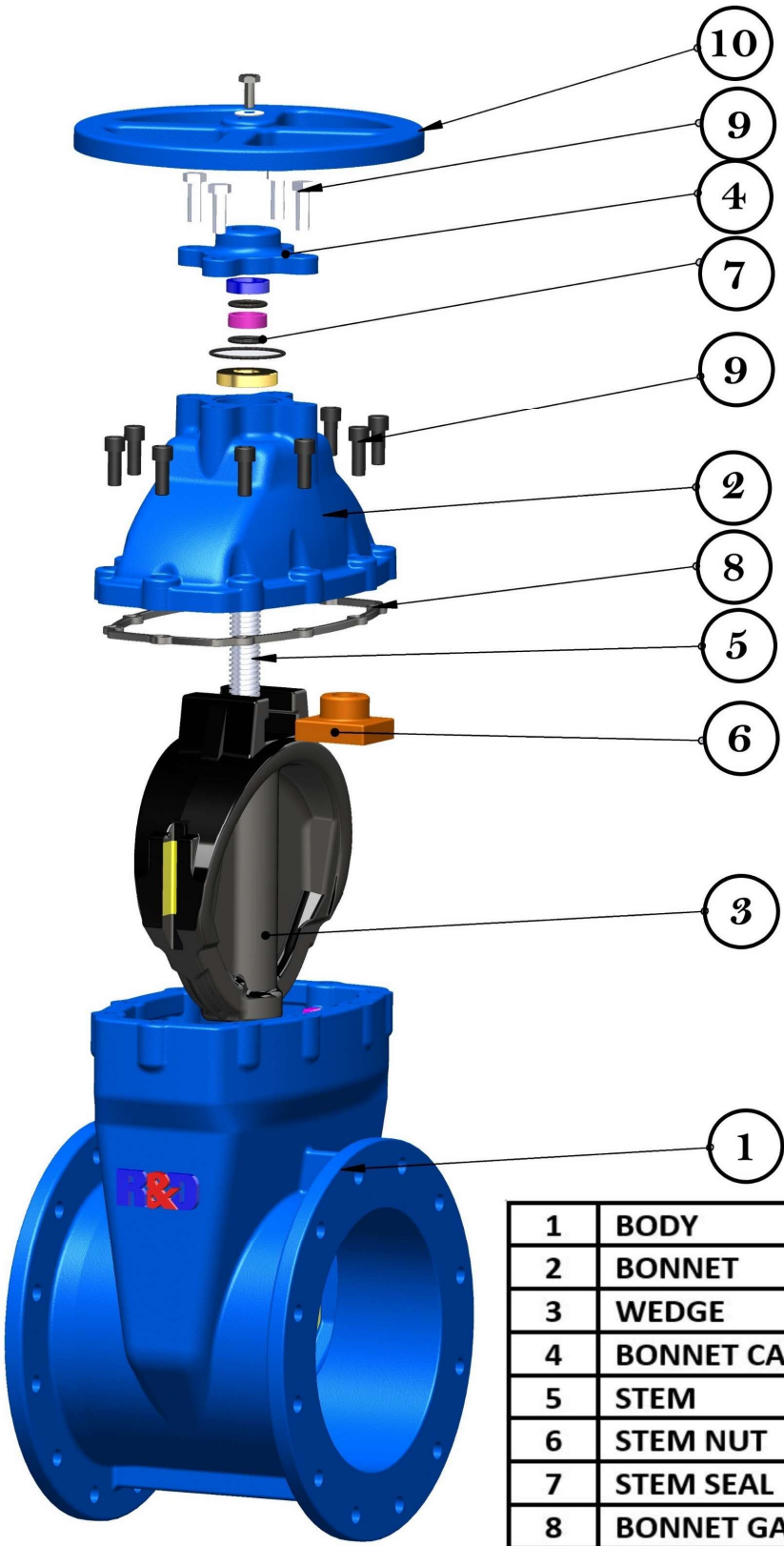
Section 6: Maintenance

R&D Multiple's gate valves are designed & manufactured so as not to need regular maintenance. However, it is advisable to:

- Periodically check visually for any signs of damage on the components
- Look for any increased friction in the opening / closing operations
- Watch out for any abnormal noise and vibrations on the valve. Any leakage past the wedge in full closed position can also cause abnormal noise
- In large size valves, if access openings or doors are provided, the condition of the wedge can be checked periodically or as required. The scaling or encrustation on the metal parts, if any, should be cleaned
- If any debris are accumulated in the body bore, the same should be removed

Dismantling & Re-assembly:

- The pipeline should be de-pressurised & drained before loosening the valve mounting fasteners
- The wedge should be in full closed position before dismantling
- The actuator electrical supply / high pressure air / oil supply should be disconnected
- The dismantling joint / mechanism if provided should be used to relieve the lateral pressure on the valve flange faces for easy removal from the pipeline
- The valve should be carefully removed from the pipeline using appropriate handling & lifting equipment
- The valve is to be kept with the valve stem vertical on a clean, flat platform. Wooden rafters can be used to keep the valve at an elevated position & for accessibility. The actuators are to be removed by loosening & removing the mounting bolts. Handle them carefully & keep their respective fasteners engaged to the respective flanges / holes
- The valve should be partially in open position. Thereafter, remove the body-bonnet joint bolts and insert a soft sling beneath the operator and gradually pull up the entire bonnet assembly, along with the wedge. Gradually, lower this assembly onto the floor, so as to not damage any of the parts. The valve stem has to be rotated by the operator, till it clears the wedge bore. The wedge can then be removed from the assembly
- Visually check for any damage to any of the individual parts, and take necessary corrective actions. Contact your R&D representative if you need help in locating any of the spares
- After all the individual parts are determined to be okay, the valve can then be re-assembled following this procedure in the reverse order



1	BODY
2	BONNET
3	WEDGE
4	BONNET CAP
5	STEM
6	STEM NUT
7	STEM SEAL
8	BONNET GASKET
9	FASTENERS
10	HANDWHEEL

Section 7: Quick reference guide

Troubleshooting

Observations	Possible root cause	Remedies / suggestions
Excessively high torque required to operate the valve / valve jammed	Failure of the stem nut, rubber damage on the wedge	Replace the stem nut / wedge as required
	In case of electrical actuators, improper setting of torque switch	Torque switches to be set as per the approved datasheets
	Valve installed too close to an elbow strainer, pipe reduction or other obstruction	Either change piping, change the location of the valve or upgrade the torque of the actuator
	Obstruction in the pipeline due to which the valve does not close fully	Remove the valve from pipeline and remove the obstruction
	Pipeline pressure exceeding the valve rated pressure	Replace the valve suitable for higher pressure rating
Valve passing across the seat	Valve not fully closed	Close the valve fully
	Rubber damage on the wedge	Replace the wedge and identify root-cause of the damage
Body leak	Wedge closed only partially	This is a on-off valve, and it is recommended to not use this valve in an intermediate position. Using the wedge in an intermediate position may cause erosion in the body casting
Valve stem threading damaged	Higher torque being applied to the valve operator	Replace the stem & check possible causes for higher torque as stated above
Leakage from the flange face	Flange bolts not evenly tightened or non-parallel pipeline flanges	Loosen the flange bolts and retighten the same. Check & ensure parallelism of pipeline flanges
	Improper pipeline flanges / gaskets	Check for the correctness of pipeline flanges, gaskets and replace as required
Water hammer or vibration	The valve is closing too quickly	Adjust the actuator speed if possible, or change control signal rate of speed
Leakage along valve stem	Valve shaft seals worn out	Replace the shaft seals

 DO'S	 DON'TS
• Always refer to the GA drawing, data sheets & name plate details & ensure that the correct valve is being installed at the correct location	• Allow any pipeline loads & forces to get imposed on the valve
• Before installation, ensure that the valve movements from closed to open & reverse are smooth & free	• Application of excessive torque using bar or pulley
• Clean the valve from inside & outside thoroughly before installation	• Force the actuator on the valve / gearbox input shaft
• Install the actuator on the valve in full closed position	• Try to align oblique / crossed flanges by tightening the bolts
• Ensure that the utilities available at site: Electricity & compressed air etc. are as per the recommendations of the valve manufacturer	• Usage of actuators for lifting & handling the valves
• Keep visual check on the valve performance. Keep a routine log of operation	• Use of force multipliers to operate the valves
• Flush the line before installation to remove cut pieces of pipeline fabrication	• Subject the valve to pressure higher than its rated pressure

Still need help? Write to us with the valve details (serial no) and a brief description of the issue on the contact details given below:

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