

GATE, GLOBE & CHECK VALVES ASSEMBLY & MAINTENANCE PROCEDURES



REVIEW CONTROL

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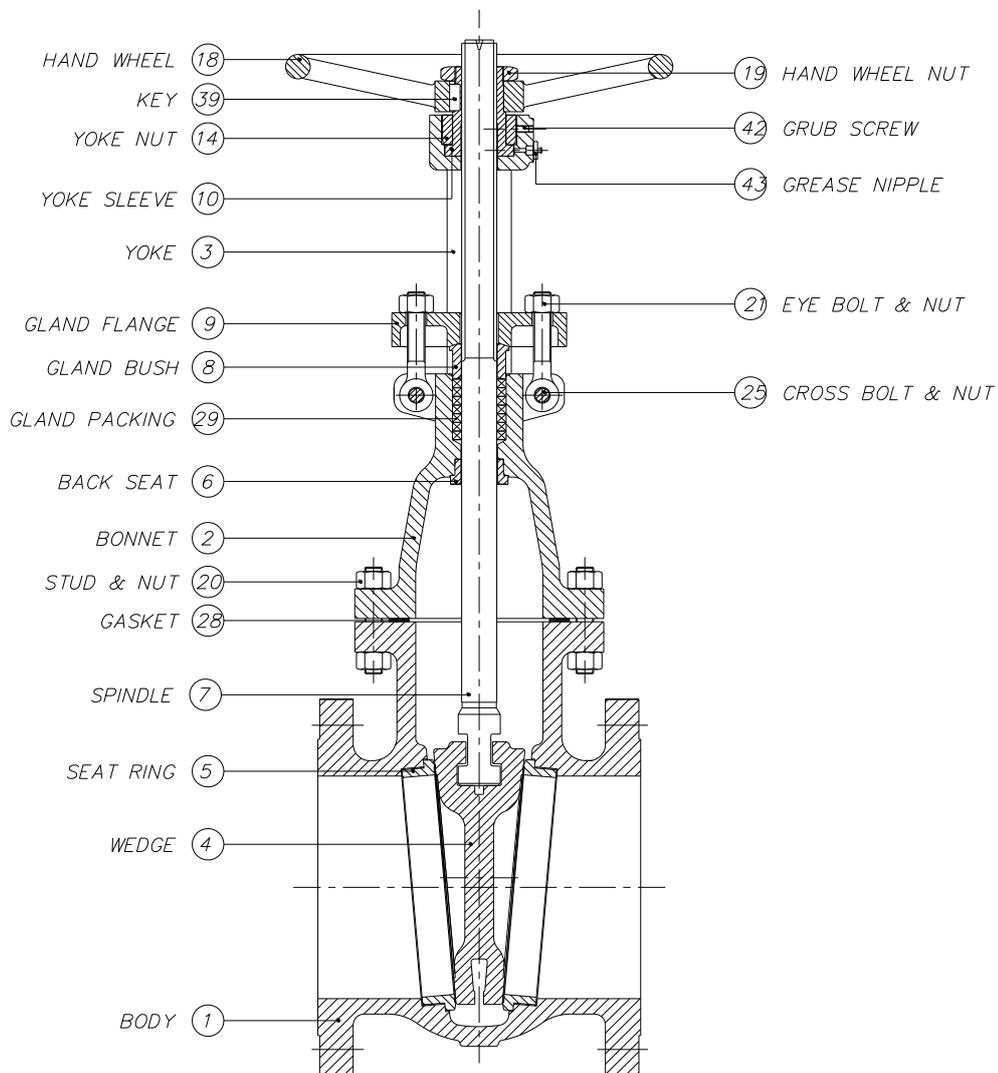
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1. Important Features of Construction & Operation

GATE VALVE

Gate Valve comprises of taper wedge, situated in between two-body seat rings, having included angle of 8 to 10 range. Guide ribs provided in the body, for smooth vertical movement secures wedge. Spindle is engaged to the wedge, 'T' head self aligned joint. Spindle is engaged in the yoke sleeve by suitable threading. Rotation of hand wheel in clockwise direction causes the yoke sleeve to rotate and spindle moves in the downward direction along with the wedge to close the valve.

Gate valves are used for on-off service where full flow with minimum pressure drop is desired in full open condition. Gate valves are not recommended for throttling service. These valves are to be used either fully closed or fully open position.

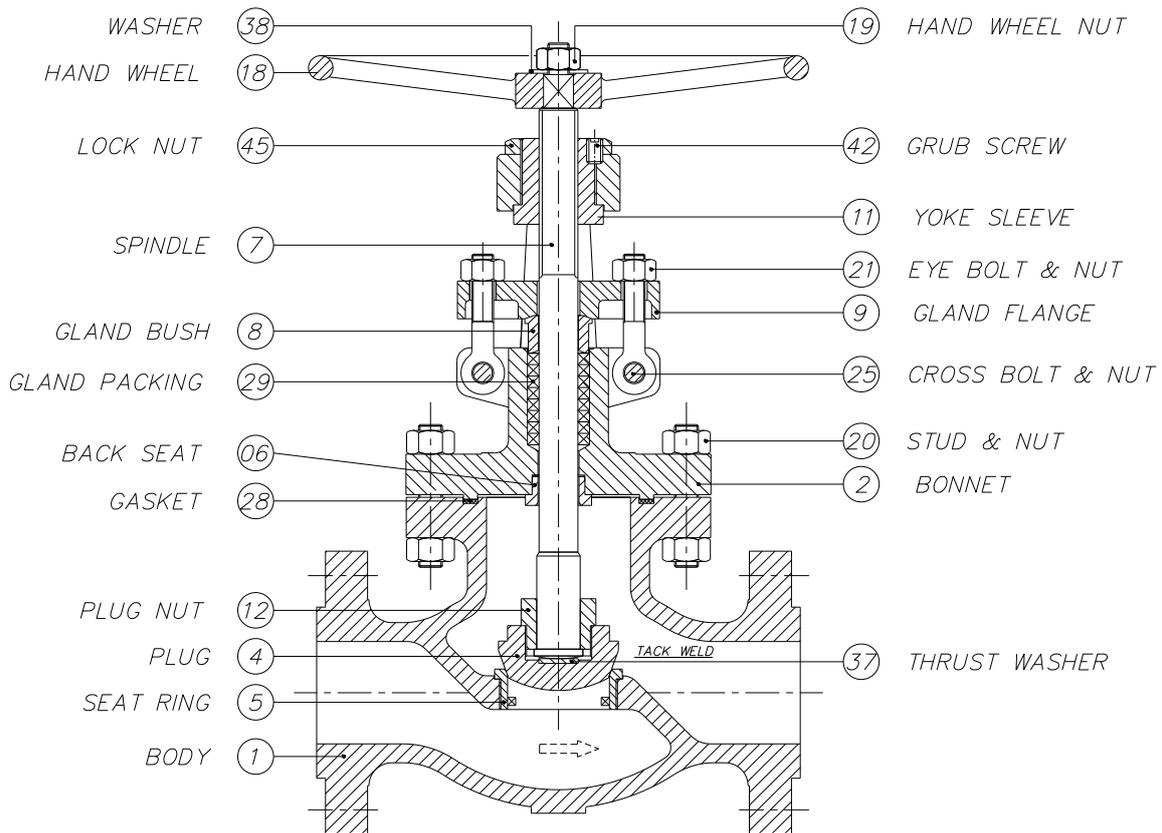


GENERAL ARRANGEMENT GATE VALVE

GLOBE VALVE

Globe valve comprises of round shape taper or regulating type disc. The disc is attached to the spindle by self-aligned swiveling joint. Vertical movement of disc along with spindle is governed by rotation of hand wheel, directly fitted on spindle. Spindle is engaged in the yoke nut on the bonnet top by suitable threading. Clockwise rotation of hand wheel leads to closing of the disc.

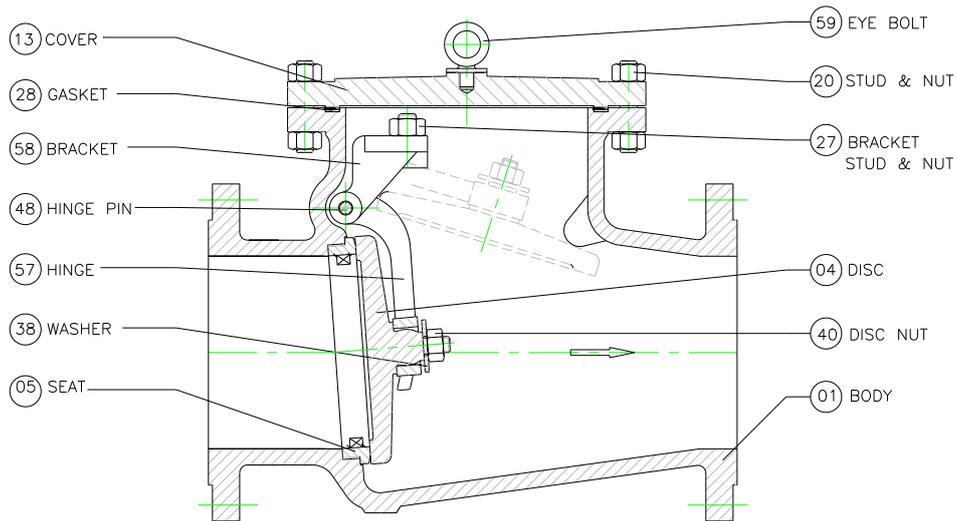
Globe valves are normally used for controlling the flow where certain pressure drop is permitted. These valves can be used for on-off service also.



GENERAL ARRANGEMENT GLOBE VALVE

SWING CHECK VALVE

Swing Check valve is self-operation non-return valve. Disc opens in the direction of flow and returns back on body seat when flow stops and seals with seat ring against back-pressure. Disc is secured in hinge; bracket & pin arrangement, which is self aligned type and moves inside body cavity. In larger sizes, hinge pin projects out of body to accommodate balance weight or dashpot arrangement.



GENERAL ARRANGEMENT SWING CHECK VALVE

2. Maintenance:

Dismantling and Servicing Instructions for Gate Valves:

Loosen the body/bonnet joint stud/nuts and remove from body, loosen the eye bolt nuts, rotate the hand wheel in clockwise direction. Wedge will come down to closed position. Further rotate the hand wheel in same direction, bonnet assembly will rise in upward direction. Continue the same till spindle comes out of threaded portion of yoke sleeve. Lift the bonnet assembly to separate it from body. Hold the spindle portion above body with left hand and pull it upward by hammering gently on topside of body surface beyond gasket area. The spindle along with wedge will come out of body. Observe the condition of seat portion and interior portion of body.

Clean body interior portion and seat surface thoroughly with suitable cleaning liquid check up for any scratches on seat ring surfaces. Minor scratches should be removed by lapping with emery paste with the help of body seat lapping fixture.

If the scratches are deep which cannot be removed by lapping, further machining may be required. Threaded seat rings are machined with 'Right Hand' threading and can be removed from body with the help of lugs provided. Where seat rings are seal welded to the body, complete body should be loaded on machine for further rectification.

Similarly minor scratches on wedge surface should be removed by lapping with emery paste. Deep scratches should be removed by machining and lapping. In case wedge surface is heavily damaged the entire seat surface should be machined and machining and lapping should follow one layer of hard facing weld deposition as per body size.

Remove old gland packing from bonnet stuffing box. Clean the bonnet surface from inside; lap the degree surface of back seat bush with the help of suitable fixture or by spindle itself. Clean threaded portion of the spindle. Polish the non-threaded portion of spindle on lathe machine or grind if possible. Clean threaded portion of yoke sleeve and apply grease with the help of grease gun through grease nipple provided on the bonnet top.

Change the body bonnet joint gasket and assemble the valve. Put new gland packing of required size and quality into the stuffing box with open end 180 with respect to each other. Tighten eyebolt nut equally on both sides. Lubricate the spindle-threading portion and operate the valve 2/3 times.

Procedure for repairs to seat and wedge/plug surface:

In case the leakage persists, open the body/bonnet joints and see if there is damage on the wedge surface. To repair this type of damage following procedure is to be adopted.

For repairs by deposition of 13% chrome by arc welding the thickness of layer required is 1.6mm minimum.

Welding Rod used: AWS A5.9 E410

The surface should be covered uniformly with complete metallurgical bond between the surface to be deposited and alloy.

Deposition of cobalt based alloys for stellite on the surface or seat/wedge:

When the seat ring surface is made from alloys other than 13% Chrome use the following procedure for stellite:

Hardness procedure:

Expected between 38 to 42 Rc for seat Valve seat are preheated to temp of 350 to 400 degrees Centigrade through out the section of the work piece and they are, then deposited with stellite alloys on the specified seat area using insert gas shielded plasma ARC process with non consumable throated (tungsten) rods.

The ARC is always directed towards the deposited alloys to minimize dilution. Dilution observed is in the range of 5-8% for deposits of 2.50-mm thick using current range of 75-125 amperes. It has to be ensured that the complete surface is covered uniformly and there is complete metallurgical

bond between the surface to be deposited and the alloy. Subsequent to the deposition the part is put in a dry lime bucket for slow cooling and also to relieve the stress. The flow of the inert gas shield should be adequate to avoid any oxide formation and also to restore all hardenable agents and the metallic constituents in the alloy that provide higher temperature and wear resistance.

MATERIAL SPECIFICATION: Conforms with AWS A5.13 ErCoCr-A

LAPPING AND FINISHING OPERATION:

Only VALVEGRIND make silicon carbide (extra coarse) lapping compound should be used. Before starting the lapping operation on the surface of the seat/wedge, ensure that surface is properly machined (▽▽▽ finishing), burns are removed. Put the lapping compound on the surface of the lapping area, and apply it on flat metallic plate (lapping plate). For proper finish, give the equal force to all contact area, till the surface is smoothly lapped (▽▽▽▽ finish). Clean the surface and observe the proper matching between the contact area. Before re-assembly, ensure that the contact area is properly matched.

Stem Repair:

All the valve stems are to be repaired for the following:

- ◆ Straightness,
- ◆ Damage to head and threads,
- ◆ Corrosion,
- ◆ Pitting and taper in the portion that slides through the packing.

Straightness:

Minimum clearance for the length of the stem when measured from a straight edge laid along side the stem, while rotated 360. The stem should be press straightened if necessary or should be re-grounded on center less grinder.

Threads and head:

Thickness and smoothness of threads must ensure smooth operation within the stem nut. The head must adequately engage the disc or plug.

Packing slide area:

The area that passes through packing should be free from pits and have smooth finish. Polishing or turning of the sliding surface within pre-decided limits can achieve this. Also the taper on the stem should be removed. If pits wear, taper or previous machining results in a reduction of the stem outside diameter beyond acceptable limit from original size; the stem to be replaced by new one.

Installation of socket weld end valves:

It is recommended that pipe be kept approximately 0.06" in (1.6mm) away from contact with the bottom of the socket before starting the weld. This is to prevent problems in the cracking of the field welds when the pipe is seated against the bottom of the socket. Valve should be welded with the disc slightly opened using weld material (rod or wire) with an appropriate diameter to meet the dimension and shape of the area to be welded for prevention of overheating the valves.

Important tips during the re-packing of gland:

1. While removing the old packing avoid hooks that can scratch the fine finishes of stem & stuffing box. Soft materials such as brass or hardwood dowels are better instruments.
2. Thoroughly clean stem & stuffing box while replacing new rings.
3. Avoid handling the parts and new packing set with bare hands after cleaning, otherwise salt is introduced which can start corrosion.
4. It is generally acknowledged that the top two rings of packing set are most effective in sealing the stem. Therefore, if two rings can be added to an in-service valve on back seat, there is an excellent chance of stopping leakage.

3. Maintenance

Dismantling and Servicing Instructions for Globe Valves:

Loosen the eyebolts/nuts; remove the body bonnet joint stud/nuts. Lift the bonnet assembly from body. Remove tack weld locking of spindle nut to disc and take out the disc from spindle assembly. Remove the hand wheel from spindle and take out spindle from bonnet assembly by rotating anti-clockwise. Clean the spindle-threaded portion and polish or grind unthreaded portion. Take a light cut on taper back seat portion, if damage is more. Remove old gland packing from bonnet stuffing box. Lap the back seat portion of bonnet bush. Check the condition of seat surface of body seat ring and disc. Minor scratches should be removed by lapping with emery paste with the help of suitable fixtures. Deep scratches should be removed by machining and lapping. Removal of threaded seat rings is similar to that of gate valve.

Assemble the disc/spindle assembly as before and assemble the valve and replace the old gasket. Add new gland packing in the stuffing box of exact size having opened ends 180 with each other. Apply proper lubrication to spindle threading and operate the valve 2/3 times.

4. Maintenance

Dismantling and Servicing Instructions for Check Valves:

Open the cover plate by removing body-cover stud/nuts. Open two bracket bolts and take out assembly of hinge, bracket and disc. Separate the disc by removing split pin and disc nut. Clean the interior portion of body with cleaning liquid. Check the condition of seat ring surface. Rectification of seat surface is same as specified in Gate and Globe Valve

After lapping disc & seat ring, assemble the hinge/bracket/disc assembly as before and also replace the old gasket. Assemble the cover plate on body and ensure that disc assembly sits properly on seat ring and is also free to move inside body.

DASHPOT ARRANGEMENT SWING CHECK VALVE

Function of dash-pot

It acts as damping device which prevents disc to hit directly on seat while closing.

Construction:

Dash pot arrangement is similar to hydraulic cylinder with piston and piston rod. Piston is provided with specific size of direct hole and small spring-loaded non-return valve. Oil is filled inside the cylinder. During opening of disc both holes and Check valve get opened for quick opening of disc while during closing operation of valve disc, non return valve gets closed and oil is passed internally through direct hole.

The above arrangement helps to disc open quickly and close slowly, without harming on seat directly due to its own weight.

Maintenance of dash pot:

Periodic lubricating oil should be applied on various moving part joints. Open portion of piston rod should be kept clean.

Oil seals for piston rod and 'O' Rings for piston may need replacement over period of time depending on frequency of use.

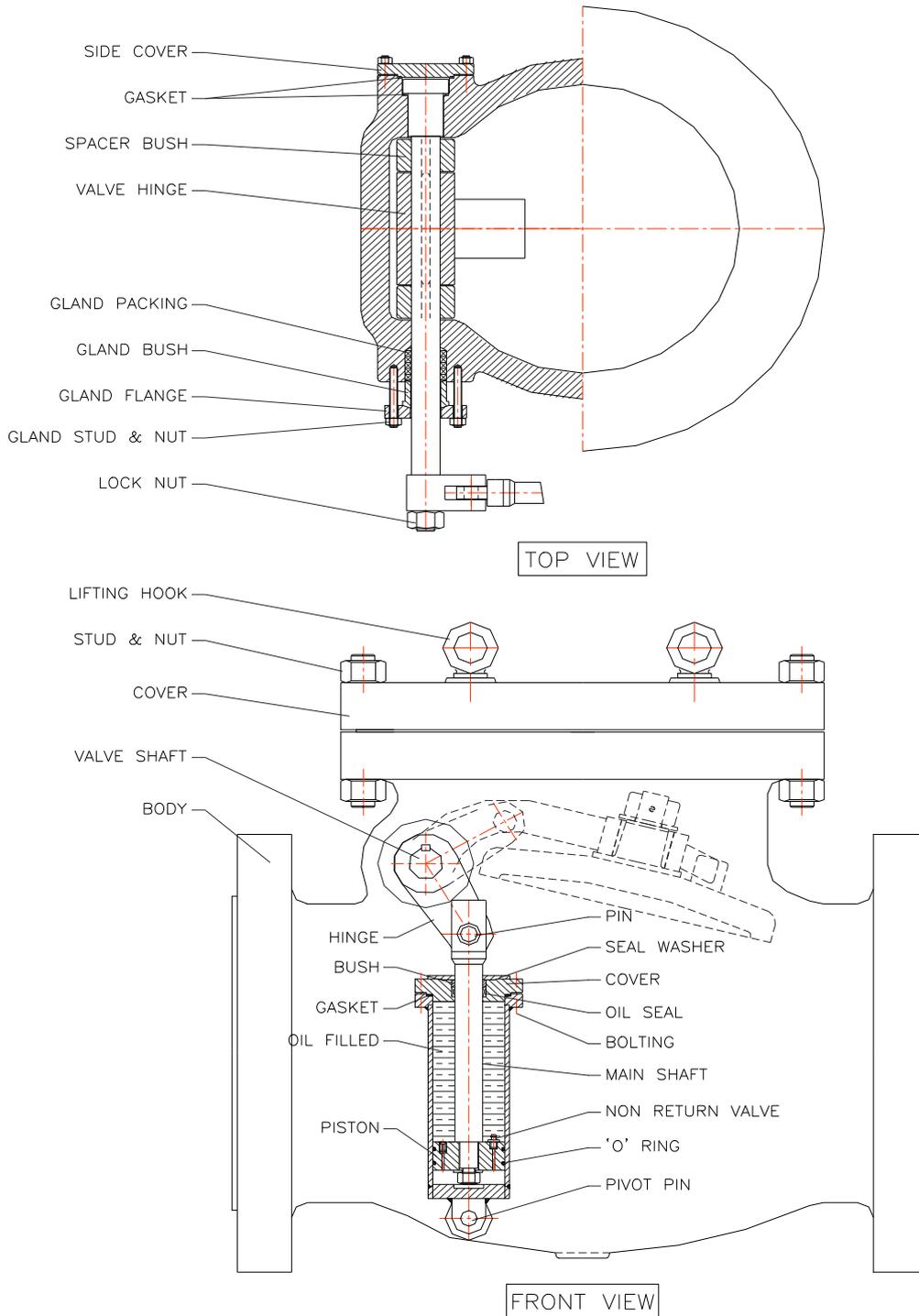
Dismantling of dash pot:

Disengage piston rod pin attached to disc pin & lever assembly of main valve.

Take out dashpot by removing nut provided on pivot pin assembly.

Remove bolts provided on top flange and take out piston assembly from cylinder. Take out oil from cylinder.

Piston rod is threaded in the piston. Take out piston rod from piston.
 Replace oil seal & 'O' Rings if required.



SWING CHECK VALVE
 DASHPOT ARRANGEMENT

5. General Maintenance:

Gland Packing:

The very frequent operation of the valve may lead to slight leakages through gland packing. Tighten the eye bolt nuts equally on both sides to stop the leakage. This sequence should be repeated a few more times. After a period of time you may have to add one or two more gland packing in the stuffing box. To add the gland packing rotates the hand wheel in anti-clockwise direction in full open position. All gate and globe valves are provided with back seating arrangement in full open position. Remove the eye bolt nuts, lift the gland bush and gland flange in upward direction and add the required nos. of gland packing.

Change of Gland Packing:

When the valve is kept in service or in the store for considerably long time, as the gland packing is in compressed position for a long time, it loses its compressibility and becomes hard. It does not hold the pressure even after further tightening. At this stage there is no alternative than to replace the old packing with a new one.

The method of replacing gland packing is similar as described in 3 (a). Old gland packing should be removed by using angular scriber and replaced with new packing of correct size having open ends placed 180 with each other.

If the valve is installed in running pipeline then precautions must be taken during replacement of gland packing under pressure. There should not be any leakage through gland when valve is in back seat position. In may cases back seat portion of spindle and bush get damaged due to hard foreign particles entering the pipeline and coming in contact with seat surface and back seat area during operation of valve.

It is not advisable to change the gland packing if some leakage is observed in gland packing when valve is in back seat position. In such cases valve should be dismantled and back seat should be repaired.

Cleanliness and lubrication of spindle:

The spindle above gland packing area is always exposed to open atmosphere where a lot of dust and adverse weather conditions can damage the surface of spindle. For smooth operation of valve, threaded portion of spindle must be protected from dust and proper lubrication must be provided periodically. Grease should be applied by grease gun through the grease nipples provided for lubrication of yoke sleeve collar.

General Care:

Normal life of the valve is designed for years together but there are some factors, which reduce the life of valve considerably. Improper storage, contamination of hard particles in the pipeline and lack of periodic maintenance can cause reduction in valve life considerably.

6. Assembly of Conduit Gate Valve:

1. Insert 'O' Rings on O.D of seat rings.
2. Insert springs in the housing provided on seat rings and secure with grease.
3. Insert both seat rings inside body and push slowly in body step. Being spring loaded, seat rings are moved towards each other. At this stage distance between seat ring faces is much less than thickness of gate hence it will not permit gate to insert from top side.
4. Make suitable fixture to pull the seat rings away from each other without damaging PTFE seat insert. This will facilitate gate to enter from top side.
5. Insert gate from topside slowly. It will start entering through taper portion provided at bottom side for smooth entry.
6. Finally when gate enters in flat portion, fixture provided for pulling out seat rings must be removed for further entry of gate. Now gate will enter between spring loaded seat rings without damaging seat insert. This procedure of assembly of gate has to be followed carefully, otherwise PTFE seat insert may get damaged.
7. Insert spindle in T slot of gate.
8. Insert bonnet / yoke assembly on top of body. Rotate handwheel in anti clockwise direction.
9. Tighten gland nuts and assemble yoke.
10. Tighten body / bonnet joint in correct sequence.
11. Operate valve 2 / 3 time to check smooth operation.

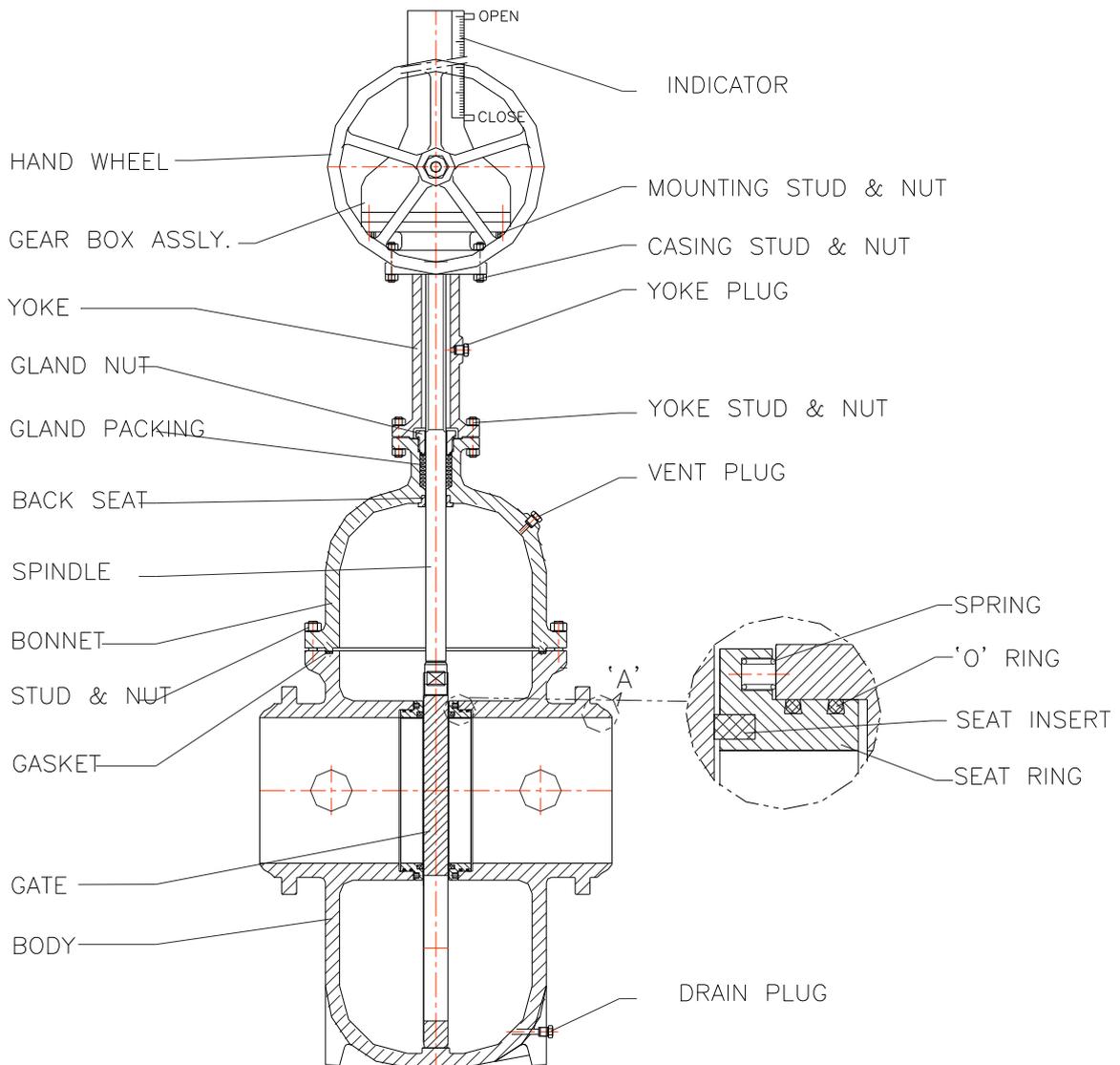
General Notes for the Bevel Gear Arrangement:

Bevel Gear consists of pinion & bevel gear perfectly aligned for operation on assly, Bevel gear is fitted on yoke sleeve of the valve, when hand wheel is rotated the motion gets transmitted through bevel pinion/gear to yoke sleeve.

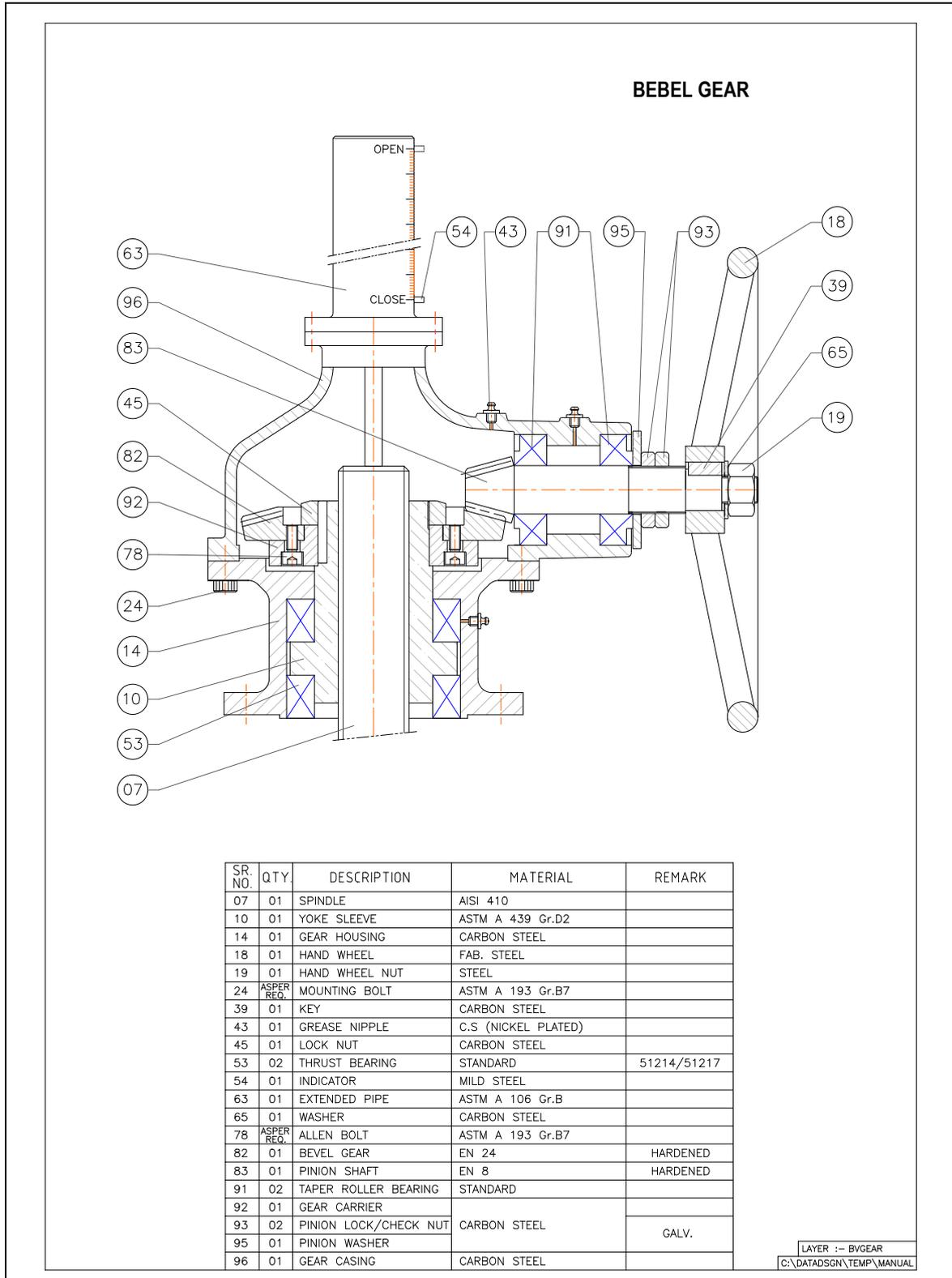
Maintenance:

In general Bevel gear/pinion teeth and taper roller bearings are properly greased before final assembly, periodic cleaning & greasing required for above moving part. Molycot grease to be used for gear box top casing can be dismantled by loosening casing bolts. After removing top casing complete cleaning and greasing should be done for pinion teeth and taper roller beams.

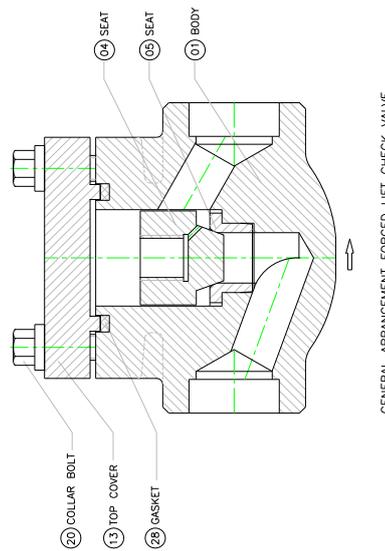
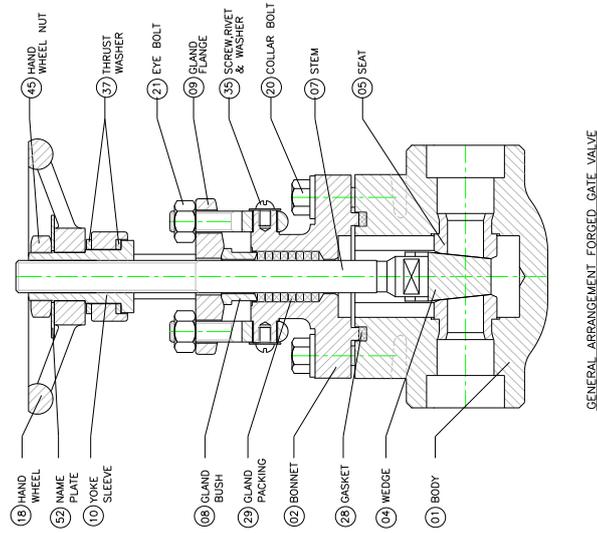
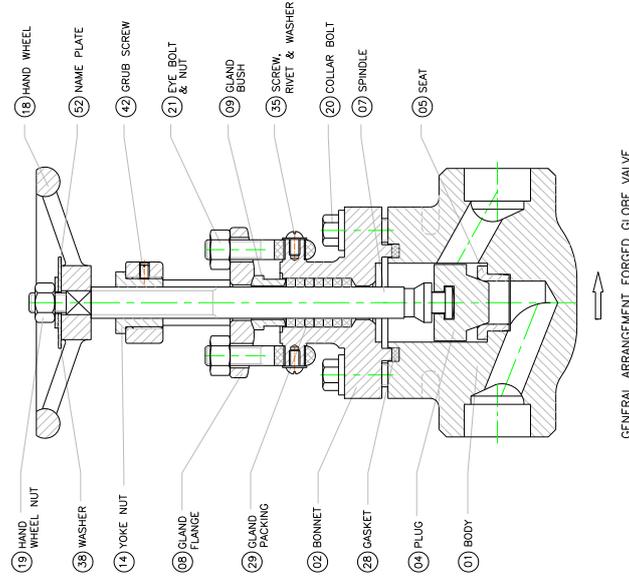
(Refer to the general diagram for details)



GENERAL ARRANGEMENT THROUGH CONDUIT
 GATE VALVE



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7. Electrically Operated Valves (Gate & Globe Valve)

Important features of construction and operation:

Electric Actuator is mounted on mounting flange of valve. Limit switches are set at close and open position of valve. Clockwise rotation of handwheel will close the valve. Open / Close indicator is provided in actuator housing.

Operation Instructions for Motor Operated Valve:

Electrical Connection: Power connection to motor and open / close limit switches should be correct phase wise so that rotation of actuator for closing & opening must be as per arrow indicated on Indicator Assly. To achieve such rotation keep the valve in half open position, start the actuator in close mode of limit switch and check up whether valve is closing in required arrow direction. If it is rotating in reverse direction, then change one phase of motor connection to get desired rotation in the direction of close / open arrow.

Never start the motor at end position of close / open without checking phase connection. It may cause damage to motor due to overload. Wiring diagram is kept in terminal box housing. Please note that wrong connection to motor and limit switches may lead to major damage to actuator.

Handwheel is provided for manual operation of valve. Engage the lever to manual mode and rotate the handwheel in clockwise direction to close the valve and anti clock wise to open the valve.

Servicing of Gear box: (wherever provided)

Periodic cleaning and greasing is required for gear, pinion teeth, bearings and other moving parts inside gear box. Open the gear box cover and apply grease at regular interval depending on frequency of operations.

Servicing of Actuators:

Servicing & maintenance of actuators should not be done at site. In case of any problem in actuator, same should be intimated to actuator manufacturer or to JC for necessary further action. Any tampering with actuator may lead to major problem. Guarantee becomes invalid in such cases. Limit switch setting may be changed slightly if required. Instruction manual for K Range Actuators is enclosed for detail information.

8. Pneumatically Operated Valves (Gate & Globe Valve)

Important features of construction and operation:

Pneumatically operated valve consists of pneumatic cylinder with reciprocating type piston operated mounted on valve and coupled with stem of valve. Two limit switches are fitted and set at end position of close / open of valve. Solenoid valve & F.R.L assembly is attached to the valve. Common terminal box is provided for internal wiring of limit switches and solenoid valve. Manual operation facility is provided in case of power failure at site.

Operation instruction for pneumatically operated valves:

Electrical connection: Terminal box is equipped with required number of terminals. Internal wiring of Solenoid valve and Two limit switches are already connected in terminal box. Outlet terminal are provided for output signals of limit switches, and input supply to Solenoid valve and limit switches. The connection should be provided as per wiring diagram.

For single acting spring loaded pneumatic cylinder, air supply is required thro' Solenoid valve to close the valve. In case of power failure or at no air supply, valve gets opened due to spring action.

Handwheel is provided on top of valve cylinder for manual closing of valve. In normal operation of valve with air supply, handwheel must be in open position of valve.

It must be noted that if handwheel is operated to close the valve manually, it must be brought back to open position for normal working of valve with air supply. Arrow direction is provided on handwheel for clockwise closing of valve.

Normal maintenance of valve with air cylinder:

Filter regulator & lubricator is provided at inlet of air supply. Care should be taken to check up condition of air filter, oil level in lubricator and required amount of oil mixture in air supply.

Piston of air cylinder will not function properly if lubricated and clean air supply is not provided. Proper lubricating oil should be provided on threaded portion of stem fitted with handwheel for manual operation.

9. Reconditioning of Valves:

- Depending upon the type and of valve it can be restored to like new conditions several times by reworking or replacing damage parts.
- In valve reconditioning following steps are generally followed to restore a used valve.
- The valve is disassembled and chemicals or blasting cleans components.
- Components thoroughly inspected to decide whether to repair or replace of defective components.
- Machining and welding of the components which are to be respired or to produce new components from appropriate materials.
- The valve components are then reassembled and tested in accordance with original specifications.
- Using this comparison of costs versus benefits becomes clear that a significant cost saving is possible only when the reconditioned valves is functionally equal to the new valve.

10. Important Tips to Improve Life Valves Service

In this approach maintenance work is carried out before actual repairs are required. This is to reduce probability of valve failures and ensure availability during its service life.

Preventive maintenance program for valve may contain following points and necessary actions are to be taken accordingly.

- Periodic static inspection, for any visible defects or failure such as packing or bonnet leakage and stem condition.
- Periodic valve stroking & lubrication of stem threads, gears to prevent jamming and corrosion every six month (lubricant to be used castrol ap3 or equal)
- Periodic packing change, to be made to ensure the packing without leakage.
- Periodic valve and actuator component inspection, to find out degradation of the components. this can be carried out when line is under shut down or stand by line is available.
- Testing of torque and limit switches periodically, to ensure their operation in motor operated valves.

11. Precautions to be taken

- Whenever gland packing is required to be replaced under full working pressure, ensure that back-seating arrangement is present and is functioning properly.
- While opening and closing of the valve please check direction of turn for open and close (operation in opposite direction may damage the yoke sleeve).
- When body bonnet joints are unbolted do not forget to put new gasket while refitting.

12. Storage Instructions

- All valves normally after inspection at our works are thoroughly cleaned from inside.
- Valves with flanged ends are covered with wooden disc or rubber cover so that no dust or foreign particles enter inside.
- Smaller size screwed/butt weld valves have p.v.c cover (push fit) and are packed in polythene bags.
- Valves are to be stored in the warehouse or covered shed to avoid damage due to sun or rain.
- Ensure valves are kept on wooden planks above floor so that it is not in contact with water/mud.
- For long storage ensures that plastic covers are provided and valves are fully covered.

13. Troubleshooting: causes and solutions

<p>EXTERNAL LEAK. THE PRODUCT IS LEAKING AT THE STEM</p>	<p>Most likely the gaskets & Packing has completely worn or is deteriorated.</p>		<ul style="list-style-type: none"> • Replace the gasket & packing
<p>INTERNAL PRODUCT LEAK (CLOSED VALVE)</p>	<p>Normal wear and tear of the seat seals</p>		<p>Replace the seat</p>
	<p>Premature wearing of seals</p>	<p>Seats worn or affected by the product. Excessive pressure on line. Work temperature too high (nuts and screws) Loss of sealability (vibrations) High manoeuvre periodicity (num. operations/tour).</p>	<ul style="list-style-type: none"> • Change the seats for others made of a different material more suitable to the product. • Tighten loose parts • Clean frequently • Decrease valve operating / closing frequency
<p>THE VALVE IS JERKING</p>	<p>The gaskets are jamming up</p>		<ul style="list-style-type: none"> • Lubricate with soapy water or lubricant compatible with the gasket material and the product & seals
	<p>The actuator does not operate the valve efficiently</p>		<ul style="list-style-type: none"> • Check the supply pressure of the compressed air. • Replace with a larger sized actuator
	<p>Excessive pressure on line</p>		<ul style="list-style-type: none"> • Check the installation pressure and adjust whenever necessary
<p>THE VALVES DOES NOT OPEN/CLOSE</p>	<p>Deformation of seats Incorrect operation of the actuator Worn actuator components Dirt in actuator or valve cavity</p>		<ul style="list-style-type: none"> • Replace the seats with others of different quality, if prematurely deteriorated. • Replace from NC to NO • Check the actuator • Check the compressed air pressure
<p>WATER HAMMER</p>	<p>The valve closes too fast</p>		<ul style="list-style-type: none"> • Adjust the closing speed of the actuator (with a flow regulator)



ATTENTION: This equipment doesn't require any specific maintenance. The end user must have a specific maintenance program adapted to the specific usage rate according to the service and environmental conditions.

It is not recommended to use the valve for an extended period of more than 2 years without a minimum annual maintenance and in the most severe cases a minimum of 6 months.



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