INSTALLATION, OPERATION & MAINTENANCE MANUAL

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GATE, GLOBE & CHECK VALVES

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AUSTRALIAN PIPELINE VALVE®

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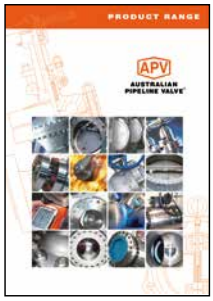

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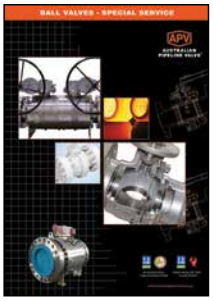
Ball Valves Floating Small Bore



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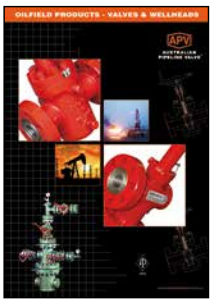

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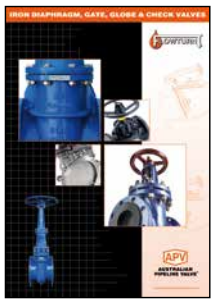

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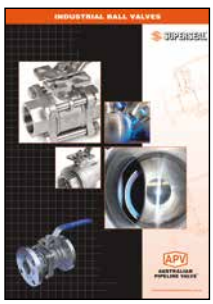

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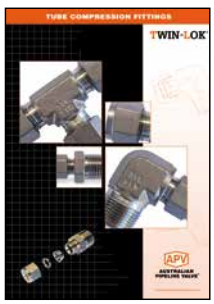

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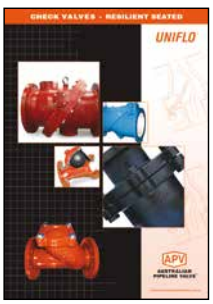

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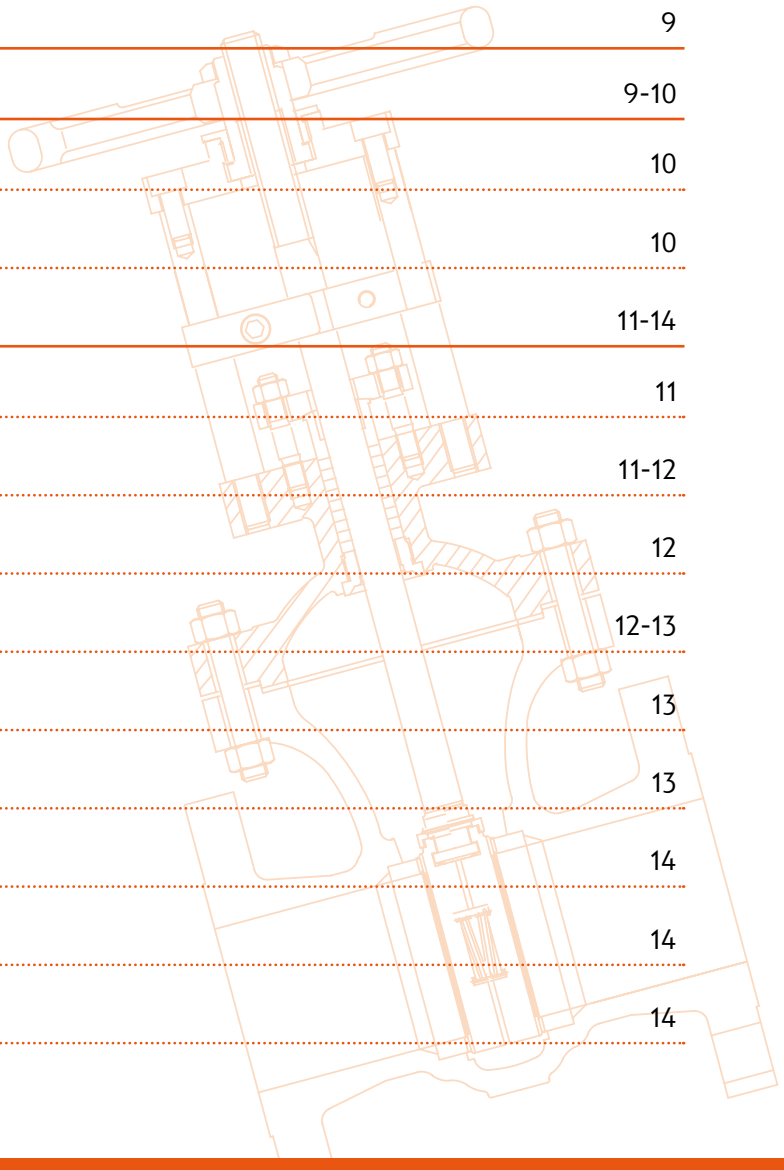
IOM Installation Operation Maintenance



INTRODUCTION

The majority of this information is common knowledge to experienced valve users. When properly installed in applications for which they were designed, Australian Pipeline Valve (APV) valves will give long reliable service. This instruction is only a guide for installation and operation of standard service valves. A professional APV approved valve engineering facility should be utilised for reconditioning or major repairs. This IOM is a generic general overview. For more detailed maintenance instructions refer to the APV Gate Valve IOM which covers parallel slide valves. Refer to the APV Check Valve IOM which covers piston check valves. Refer to the APV Globe Valves IOM which covers globe valves and screw down non-return (stop check) check valves. For speciality valves such as piston type globe valves and bellows sealed valves there are some differences but this IOM provides a generic overview for these valves. Refer to APV for specific instructions pertaining to these valves.

We do recommend however that this entire document be read prior to proceeding with any installation or repair. Australian Pipeline Valve and it's parent company take no responsibility for damage or injury to people, property or equipment. It is the sole responsibility of the user to ensure only specially trained valve repair experts perform repairs under the supervision of a qualified supervisor.

RESPONSIBILITY FOR VALVE APPLICATION

The User is responsible for ordering the correct valves. The user is responsible for ensuring APV Valves are selected and installed in conformance with the current pressure rating and design temperature requirements. Prior to installation, the valves and nameplates should be checked for proper identification to ensure the valve is of the proper type, material and is of a suitable pressure class and temperature rating to satisfy the requirements of the service application.

Do not use valves in applications where either the pressure or temperature is higher than the allowable working values. Also valves should not be used in service media if not compatible with the valve material of construction, as this will cause chemical attacks, leakage, valve failure.

RECEIVING INSPECTION AND HANDLING

Valves should be inspected upon receipt to ensure:

- Conformance with all purchase order requirements.
- Correct type, pressure class, size, body and trim materials and end connections.
- Any damage caused during shipping and handling to end connections, hand wheel or stem.

The User is advised that specifying an incorrect valve for the application may result in injuries or property damage. Selecting the correct valve type, rating, material and connections, in conformance with the required performance requirements is important for proper application and is the sole responsibility of the user.

SAFETY INFORMATION

The following general safety information should be taken in account in addition to the specific warnings and cautions specified in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered in this IOM

Never attempt to disassemble a valve while there is pressure in the line. Ensure both upstream and downstream pressures are removed. Disassemble with caution in the event all pressures are not relieved. Even when replacing stem packing, caution is necessary to avoid possible injury.

To prevent valve bending, damage, inefficient operation, or early maintenance problems, support piping on each side of the valve.

- *A valve is a pressurised mechanism containing energised fluids under pressure and consequently should be handled with appropriate care.*
- *Valve surface temperature may be dangerously too hot or too cold for skin contact.*
- *Upon disassembly, attention should be paid to the possibility of releasing dangerous and or ignitable accumulated fluids.*
- *Ensure adequate ventilation is available for service.*

Packing leakage could result in personal injury. Valve packing is tightened prior to shipping but may require readjustments to meet specific service conditions.

Caution

Personal injury may result from sudden release of any process pressure. APV recommends the use of protective clothing, gloves and eyewear when performing any installation or maintenance.

Isolate the valve from the system and relieve pressure prior to performing maintenance.

Disconnect any operating line providing air pressure, control signals or electrical power to actuators.

Caution

Check the packing box for pressurised process fluids even after the valve has been removed from the pipeline, particularly when removing packing hardware or packing rings, or removing packing box pipe plug.

Caution

If a gasket seal is disturbed while removing or adjusting gasketed parts, APV recommends installing a new gasket while reassembling. A proper seal is required to ensure optimum operation.

This manual provides instructions for storing, general servicing, installation and removal of gate valves.

APV and it's resellers refuse any liability for damage to people, property or plant as well as loss of production and loss of income under any circumstances but especially if caused by: Incorrect installation or utilisation of the valve or if the valve installed is not fit for intended purpose. It is the sole responsibility of the user to ensure the valve type and materials are correctly specified.

DURING OPERATION TAKE INTO ACCOUNT THE FOLLOWING WARNINGS:

a- Graphite/Graphoil packing and body gasket is very brittle, any impacting, twisting or bending should be avoided.

b- The valve's internal parts such as disc, stem, seats, seals and gaskets shall be handled with care avoiding scratches or surface damage.

c- All tools and equipment for handling the internal parts shall be soft coated or else take extreme care, especially on machined mating surfaces and with soft parts .

d- Valves can be fitted with gaskets or seals in PTFE, Buna, Viton, etc., hence high temperatures will damage sealing components.

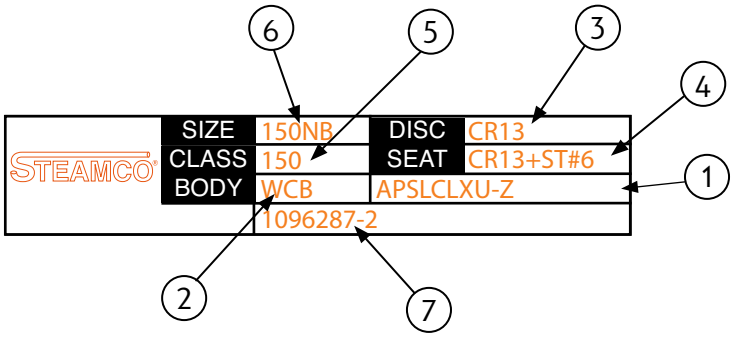
For all operations make reference to position number on part list of the applicable drawing listed.

Caution

At no time shall any weld repair be conducted on the valve while in service. Never strike the valve with a hammer or other impact device. Ensure that no excess weight is placed on the valve that was not part of the original manufacture design.

VALVE IDENTIFICATION

Each APV valve is identified with a nameplate. Below is an example.



ITEM	DESCRIPTION
1	APV-Steamco valve figure number
2	Shell material (e.g. body, bonnet)
3	Closure member material
4	Seat material
5	Rated pressure class as per ASME B16.34. Section 2
6	Nominal pipe size
7	Serial/batch number

When performing any work, ordering spare parts, or requesting technical support, please refer to this tag. The serial number, the part number and numbers cast on the side of the valve body are keys to proper valve identification.

1.0 INSTALLATION

Caution

Piping should be properly aligned and supported to reduce mechanical loading on the end connections.

1.1 INSTALLATION POSITIONS

Parallel slide gate valves are usually bi-directional and therefore may be installed in either direction. In some cases, gate valves may be uni-directional, in which case the direction of flow will be indicated on the valve body. Globe valves and check valves are uni-directional (direction of flow indicated with arrow also refer to APV globe and check valve IOM). Parallel slide gate, globe & piston check valves are designed for horizontal pipelines with the bonnet faced upwards. In smaller sizes, specially guided right angle globe valves and specially guided piston check valves and spring loaded SDNR globe valves can be used for vertical service with upwards flow but must be specified with order and tested. Right angle design SDNR globe and piston check complete with spring are recommended for vertical service applications.

1.2 PREPARATION FOR INSTALLATION

- Remove protective end caps or plugs and inspect valve ends for damage to threads, socket weld bores or flange faces.
- Ensure valve is in full closed position to protect seat area.
- Thoroughly clean adjacent piping system to remove any foreign material that could cause damage to seating surfaces during valve operation.
- Verify that the space available for installation is adequate to allow the valve to be installed and to be operated.

Note

Ensure sufficient clearance for the stem in the full open position may cause the valve to be inoperable. Inadequate clearance for valve may add mechanical loading to the valve ends. Sufficient clearance should be allowed for threaded valves to be 'swung' during installation.

1.3 END CONNECTIONS

1.3.1 Threaded Ends

Check condition of threads on mating pipe.

Apply joint compound to the male end of joint only. This will prevent compound from entering the valve flow path.

1.3.2 Flanged Ends

Check to see that mating flanges are dimensionally compatible with the flanges on the valve body and ensure sealing surfaces are free of debris.

Install the correct studs and nuts for the application and place the gasket between the flange facings.

Stud nuts should be tightened in a an opposing criss-cross pattern in equal increments to ensure proper gasket compression.

1.3.3 Socket Weld Ends

Remove all debris, grease, oil, paint, etc., from the pipe that is to be welded into the valve and from the valve end connections.

Insert the pipe into the valve end connection until it bottoms out in the socket weld bore. Withdraw the pipe 1/16" so that a gap remains between the pipe and the bottom of the socket weld bore to prevent cracks (ASME B16.11). Tack the pipe into the valve and complete the fillet weld.

Gate & Globe valves should be lightly closed during welding to prevent damage to the seating surfaces and stem caused by thermal expansion during the socket weld process.

1.3.4 Buttweld Ends

Clean the weld ends as necessary and weld into the line using an approved weld procedure. Make sure the pipe and body material given on the nameplate or valve body is compatible with the welding procedure. (Refer our compatibility cross reference chart for equivalent pipe, valve & fittings grades).

1.3.5 Valve Installation by Welding

Keep valve in full closed position to avoid seat distortion and debris entering seat area.

Unless the valve contains PTFE packing and/or gasket, leave valves assembled and in the lightly closed position during installation, welding and post-weld heat treatment. This will prevent the valve seat from floating or distorting during the process. After welding completion, open the valve and flush line to clear out any foreign matter. Valves of carbon steel should be allowed to cool slowly. The valve may be covered with a heat-insulating blanket to promote slow cooling and limit the heat-affected zone. Appropriate industry standards should be followed for all PWHT.

In the unlikely event that the valves under 80NB (3") have a PTFE bonnet gasket and/or stem packing, ensure the temperature of the body near these areas does not go over 200°C during welding.

The responsibility for welding of the valves into piping systems is that of those performing the welding. Refer to ASME B31.1, B31.3, etc. Written welding procedures covering all attributes of the process and materials to be welded shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel Code and any additional requirements from the applicable piping.

2.0 STORAGE

1. Steamco valves are thoroughly cleaned to remove fluids, rust and other foreign materials after testing and before shipping.
2. Valves should be stored in a suitable sheltered place to prevent contamination by weather, dirt or dampness. Valves will eventually rust unless treated with a light oil coating when stored for long periods of time.

3.0 PRE-OPERATION

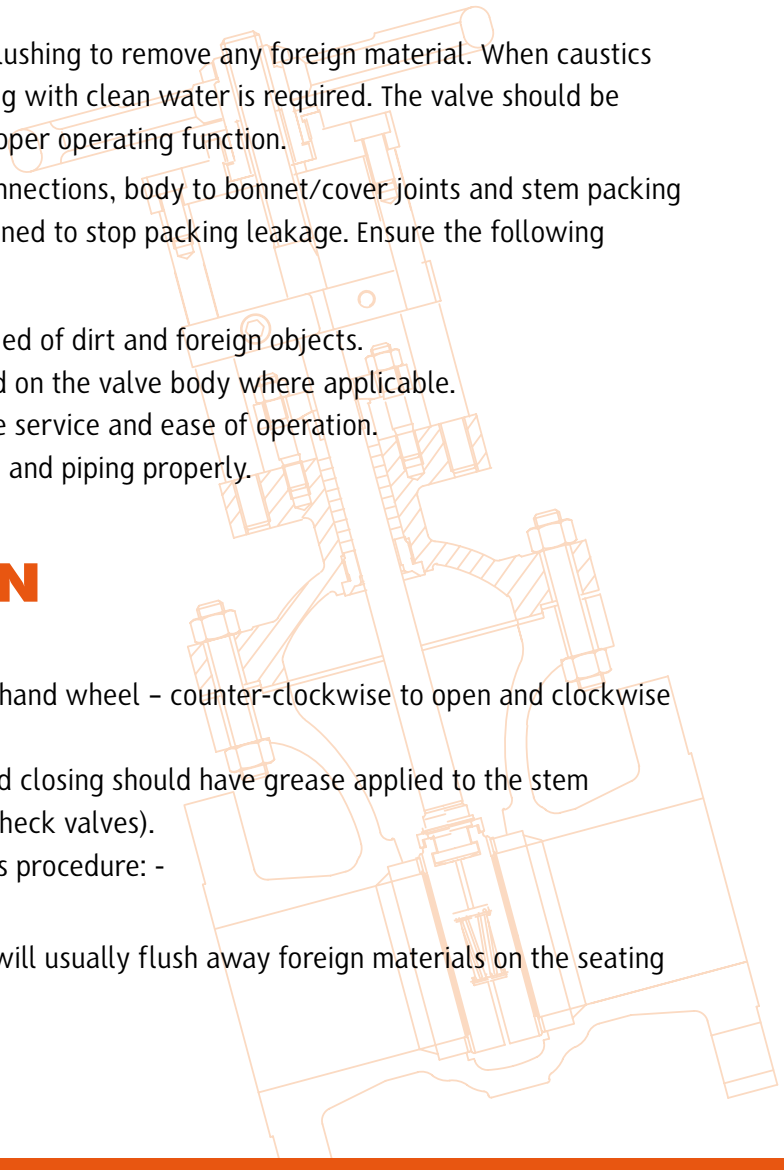
After installation, the line should be cleaned by flushing to remove any foreign material. When caustics are to be used to flush the line, additional flushing with clean water is required. The valve should be opened and closed after installation to ensure proper operating function.

With the line pressurised, check the valve end connections, body to bonnet/cover joints and stem packing area for leaks. The packing may have to be tightened to stop packing leakage. Ensure the following checks are done.

1. Make sure all piping and components are cleaned of dirt and foreign objects.
2. Install valves as indicated by the arrow marked on the valve body where applicable.
3. Install valves in a manner that will allow future service and ease of operation.
4. Use hangers to support the weight of the valve and piping properly.

4.0 OPERATION

1. Valves are manually actuated by means of the hand wheel – counter-clockwise to open and clockwise to close. (Not applicable to check valves).
2. Valves that do not require frequent opening and closing should have grease applied to the stem threads on a regular basis. (Not applicable to check valves).
3. If leakage starts in our valve, please follow this procedure: -
   a) Do not apply extra force to close the valve.
   b) Open the valve fully, then close again. This will usually flush away foreign materials on the seating surface.



c) If leakage still continues after flushing (Step b), disassemble the valve, clean the seating surface and assemble the valve.

4. Gate valves are not to be used part open or part closed. Throttling will damage the valve.
5. Globe valves are ideal for on/off service especially for frequent operation due to the short travel between open and closed. The globe design is heavy duty but the flow passage translates to flow resistance.

   Globe valves should not be used continuously to openings less than 20% or else venturi effect will damage seat and disc. Never attempt throttling under 20% of travel stem. Any throttling will reduce the life of the seat and disc. Closer throttling, can result in higher pressure drops which may cause excessive velocities or cavitation and could cause vibration or high noise levels resulting in damage to the valve or adjacent components/structure.

   Globe valves are multi-turn valves with a rotating stem and rising hand wheel (unless a guide bar/stem guide is fitted, then they are non rotating rising stem (see APV Globe valve IOM). Standard plug disc globe valves can be used for some minor very short term flow regulation. Alternate disc types are available (see APV Globe valve IOM). Where a guided disc is specified and a torque arm (guide bar) is fitted, globe valves will have a longer life when used for minor throttling applications but should still be used under 20% open.

   All globe valves close by rotating the hand wheel clockwise and open by rotating counter-clockwise.

Gate & globe valves should not be left in the fully back seated position under normal operating conditions. The packing may dry out under these conditions and leak as the valve is closed.

4.1 DIFFICULTY OPENING & CLOSING

For manual operated valves, loosen the two gland tightening nuts and the spindle should become free (otherwise dismantle the valve bonnet to inspect).

After dismantling the valve bonnet, inspect the exposed part of the spindle for scouring marks. Smooth out these marks with fine emery paper. Lightly lubricate the spindle and the spindle should become free again.

4.2 OTHER SERVICES

Use Graphite (Graphoil)/PTFE impregnated Graphoil/Pure PTFE packings as per permissible limits of line pressure, temperature as well as media of flow through the valves. Bellows sealed valves utilise special inconel bellows to seal area, refer to as-built drawing.

5.0 MAINTENANCE PROCEDURES

5.1 PERIODIC INSPECTION

APV recommends that periodic inspections be carried out on all valves. The frequency of these inspections depends on the severity of the service and the frequency of the valve operation. As a minimum, all valves should be inspected quarterly to ensure proper operation and discourage the damage compounding effects of leakage. The following list details the specific valve types and areas requiring inspection and maintenance.

Item to Inspect	Stop Check	Gate	Globe	Check
Check all lubrication points	✓	✓	✓	✗
Check body/bonnet join for leaks	✓	✓	✓	✓
Check for packing leaks	✓	✓	✓	✗
Check stem threads for wear	✓	✓	✓	✗
Ensure stem and seal areas are free from debris	✓	✓	✓	✗
If conditions permit, operate valve	✓	✓	✓	✓
Inspect all external connections	✓	✓	✓	✓
Inspect condition of actuator and/or gear operators (if applicable)	✓	✓	✓	✗
Inspect valve for obvious damage	✓	✓	✓	✓

Do not remove or loosen the packing gland or bonnet bolts while the valve is pressurised.

5.2 PREVENTATIVE MAINTENANCE

1. Inspect whether all valves can be opened or closed smoothly at least once a month. If the operation is sluggish, clean the spindle threads and lubricate the same. APV valves are supplied with the stem threads engaging the yoke nut pre-greased. These components should be kept constantly lubricated by applying the grease directly on the stem when the valve is in the open position or through the grease injector in the yoke nut when provided. Lubrication/greasing of the stem should be conducted every six months or more often as needed, based on the environment the valve is installed. Inspection should confirm that the valve is sealing properly. Stem packing should be inspected at least every six months to ensure zero leakage from the packing chamber. For water & oil service, regular maintenance should be scheduled every 3 months. For gas and more corrosive mediums, inspection and maintenance should be completed once a month.
2. Check the gland tightening nuts for any slackness, if required tighten these nuts and ensure that the valve operation is not hampered by over tightening the gland.

3. Bonnet bolt tension should be checked periodically when valves are used in high temperature applications where creep may occur. Refer Appendix A, Tables A & B and Figure 11 for torque figures and tightening sequence. Although leaks through bonnet ring or spiral gaskets are rare, erosion or corrosion could cause bonnet seal to fail. In these cases, a new gasket is required. Refer Section 5.3 for replacing bonnet gasket.
4. With problematic service applications it is recommended that the valve be periodically at least partially stroked to ensure valve functions and to ensure there is no product deposits entering into seat or stem area which may render operating more difficult. Duration depends on service, criticality, etc. However, it also must be factored in that if there are impurities or particulates in the line, likely to be built up in the seat area, each operation could reduce seat life proportionately.

Note, use suitable new gland packing rope/rings of correct size and type when replacing.

Do not attempt to repack the stem packing in line while the valve is under pressure. The line must be totally purged. Cast iron valves do not have 'back seating' feature. Prior to removing bonnet, exercise extreme caution no pressure is trapped in the valve cavity. Wear appropriate safety apparel and follow industry and plant safety procedures.

5.3 ADJUSTING GLAND PACKING

(Not applicable for check valves).

1. When trying the valve for the first time in the piping, it is recommended to adjust the gland packing by tightening the gland bolt nut. Tighten the gland packing uniformly so as to stop leakage. Over tightening can result in the valve hand wheel being hard to turn.
2. If tightening of the gland does not stop the leakage around the stem, repacking should be considered at once.
3. When placing a new valve into service, Australian Pipeline Valve recommends a preliminary packing adjustment to verify proper packing load. Additionally, it is recommended that a Baseline Leakage Test be performed following installation, but prior to start-up.
4. During the packing life cycle, normal and routine maintenance of the packing arrangement must be administered. Normal cycle life will typically require 5 to 8 packing gland nut adjustments. Torque values vary depending upon valve size. Refer to the Packing Bolt Torque chart for the recommended torque values. Tighten the gland packing nuts clockwise. Do not over tighten or the valve will become too tight to turn.

5.4 USE OF BACKSEAT

Some APV valves are designed with stem backseats. However, valve manufactures in general including APV do not allow packing in-line while the valve is under pressure due to the inability of determining the effectiveness of the backseat seal. In addition, backseating is not designed to be absolutely drip tight. This is not the purpose of backseating. Due to the inherent risks, backseat should never be used to allow gland packing replacement or repair while the valve is pressurised.

Caution

Over tightening will cause the packing to fail prematurely as well as increasing the force required to operate the valve.

Adding additional packing rings may damage the stem sealing system over a longer term. It is NOT ALLOWED TO REPACK VALVES UNDER PRESSURE. For low emission service, proprietary fugitive emission packing must be used.

For normal operation in the open position, the stem should be backed off so that the backseat (where applicable) is not in contact. This permits the stem packing to assume it's intended sealing function and not conceal unsatisfactory stem packing. In the event of stem packing leakage, the back seat can be used to stop stem leakage until circumstances permit a system shutdown and time for packing replacement. Stem packing replacement with the valve under pressure and back seated represents a hazard and should not be undertaken. The hazard is magnified as fluid pressure or temperature increases or when the fluid is toxic.

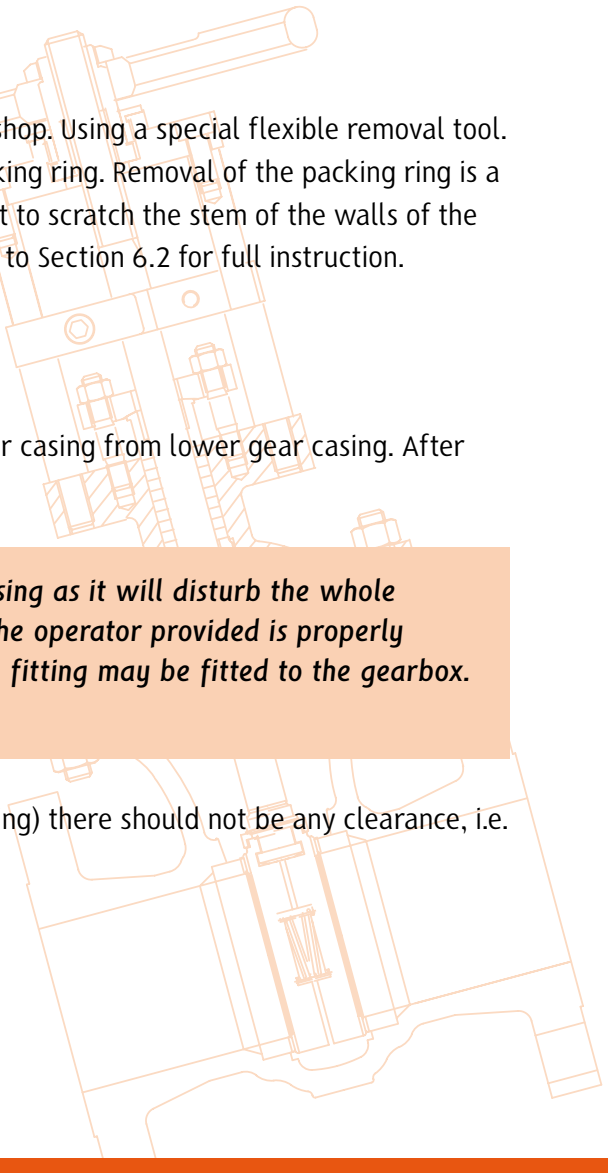
5.5 PACKING RING REPLACEMENT

Removal of old packing should be done in an experienced workshop. Using a special flexible removal tool. The removal tools have special hooks, which screw into the packing ring. Removal of the packing ring is a difficult and time-consuming operation. Care has to be taken not to scratch the stem of the walls of the packing chamber during the removal of the packing rings. Refer to Section 6.2 for full instruction.

5.6 GEAR OPERATOR MAINTENANCE

The gear operator is lubricated with grease (2% MOS2) for life.

Only in case of failure of any components remove the upper gear casing from lower gear casing. After inspection replace the necessary components.



Caution

Do not dismantle the upper and lower gear casing as it will disturb the whole assembly and the deep groove ball bearings, the operator provided is properly lubricated for long life. In larger sizes a grease fitting may be fitted to the gearbox.

1. When repairing the drive sleeve and bearing (thrust ball bearing) there should not be any clearance, i.e. the drive should not move axially.
2. Proper installation will correct operation.

5.7 LEAKAGE ACROSS SEAT

It is always difficult to ascertain whether there is an internal seat leakage unless there is pressure or leak detection facility in place to monitor any rise or fall in pressure or leakage. Globe valves allow a higher rate of seat leakage than gate valves, consult appropriate test standard for leakage allowance.

To investigate suspected leakage, the valve should be removed from the line then dismantled. Prior to removal from line ensure all pressure and fluid is purged from line and valve cavity. Remove disc and inspect the seating surfaces, also inspect the body seat for any sign or wire drawing/light scratches.

Relap the seats or disc as required if minor damage or else send the valve to an experienced APV approved valve repair facility. Assemble the valve, should any leaks still persist then the concerned part may need complete replacement.

When ordering spare parts for replacements, kindly inform us the size, type, rating, part description, model number and serial number.

5.8 DISASSEMBLING VALVES

1. Check that the line is in a complete shut down phase.
2. Pre-order all necessary spare gland packings and jointing gaskets.
3. Open the valve slightly by turning the handwheel anti-clockwise and loosen the gland.
4. Put identification markings on valve body, bonnet, disc/gate, yoke, and actuator. This helps to avoid mismatching of parts at the time of re-assembly.
5. If the bolts and nuts are too tight, apply deep penetrating oil and then unscrew.

5.9 LEAKAGE ACROSS GASKET

Should any bonnet gasket leaks occur, tighten the bolts/nuts & studs (refer Appendix A, Table A and Figure 2). If leakage still persists, the bonnet gasket should be changed.

5.10 REASSEMBLY

1. Re-assemble in reverse order of disassembly.
2. For larger valves, lift up the bonnet using lifting lugs where provided. For smaller valves, gently and evenly break the bonnet seat with a lever (if required) before lifting the bonnet off (where required use with a sling mechanical lifting device). Clean gasket surface areas, replace gasket and refit bonnet.
3. Refer Appendix A, Table A and Figure 2 in the Appendix for bonnet bolt re-tightening procedure.

6.0 EXTRAORDINARY MAINTENANCE

6.1 STEM

If the stem locks or "freezes", causes can generally be attributed to dry worn packing or a dry yoke nut. In either of these cases, the following service is required:

a) Unscrew gland nuts, remove the gland flange and bushing to expose stem packing and lantern ring/ packing spacer (where applicable). Replace stem packing if it is damaged. If the lantern ring is seized, completely disassemble the stem and replace the lantern ring (where one is fitted). Smaller sizes and larger sizes with fugitive emission packing sets do not require spacers/lantern rings as standard.
b) Check lubrication of yoke nut. If it is dry, remove the yoke nut and determine if there is evidence of seizure marks. If so replace it with a new yoke nut.

6.2 GLAND DISASSEMBLY & REPLACEMENT OF STEM PACKING

In those cases where the valve cannot be removed from the piping system, it is important that prior to servicing, the valve be opened to its fullest extent and the valve be purged of any pressure and fluid (protective goggles should be worn). Partially unscrew nuts to reduce the compression load on the stuffing box. Next, if so equipped, remove the stem plug to check that there is no leakage. Remove the stem packing and, if so equipped, the lantern ring and bottom set of stem packing.

A compatible ribbon packing system or equivalent braided packing stock should be used but the emissions will be higher. Also, torque may increase. A stuffing box corrosion inhibitor is recommended. The joints in the packing rings should be diagonally cut. When installing the rings, care should be taken to stagger the ring joints. Where it is necessary to repack the valve in-line, ensure the line pressure is totally isolated prior to attempting to repack valve in-line. Wear anti-splash eye protection goggles.

Especially in the case of dangerous, hazardous, volatile, caustic or flammable liquids or gases, do not ever attempt to repack the valve in-line even if pressure has been isolated.

Other specialty packing such as V-ring Teflon will require that the valve be disassembled if repacking is required.

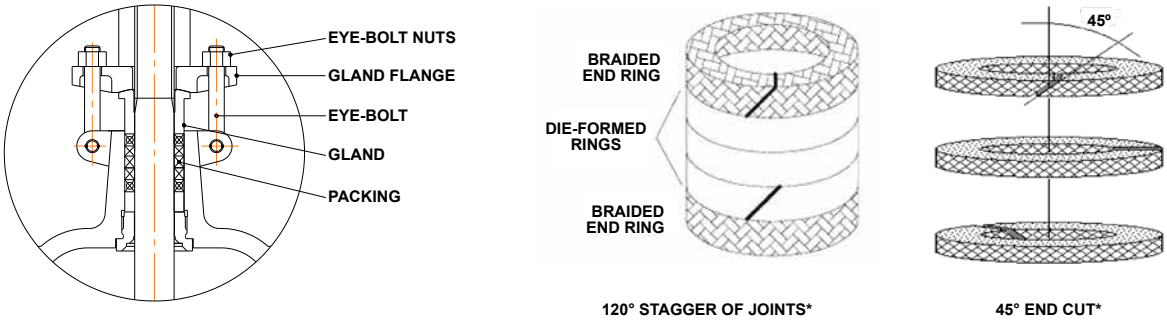
6.2.1 Stem Packing Replacement

First remove the valve from the line. To prevent injury ensure that all fluid and pressure is removed from the valve both upstream and downstream before removal and disassembly. When removing drain or stem plug wear protective eye masks to avoid injury.

1. Check tightness of valve operation to serve as a reference when re-tightening. Remove gland nuts and the hook. Lift the gland up the stem clear away from the packing chamber.
2. Remove the defective packing rings with a sharp tool or packing hook. Do not scratch or score the machined surfaces of the stem or packing chamber.
3. Examine the machined surfaces of the stem and packing chamber. Remove any scratches, scoring or burrs with an emery cloth or by hand filing. Clean the stem with a solvent soaked rag.
   Scratches to the stem and the packing chamber no deeper than 0.25mm (0.010") can be removed by polishing the surface with a buffing wheel. The surface finish of the packing chamber should be Ra 3.2µm and the stem should be Ra 0.8µm.
4. Count original number of rings and measure x-section thickness. If original packing cannot be counted or measured, follow the steps below:

   a) Measure the stem diameter (OD), stuffing box diameter (ID) and stuffing box depth (d).
   b) Packing x-section (R)=(ID - OD)/2
   c) # rings = (1.25 x d)/R
5. Install new packing. Use a genuine APV low emission, low friction packing set. If using standard coils of packing material: cut each ring at a 45 degree angle and stagger the joints at 120 degrees, every fourth joint will be in the same position as the first. Install rings individually using a split ring spacer, compressing each ring by hand tightening + 1/4 turns on each packing gland nut.
6. When packing chamber becomes filled with packing, reassemble gland and gland flange. Alternate tightening packing gland flange nuts 1/4 turn at a time until eyebolts begin to get tight. (If gland travels more than the height of one packing ring into the packing chamber, insert one more ring and repeat step 6. until chamber is filled).
7. Compare valve operation to original tightness. If valve operation is considerably tighter than original operating tightness, back off 1/4 turn on each gland nut & recheck tightness. Where proprietary packing sets are used such as (example only) Garlock EVSP 9000, Burgmann 6070 or Chesterton 1622 please consult packing manufacturer's torques. The serialised as-built drawing will indicate the packing used, please refer to APV. Various packing types, materials, proprietary combinations and styles with and without spacers/lantern rings, etc, and torque limitations of some bolting materials, bonnet design variations, stuffing box and stem smoothness, means it is not possible to safely publish recommended torques for packing. In addition, higher pressure ratings will require higher torques especially if media types are hazardous or more leak searching prone such as gas and steam.
8. Several hours after a repacked valve has been returned to service, inspect the packing area to ensure full compression, tight bolting and no leakage. Should leakage occur, tighten gland nuts at 1/4 turn increments until leakage stops. Do not over tighten or valve will become difficult to turn.

FIGURE 1



Stuffing Box*

Stem Packing*

* Example only, refer to as-built drawing. Genuine APV die formed/moulded packing sets are essential for fugitive emission service.

Note

The stem packing style will vary according to valve size, type and class as well as the stem packing material specified. Examples include combination sets, wire reinforced braided packing, PTFE Chevron moulded sets, live loaded sets.

6.3 BONNET DISASSEMBLY & STEM REPLACEMENT

Before disassembly:

1. Check that the line is in a complete shut down phase then remove the valve from the line.
2. Pre-order all necessary spare gland packings and jointing gaskets.
3. Open the valve slightly by turning the handwheel anti-clockwise and loosen the gland.
4. Put identification markings on valve body, bonnet, disc/wedge, yoke and actuator. This helps to avoid mismatching of parts at the time of re-assembly.
5. If the bolts and nuts are too tight, apply deep penetrating oil then unscrew.

To replace the stem when the valve is completely disassembled for general maintenance follow this procedure:

- Open valve half way then remove bonnet bolts and nuts.
- Lift up the bonnet to remove wedge. The wedge has to be reassembled in the same position as originally assembled: take care not to rotate it 180°. The valve could leak through the seats if wedge is rotated.
- With the bonnet removed, unscrew the gland bolts then lift up gland flange exposing the stem packing.
- Remove stem packing above the lantern ring (if so required) and then turn the hand wheel to force the stem down.
- Remove the stem through the stuffing box. Turn the bonnet up side down and remove lantern ring.
- If so equipped, remove stem packing below the lantern ring.

Always be sure that the valve is de-pressurised and isolated prior to performing any maintenance work. Do not attempt to repair valve in-line if volatile, dangerous, hazardous or flammable service.

Welded bonnet valves can be replaced but otherwise are not repairable.

6.3.1 Bolted Bonnet Removal & Gasket Replacement

Always replace the bonnet gasket whenever a valve is disassembled. Gasket sealing surface should be scraped clean (avoid radial marks).

1. Disassemble all cover bolts and nuts.
2. Lift up the bonnet using lifting lugs where provided, evenly break the bonnet seal with a lever if required before lifting the bonnet off (where required with a sling and mechanical lifting device).
3. Clean gasket surface areas, replace gasket and refit bonnet as detailed below.

6.3.2 Pressure Seal Bonnet Removal & Gasket Replacement

Refer APV Gate & Globe valve IOMs.

7.0 OTHER MAINT. & REPAIRS

This IOM is a generic general overview. Due to the relatively low replacement cost of small diameter standard carbon steel valves under 100NB (4"), it is usually less expensive to replace the complete valve than to have maintenance personnel effect repairs. Generally, the only justifiable repairs are replacement of packing and gaskets as previously described. For more detailed maintenance instructions* refer to the APV Cast Gate Valve IOM, which also covers the key elements of parallel slide valves, even though the spring loaded disc design can vary* (see note below). Refer to the APV Cast Check Valve IOM section 3.0 and 4.0, which also covers piston check valves. Refer to the APV Globe Valves IOM section 3.0 to 6.0, which covers globe valves and screw down non-return (stop check) valves. For speciality valves such as piston type globe valves and bellows sealed gate and globe valves there are some differences but this IOM provides a generic overview for these valves. For Forged Globe & Gate valves also refer the APV Forged Gate & Globe valve IOM. Refer to APV for specific instructions pertaining to these valves if further information is required.

Only a specialist APV repairer should conduct reconditioning. Refer to the as-built drawing.

* There are so many different configurations it is not possible to cover all configurations. Contact your nearest APV approved repairer facility for more information.

During maintenance or servicing of the valve, all replacement parts must be the same as the original specification (parts dimensions and materials). End user may also purchase the spare parts such as packing, gaskets, bolt/nuts, etc. when ordering the valve. With the new packing, gasket or bolt/nuts installed, the valve must be applicable pressure testing prior to installation and service.

APPENDIX A

INDICATIVE BONNET BOLTING (BOLTED BONNET) TORQUE NM

TABLE A

Stud Size	Bolting Material			
	B7M/L7M	B7/B16/L7	B8/B8M CL.1	B8/B8M CL.2
3/8 - 16 UNC	15 (20)	20 (27)	15 (20)	20 (27)
7/16 - 14 UNC	25 (34)	30 (41)	22 (30)	25 (34)
1/2 - 13 UNC	40 (54)	50 (68)	35 (47)	45 (61)
9/16 - 12 UNC	55 (75)	70 (95)	55 (75)	65 (88)
5/8 - 11 UNC	75 (102)	100 (136)	70 (95)	85 (115)
3/4 - 10 UNC	135 (183)	170 (231)	125 (170)	150 (203)
7/8 - 9 UNC	200 (271)	270 (366)	170 (230)	200 (271)
1 - 8 UNC	350 (475)	400 (542)	219 (298)	350 (475)
1 1/8 - 8 UN	500 (678)	520 (705)	256 (398)	450 (610)
1 1/4 - 8 UN	675 (915)	850 (915)	321 (498)	650 (881)
1 3/8 - 8 UN	900 (1220)	1200 (1627)	384 (598)	900 (1220)
1 1/2 - 8 UN	1200 (1627)	1500 (2034)		1200 (1627)
1 5/8 - 8 UN	1600 (2170)	2000 (2712)		1501 (2035)
1 3/4 - 8 UN	2000 (2712)	2500 (3390)		1907 (2585)
1 7/8 - 8 UN	2500 (3390)	3100 (4204)		2357 (3195)
2 - 8 UN	3000 (4068)	3800 (5153)		2876 (3898)
2 1/8 - 8 UN	3600 (4882)	4500 (6102)		
2 1/4 - 8 UN	4400 (5966)	5400 (7322)		
2 1/2 - 8 UN	6000 (8136)	7500 (10170)		

Note:

(1) Torques shown are for A193 B7/B7M/B16/B8/B8M and A320 L7/L7M/B8/B8M.
(2) Torque tolerance ±10%.
(3) For temperatures above 750°F (400°C) use 75% of the torque values.
(4) Above torque values are with the bolts lubricated.
(5) Values above are based on 30,000 psi (206.85 Mpa) bolting stress and lubricated with heavy graphite and oil mixture or a copper based anti-seize grease.
(6) Do not exceed by more than 25% of values stated when emergency torquing is required.
(7) All bolts shall be torqued in the pattern as shown in Figure 2 on next page to ensure uniform gasket loading.
(8) Optimum torque can vary depending on type of body gasket but do not increase torque more than 10% above those shown.
(9) Consult us for other bolt material.
(10) Most B8M and B8 bolts are class 1 so do not assume class 2 unless you are sure.
(11) For 'pressure seal' bonnet torques consult APV.

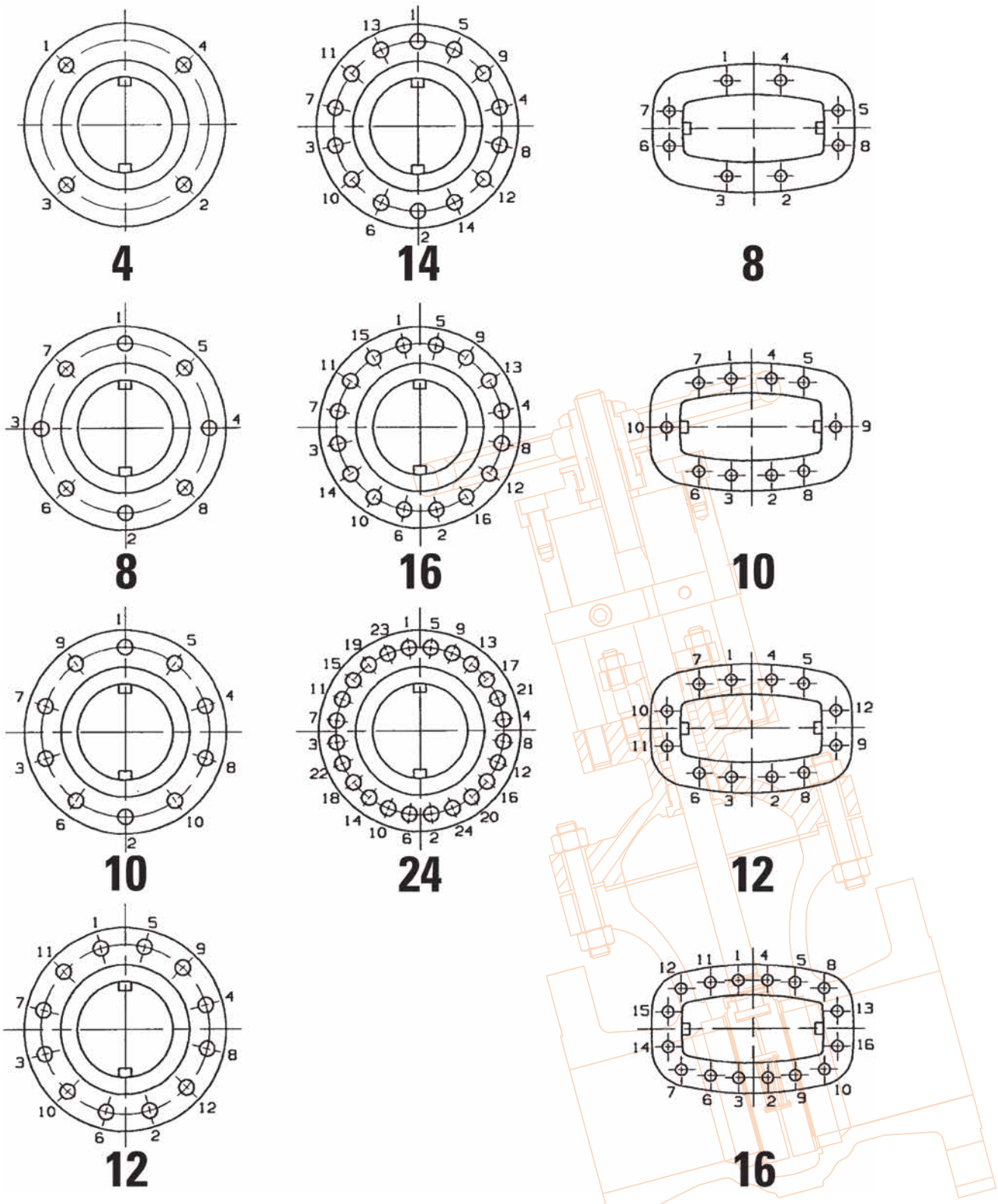
Note

Bolt tensions shown must be decreased by 25% when other or no lubrication used. Non lubricated bolts can have an efficiency of less than 50% the torque of values stated. Indicative torques are shown only, different body gasket systems, different sizes & classes, etc., will have different torque requirements. Furthermore, other stud grades can have much lower torques depending if class 1 or class 2 and or above variables.

APPENDIX A - CONT.

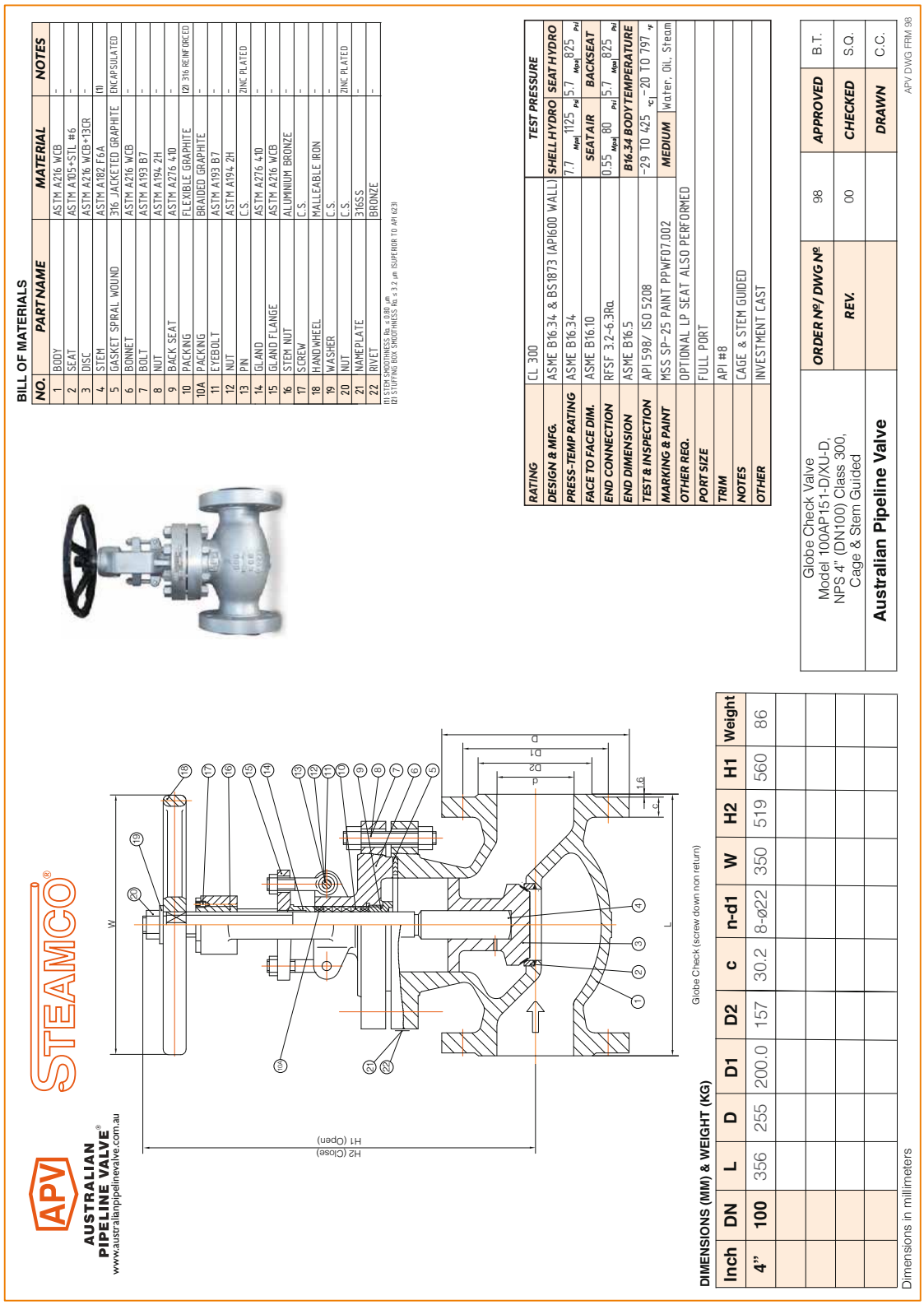
BOLT TIGHTENING SEQUENCE

FIGURE 2



APPENDIX B

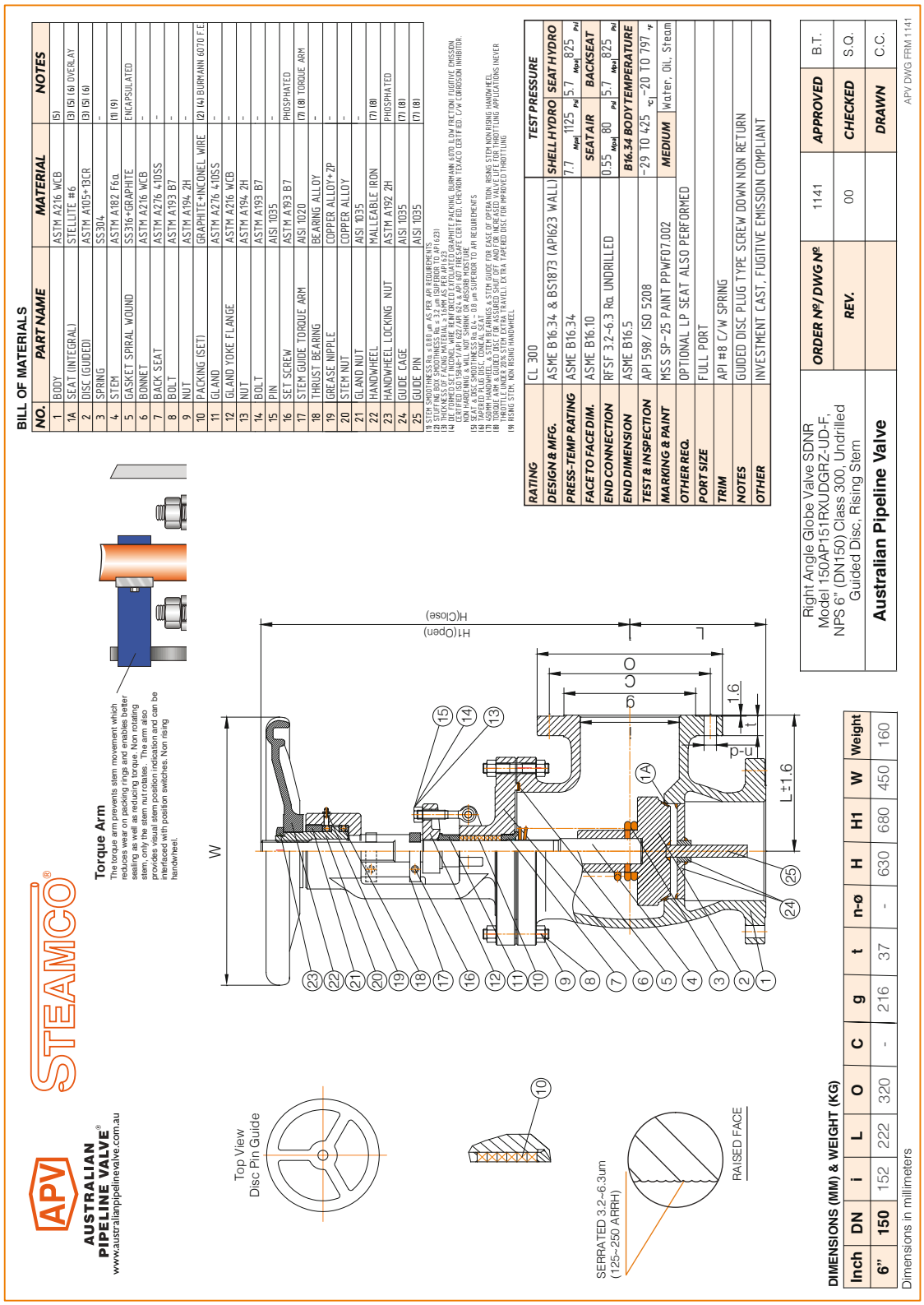
EXPLODED B.O.M. GLOBE CHECK VALVE



Example only, refer to as-built drawing.

APPENDIX B - CONT.

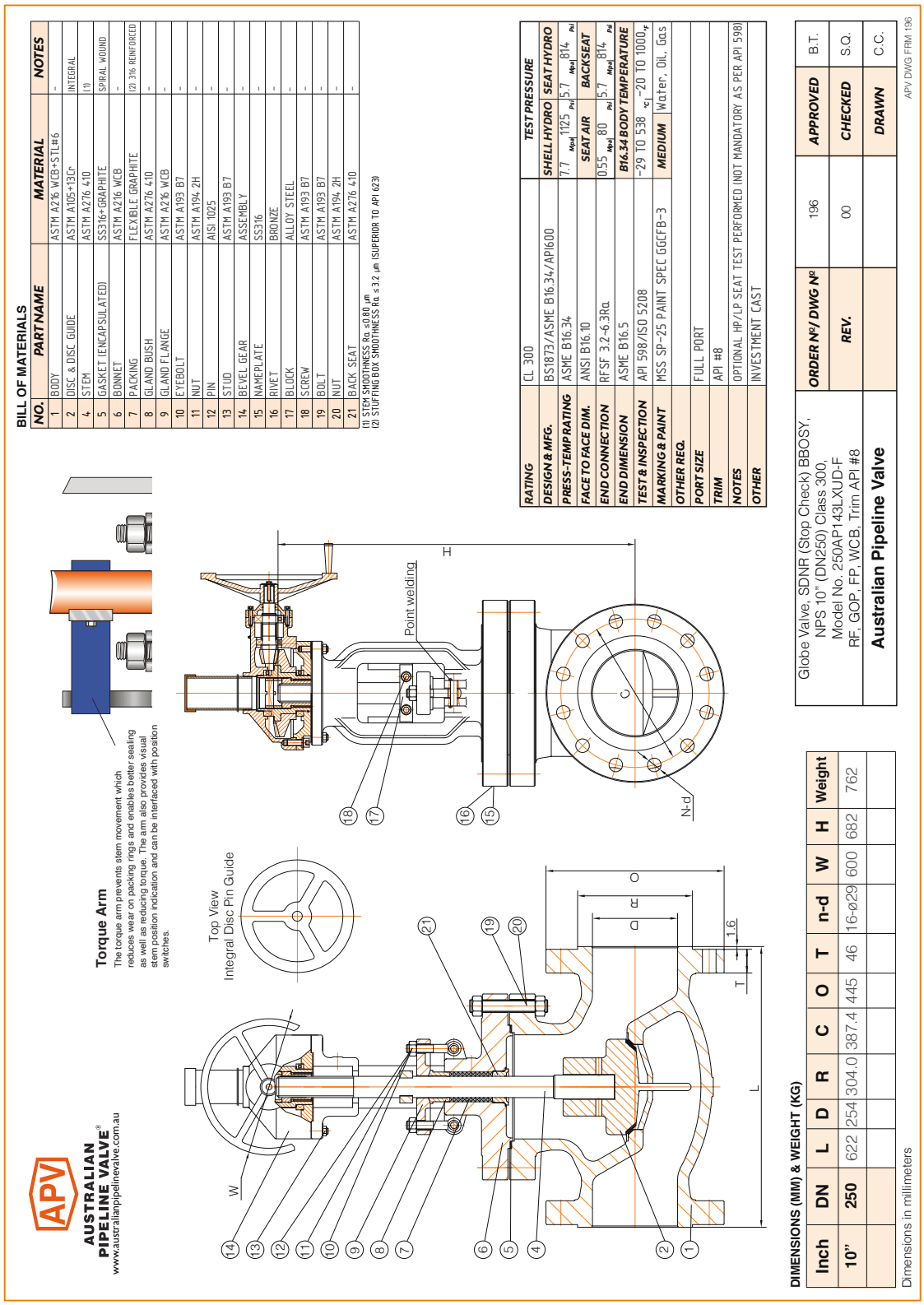
EXPLODED B.O.M. RIGHT ANGLE GLOBE VALVE



Example only, refer to as-built drawing.

APPENDIX B - CONT.

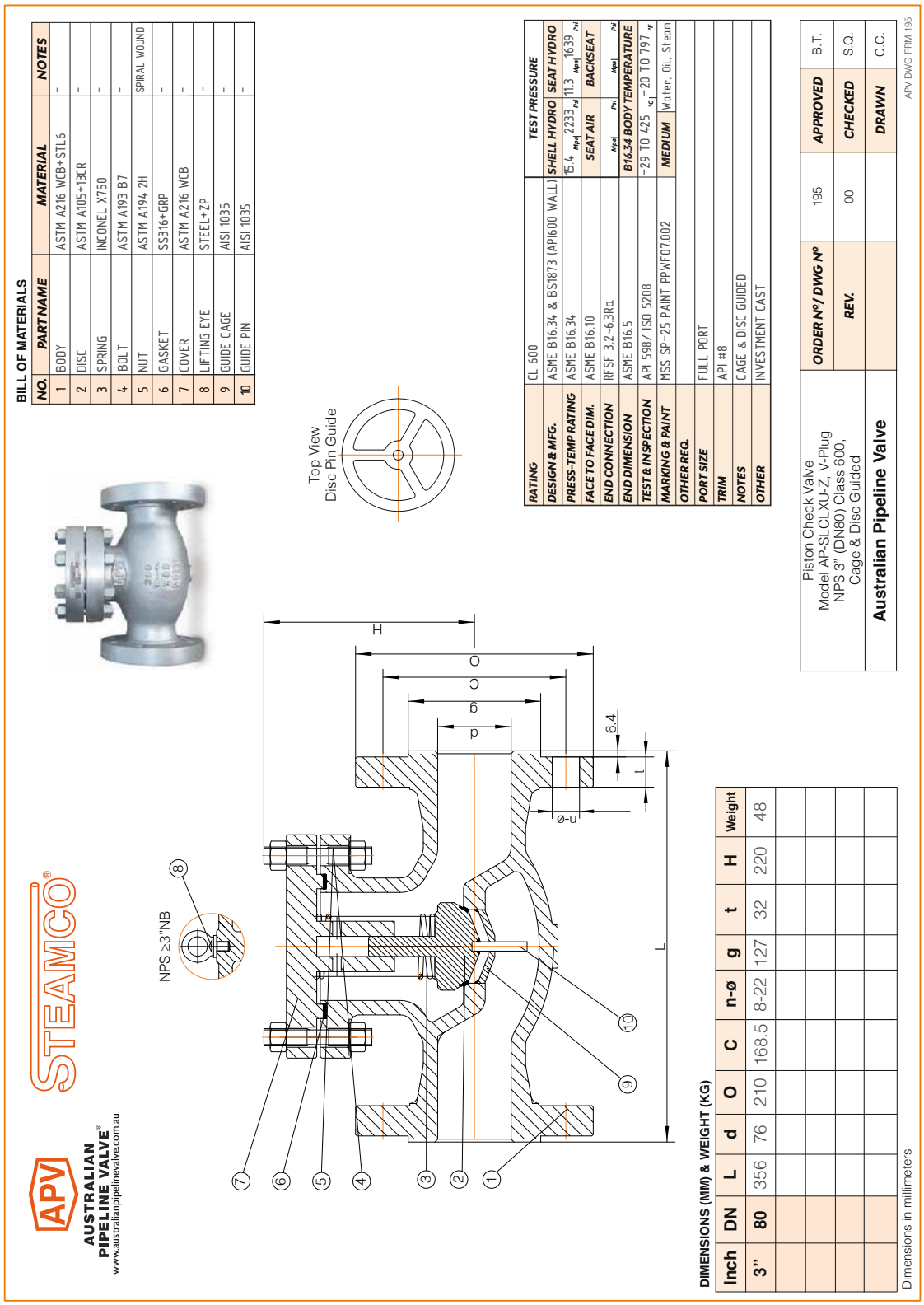
EXPLODED B.O.M. SDNR GLOBE VALVE



Example only, refer to as-built drawing.

APPENDIX B - CONT.

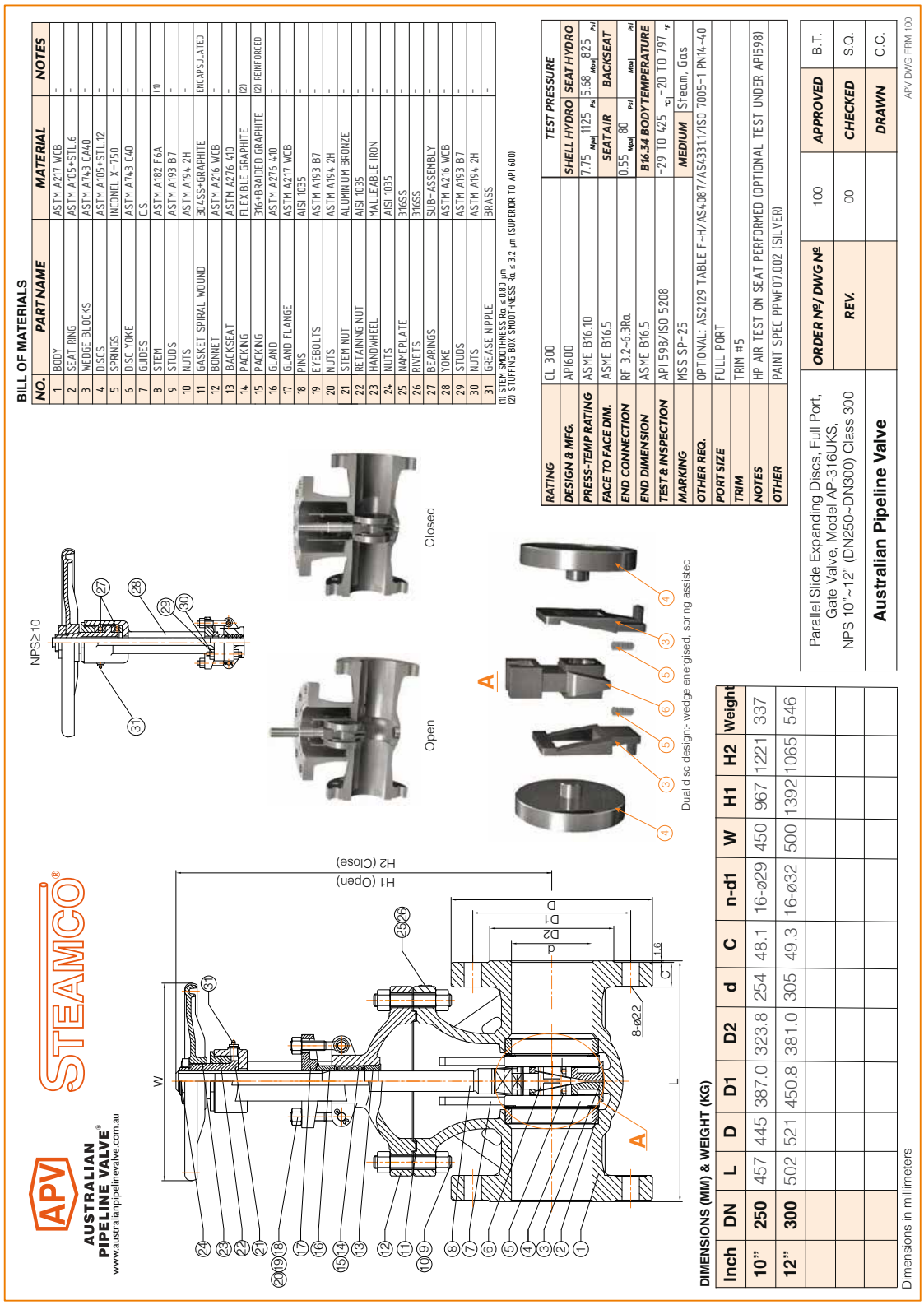
EXPLODED B.O.M. PISTON CHECK VALVE



Example only, refer to as-built drawing.

APPENDIX B - CONT.

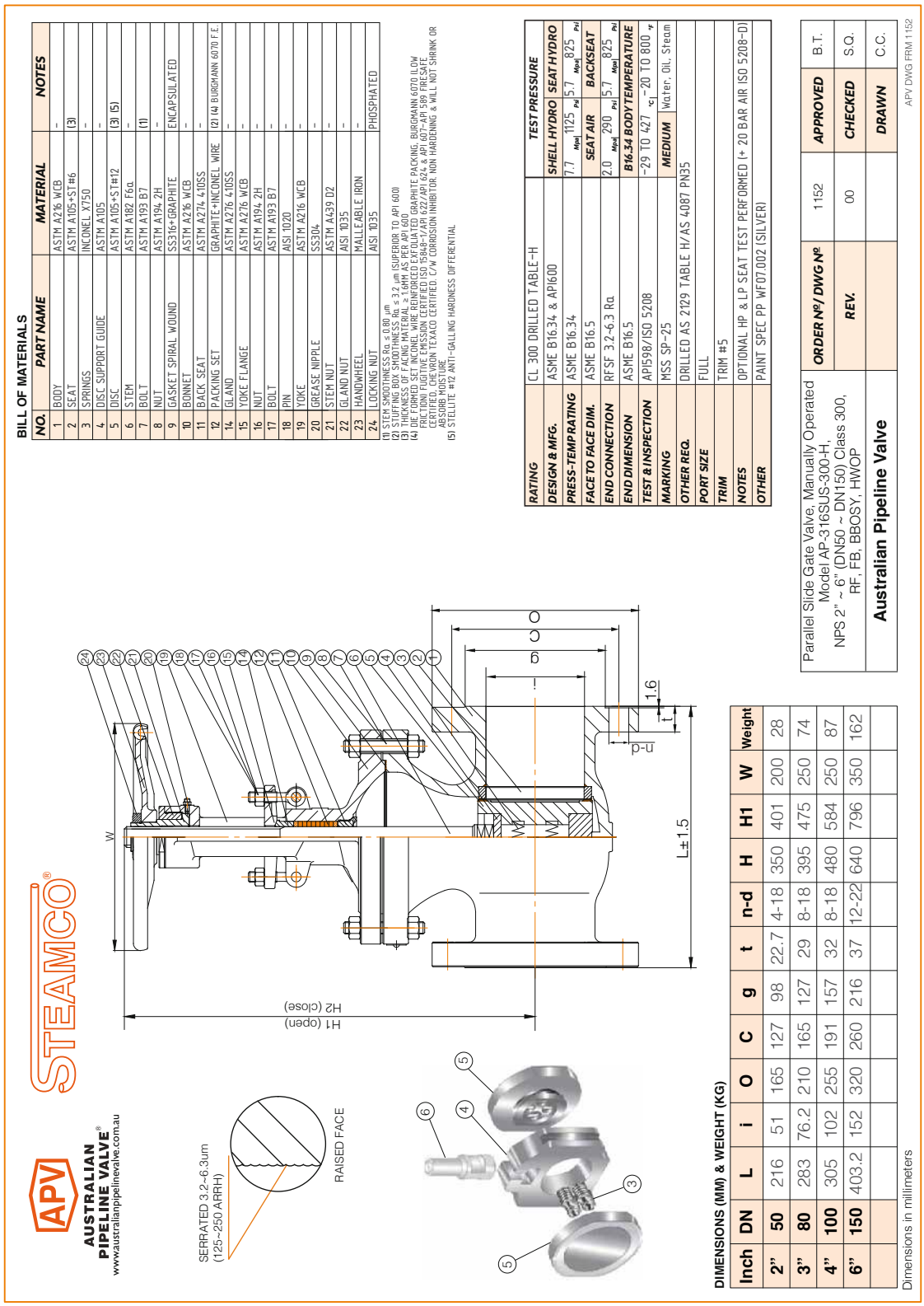
EXPLODED B.O.M. PARALLEL SLIDE GATE VALVE



Example only, refer to as-built drawing.

APPENDIX B - CONT.

EXPLODED B.O.M. PARALLEL SLIDE GATE VALVE



BILL OF MATERIALS

NO.	PART NAME	MATERIAL	NOTES
1	BODY	ASTM A216 WCB	–
2	SEAT	ASTM A105+ST#6	(3)
3	SPRINGS	INCONEL X750	–
4	DISC SUPPORT GUIDE	ASTM A105	–
5	DISC	ASTM A105+ST#12	(3) (5)
6	STEM	ASTM A182 F6a	–
7	BOLT	ASTM A193 B7	(1)
8	NUT	ASTM A194 2H	–
9	GASKET SPIRAL WOUND	SS316+GRAPHITE	ENCAPSULATED
10	BONNET	ASTM A216 WCB	–
11	BACK SEAT	ASTM A274 410SS	–
12	PACKING SET	GRAPHITE+INCONEL WIRE	(2) (4) BURGMANN 6070 F.E.
14	GLAND	ASTM A276 410SS	–
15	YOKE FLANGE	ASTM A276 WCB	–
16	NUT	ASTM A194 2H	–
17	BOLT	ASTM A193 B7	–
18	PIN	AISI 1020	–
19	YOKE	ASTM A216 WCB	–
20	GREASE NIPPLE	SS304	–
21	STEM NUT	ASTM A439 D2	–
22	GLAND NUT	AISI 1035	–
23	HANDWHEEL	MALLEABLE IRON	–
24	LOCKING NUT	AISI 1035	PHOSPHATED

(1) STEM SMOOTHNESS Ra ≤ 0.80 µm
(2) SEAT FACE SMOOTHNESS Ra ≤ 3.2 µm (SUPERIOR TO API 600)
(3) THICKNESS OF FACING MATERIAL ≥ 3.6MM AS PER API 600
(4) DIE FORMED SET INCONEL WIRE REINFORCED EXFOLIATED GRAPHITE PACKING, BURGMANN 6070 (LOW FRICTION) FUGITIVE EMISSION CERTIFIED ISO 15848-1/API 622/API 624, & API 607-API 589 FIRESAFE CERTIFIED, CHEVRON TEXACO CERTIFIED. C/W CORROSION INHIBITOR. NON HARDENING & WILL NOT SHRINK OR ASSUME PLASTIC FLOW.
(5) STELLITE #12 ANTI-GALLING HARDNESS DIFFERENTIAL

TEST PRESSURE		
	SHELL HYDRO	SEAT HYDRO
	7.7 Mpa 1125 Psi	5.7 Mpa 825 Psi
	SEAT AIR	BACKSEAT
	2.0 Mpa 290 Psi	5.7 Mpa 825 Psi

RATING	CL 300 DRILLED TABLE-H
DESIGN & MFG.	ASME B16.34 & API600
PRESS-TEMP RATING	ASME B16.34
FACE TO FACE DIM.	ASME B16.5
END CONNECTION	RFSF 3.2~6.3 Ra
END DIMENSION	ASME B16.5
TEST & INSPECTION	API598/ISO 5208
MARKING	MSS SP-25
OTHER REQ.	DRILLED AS 2129 TABLE H/AS 4087 PN35
PORT SIZE	FULL
TRIM	TRIM #5
NOTES	OPTIONAL HP & LP SEAT TEST PERFORMED (+ 20 BAR AIR ISO 5208-D)
OTHER	PAINT SPEC PP WF07.002 (SILVER)
B16.34 BODY TEMPERATURE	
MEDIUM	Water, Oil, Steam
	-29 TO 427 °C -20 TO 800 °F

Parallel Slide Gate Valve, Manually Operated
Model AP-316SUS-300-H,
NPS 2" ~ 6" (DN50 ~ DN150) Class 300,
RF, FB, BBOSY, HWOP

Australian Pipeline Valve

ORDER Nº/ DWG Nº	1152	APPROVED	B.T.
REV.	00	CHECKED	S.Q.
		DRAWN	C.C.

APV DWG FRM 1152

DIMENSIONS (MM) & WEIGHT (KG)

Inch	DN	L	i	O	C	g	t	n-d	H	H1	W	Weight
2"	50	216	51	165	127	98	22.7	4-18	350	401	200	28
3"	80	283	76.2	210	165	127	29	8-18	395	475	250	74
4"	100	305	102	255	191	157	32	8-18	480	584	250	87
6"	150	403.2	152	320	260	216	37	12-22	640	796	350	162

Dimensions in millimeters

Example only, refer to as-built drawing.

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IOM Steamco Gate Globe Check