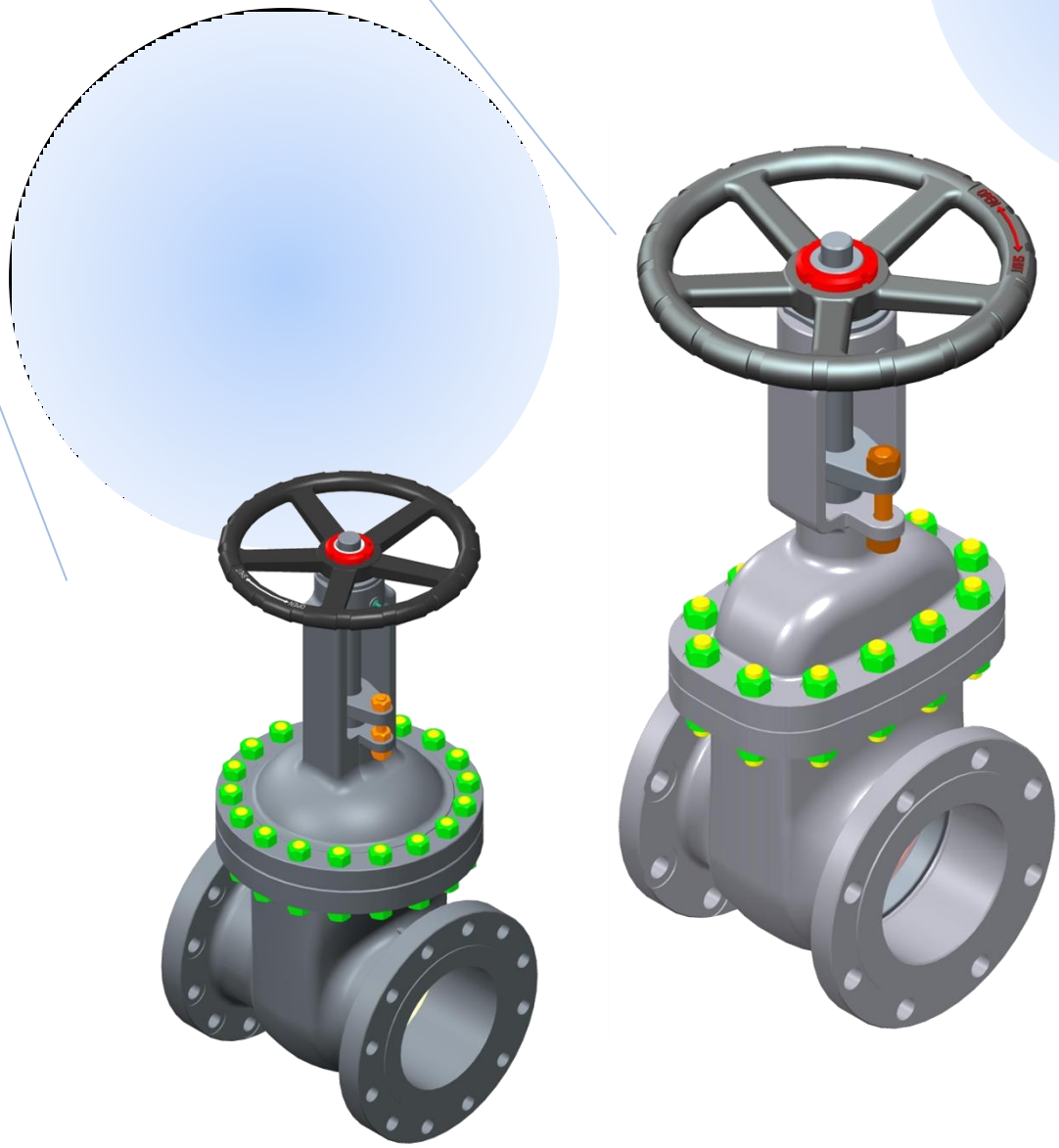
L&T Valves



Installation, Operation & Maintenance Manual

Bolted Bonnet Gate Valves

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1 Introduction

1.1 Scope

This manual covers the Installation, Operation and Maintenance (IOM) procedures of *Larsen & Toubro Limited's (L&T Valves)* Low Pressure Bolted Bonnet Gate Valves.

The Low Pressure range of Gate Valves is designed in accordance with API 600 and ASME B16.34, Standard and Special, Pressure Class ratings from 150 to 600.

Mail us at: valves@larsentoubro.com

Visit us at: www.lntvalves.com

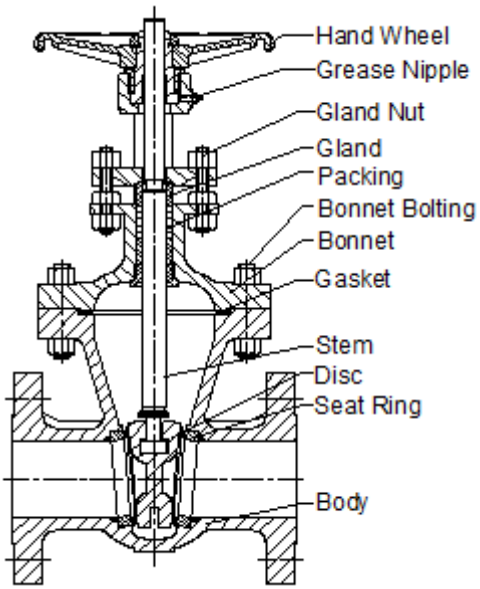
2 General Safety

2.1 Precautions

1. Work shall be carried out in accordance with safe systems and all site health and safety rules shall be observed.
2. Line pressure shall always be **fully de-pressurized and drained** before,
   i. Gasket or Packing removal
   ii. Dismantling the motor or gear unit
   iii. Removing the valve from the line for maintenance and inspection
3. When installing or maintaining valves, conduct a risk assessment and eliminate or reduce hazards to an acceptable level.
4. Due to the variety of duties in which this product can be deployed, the end user shall ensure the compatibility of the media with the material of construction of product for each specific application.
5. Before the equipment is installed in areas, which may be subject to extreme seismic activity, consult L&T Valves with available data.
6. **Do's & Don'ts**
   i. Wear all necessary protective equipment for conducting the work.
   ii. Never remove or maintain a valve or joint unless the line has been fully drained and de-pressurized.
   iii. Ensure that the valves are used within the pressure temperature service conditions as per **ASME B 16.34 Section 2**. Also refer the Identification Plate for pressure and temperature limits. In case of additional assistance, consult with L&T Valves.
   iv. Always operate the valve to full open position to ensure that no trapped pressure exists within the cavity.
   v. Any modification of a L&T valve, to accept a gear operator, motor operated, or hydraulic/pneumatic operator should be accomplished using only those designs authorized by L&T Valves.

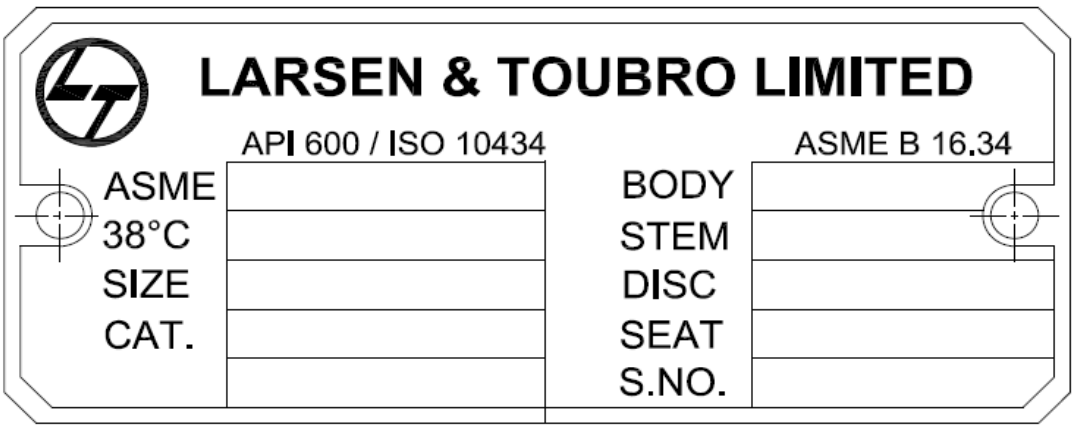
3 Typical Gate valve

Standard L&T gate valves are multi-turn valves with rising stem and non-rising hand wheel. Fluid flow is in a straight line in a gate valve. This Construction offers minimum pressure drop in service.



4 Identification Plate marking

Every valve is provided with a stainless steel identification plate fixed to the yoke or the bonnet flange. The details on the identification plate are as follows:



Valves shall not be used for more than the pressure indicated with temperature as indicated in identification plate.

5 Storage / Handling

a. All Gate valves are shipped in closed position with the end flange protectors in place. In all direct hand wheel operated valves, the hand wheel is fitted to the valve, while in gear operated valves, the hand wheel is sent separately and needs to be assembled at site.

b. Valves shall be stored in a clean dry environment and suitably covered to prevent ingress of moisture and dust.

c. All valves shall be handled with slings across the body of the valve.

6 Planning & Responsibilities

a. When installing or maintaining valves.

b. Conduct a risk assessment and eliminate or reduce hazards to an acceptable level.

c. Follow safe systems of works.

d. Observe all site health and Safety rules.

e. Due to the variety of duties in which this product can be employed, it is the end users responsibility to ensure the compatibility of the media with the material of construction of product for each specific application.

f. Before equipment is installed in areas, which may be subject to extreme seismic activity, consult L&T sales with data. (To be done at enquiry stage)

6.1 Do's & Don'ts

a. Wear all necessary protective equipment for conducting the work.
b. Never remove or maintain a valve or joint unless the line has been fully and de pressurized and drained.
c. Always operate the valve to the open position to ensure that no trapped pressure exists within the cavity.
d. Ensure that the valves are used within the pressure temperature service conditions as per ASME B16.34 Sec 2. Also refer identification plate for pressure and temperature limits. In case of additional assistance, consult with L&T.
e. The valve hand wheels are designed only for operation. The hand wheel must not be used for handling the valve.
f. Do not lift the valve by the bypass arrangement, gear unit or actuator, which would lead to damage of valve operating elements.

7 Preparation for Installation

a. When shipped, rust preventive oil is applied on the valve bore and other exposed machined surfaces. This can be removed with a commercial solvent if necessary.
b. Operate the valve to open position and check valve internals are clean and free of dirt, grit and other extraneous particles.
c. In flanged end valves the raised face should be cleaned and free of any damage / score mark.
d. In BW end valves ensure that the end preparation is in line with the mating part and free from any damage / nicks etc.
e. Ensure that the pipeline has been flushed free of dirt, weld spatter etc before installation.
f. Use proper gaskets and bolting as per the standard recommendations for installing the valves on the line.
g. For BW end valves, field joints connecting valves & pipes shall be done by qualified welders using approved WPS/PQR to recognized standards like ASME Sec IX.

Warnings:

All valves are pressure tested at the factory. Should customer desire a test before installation, ensure test pressures are as per the ASME B16.34 section 7 and API 598 requirements.

8 Installation

a. Standard valves can be installed in either direction. Valves identified with "high pressure side" and upstream hole are unidirectional and must be installed in the direction with the label on the upstream side.
b. The valve shall be kept in the closed position when installing on the pipeline.
c. Valves shall be installed with the stem in a vertical position or in a position above the horizontal. Use of valves with the stem position in vertically down below is not recommended.
d. Installation of flanged valves shall follow prevailing site standards. The following will also be considered.

8.1 Installation of valves with Flanged End Construction

a. The valve ends and the pipe ends / flanges should be aligned.
b. Pipe work in flanged construction shall have the correct gap to allow for the valve face-to-face and assembled gasket thickness.
c. Flange fasteners for end flanges shall be of the correct size, length and material for the service conditions. As a minimum the material shall be compatible to one used for valve bonnet / bolting
d. Assemble all bolts and hand tight. Evenly tighten the bolts at diametrically opposite end to the correct torque required for the specific gasket material.

8.2 **Installation of valves with BW End Construction**

a. The valve ends and the pipe ends shall be aligned.
b. Pipe work in BW end construction shall also have the correct gap to allow the end-to-end dimension of the valve.
c. Correct welding material shall be used as per approved procedures for welding.

Warning:
Valves shall be kept in the closed position during welding.

8.3 Ensure that there is access to the hand wheel for convenient operation of the valve. When required, necessary extension arrangements such as chain wheel and extension arrangements can be considered.

9 Operation

a. Gate valves should be used in the fully closed or fully open position only. Gate valves must never be used for regulation duty.
b. Valves are opened by turning the hand wheel in the anti-clockwise direction and closed by rotating in the clockwise direction. An arrow mark is provided in the hand wheel for easy identification. Personnel protection equipment e.g. gloves shall be used when operating the valve.
c. Gear operated valves are fitted with fully enclosed water proof gear units. Gear housing is filled with lubricant and under normal operating condition, no maintenance is required.
d. For electrically operated valves;
    i. Ensure correct phase connection to avoid failure of the actuator
    ii. Do not disturb the torque and position setting as set in the factory. (Close position is done on torque and open limit is done by position setting.)

Warning:

In electrically operated valves, do not set the open limits switch with torque, since the back seat will get damaged

10 Reorientation of Gear Unit

a. In actual installation if the gear unit requires reorientation, it is necessary to proceed as follows

b. To start with unscrew the stem protector / enclosure.

i. Unscrew the bolts holding the gear unit to the bonnet/yoke flange.
ii. Lift the gear unit by proper winch and perform the rotation every 90◦.
iii. Reinstall the gear unit on valve.
iv. Tighten the bolts and nuts of valve-gear unit connection.

Warning:

In services where there is a possibility of pressure built up in entrapped liquid in the body cavity, it is necessary to address cavity relief either by an upstream hole or other relieving devices. These valves are unidirectional and should be installed with the pressure relief to the upstream side only.

In valves fitted with PTFE gland packing, and gasket with PTFE filler, which have been exposed to an external fire, it is recommended that the packing and the gasket be changed immediately before further use of the valve.

For Ferritic steel materials (ASTM A105, ASTM A216 Gr. WCB, ASTM A216 Gr. WCC etc.), if the lowest scheduled operating temperature is above 0°C, but due to climatic conditions (e.g., during startup) the valve is subjected to operating temperatures below 0°C, a lower pressure than the design pressure should be ensured until the metal temperature has risen above 0°C. This is to deal with risk of brittle failure.

11 Maintenance

L&T gate valves are of rugged construction. The following checks would help ensure good performance of the valve over an extended period.

11.1 Lubrication

a. Ensure that the stem threads are smeared with adequate amount of lubricant (commercial grease) which would ensure smooth operation

b. Regular lubrication of the yoke sleeve with commercial grease would help reduce friction and ensure smooth operation. The frequency of lubrication would depend on the frequency of operation of the valve and ambient service

conditions. This lubrication is done by injecting through the grease nipple provided in the bonnet/yoke of the valve.

c. For certain graphite gland packing, in the event of high torque, it is suggested that a drop of light oil be smeared on the plain shank of the stem.

11.2 Gland

In the event of leakage of line fluid through the gland area, check the gland nut for tightness. Tighten evenly if necessary. The Gland Tightening Torque should be as follows

Valve Size	Class 150		Class 300		Class 600	
	Stud Size	Torque	Stud Size	Torque	Stud Size	Torque
2"	1/2"-13 UNC-2A	13	1/2"-13 UNC-2A	13	1/2"-13 UNC-2A	16
3"	1/2"-13 UNC-2A	13	1/2"-13 UNC-2A	13	1/2"-13 UNC-2A	20
4"	1/2"-13 UNC-2A	16	1/2"-13 UNC-2A	16	5/8"-11 UNC-2A	37
6"	5/8"-11 UNC-2A	29	5/8"-11 UNC-2A	31	3/4"-10 UNC-2A	71
8"	5/8"-11 UNC-2A	31	5/8"-11 UNC-2A	34	3/4"-10 UNC-2A	75
10"	5/8"-11 UNC-2A	34	3/4"-10 UNC-2A	55	3/4"-10 UNC-2A	85
12"	3/4"-10 UNC-2A	55	3/4"-10 UNC-2A	59	3/4"-10 UNC-2A	107
14"	3/4"-10 UNC-2A	59	3/4"-10 UNC-2A	62	1"-8 UN-2A	190
16"	3/4"-10 UNC-2A	62	3/4"-10 UNC-2A	66	1"-8 UN-2A	218
18"	3/4"-10 UNC-2A	66	3/4"-10 UNC-2A	83	1"-8 UN-2A	226
20"	3/4"-10 UNC-2A	83	7/8"-9 UNC-2A	103	-	
24"	7/8"-9 UNC-2A	126	1"-8 UN-2A	164		
26"	7/8"-9 UNC-2A	125	-			
28"	1"-8 UN-2A	170	1 1/4"-8 UN-2A	295		
30"	1"-8 UN-2A	170	1 1/4"-8 UN-2A	295		
32"	1"-8 UN-2A	170	1 1/4"-8 UN-2A	295		
34"	1"-8 UN-2A	186	-			
36"	1"-8 UN-2A	186	1/2"-13 UNC-2A	391		
38"	1"-8 UN-2A	186	-			
40"	1/2"-13 UNC-2A	521				
42"	-		1 1/4"-8 UN-2A	425		

11.3 Bonnet Gasket

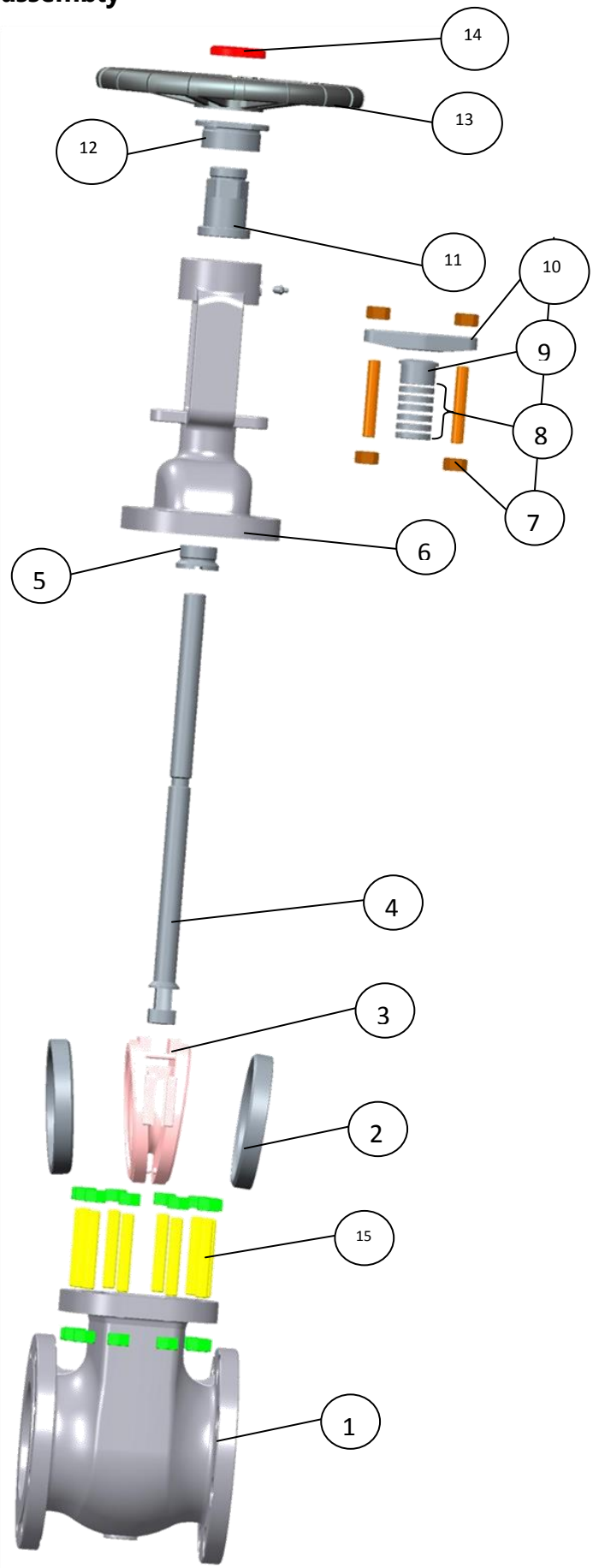
In high temperature services, there is a possibility of creep in the bonnet studs. Regular checking of the bonnet – studs for tightness, would help prevent leakage through the bonnet gasket. Tightening should be done evenly in a sequence of diametrically opposite nuts. The Tightening Torque for Bonnet studs should be as follow

Stud Size	B7/ B16 / L7	B7M / L7M	B8 CL.2 / B8M CL.2
	Torque (Nm)	Torque (Nm)	Torque (Nm)
3/8"-16 UNC-2B	27	20	27
7/16"-14 UNC-2B	40	35	35
1/2"-13 UNC-2B	75	60	60
9/16"-12 UNC-2B	90	75	90
5/8"-11 UNC-2B	135	110	115
3/4"-10 UNC-2B	260	200	200
7/8"-9 UNC-2B	390	285	270
1"-8 UNC-2B	530	475	475
1 1/8"-8 UN-2B	775	675	600
1 1/4"-8UN-2B	1100	950	900
1 3/8"-8 UN-2B	1500	1300	1020
1 1/2"-8 UN-2B	1900	1700	1290
1 5/8"-8 UN-2B	2450	2150	1630
1 3/4"-8 UN-2B	3120	2750	2040
1 7/8"-8 UN-2B	3800	3310	2510
2"-8 UN-2B	4610	4110	3060
2 1/4"-8 UN-2B	6650	5850	4410
2 1/2"-8 UN-2B	8950	7970	5970
2 3/4"-8 UN-2B	11950	10620	7870
3"-8 UN-2B	15600	13730	10310

12. General Troubleshooting

Issue	Probable cause	Solution
Leakage through the stem packing	a) Gland nuts are loose b) Gland is binding against the stem or packing chamber wall c) Inadequate amount of packing rings d) Packing is hard and dry e) Packing was not properly cut and staggered f) Stem is damaged	a) Tighten gland nuts. b) Ensure gland is centered and evenly tightened c) Install additional packing rings. d) Replace with new packing. e) Replace with new packing. f) Repair or replace as required.
Problems while operating the valve	a) Stem binding during travel b) Packing is exerting excessive force on the stem c) Stem is damaged d) Internal components may be damaged	a) Remove dirt and lubricate stem. b) Optimize the torque on gland nuts. c) Examine stem through full open and close action. Repair or replace as required. d) Disassemble the valve. Inspect and repair as needed.
Seat Leakage	a) Valve is not properly seated b) Internal components are damaged or have worn out.	a) Check whether the valve is tightly closed. b) Disassemble the valve and inspect internal components. In case of Disc or Seat ring damage, contact L&T Valves
Leakage through valve body neck	a) Gasket is damaged or not properly compressed b) Body-Bonnet fasteners may be loose	a) Check whether the gasket is properly placed between anti-extrusion rings. b) Use the values in Appendix I Table 1 to tighten the studs.

13. Disassembly



1. Body
2. Seat Ring
3. Disc
4. Stem
5. Bonnet Bush
6. Bonnet
7. Gland Fasteners
8. Packing
9. Gland
10. Gland Flange
11. Yoke Sleeve
12. Retainer Nut
13. Hand wheel
14. Hand wheel nut
15. Body- Bonnet fasteners

Warning:

Before disassembly of valve, ensure that there is no pressure inside the valve/line and the fluid medium is completely drained out.

a) Unscrew the Hand wheel nut (14)
b) Lift the Hand wheel(13) upwards out of Yoke Sleeve(11)
c) Unscrew the Retainer Nut(12) from Yoke Sleeve(11)
d) Lift the Yoke Sleeve(11) upwards out of Bonnet(6)
e) Unthread the Gland Fasteners(7)
f) Unscrew the Body-Bonnet Fasteners(15)
g) Lift the Bonnet(6) above the Stem(4) along with Gland(9) and Gland flange(10)
h) Now, remove the Gland(9), Gland flange(10) and Packings(8)
i) Unscrew the Bonnet Bush(5) and take out downwards from Bonnet(6)
j) Lift the Stem(4)-Disc(3) assembly above Body(1)

14. Recommended Spare parts

The importance of planning is the key for good plant operation. Part of that planning involves making sure that replacement parts needed to repair valves is available at the jobsite when required. Developing and implementing a standard valve maintenance plan will quickly pay for itself by eliminating costly downtime, unscheduled outages, etc.

Having parts immediately available from plant storeroom inventory is obviously the best way to accomplish those objectives. Since it is impractical to have every part that might be needed to accomplish a given repair in stock at all times, guidelines for establishing meaningful inventory levels are summarized in the table below:

Sl. No.	Part Name	Qty. of Parts/ Same Size & type of Valve
1	Packing	1/10
2	Gasket	1/10

Consult the Recommended Spare Parts list to define the parts to be included in the inventory plan. Select the desired parts and determine those required for proper maintenance of the valve in the plant.

15. How to Order Parts

During normal working hours, call us at the no given in the last page of this manual. To assure the correct parts for your valve, include the following;

1. Valve size & Class
2. Type
3. Catalogue number - including any prefix and/or suffixes

This information is located on the valve nameplate. The nameplate is attached to the Body / Bonnet flange. All requests for replacement parts for the valves should be forwarded to the address mentioned in the last page of this manual.

The information and specifications contained in this literature are believed to be accurate, they are supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because L&T Valves is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice. Should any question arise concerning these provisions, the purchaser/user should contact L&T Valves at any one of its worldwide operations or offices.

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