CONSOLIDATED®

Installation &
Maintenance
Manual

Safety Relief Valve
Type 1900, 1970, 1975, 1980, 1982

INDUSTRIAL VALVE DIVISION | DRESSER
ALEXANDRIA, LOUISIANA

REVISED DECEMBER, 1980

SAFETY NOTICE

PROPER SERVICE AND REPAIR IS IMPORTANT TO THE SAFE, RELIABLE OPERATION OF ALL VALVE PRODUCTS. THE SERVICE PROCEDURES RECOMMENDED BY DRESSER INDUSTRIAL VALVE OPERATIONS (DIVO) AND DESCRIBED IN THIS MAINTENANCE AND SERVICE MANUAL ARE EFFECTIVE METHODS OF PERFORMING THE REQUIRED MAINTENANCE OPERATIONS. SOME OF THESE SERVICE OPERATIONS REQUIRE THE USE OF TOOLS SPECIFICALLY DESIGNED FOR THE PURPOSE. THESE SPECIAL TOOLS SHOULD BE USED WHEN AND AS RECOMMENDED.

IT IS IMPORTANT TO NOTE THAT THIS SERVICE MANUAL CONTAINS VARIOUS WARNINGS AND CAUTIONS WHICH SHOULD BE CAREFULLY READ IN ORDER TO MINIMIZE THE RISK OF PERSONAL INJURY OR THE POSSIBILITY THAT IMPROPER SERVICE METHODS WILL BE FOLLOWED WHICH MAY DAMAGE THE VALVE OR RENDER IT UNSAFE. IT IS ALSO IMPORTANT TO UNDERSTAND THAT THESE WARNINGS AND CAUTIONS ARE NOT EXHAUSTIVE. DIVO COULD NOT POSSIBLY KNOW, EVALUATE, AND ADVISE THE CUSTOMER OR UTILITY OF ALL CONCEIVABLE WAYS IN WHICH SERVICE MIGHT BE DONE, OR OF THE POSSIBLE HAZARDOUS CONSQUENCES OF EACH WAY. CONSEQUENTLY, DIVO HAS NOT UNDERTAKEN ANY SUCH BROAD EVALUATION. ACCORDINGLY, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY DIVO MUST SATISFY HIMSELF THOROUGHLY THAT NEITHER HIS OR OTHER PERSONNEL'S SAFETY NOR VALVE SAFETY AND PROPER OPERATION WILL BE JEOPARDIZED BY THE SERVICE METHOD HE SELECTS. CONTACT DIVO IF THERE IS ANY QUESTION ON THE METHOD.

THE TESTING, INSTALLATION, AND REMOVAL OF VALVE AND VALVE PRODUCTS MAY INVOLVE THE USE OF FLUIDS AT EXTREMELY HIGH PRESSURE AND TEMPERATURE AND/OR ARE CORROSIVE OR EROSIVE. CONSEQUENTLY, EVERY PRECAUTION SHOULD BE TAKEN TO PREVENT INJURY TO PERSONNEL DURING THE PERFORMANCE OF ANY TEST, INSTALLATION OR REMOVAL SUCH AS, BUT NOT LIMITED TO, EAR DRUM PROTECTION, EYE PROTECTION, AND PROTECTIVE CLOTHING SUCH AS GLOVES, ETC., IN AND AROUND THE TESTING, INSTALLATION, OR REMOVAL AREA. DUE TO THE VARIOUS CIRCUMSTANCES AND CONDITIONS IN WHICH THESE OPERATIONS MAY BE PERFORMED ON OUR PRODUCTS, OR THE POSSIBLE HAZARDOUS CONSEQUENCES OF EACH WAY, DIVO COULD NOT POSSIBLY EVALUATE ALL CONDITIONS THAT COULD INJURE PERSONNEL OR EQUIPMENT, BUT DOES OFFER THESE SAFETY PRECAUTIONS AS AN ASSISTANCE ONLY.

SAFETY PRECAUTIONS

1. DO NOT STAND IN FRONT OF THE DISCHARGE SIDE OF A PRESSURE RELIEF VALVE WHEN TESTING OR OPERATING.

2. HEARING PROTECTION SHOULD BE USED WHEN TESTING OR OPERATING VALVE.

3. EXERCISE CAUTION WHEN EXAMINING A PRESSURE RELIEF VALVE FOR VISIBLE LEAKAGE.

4. NEVER INSTALL A PRESSURE RELIEF VALVE IN A HORIZONTAL POSITION. PRESSURE RELIEF VALVE INTERNALS ARE DESIGNED TO MOVE VERTICALLY, WHEN INSTALLED HORIZONTALLY, MISALIGNMENT AND GALLING OR HANG-UP MAY PREVENT THE VALVE FROM OPENING OR CLOSING PROPERLY.

5. THE BODY DRAIN MUST BE PIPED TO A SAFE AREA.

   IF LEFT PLUGGED, CONDENSATE WILL ACCUMULATE INSIDE THE VALVE BODY. IF LEFT OPEN, HOT AND/OR CORROSIVE MEDIUMS WILL ESCAPE AND PRESENT A HAZARD TO PERSONNEL NEAR THE VALVE.

6. PRESSURE RELIEF VALVES SHOULD BE MOUNTED TO PROVIDE ADEQUATE ACCESS, 360° AROUND THE VALVE PLUS OVERHEAD TO PERMIT REMOVAL FOR TESTING AND MAINTENANCE.

7. WHEN REMOVING THE PRESSURE RELIEF VALVE DURING DISASSEMBLY, STAND CLEAR AND/OR WEAR PROTECTIVE CLOTHING TO PREVENT EXPOSURE TO SPLATTER OF ANY CORROSIVE PROCESS MEDIUM WHICH MAY HAVE BEEN TRAPPED INSIDE.

8. ALWAYS GAG A PRESSURE RELIEF VALVE BEFORE MAKING RING ADJUSTMENTS. BE SURE TO REMOVE GAG AFTER ADJUSTMENTS ARE COMPLETED.

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NOMENCLATURE/TERMINOLOGY
(Ref. Fig. 1)

REF. NO.	NOMENCLATURE	MATERIAL
1	Base 1905-1918 1920-1928	ASTM A216 Grade WCB Carbon Steel ASTM A217 Grade WC1 Alloy Steel
2	Eductor Tube	ASTM A479 Type 304 Stainless Steel
3	Nozzle	ASTM A182 Grade F316 Stainless Steel
4	Adjusting Ring	ASTM A296-75 Grade CA15 Stainless Steel
5	Adjusting Ring Pin	
	Ring Pin Head	416 Stainless Steel
	Ring Pin Stem	416 Stainless Steel
6	Adj. Ring Pin Gasket	316 Stainless Steel Asbestos Filled
7	Disc	ASTM A479 Type 316 Stainless Steel
8	Disc Retainer	17-7PH Condition A Stainless Steel
9	Disc Holder	ASTM A479 Type 304 Stainless Steel
10	Guide	
	Guide Sleeve	ASTM A479 Type 430 Stainless Steel
	Guide Flange	ASTM A476 Grade 410 Condition A Stainless Steel
11	Guide Gasket	Soft Iron
12	Bonnet	ASTM A216 Grade WCB Carbon Steel
13	Bonnet Gasket	Soft Iron
14	Base Stud	ASTM A193 Grade B7 Alloy Steel
15	Stud Nut	ASTM A194 Class 1 Steel
16	Spindle	
	Spindle Head	ASTM A276 Grade 410 Condition "T" Hardness RC 24-29
	Spindle Stem	416 Stainless Steel
17	Spindle Retainer	17-7PH Condition A Stainless Steel
18	Spring Washer	C1020 Carbon Steel
19	Spring	
	Types 1900 ( )c	Carbon Steel (Phosphated)
	Types 1900 ( )t	Tungsten Steel*
20	Adjusting Screw	ASTM A276 Grade 410 Condition "T" Hardness RC 24-29
21	Adjusting Screw Nut	416 Stainless Steel
22	Cap	ASTM A216 Grade WCB Carbon Steel
23	Cap Gasket	316 Stainless Steel Asbestos Filled

NOTE 1 ALTERNATE MATERIALS AVAILABLE. SEE CATALOG

*SPRINGS WITH WIRE SIZE ½" AND SMALLER WILL BE SUPPLIED IN INCONEL X-750 MATERIAL.

2. DUE TO SPECIAL MANUFACTURING REQUIREMENTS, IT IS HAZARDOUS TO USE VALVE PARTS WHICH HAVE NOT BEEN FACTORY SUPPLIED.

INTRODUCTION

A safety relief valve is an automatic pressure actuated relieving device suitable for use either as a safety valve or relief valve, depending on application.

Safety relief valves are used on hundreds of different applications, including liquids and hyrdo carbons and, therefore, the valve is designed to meet many requirements. As such, the 1900 series valve can only be used to meet Section VIII requirements. It cannot be used on steam boilers or superheaters, but may be used on process steam.

DESIGN FEATURES

DESIGN SIMPLICITY — Consolidated Safety Relief Valves embody a minimum number of component parts, which results in a savings by minimizing spare parts inventory and simplifying valve maintenance. Contact the Parts Marketing organization, P.O. Box 1430, Alexandria, La. for parts inventory planning assistance.

VALVE INTERCHANGEABILITY — A Consolidated Safety Relief Valve may be converted from the standard conventional type valve to the bellows type, or to the "O" ring seat seal type, or vice versa, requiring a minimum number of new parts. This results in lower costs should conversion be required.

CAP AND LEVER INTERCHANGEABILITY — Many times it is necessary to change the type of cap or lever in the field after a valve has been installed. All flanged Consolidated Safety Relief Valves are supplied so they can be converted to any type of lever or cap desired. It is not necessary to remove the valve from the installation, nor will the set pressure be affected when making such a change.

SIMPLE BLOWDOWN ADJUSTMENT — The Consolidated single blowdown ring design makes it possible to set and test a valve that has been in service when it cannot be set on line and must be taken to the customer's shop. The ring can be positioned so that the set point can be observed although the volume of the testing media is very low. After the set pressure has been established, proper blowdown can be attained by merely positioning the ring in accordance with a chart published on Page in this manual.

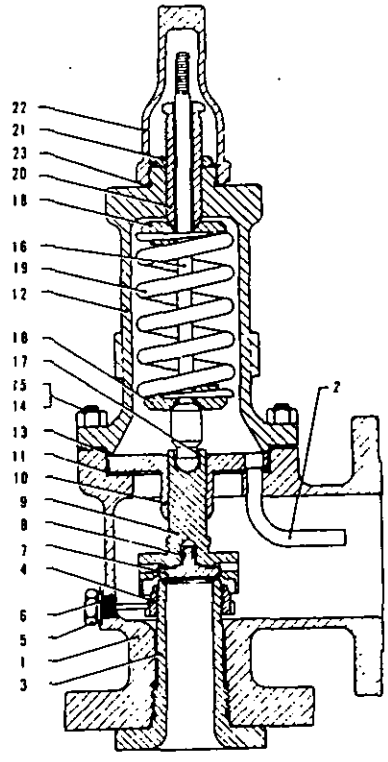


FIGURE 1

HANDLING, STORAGE, AND PREINSTALLATION

1. Flanged valves, either crated or uncrated, should always be kept with the inlet flange down, i.e., never laid on its side, to prevent misalignment and damage to internals.

2. Safety Relief Valves should be stored in a dry environment to protect them from the weather. They should not be removed from the skids or crates until immediately prior to installation.

3. Flange protectors and sealing plugs should not be removed until the valve is ready to be bolted into the installation, i.e., both inlet and outlet.

4. Safety Relief Valves, either crated or uncrated, should never be subjected to sharp impact. This would be most likely to occur by bumping or dropping during loading or

unloading from a truck or while moving with a power conveyor, such as a fork lift truck. While hoisting to the installation, care should be exercised to prevent bumping the valve against steel structures and other objects.

5. Uncrated valves should be moved or hoisted by wrapping a chain or sling around discharge neck, then around upper bonnet structure in such manner as will insure the valve is in vertical position during lift, i.e., not lifted in horizontal position.

   CAUTION: Never lift the full weight of the valve by the lifting lever.

   Crated valves should always be lifted with the inlet flange down, i.e., same as installation position.

6. When Safety Relief Valves are uncrated and the flange protectors or sealing plugs removed immediately prior to installation, meticulous care should be exercised to prevent dirt and other foreign materials from entering the inlet and outlet ports while bolting in place.

INSTALLATION

Consolidated Safety Relief Valves are checked, set and adjusted at the factory. Inlet and outlet connections are protected for shipment and storage. Accumulation of sand, dirt, etc., in relief valve inlet ports will be carried across the seat while the valve is in operation and is frequently the cause of seat leaks and unsatisfactory operation. To prevent future trouble, store Safety Relief Valves in a clean dry place and do not remove the wooden skid or flange protectors until ready for installation.

Safety Relief Valves must be connected on full sized vessel nozzles as direct and close as possible to the vessel or pipeline (Figure 2). No stop valve should be placed between the pressure vessel and its relief valve except as permitted by code regulations. If a stop valve is located between the pressure vessel and Safety Relief Valve, the stop valve port area should equal or exceed the nominal internal area associated with the pipe size of the safety relief valve inlet. Remove all dirt, sediment, or scale from the relief valve inlet port and vessel. The relief valve should be installed in a vertical position only, (Per API-520. Inlet bolts must be drawn down evenly to prevent distortion of the valve body and inlet nozzle.

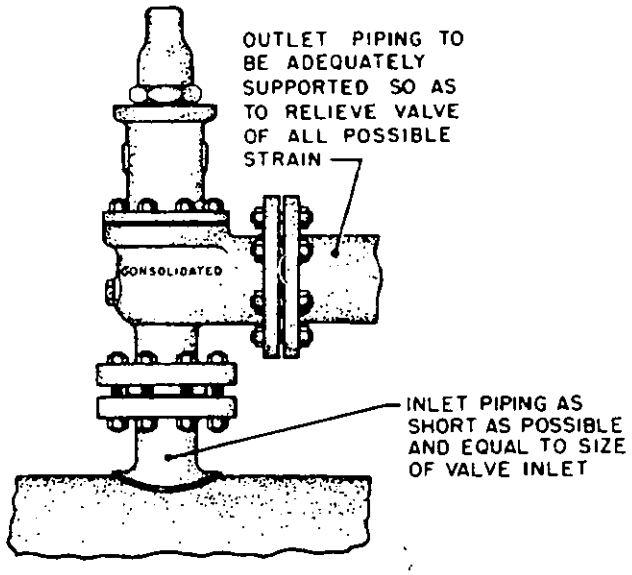


Fig. 2

For conventional valves, the size of the discharge piping should never be less than the valve outlet size, and designed so as to limit variable back pressure to a maximum of 10% of the valve set pressure. The arrangement should be as short and direct as possible. For Type 1900-30 bellows valves, variable back pressure may be used within higher limits. (See current Consolidated catalog for capacity performance applicable to existing back pressure conditions.) The outlet system should be designed and installed to eliminate all possible piping strains on the valve from various sources.

DISASSEMBLY OF FLANGED VALVES

DISASSEMBLY OF FLANGED VALVES
(For Parts identification refer to Fig. 3, 4, and 5)

The Consolidated Safety Relief Valve can be disassembled by the procedure outlined below:

1. Remove cap (including lifting gear). Remove cap gasket.

2. Remove adjusting ring pin and gasket. If the existing blowdown is to be restored upon reassembly, the position of the adjusting ring with respect to the disc holder should be determined. Turn the adjusting ring counterclockwise, i.e., move notches on the adjusting ring from left to right. Record the number of notches passing the ring pin hole required for the ring to contact the disc holder. This information will be used in setting the ring upon reassembly of the valve.

3. Loosen adjusting screw nut. Mark or note the position of the adjusting screw and count the number of turns required to barely remove all of the spring compression. This procedure will facilitate later adjustment of the valve to near its original set pressure. When turning the adjusting screw it is good practice to keep the spindle from turning. Channel lock pliers, applied to the top of the spindle, may be used for this purpose.

4. Remove the stud nuts and lift off the bonnet. Remove the bonnet gasket.

5. Remove the spring and spring washers. The spring and spring washers should be kept together as a unit at all times.

6. All of the upper internal parts can be removed as a unit by lifting out the spindle. These parts should be removed by lifting straight up. On bellows valves care should be taken so as not to bend or distort the bellows or its flange.

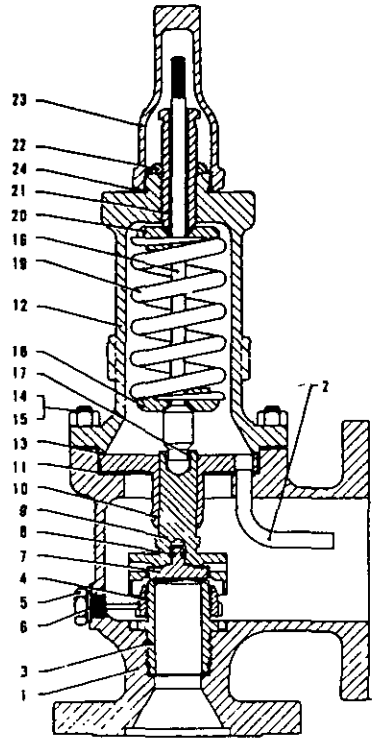


Fig. 3
1902

NOMENCLATURE

1	BASE	13	BONNET GASKET
2	EDUCTOR TUBE	14	BASE STUD
3	NOZZLE	15	BASE STUD NUT
4	ADJUSTING RING	16	SPINDLE
5	ADJUSTING RING PIN	17	SPINDLE RETAINER
6	ADJUSTING RING PIN GASKET	18	LOWER SPRING WASHER
7	DISC	19	SPRING
8	*DISC RETAINER*	20	*UPPER SPRING WASHER*
9	DISC HOLDER	21	ADJUSTING SCREW
10	GUIDE	22	ADJUSTING SCREW NUT
11	GUIDE GASKET	23	CAP
12	BONNET	24	CAP GASKET

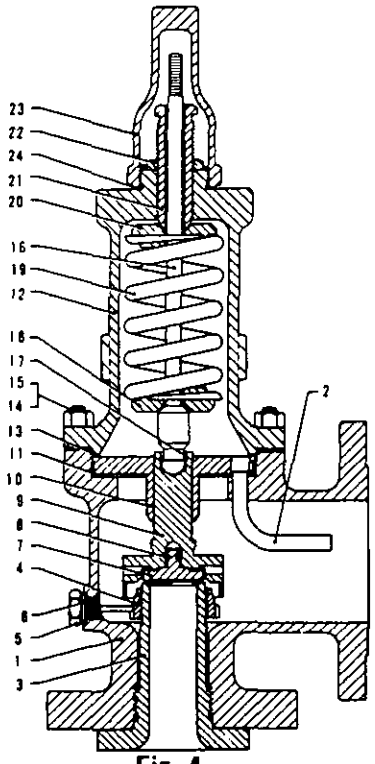


Fig. 4
1900

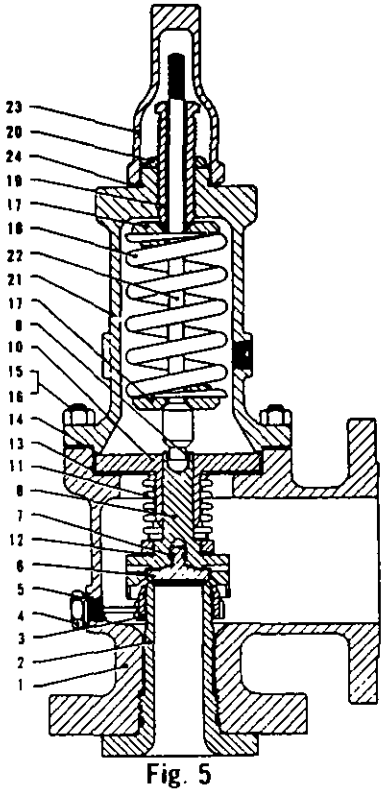


Fig. 5
1900-30

NOMENCLATURE

1	BASE	13	GUIDE GASKET
2	NOZZLE	14	BONNET GASKET
3	ADJUSTING RING	15	BASE STUD
4	ADJUSTING RING PIN	16	BASE STUD NUT
5	ADJUSTING RING PIN GASKET	17	SPRING WASHER
6	DISC	18	SPRING
7	DISC RETAINER	19	ADJUSTING SCREW
8	*DISC HOLDER*	20	*ADJUSTING SCREW NUT*
9	SPINDLE RETAINER	21	BONNET
10	GUIDE	22	SPINDLE
11	BELLOWS	23	CAP
12	BELLOWS GASKET	24	CAP GASKET

7. Remove the spindle from the disc holder. Clamp the skirt portion of the disc holder snugly between two wooden V-blocks in a suitable vise. Then compress the spindle retainer with a screwdriver or similar tool through the slots provided, and remove the spindle.

8. Remove guide from the disc holder.

9. The bellows is attached to the disc holder by right-hand threads. Apply a special spanner wrench[2] to the bellows ring and lossen bellows ring and loosen bellows by turning counterclockwise (Fig. 6). The bellows convolutions are very thin metal and care should be taken to protect them from damage at all times. Remove bellows gasket.

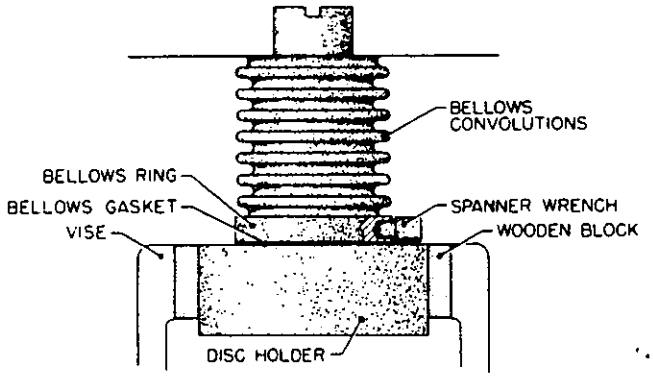


Fig. 6

[1]In instances where valves are fouled with foreign materials and/or heavy products, disassembly may be eased if these parts are given a prior soaking in a suitable solvent.
[2]Rev. Maintenance Tools and Supplies section.

10. To remove disc from disc holder, proceed as follows: (See Fig. 7) Clamp stem portion of the disc holder, disc end up, snugly between two V-blocks in a suitable vise. Then start special drift pins[3] into the holes in disc holder with tapered portion of pins working against top of disc as indicated. Tap each pin alternately with a light machinist's hammer until disc snaps out of recess in disc holder.

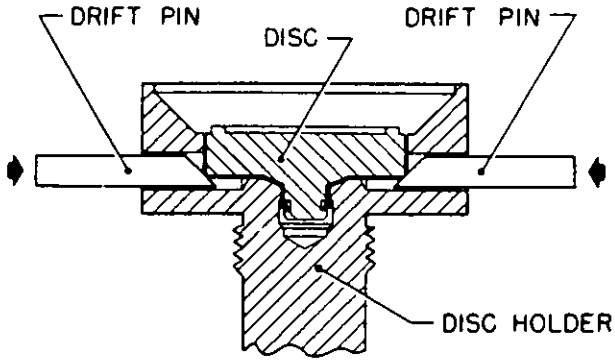


Fig. 7

11. Remove the adjusting ring by turning counterclockwise (left-handed).

12. The nozzle should not be removed from the base unless absolutely necessary. Reference Repair Section.

DISASSEMBLY OF TYPE 1970 AND 1975
(For parts identification refer to Fig. 8 and 9)

1. Remove cap (lifting gear) and cap gasket.

2. Remove guide pin and gasket. If the existing valve action is to be restored, the position of the guide should be determined. Work through the valve outlet and turn the guide clockwise until it contacts the base, recording the number of holes turned. Leave in this position during disassembly. Return to the original position upon assembly.

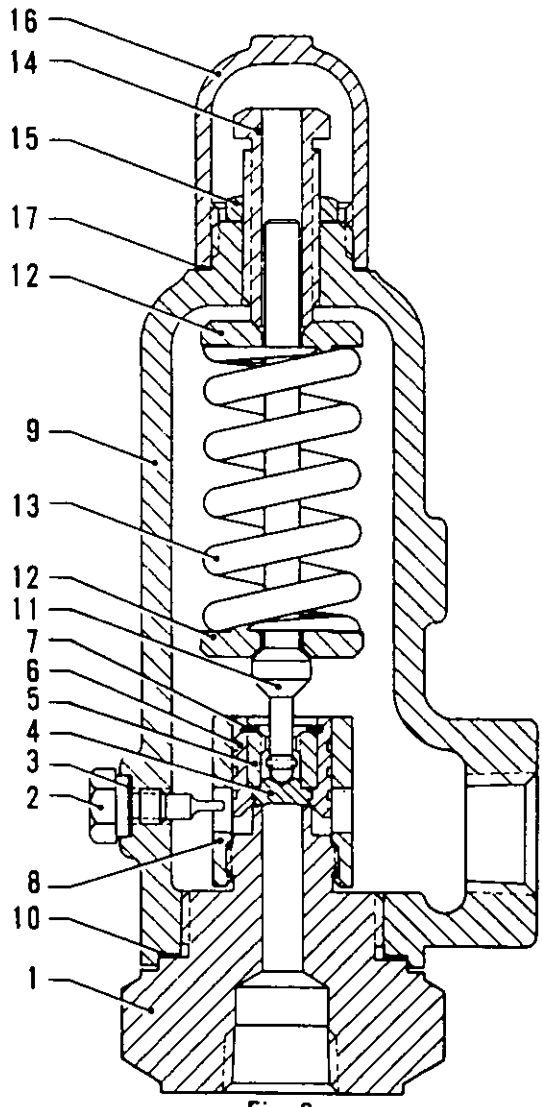


Fig. 8
1970

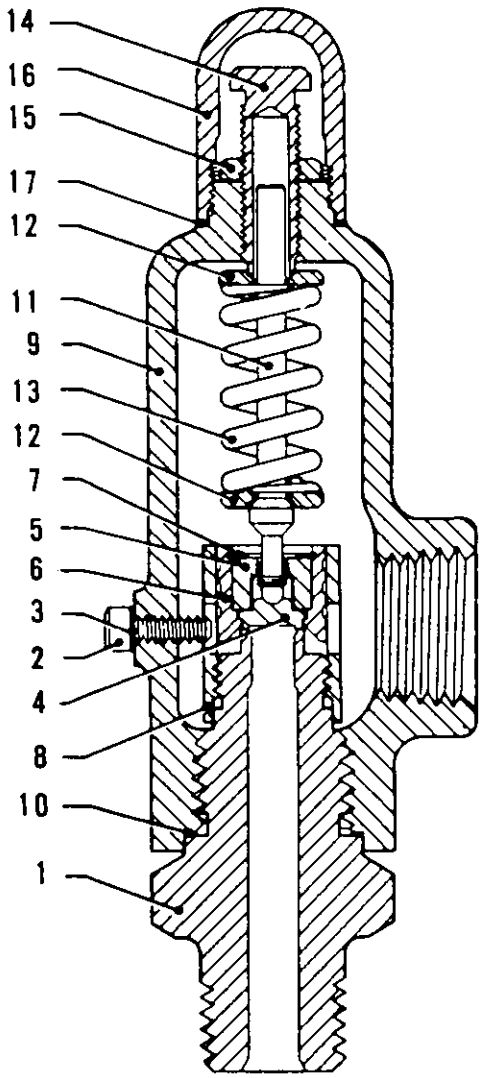


Fig. 9
1975

NOMENCLATURE (Ref Fig 8&9)

1	BASE	10	BONNET GASKET
2	GUIDE PIN	11	SPINDLE
3	GUIDE PIN GASKET	12	SPRING WASHER
4	DISC	13	SPRING
5	DISC RETAINER	14	ADJUSTING SCREW
6	DISC HOLDER	15	ADJUSTING SCREW NUT
7	RETAINER LOCK RING	16	CAP
8	GUIDE	17	CAP GASKET
9	BONNET		

3. Loosen the adjusting screw lockout.

4. Remove the adjusting screw. Count the number of turns necessary to barely remove all spring compression and record this figure. Removal of spring compression is indicated when the spindle stops rotating.

5. Unscrew bonnet from base.

[3]The special drift pins may be purchased from Industrial Valve Operations, Dresser Industries, Inc., Alexandria, La. 71301. Ref. page 24 for part numbers.

6. Remove spring, spring washers, spindle and disc holder assembly.

7. Remove guide from base.

DISASSEMBLY OF TYPE 1980 & 1982 VALVE
(For parts identification refer to Fig. 10)

1. Remove cap (lifting gear). Remove cap gasket.

2. Remove adjusting ring pin and gasket. If the existing valve action is to be restored, the position of the ring should be determined by turning it counterclockwise until it contacts the roof of the disc recording the number of notches that the ring is moved. Return to the original position below the disc upon reassembly.

3. Loosen adjusting screw locknut. Record the number of turns necessary to barely remove all spring compression. Remove compression screw from the bonnet. Return to original position when reassembling.

4. With valve base held in vise, loosen the bonnet to base connection (use strap wrench).
CAUTION: Do not distort base.

5. Remove bonnet, disc assembly, spindle, spring and spring washer assembly from the base, holding the spindle to be sure that the disc does not drop.

6. Remove disc assembly, spindle, spring and spring washers from bonnet.

7. Remove disc from spindle by engaging the drop-out threads and turning the disc counterclockwise.

MAINTENANCE OF FLANGED VALVES

VALVE SEAT MAINTENANCE

After the valve has been disassembled, a close inspection should be made of the seating surfaces.

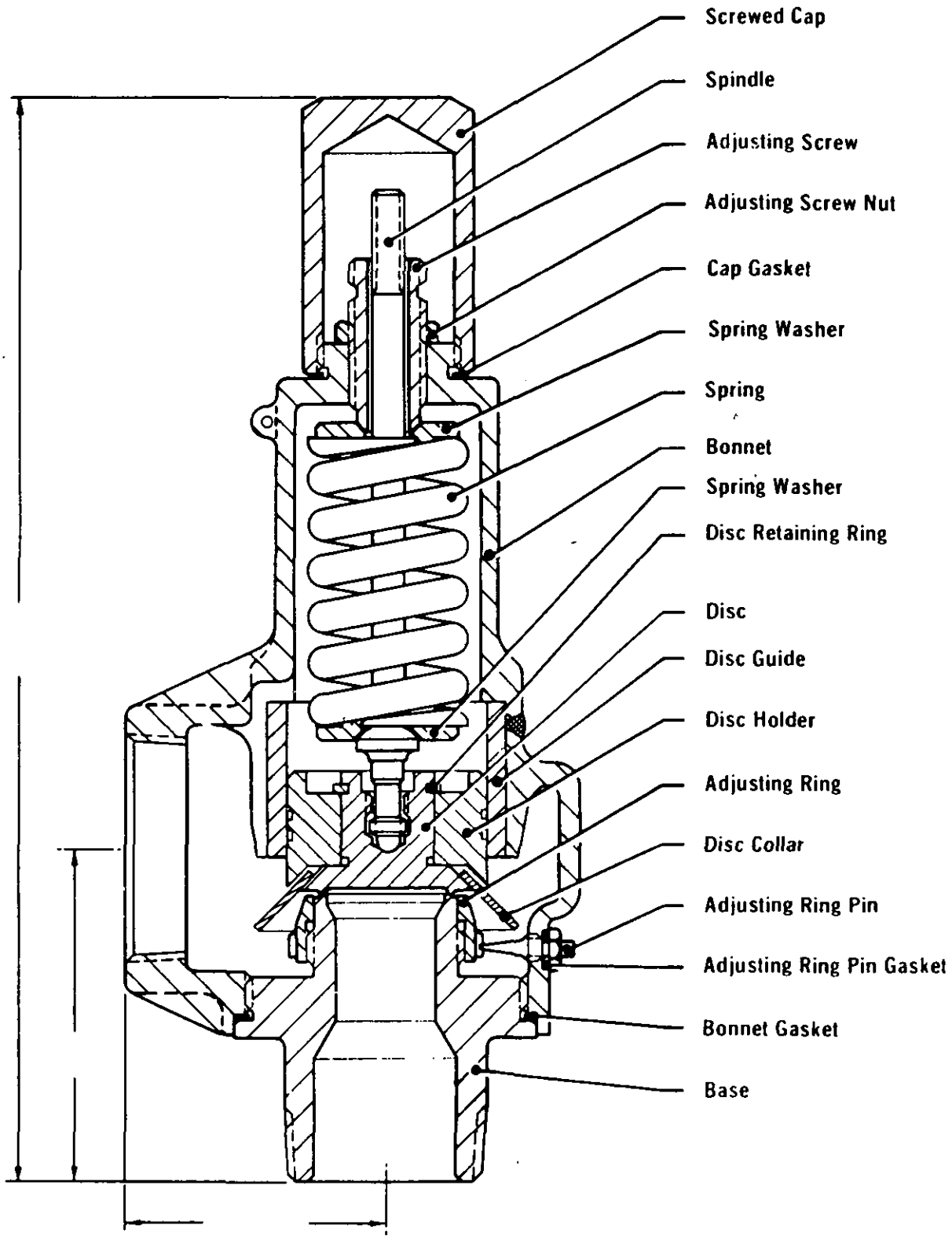


Fig. 10
1980 & 1982

In a majority of cases, a simple lapping of seats is all that is necessary to put the valve in first class working order. If an inspection of the parts shows the valve seating surfaces to be badly damaged, machining will be required before lapping. (For machining of nozzle and disc seating surfaces, see pages 13 and 14.)

The seating surfaces of the Consolidated Safety Relief Valve are flat. The nozzle seat is relieved by a 5° angle on the outside of the flat seat. The disc seat is wider than the nozzle seat; thus, the control of seat width is the nozzle seat (Fig. 11).

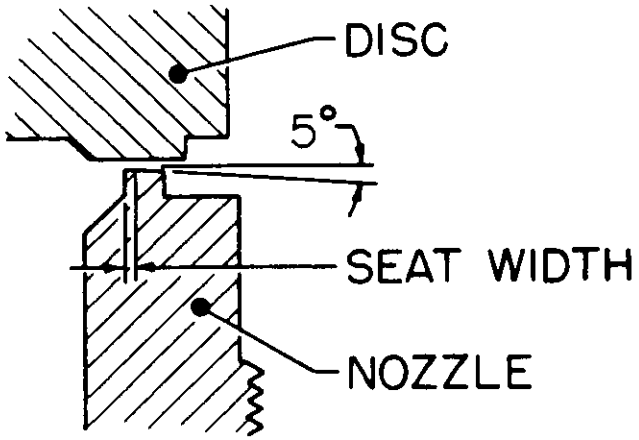


Fig. 11

LAPPING

Reconditioning of the seating surfaces of the nozzle and disc is accomplished by lapping with a cast iron lap, coated with a lapping compound. To insure that the seating surface is flat, an optical flat and monochromatic light source should be employed to determine if the degree of flatness is adequate. Straight, parallel and equally spaced bands show that the surface is perfectly flat.

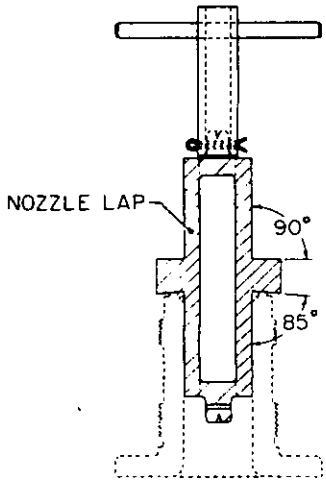


Fig. 12

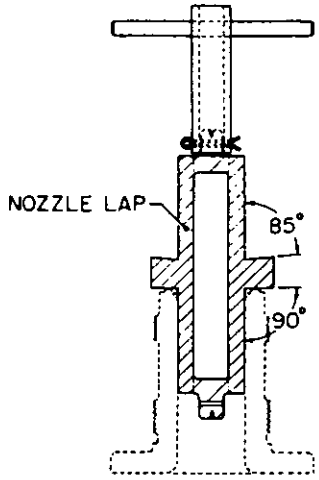


Fig. 13

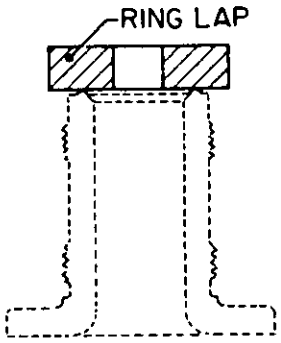


Fig. 14

LAPPING NOZZLE SEATS

The 5° angle of the nozzle should be lapped first (Fig. 12). Then, invert the nozzle lap and use the flat side as a "starter" lap to insure squareness of the seat (Fig. 13). Finish lapping should be done with a ring lap (Fig. 14). The ring lap is to be used in an eccentric or figure-eight motion. Keep the lap squarely on the flat surface and avoid any tendency to rock the lap which will cause rounding of the seat.

A wide nozzle seat will induce simmer, especially in the smaller orifice lower pressure valves. For this reason, the seat should be as narrow as practical. Since the seat must be wide enough to carry the bearing load imposed upon it by the spring force, the higher pressure valves must have wider seats than the low pressure valves. The nozzle seat width should conform with the following table.

Orifice	Valve Type	Seat Width Min.	Max.
D	1905D, 1906D, 1910D, 1912D, 1920D, 1922D	.015 -	.022
	1914D, 1916D, 1918D, 1924D, 1926D, 1928D	.023 -	.030
E	1905E, 1906E, 1910E, 1912E, 1920E, 1922E	.015 -	.022
	1914E, 1916E, 1918E, 1924E, 1926E, 1928E	.030 -	.037
F	1901F, 1902F, 1905F, 1906F, 1910F, 1912F 1914F, 1916F, 1920F, 1922F, 1924F, 1926F 1905-30F, 1906-30F, 1910-30F, 1912-30F 1914-30F, 1916-30F, 1920-30F, 1922-30F 1924-30F, 1926-30F	.015 -	.022
	1918F, 1928F, 1918-30F, 1928-30F	.030 -	.037
G	1901G, 1902G, 1905G, 1906G, 1910G, 1912G, 1914G, 1920G, 1922G, 1924G, 1926G, 1905-30G, 1906-30G, 1910-30G, 1912-30G, 1914-30G, 1920-30G, 1922-30G 1924-30G, 1926-30G	.015 -	.022
	1916G, 1918G, 1928G, 1916-30G, 1918-30G 1928-30G	.023 -	.030
H	All	.023 -	.030
J	1901J, 1902J, 1905J, 1906J, 1910J 1911J, 1912J, 1913J, 1914J, 1920J 1922J, 1924J, 1905-30J, 1906-30J, 1910-30J 1911-30J, 1912-30J, 1913-30J, 1914-30J 1920-30J, 1922-30J, 1924-30J	.023 -	.030
	1916J, 1926J, 1916-30J, 1926-30J	.030 -	.037
K	All	.030 -	.037
L	All	.030 -	.037
M	All	.030 -	.037
N	All	.030 -	.037
P	All	.037 -	.045
Q	All	.037 -	.045
R	All	.037 -	.045
T	All	.045 -	.053

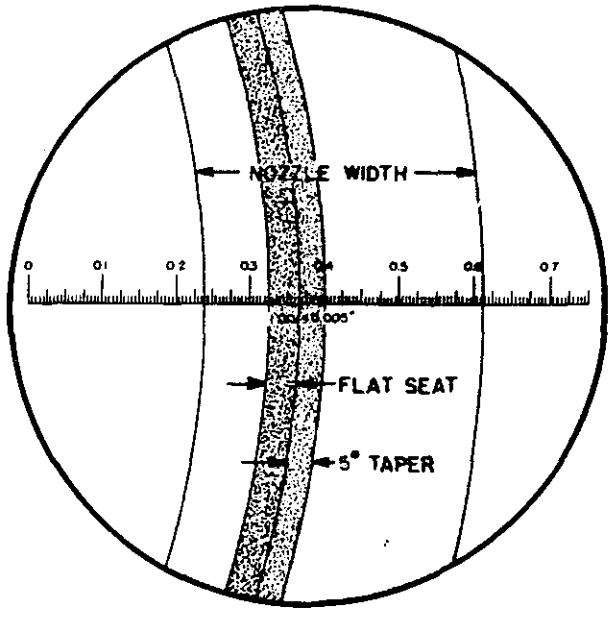


Fig. 16

The seat width can be measured simply and accurately by the use of a "Measuring Magnifier" (Fig. 15). We recommend the use of Model 81-34-35-37 manufactured by Bausch and Lomb Optical Co., Rochester, N.Y. It is a seven power glass with a three-quarter inch scale showing graduations of 0.005 inch. The use of this scale in measuring the nozzle seat width is shown in Fig. 16.

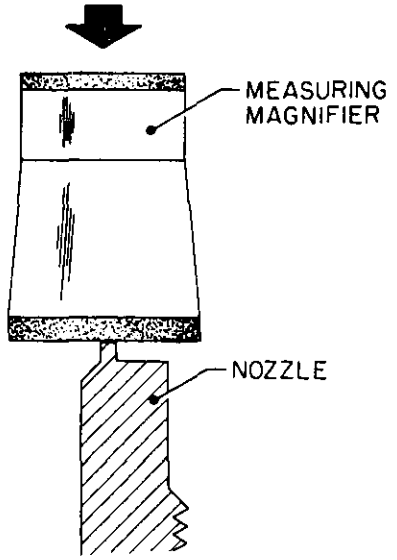


Fig. 15

If additional lighting is required for measuring the seat, we suggest a goose-neck flashlight similiar to the Type A Lamp Assembly Flashlight manufactured by Standard Molding Corporation, Dayton, Ohio.

LAPPING DISC SEAT

The disc seat may be lapped with a ring lap or a lapping plate (Fig. 17). Lapping should be done in an eccentric or figure-eight motion in all directions, applying uniform pressure and rotating the disc or lap slowly.

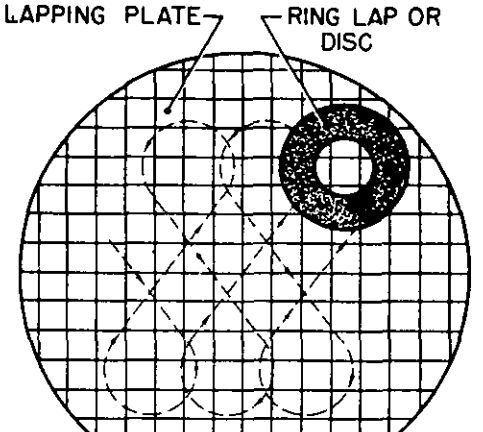


Fig. 17

PRECAUTIONS AND HINTS FOR LAPPING SEATS

1. Keep work clean.

2. Always use a fresh lap. If signs of wearing are evident, recondition the lap and verify flatness with an optical flat and monochro-

matic light source.

3. Apply a very thin layer of compound to the lap. This will prevent rounding off the edges of the seat.

4. Keep the lap squarely on the flat surface and avoid any tendency to rock the lap which cause rounding of the seat.

5. Keep a firm grip on the lap or part to prevent the possibility of dropping it and damaging the seat.

6. Wipe off old compound and apply new compound frequently.

7. After lapping, the seats should be thoroughly cleaned with kerosene or light oil, using a lint-free cloth.

RECONDITIONING OF LAPS

Ring laps are reconditioned by lapping them on a flat lapping plate. The lapping should be done with a figure-eight motion as indicated in Figure 17. To assure the best results when lapping seats, the ring laps should be reconditioned after each usage and checked with an optical flat.

Nozzle laps must be remachined to recondition the lapping surfaces. Place the nozzle-lap in a lathe between centers (Fig. 18). Surfaces marked A and B must be running concentric. One lapping surface is 90° and the other is 85°. The angle of each surface is marked on the lap. Machine surfaces C and D by taking light cuts at the proper angle until the lapping surfaces are reconditioned.

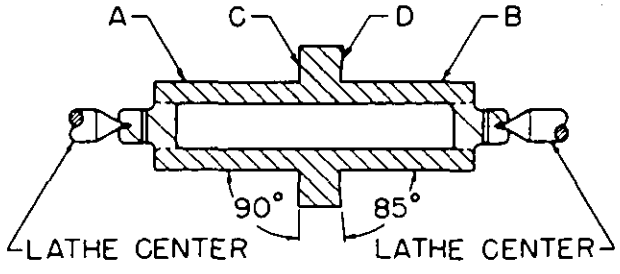


Fig. 18

REPAIR OF FLANGED VALVES

REMACHINING NOZZLE SEATS

The nozzle seat should be machined with the nozzle assembled in the base whenever possible. If it should be necessary to remove the nozzle from the base, see nozzle removal methods in Maintenance, Tools & Supplies Section. The nozzle is assembled to the base with threads and may be removed by turning counter-clockwise (left-handled). To facilitate removal of the nozzle from the base it may be found beneficial to first soak the threaded joint with a suitable penetrating liquid or solvent. In instances where the nozzle is frozen into the base, its removal may be helped by sufficiently heating the base from the outside with a blowtorch in the area of the nozzle threads while dry ice or other cooling medium is applied to the inside of the nozzle.

CAUTION: Should heat be applied, use care to prevent cracking of cast parts. Dye penetrant inspection should be used to check for cracking on cast parts where heat has been applied.

LATHE SET-UP FOR MACHINING OF NOZZLE WHEN ASSEMBLED IN BASE (Fig. 19).

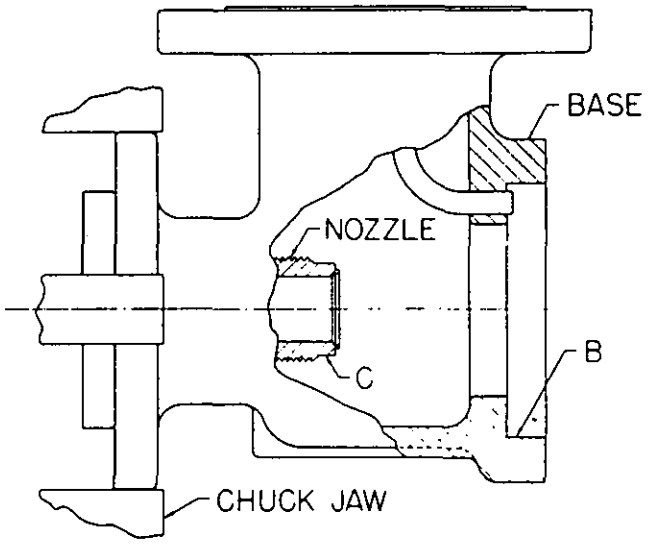


Fig. 19

1. Grip the nozzle in a four-jaw independent jaw independent chuck.

2. True up the work so that the top of the nozzle at C and the base surface at B run true within .001" on indicator.

LATHE SET-UP FOR MACHINING OF NOZZLE WHEN REMOVED FROM BASE (Fig. 20).

1. Grip the nozzle a four-jaw independent chuck, using a piece of soft material such as copper or fiber between the jaws and the nozzle as shown at A.

2. True up the nozzle so that the surfaces marked B and C run true within .001" on indicator.

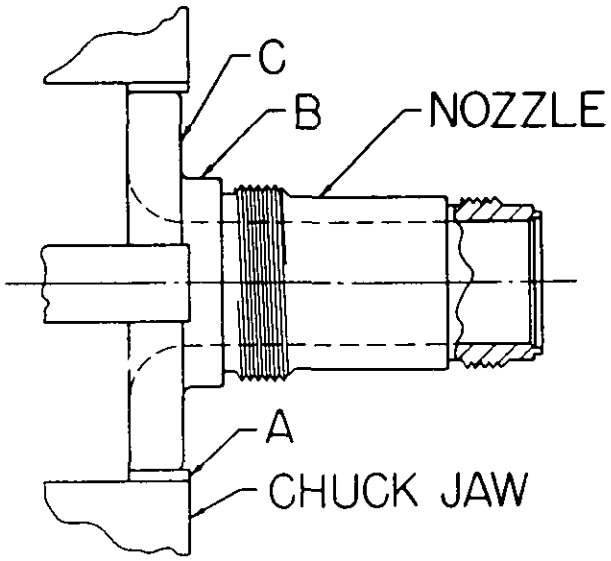


Fig. 20

MACHINING OF NOZZLE SEAT (Fig. 21)

Orifice	D	E	F	H
F	5/16	.035	.954	.831
G	5/16	.035	1.093	.953
H	1/4	.035	1.224	1.123
J	3/8	.035	1.545	1.435
K	7/16	.063	1.836	1.711
L	7/16	.063	2.257	2.132
M	7/16	.063	2.525	2.400
N	1/2	.063	2.777	2.627
P	5/8	.093	3.332	3.182
Q	7/8	.093	4.335	4.185
R	1	.093	5.110	4.960
T	3/4	.093	6.234	6.040

MACHINING DIMENSIONS FOR NOZZLE SEATS (Fig. 21)

1. Take light cuts across the surface L at 5° until the damaged areas are removed. Turn to the smoothest possible finish.

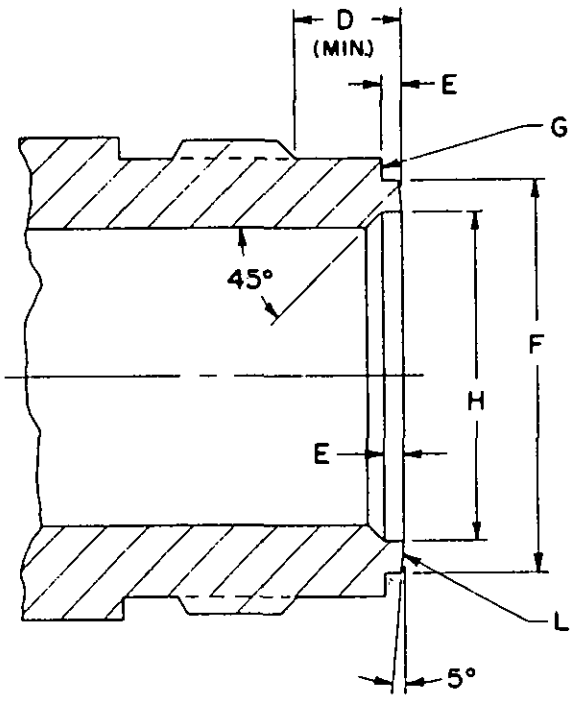


Fig. 21

2. Cut back the outside surface at G until dimension E is obtained.

3. Cut back inside surface at the angle shown until dimension E is obtained.

4. The nozzle is now ready for lapping. See pages 11 and 12.

5. When the minimum dimension D is reached the nozzle should be discarded.

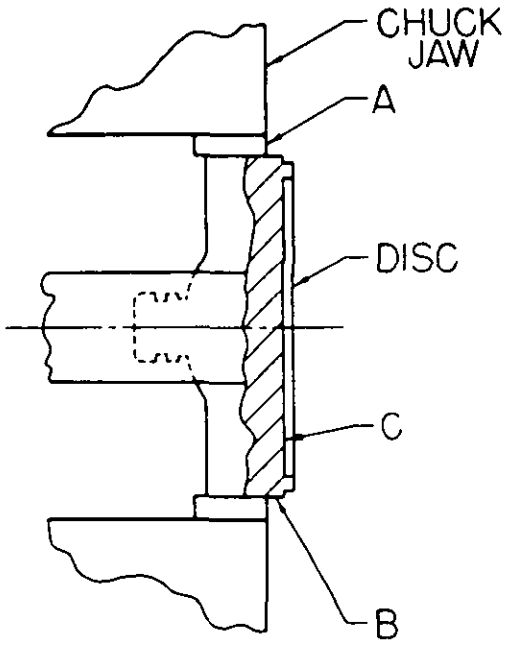


Fig. 22

REMACHINING THE DISC SEATS (Fig. 22)

The disc seating surface can easily be machined as follows:

1. Grip the disc in a four-jaw independent chuck, using a piece of soft material such as copper or fiber between the jaws and the disc as shown at A.

2. True up the disc so that the surfaces marked B and C run true.

MACHINING OF THE DISC SEAT (Fig. 23)

1. Take light cuts across the seating surface L until damaged areas are removed. Turn to smoothest possible finish.

2. The disc is now ready for lapping.

3. When the minimum dimension N is reached, the disc should be discarded.

CHECKING SPINDLE CONCENTRICITY

It is important that the spindle of a safety relief valve be straight in order to transmit the spring load to the disc without lateral binding. Over-gagging is one of the common causes of bent spindles. To check the essential working surfaces of the spindle, either of the following methods is recommended.

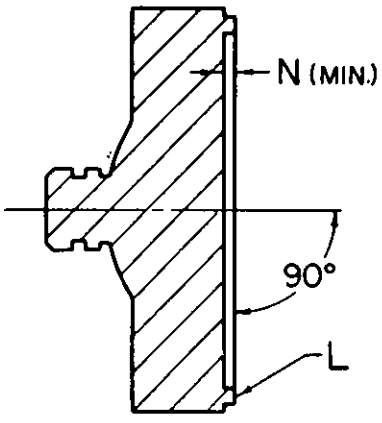


Fig. 23

CHECKING SPINDLE CONCENTRICITY IN LATHE (Fig. 24)

The following procedure can be used when checking spindle concentricity in a lathe.

1. Machine center hole A.

2. Place the spindle in a lathe, using a block, B, to support the point of the spindle.

3. Apply a machinist's indicator at approximately 45° to the outer edge of the spring washer seat at C. Rotate the spindle between the centers, keeping B stationary. At D, spindle passes through the adjusting screw, the total indicator reading should not exceed .007". Straighten if necessary.

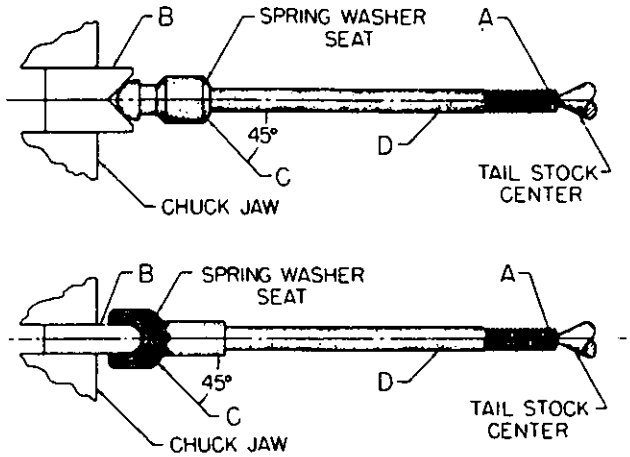


Fig. 24

CHECKING SPINDLE CONCENTRICITY WITH V-BLOCK SUPPORT (Fig. 25)

1. The ball pointed spindles should be placed in a piece of material, B, that has been recessed to permit free rotation of the spindle. For hollow spindles, a ball pointed support is required.

2. Support the spindle with a V-block, A, placed near the upper end of the spindle, but below the threads.

3. Apply a machinist's indicator at approximately 45° to the outer edge of the spring washer seat at C. Rotate the spindle. The total indicator reading should not exceed .007". Straighten if necessary.

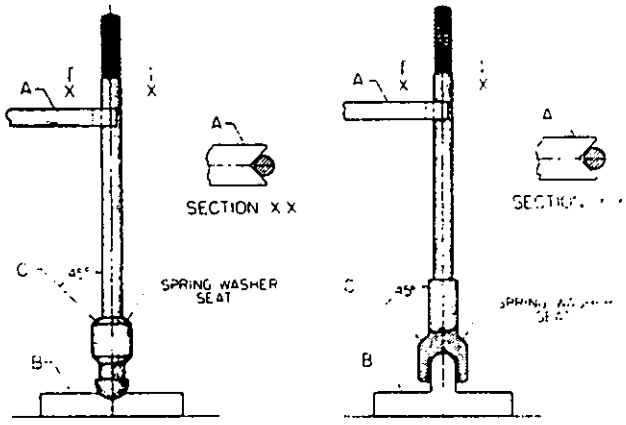
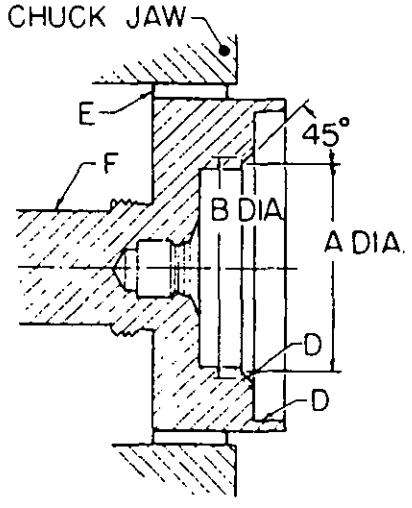


Fig. 25

DISC HOLDER FOR SMALL ORIFICE LOW PRESSURE VALVES

The F orifice valves have different disc holders for set pressures 100 psig and below than for set pressure of 101 psig and above. If an F orifice valve is changed from a set pressure of 100 psig or below to a set pressure of 101 psig or above, a new disc holder should be obtained. If an F orifice valve is changed from a set pressure of 101 psig or above to a set pressure of 100 psig or below, a new disc holder should be obtained or the present disc holder reworked as shown by Figure 26.

The G through J orifice valves have different disc holders for set pressures 50 psig and below than for pressures 51 psig and above. If a G through J orifice valve is changed from a set pressure of 50 psig or below to a set pressure of 51 psig or above, a new disc holder should be obtained. If a G through J orifice valve is changed from a set pressure of 51 psig or above to a pressure of 50 psig or below a new disc holder should be obtained or the present disc holder reworked as shown by Figure 26.



Orifice	A	B
D	.714	.810
E	.858	.970
F	1.031	1.166
G	1.182	1.271
H	1.393	1.490
J	1.779	1.928

Fig. 26

1. Grip the disc holder in a four-jaw independent chuck using a piece of soft material between the jaws and the disc holder as shown at E. If possible, the disc holder should be gripped on the large section as shown. If it should be necessary to grip the disc holder on the small portion, F, extra care should be taken to prevent scarring since this is a guiding surface.

2. Align the part so that surfaces marked D run true.

3. Machine 45° angle to diameter B (designated by dotted line on illustration).

The K through T orifice valve disc holders are the same for both low and high pressure.

SEAT REPAIRING AND LAPPING TYPES 1970 and 1975 VALVES

Reconditioning of the seating surface of the disc and base is accomplished by lapping with a flat cast iron ring lap coated with Grade No. 1000 KWIK-AK-SHUN Silicon-Carbide compound, or equivalent.

Lapping a flat seat is extremely simple. No special skill is required and the technique is readily apparent after a few minutes of actual lapping.

The following precautions and hints will enable anyone to do a "professional" job of lapping seats.

1. Keep the work clean.

2. Always use a fresh lap. If signs of wearing (out of flatness) is evident recondition the lap.

3. Apply a very thin layer of compound to the lap. This will prevent rounding off the edges of the seat.

4. Keep the lap squarely on the flat surface and avoid any tendency to rock the lap which will cause rounding of the seat.

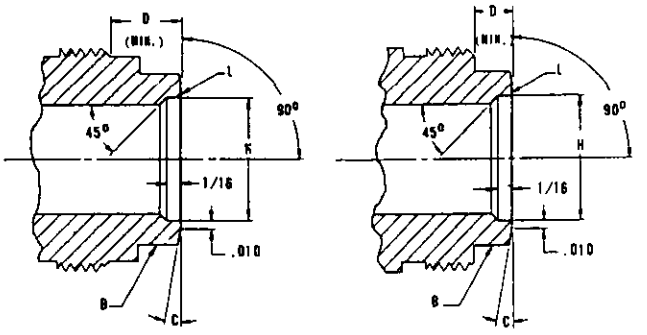
5. When lapping, keep a firm grip on the part to prevent the possibility of dropping it and damaging the seat.

6. Lap, using a reciprocating motion in all directions, at the same time applying uniform pressure and rotating the lap slowly.

7. Replace the compound frequently after wiping off the old compound, and apply more pressure to speed the cutting action of the compound.

8. To check the seating surfaces, remove all compound from both the seat and the lap. Then shine up the seat with the same lap using the lapping motion described above. Low sections on the seating surface will show up as a shadow in contrast to the shiny portion. If shadows are present, further lapping is necessary and only laps known to be flat should now be used. Only a few minutes will be required to remove the shadows.
9. When the lapping is completed, any lines appearing as cross scratches can be removed by rotating the lap, which has been wiped clean of compound, on the seat about its own axis.
10. The seat should now be thoroughly cleaned with kerosene, light oil, or carbon tetrachloride, using a lint-free cloth or tissue paper.

When the seats cannot be repaired by lapping, they can be remachined using dimensions given in Fig. 27.



VALVE	SIZE	H	C	D(MIN.)
1970	3/4 & 1	.576	15°	1/2
1970	1-1/2 & 2	.854	7½°	15/16
1975	1/2, 3/4, & 1	.389	10°	3/16

Fig. 27

The following procedure can be used when machining the base seat:

1. Using a four-jaw chuck, align the base so that it is running true.
2. Take light cuts on the seat surface until all damage is removed. Reestablish dimension.
3. Lap the seat.
4. When minimum dimension "D" is exceeded, the base should be discarded.

SEAT REPAIR, TYPE 1980 VALVE

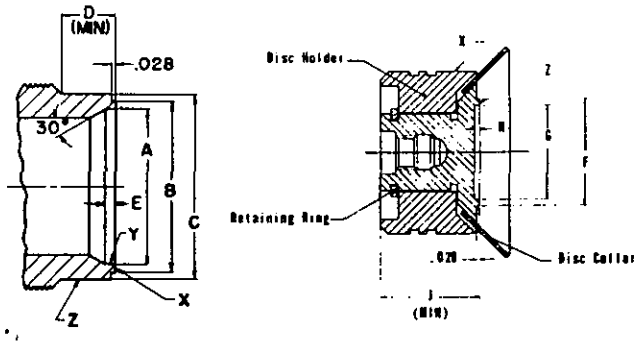
To recondition the disc seat by lapping, it is necessary to disassemble the disc assembly. This is done in the following manner:

The disc insert is contained in the disc holder by a Truarc retaining ring. The ring may be removed by using a Truarc Plier #4. After removing the Truarc ring, the disc insert and disc collar can be removed from the disc holder.

The disc insert can now be lapped using the same procedure as used for Type 1970 and 1975 valves.

If the disc is damaged to the extent that machining is necessary, the following procedure can be used:

1. Using a four-jaw chuck, align the disc insert so that it is running true.
2. Take light cuts on the seat surface until all damage is removed. Reestablish dimensions as shown in Fig. 28.
3. When "H" dimension has been reduced to .025, the disc insert should be replaced.



Size	A	B	C	D	E	F	G	H
½	.443	.487	.528	7/32	.031	.516	.414	.050
¾	.590	.640	.701	7/32	.041	.669	.561	.050
1	.738	.802	.874	25/64	.054	.834	.706	.050
1-½	1.180	1.294	1.399	13/32	.079	1.339	1.139	.062
2	1.511	1.634	1.794	29/64	.111	1.680	1.465	.062

Reworking Dimensions of 1980 and 1981.

FIG. 28

LAPPING TYPE 1980 & 1982 DISCS

Laps are available to allow repair-lapping of discs for 1980 & 1982 valves. The lap diameters necessary for each 1980 & 1982 valve size are shown in the following Table:

1980 & 1982 Inlet Size
1/2", 3/4", 1", 1½", 2"

Lap Diameter

9/16", 13/32", 1", 1-3/4", 2-1/8"

REASSEMBLY OF FLANGED VALVES

(For part identification refer to Fig. 3, 4 and 5)

Before reassembling the valve, all parts should be cleaned. Special attention should be given to guiding surfaces, bearing surfaces, and retainer recesses. Inspect the bellows for corrosion and possible leaks.

Reassemble the valve as follows:

1. Thread the adjusting ring into the nozzle. Make sure the ring is low enough on the nozzle to allow sufficient clearance between the disc holder and the adjusting ring so that the disc will seat on the nozzle.
2. Install the disc into the disc holder. The disc retainer should "snap" into the pocket with moderate finger or hand force. DO NOT USE FORCE TO ASSEMBLE THESE PARTS. Be sure that the disc is free to "wobble" after it is in place.
3. To install the bellows, clamp the large end of the holder between two wooden V-blocks in a vise. Place a new bellows gasket (graphited side down) on the disc holder. Thread the bellows down to the gasket finger-tight. Then place a spanner wrench around the bellows ring and tighten. It is very important that a pressure tight joint be obtained between the disc holder and the bellows.
4. Place the guide on the disc holder. Do not drop. The weight of the guide will slightly compress the bellows.
5. Place the spindle retainer over the end of the spindle. Apply lubricant to the ball tip of the spindle. Place the spindle in the disc holder and align the spindle retainer so that the gap is midway between the two slots. Compress the spindle retainer and place it in the retaining groove. Be sure that the spindle turns freely. Slightly grind the ball tip of the spindle into the disc holder pocket to assure a good bearing surface.
6. Place a new guide gasket in the base.
7. Install the disc, disc holder, guide and spindle assembly in the valve base. If a conventional valve, be sure that the hold in the guide flange is located over the small projection of the eductor tube.
8. Apply a small quantity of lubricant to the spring washer bearing surface of the spindle. Place the spring assembly on the spindle.
9. Install a new bonnet gasket and the bonnet. Tighten the bonnet stud nuts uniformly.
10. Thread in the adjusting screw (with adjusting screw nut assembled to adjusting screw) until it contacts the top spring washer.
11. When compressing the spring, hold the spindle with channel lock pliers to prevent the spindle point from turning in the disc holder. Turn the adjusting screw clockwise, or right-handed, until the original number of turns has been restored. This method of compressing the spring will approximately establish the original set pressure. Be sure that the spindle locates itself centrally within the adjusting screw before proceeding with setting.
12. Restore the adjusting ring to its original position with reference to the disc holder and replace the adjusting ring pin. If original position of the adjusting ring is not known, position the ring in accordance with the following table.

Orifice	Set Pressures 100 psig and below	Set Pressures 100 psig and above
D,E,F,G	4 notches	7 notches
H & J	5 notches	9 notches
K	6 notches	14 notches
L	6 notches	18 notches
M & N	7 notches	20 notches
P	8 notches	24 notches
Q	10 notches	28 notches
R	28 notches	36 notches
T	30 notches	38 notches

Be sure that the pin enters the notch in the ring, but does not bind the ring. The ring should feel free after the pin is installed.

13. The valve is now ready for setting. After the valve has been set, tighten the adjusting screw nut. Install the cap gasket and cap or lifting gear to the valve.

REASSEMBLY OF TYPES 1970 AND 1975 VALVES
(For parts identification refer to Fig. 8 and 9)

Before assembly, all parts should be cleaned.

1. Thread the guide onto the base until it contacts the base shoulder.
2. Apply a small amount of lubricant (Moly-Kote) to the end of the spindle and install it in the disc holder assembly.
3. Insert assembly into guide.
4. Apply a small amount of lubricant to the bearing surface of the lower spring washer and slip over spindle. Install the spring and upper spring washer.
5. Install a new bonnet gasket on base. Apply a small amount of lubricant to the bonnet thread on the base and install bonnet on base.
6. Apply a small amount of lubricant to the tip of the adjusting screw. Install the adjusting screw in the bonnet, rotating the number of times required to restore it to the original position. When the spindle begins to turn, use pliers to hold in position.
7. Restore the guide to the original position and install the guide pin with the guide pin gasket.
8. Valve is now ready for testing.

REASSEMBLY OF TYPE 1980 & 1982 VALVE
(For parts identification refer to Fig. 10)

1. Before reassembly, all parts should be cleaned. All burrs on guiding surfaces should be

carefully removed.

2. Put a small amount of Moly-Kote on the spindle tip and on the lower spring washer bearing. Thread the disc on the spindle and assemble spring and spring washers on the spindle.
3. Insert disc, spindle, spring and spring washer assembly into the bonnet.
4. Assemble adjusting ring to base (top of adjusting ring to flush with seat). Place a new bonnet gasket on the base.
5. Place a small amount of Moly-Kote on the ball end of the adjusting screw.
6. Holding bonnet and spindle (so that disc will not drop) install bonnet assembly to base. Tighten bonnet on base with strap wrench.
7. Assemble compression screw and reestablish spring compression by first turning down the compression screw to take out all play and then add the same number of turns that it took to relieve the compression when the valve was disassembled.
8. Reestablish position of adjusting ring as follows:
   a. Using a pointed tool, turn the adjusting ring to the right slowly, thus raising the ring until it touches the disc.
   b. Then, counting the notches, turn the adjusting ring to the left, thereby lowering the ring, until the original position is established.
9. Test valve per instructions outlined under "Testing."

SETTING, TESTING AND ADJUSTMENTS

SAFETY RELIEF VALVE PERFORMANCE

Satisfactory safety relief valve operation requires that the valve seat shall be satisfactorily tight at the operating pressure (normally about 90% of the set pressure). Refer to Page 20 for leakage test. On gases and vapors, the valve should pop at set pressure after the usual slight warning.

BLOWDOWN ADJUSTMENT (Reseating Pressure)

NOTE: UNLESS THE TEST STAND CAPACITY IS EQUAL TO OR GREATER THAN THAT OF THE VALVE, DO NOT ATTEMPT TO SET BLOWDOWN. SIMPLY RETURN THE ADJUSTING RING OR GUIDE TO THE ORIGINAL POSITION.

Blowdown adjustments are made by means of the adjusting ring on the 1900 and 1980 valves and the guide on the 1970 and 1975 valves.

If longer or shorter blowdown is required, it can be obtained as follows:

a. To increase blowdown (lower reseating pressure), the adjusting ring or guide must be raised by moving the notches from left to right past the ring pin hole.

b. To decrease blowdown (raise reseating pressure), the adjusting ring or guide must be lowered by moving the notches from right to left past the ring pin hole.

SETTING AND TESTING AFTER RECONDITIONING

Before putting the reconditioned valve in service, it must be set to open at the required set pressure. Although the valve can be set on the service installation, it is more convenient to set the valve and check seat tightness on a test stand.

When using a test stand, the valve should be set to open at the cold differential set pressure as shown on the nameplate. The cold differential set pressure is the set pressure corrected to compensate for back pressure and/or operating temperature. (See Page 20.)

SETTING THE VALVE

Set the valve on clean air. Before mounting the valve on the test stand, remove all dirt, sediment or scale from the test tank nozzle and the inlet port of the valve. Be sure that the test gauge is accurate and has recently been calibrated on a dead weight gauge tester.

Mount the valve on the test stand. If the adjusting screw of the reconditioned valve has been turned down to its original position, slowly bring the pressure up in the test tank to the cold differential set pressure. If the valve opens before the desired pressure is reached, additional compression is required on the spring. Hold the spindle to prevent rotation and turn the adjusting screw down (clockwise or righthanded). If the valve does not open at the desired pressure, maintain the required pressure in the test tank and slowly release the compression on the spring by turning the adjusting screw counterclockwise or left-handed until the valve opens. Continue adjustment until the valve opens at the desired pressure. Be sure to hold the spindle when turning the adjusting screw. The spindle should be centrally located within the adjusting screw as hard rubbing of the spindle against the side of the adjusting screw may cause poor valve action.

After the required set pressure is obtained, tighten the adjusting screw nut and repeat test. At least two repeat openings at the same pressure should be obtained to be sure that the valve is set accurately.

CHECKING SEAT TIGHTNESS

SCOPE

This standard describes a method of determining seat tightness of safety relief valves. Consolidated "O" ring valves are designed to be bubble tight on air according to Table 1.

NOTE: The cover plate should be fitted with a suitable device to relieve body pressure in case of accidental popping of the valve.

SET PRESSURE PSIG	PERCENT OF SET PRESSURE
15-60	5 psi below pop point
51-6000	90%

TABLE 1

PERCENT OF SET PRESSURE (POPPING PRESSURE) AT WHICH VALVE WILL BE TIGHT ON AIR.

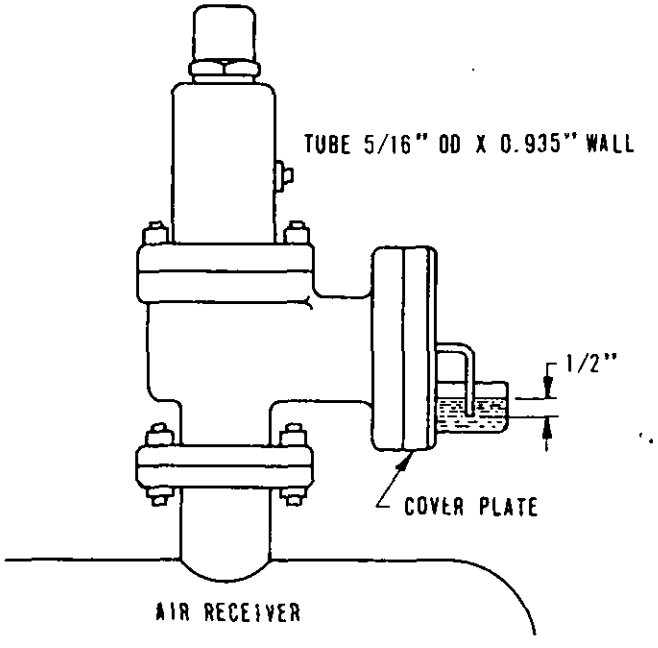


FIG. 29

TEST APPARATUS

A typical test arrangement for determining seat tightness for safety relief valves is shown in Fig. 29. Leakage measurement shall be made with use of a 5/16 in. OD tubing with .035 in, wall. The tube end shall be cut square and smooth. It shall be parallel to and 1/2 in. below the surface of the water.

PROCEDURE

With the valve mounted vertically, as shown in Fig. 29, the leakage rate in bubbles per minute shall be determined with pressure at the safety relief valve inlet held at the percent of the set pressure shown in Table 1. The test pressure shall be applied for a minimum of 1 min. for valves of inlet sizes through 2 in.; 2 min. for sizes 2-1/2, 3 and 4 in.½ 5 min. for sizes 6 in. and 8 in. Air at approximately atmospheric temperature shall be used as the pressure medium.

"Tightness Standard" the leakage rate in bubbles per minute shall not exceed the following:

TYPE OF VALVE	MANUFACTURER'S ORIFICE SIZE	MAX. LEAKAGE RATE (BUBBLES PER MINUTE)	APPROX. LEAKAGE RATE (STD. CU. FT. PER 24 HR.)
Conventional	F and smaller	40	0.60
	G and larger	20	0.30
Balanced	F and smaller	50	0.75
	G and larger	30	0.45

COLD DIFFERENTIAL SET PRESSURE

When a Consolidated Safety Relief Valve is to be set on a test stand at room temperature and atmospheric back pressure and is to operate at a higher temperature and/or a higher back pressure, a set pressure adjustment is required. The adjusted set pressure is designated as the "Cold Differential Set Pressure."

TEMPERATURE ADJUSTMENT

Safety relief valves set on air at atmospheric temperatures and to be used at higher temperatures should have the set pressure adjusted as follows:

Operating Temperature	Set Pressure
-20°F. to 250°F.	None
251°F. to 1000°F	3%

EXAMPLES OF COLD DIFFERENTIAL SET PRESSURE CALCULATIONS

Conventional Valve

(Type 1900 Consolidated Safety Relief Valve)

(a) Set pressure 2550 psig, temperature 300°F., back pressure atmospheric.
Set Pressure..... 2550 psig
plus 3% or figure from Pressure Adjustment column..... 76 psig
Cold Differential Set Pressure..... 2626 psig

(b) Set pressure 2550 psig, temperature 300°F., constant back pressure 150 psig.
Set Pressure..... 2550 psig
minus constant back pressure..... 150 psig
differential pressure..... 2400 psig
plus 3% or figure from Pressure Adjustment column..... 72 psig
Cold Differential Set Pressure..... 2472 psig

(c) Set pressure 2550 psig, temperature 100°F., constant back pressure 150 psig.
Set Pressure..... 2550 psig
minus constant back pressure..... 150 psig
Cold Differential Set Pressure..... 2400 psig

Bellows Valve

(Type 1900-30 Consolidated Safety Relief Valve)

(a) Set pressure 2550 psig, temperature 300°F., back pressure atmospheric.
Set Pressure..... 2550 psig
plus 3% or figure from Pressure Adjustment column..... 76 psig
Cold Differential Set Pressure..... 2626 psig

(b) When constant back pressure or variable back pressure is present, disregard the back pressure and determine the cold differential set pressure as specified above.

The following table can be used for set pressure adjustment of valves with operating temperatures from 251°F. to 1000°F.

Set Press.	Press. Adj.	Set Press.	Press. Adj.	Set Press.	Press. Adj.
1-16	0				
17-49	1	2018-2050	61	4018-4050	121
50-83	2	2051-2083	62	4051-4083	122
84-117	3	2084-2117	63	4084-4117	123
118-150	4	2118-2150	64	4118-4150	124
151-183	5	2151-2183	65	4151-4183	125
184-217	6	2184-2217	66	4184-4217	126
218-250	7	2218-2250	67	4218-4250	127
251-283	8	2251-2283	68	4251-4283	128
284-317	9	2284-2317	69	4284-4317	129
318-350	10	2318-2350	70	4318-4350	130
351-383	11	2351-2383	71	4351-4383	131
384-417	12	2384-2417	72	4384-4417	132
418-450	13	2418-2450	73	4418-4450	133
451-483	14	2451-2483	74	4451-4483	134
484-517	15	2484-2517	75	4484-4517	135
518-550	16	2518-2550	76	4518-4550	136
551-583	17	2551-2583	77	4551-4583	137
584-617	18	2584-2617	78	4584-4617	138
618-650	19	2618-2650	79	4618-4650	139
651-683	20	2651-2683	80	4651-4683	140
684-717	21	2684-2717	81	4684-4717	141
718-750	22	2718-2750	82	4718-4750	142
751-783	23	2751-2783	83	4751-4783	143
784-817	24	2784-2817	84	4784-4817	144
818-850	25	2818-2850	85	4818-4850	145
851-883	26	2883	86	4851-4883	146
884-917	27	2884-2917	87	4884-4917	147
918-950	28	2918-2950	88	4918-4950	148
951-983	29	2951-2983	89	4951-4983	149
984-1017	30	2984-3017	90	4984-5017	150
1018-1050	31	3018-3050	91	5018-5050	151
1051-1083	32	3051-3083	92	5051-5083	152
1084-1117	33	3084-3117	93	5084-5117	153
1118-1150	34	3118-3150	94	5118-5150	154
1151-1183	35	3151-3183	95	5151-5183	155
1184-1217	36	3184-3217	96	5184-5217	156
1218-1250	37	3218-3250	97	5218-5250	157
1251-1283	38	3251-3283	98	5251-5283	158
1284-1317	39	3284-3317	99	5284-5317	159
1318-1350	40	3318-3350	100	5318-5350	160
1351-1383	41	3351-3383	101	5351-5383	161
1384-1417	42	3384-3417	102	5384-5417	162
1418-1450	43	3418-3450	103	5418-5450	163
1451-1483	44	3451-3483	104	5451-5483	164
1484-1517	45	3484-3517	105	5484-5517	165
1518-1550	46	3518-3550	106	5518-5550	166
1551-1583	47	3551-3583	107	5551-5583	167
1584-1617	48	3584-3617	108	5584-5617	168
1618-1650	49	3618-3650	109	5618-5650	169
1651-1683	50	3651-3683	110	5651-5683	170
1684-1717	51	3684-3717	111	5684-5717	171
1718-1750	52	3718-3750	112	5718-5750	172
1751-1783	53	3751-3783	113	5751-5783	173
1784-1817	54	3784-3817	114	5784-5817	174
1818-1850	55	3818-3850	115	5818-5850	175
1851-1883	56	3851-3883	116	5851-5883	176
1884-1917	57	3884-3917	117	5884-5917	177
1918-1950	58	3918-3950	118	5918-5950	178
1951-1983	59	3951-3983	119	5951-5983	179
1984-2017	60	3984-4017	120	5984-6000	180

HYDROSTATIC TEST

When hydrostatic tests are required after installation of the safety relief valve, a test gag must be used (Fig. 30). Very little force (fingertight) on the test gag is sufficient to hold hydrostatic pressures. Too much force applied to the gag may bend the spindle and damage the seat. After hydrostatic test the gag must be removed and replaced by the sealing plug furnished for this purpose. Test gags for Consolidated Safety Relief Valves can be furnished for all types of caps and lifting gears.

MANUAL POPPING

After the valve has been installed and is in use, it may be necessary to pop it by hand or by pressure to make sure it has not become fouled by chemical action, such as corrosion, and that it continues to function properly. Consolidated Safety Relief Valves are furnished when so ordered with packed or plain lifting gears for hand popping or with air operated lifting device for remote control (Figs. 30 to 35 incl.).

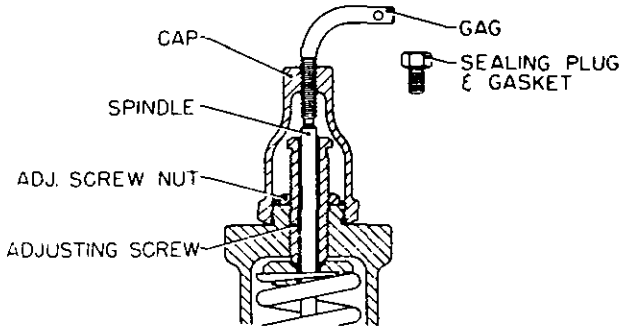


FIG. 30

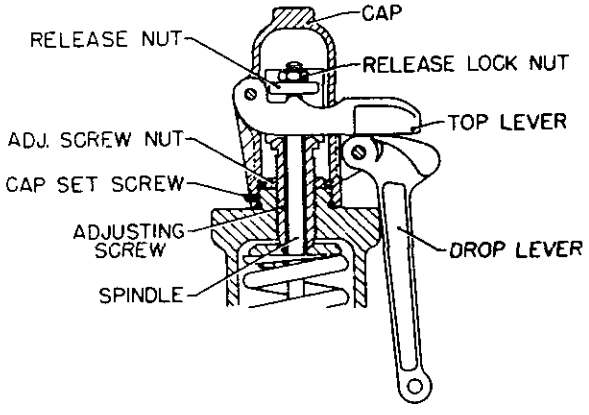


FIG. 31

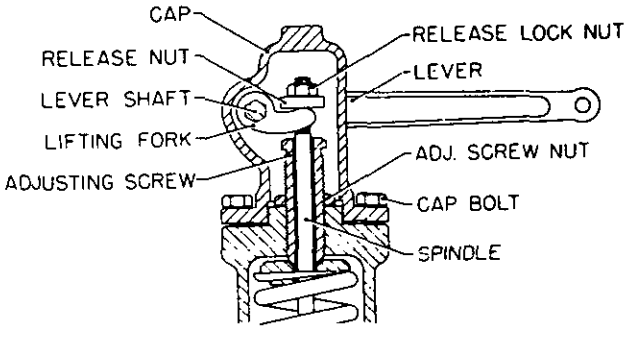


FIG.32

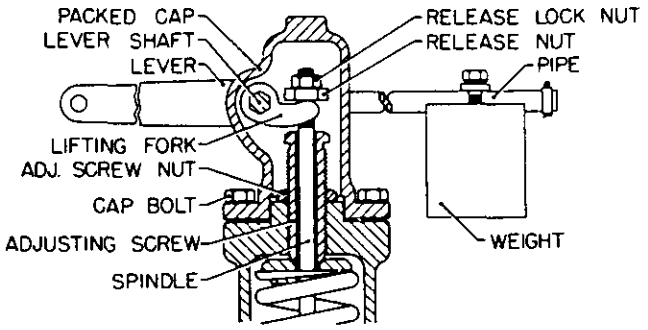


FIG. 33

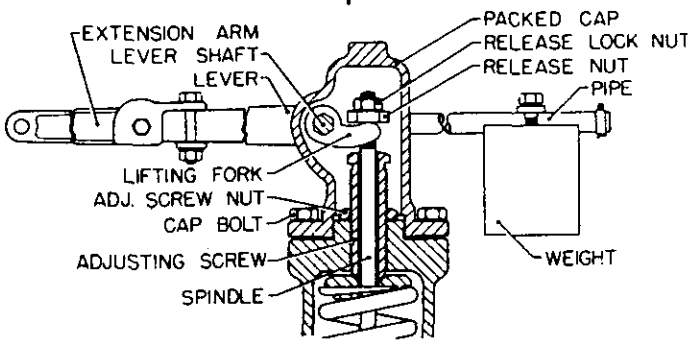


FIG. 34

When the valve is opened by hand it is better to have some pressure at the valve inlet, although lifting levers furnished are heavy enough to permit opening all except very high pressure valves with no pressure on the inlet. Under flowing conditions the valve must be fully lifted from its seat so that dirt, sediment and scale will not become trapped on the seating surfaces. When allowing the valve to close under flowing conditions, completely release the lever from maximum lift to snap the valve back on its seat. Since the dead weight of the lever will have a tendency to lift the valve, the lever should be hung or supported so that the lifting fork does not contact the release nut.

The air operated lifting device is designed to fully open the valve with 75% of set pressure under the valve disc in compliance with ASME Section VIII.

The air operator may be designed to fully open the valve with no pressure at the valve inlet. This lifting device can be operated from a remote point and can be used as a "drop out" valve.

The lifting lever or device is independent of the automatic valve action and may be located in any convenient position on the bonnet.

The air assisted lifting device, Figure 35 may be purchased to assist the valve to open at pressures from zero to set pressure depending on the requirements.

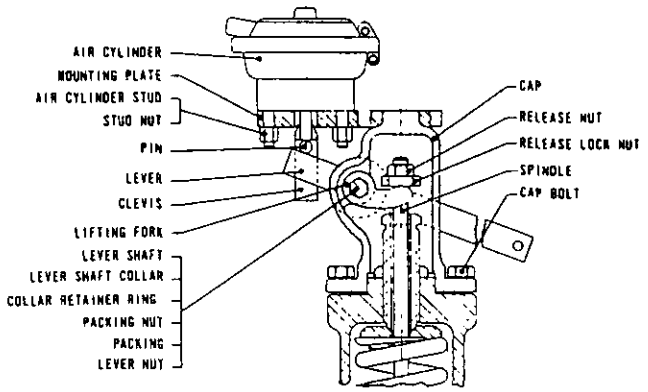


FIG. 35

MAINTENANCE TOOLS & SUPPLIES

LAPPING TOOLS

The following tools are required for proper maintenance of Consolidated Safety Relief Valve seats.

Nozzle Lap* - The nozzle lap is used for lapping the nozzle seat and has one flat side and one side with a 5° angle. This lap guides in the bore of the nozzle. A different size lap is required for each valve orifice.

Ring Lap* - The ring lap is used for lapping the disc seat and finish lapping of the nozzle seat. The entire line of flanged valves is covered by four ring laps, as follows: (1) Orifice D thru J, (2) Orifice K thru N, (3) Orifice P thru R, (4) Orifice T.

Lapping Plate* - The lapping plate is used for reconditioning the ring lap. It may also be used for lapping the disc. One 11" diameter plate is required for the entire line of valves.

Lapping Compound - Lapping compound is used as a cutting medium in lapping the valve seats.

*Nozzle laps, ring laps and lapping plate may be purchased from Dresser Industrial Valve & Instrument Division, Alexandria, La. 71301

B. Resurfacing Plate - 11" Diameter
   For reconditioning all sizes of Ring Laps
   Part No. VH-272

C. Lapping Compounds

Brand	Grade	Grit	Lapping Function	Size Container	Part No.
Clover	1A	320	General	4 oz.	199-3
Clover	3A	500	Finishing	4 oz.	199-4
Kwik-Ak-Shun	--	1000	Polishing	1 lb.	199-11
				2 oz.	199-12

D. Drift Pins (For removal of Disc from Disc Holder) (Fig. 36)

Orifice	Part No.	Qty. Required
F,G,H,J, & K	0430401	2
L,M.N, & P	0430402	2
Q & R	0430403	2
T	0430404	2

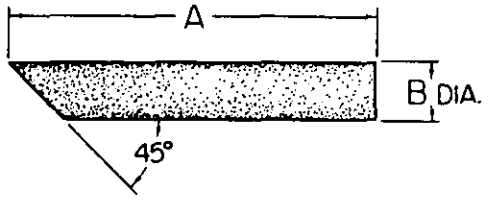
Orifice	* Original Nozzle		*New Nozzle		** Nozzle Lap Handle	*** Ring Lap
	Nozzle Bore Diameter	Nozzle Lap Part No.	Nozzle Bore Diameter	Nozzle Lap Part No.		
D	.393-.398	0543001	.404-.409(*4)	4451501	0544603	1672805
E	.524-.529	0543002	.539-.544(*5)	4451502	0544601	1672805
F	.650-.655	0543003	.679-.674(*6)	4451503	0544601	1672805
G	.835-.840	0543004	.863-.868	4451504	0544601	1672805
H	1.045-1.050	0543005	1.078-1.083	4451505	0544601	1672805
J	1.335-1.340	0543006	1.380-1.385	4451506	0544601	1672805
K	1.595-1.600	0543007	1.650-1.655	4451507	0544601	1672807
L	1.985-1.990	0543101	2.055-2.060	4451601	0544601	1672807
M	2.234-2.239	0543102	2.309-2.314	4451602	0544601	1672809
N	2.445-2.450	0543103	2.535-2.540	4451603	0554601	1672809
P	2.965-2.970	0543104	3.073-3.078	4451604	0544602	1672810
Q	3.900-3.905	0543105	4.045-4.050	4451605	0544602	1672812
R	4.623-4.628	0543106	4.867-4.872	4451606	0544602	1672812
T	6.000-6.006	0543107	6.037-6.043	4451607	0544602	1672813

NOTE 1: After August, 1978, all 1900 SRV Nozzles manufactured, have increased bore diamters. The above chart shows how each orifice was affected. Nozzles - original vs. new - are interchangeable, but Nozzle Laps are not. On the O.D. of the new Nozzles, the letter "C" is stamped. If this stamp becomes obliteratred, the Nozzle bore diameter must be measured to select the correct Nozzle Lap from above chart.

Note 2: Nozzle Lap Handles are interchangeable between original and new Nozzle Laps.

*Note 3. Ring Laps - One set of three (3) Ring Laps is recommended for each orifice to assure ample flat laps are available at all times.

****Note 4: Use for 1914D, 1916D, 1924D and 1926D only.
*****Note 5: Use for 1914E, 1916E, and 1926E only.
******Note 6: Also used for all "D" orifices except above.



Orifice	A	B
D, E, F, G, H, J, K	1 - 3/4	7/32
L, M, N, P	2 - 1/2	3/8
Q, R	3	5/8
T	3 - 1/2	7/8
1970	1 - 1/4	1/8
1975	1 - 1/4	3/64

Drift Pin
FIG. 36

E. Lubricants

Location	Lubricant	Material	Temp.
Nozzle Threads	Led-Plate	Stainless Nozzle Carbon Stl. Body	All
Nozzle Threads	Teflon Plate	Stainless Body	To 500°F
Nozzle Threads	Moly-Kote	Stainless Body	Above 500°F
Adjusting Ring Threads	Moly-Kote	All	All
Spindle-Ball Tip	Moly-Kote		
Spindle-Ball Tip	Moly-Kote	All	All
Lower Spring Wshr. Bearing Surface/ Spindle	Moly-Kote	All	All
Adjusting Screw-Lower Bearing End/Upper Spring Washer	Moly-Kote	All	All

NOZZLE REMOVAL METHODS

1. Utilize a 3 or 4 jaw chuck welded vertically to a stand bolted to a concrete floor. Chuck on nozzle flange and break the body loose from the nozzle with a heavy rod or pipe (Fig. 37).
2. Use a large pipe wrench on nozzle flange to remove nozzle from base (Fig.).

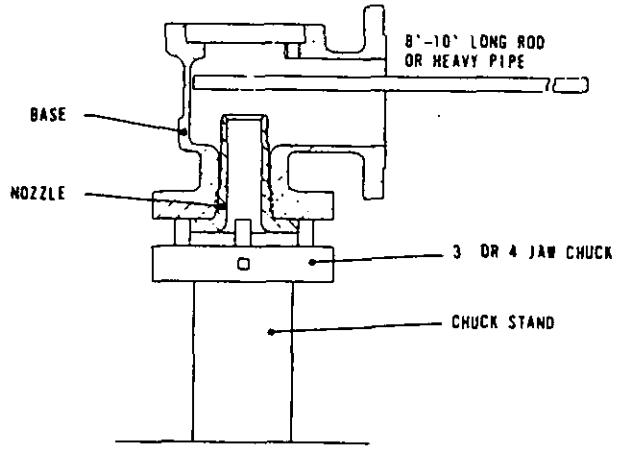


FIG. 37

WRENCHES FOR REMOVAL OF BELLOWS*

Valve Orifice	Description of Wrench	Pin Spanner Wrench No.
F	3/4" Radius-7/32" Pin	4451801
G	3/4" Radius-7/32" Pin	4451801
H	7/8" Radius-15/64" Pin	4451802
J	1-1/8" Radius-17/64" Pin	4451803
K	1-1/4" Radius-9/32" Pin	4451804
L	1-3/8" Radius-19/64" Pin	4451805
M	1-5/8" Radius-21/64" Pin	4451806
N	1-7/8" Radius-23/64" Pin	4451807
P	1-7/8" Radius-23/64" Pin	4451807
Q	2-1/2" Radius-7/16" Pin	4451808
R	3" Radius-1/2" Pin	4451809
T	3-3/4" Radius-1/2" Pin	4451810

*Purchase from Industrial Valve Operations, Dresser Industries, Inc., Alexandria, La. 71301.

SERVICE PARTS INVENTORY PLANNING

The basic objective in formulating a service parts inventory philosophy is to provide prompt valve service capability, thus preventing maintenance outage time extensions. To accomplish this, it is necessary to have immediate availability of the proper inventory of service parts for optimum valve quantities. This can be achieved at a minimum of cost by defining the inventory on a frequency of need basis.

To assist towards this objective, the Field service and Repair Organization of Dresser Industries - Industrial Valve Operation recommends that the following guidelines be utilized to establish meaningful inventory levels:

1. Identify the total number of safety valves in service by size, type number, temperature class, and serial number.
2. Identify the frequency of replacement tendency

of specific parts.
Class I - Parts Most Frequently Replaced
Class II - Parts Less Frequently Replaced, but Critical in the Event of an Emergency Requirement.
Class III - Parts Seldom Replaced
Class IV - Hardware (e.g. nuts, bolts, pins, cap components, etc.)
Class V - Parts Practically Never Requiring Replacement

3. "Need probability coverage" is defined as the probable per cent (%) of total, uninterupted operational time which can be expected by stocking predetermined valve component classifications.

   Determine "need probability coverage" which is compatible with a specific company's operational objectives and service parts inventory investment philosophy. Then relate "need probability coverage" to parts classifications which will satisfy that need. Guidelines are as follows:

Parts Classification	Need Probability Coverage
Class I	70%
Class I, & II	85%
Class I, II, & III	95%
Class I, II, III, & IV	99%

4. Consult recommended spare parts list by valve type to determine quantity of parts for valves to be covered by the inventory plan.
5. Select parts and specify quantities.

IDENTIFICATION AND ORDERING ESSENTIALS

When ordering service parts, please furnish the following information to insure receiving the correct replacement parts:

Identify Valve By:	Specify parts required by:
1. Size	1. Part Name
2. Type	2. Part Number (if known)
3. Temperature Class	3. Quantity
4. Serial Number	

Example One: 1-1/2"1910Fc
S/NTD-94578

Example Two: 6"1910qc
S/N TD-07961

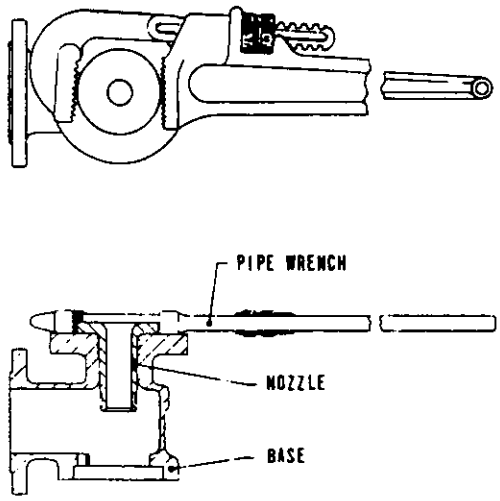


FIG. 38

The correct part names may be obtained from Figures 1, 8, 9 and 10. All other required information will be found stamped on the nameplate attached to the bonnet of the valve. Typical nameplates are shown in Figure 39. Should the nameplate be lost, the valve type and serial number are stamped on the outlet flange.

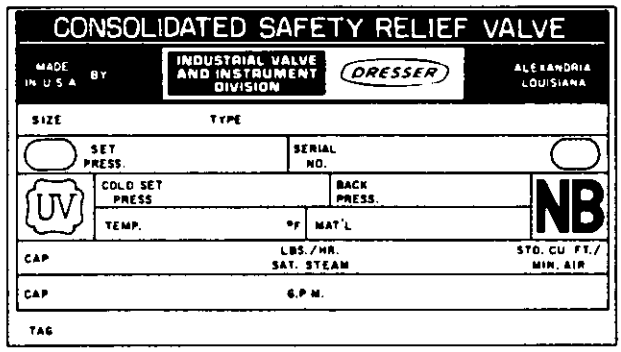


FIG. 39

RECOMMENDED SPARE PARTS
SAFETY RELIEF VALVES
1900 Conventional
1900-30 Bellows

CLASS	PART NAME	C-CONVENTIONAL B-BELLOWS	QTY. PARTS/ SAME VALVES IN SERVICE	NEED PROBABILITY COVERAGE
I.	Disc	C&B	1/3	70%
	Nozzle	C&B	1/10	70%
	Bellows	B	1/3	70%
	Adj. Ring Pin	C&B	1/3	70%
	Disc & Spindle Retainers	C&B	1 Set/1	70%
	Gasket (Set)			
	(1) Cap Gasket	C&B	1/1	70%
	(1) Bonnet Gasket	C&B	1/1	70%
	(1) Guide Gasket	C&B	1/1	70%
	(1) Adj. Ring Pin Gasket	C&B	1/1	70%
	(1) Bellows Gasket	B	1/1	70%
II.	Disc Holder	C&B	1/6	85%
	Spindle	C&B	1/6	85%
	Studs, Base	C&B	1 Set/6	85%
	Nuts, Base Stud	C&B	1 Set/6	85%
III.	Adjusting Ring	C&B	1/10	95%
	Spring Assembly			
	(1) Spring	C&B	1/10	95%
	(1) Spring Washer (U)	C&B	1/10	95%
	(1) Spring Washer (1)	C&B	1/10	95%
	Compression Screw	C&B	1/10	95%
IV.	Compression Screw Lock Nut	C&B	1/10	99%
	Cap (Select One):			
	1. Screwed	C&B	1/10	99%
	2. Plain Lever Assembly	C&B	1/10	99%
	(1) Cap Assembly			
	(1) Release Nut			
	(1) Lock Nut			
	3. Packed Lever Assembly	C&B	1/10	99%
	(1) Cap Assembly			
	(4) Cap Bolts			
	(1) Release Nut			
	(1) Lock Nut			

RECOMMENDED SPARE PARTS
1970 & 1975 CONVENTIONAL

CLASS I	Qty. Parts/Same Size, Type & Material Valves In Service	Need Probability Coverage
1. Disc	1/1	
2. Guide Pin	1/1	70%
3. Gaskets	1 Set/1	
3A. Cap		
3B. Guide Pin		
3C. Bonnet		

CLASS II		
5. Disc Holder Assembly	1/5	
5A. Disc Holder		
5B. Lift Nut		
5C. Retainer Ring		
6. Spindle	1/5	
7. Guide	1/5	85%
CLASS III		
8. Spring Assembly	*1/5	
9. Adjusting Screw	1/5	95%
CLASS IV		
10. Adjusting Screw Nut	1/5	
11. Cap (Specify Screwed, Packed, Plain)	1/5	
12. Release Nut (Used on Packed or Plain Lever Only)	1/5	99%
13. Release Lock Nut (Used on Packed or Plain Lever Only)	1/5	

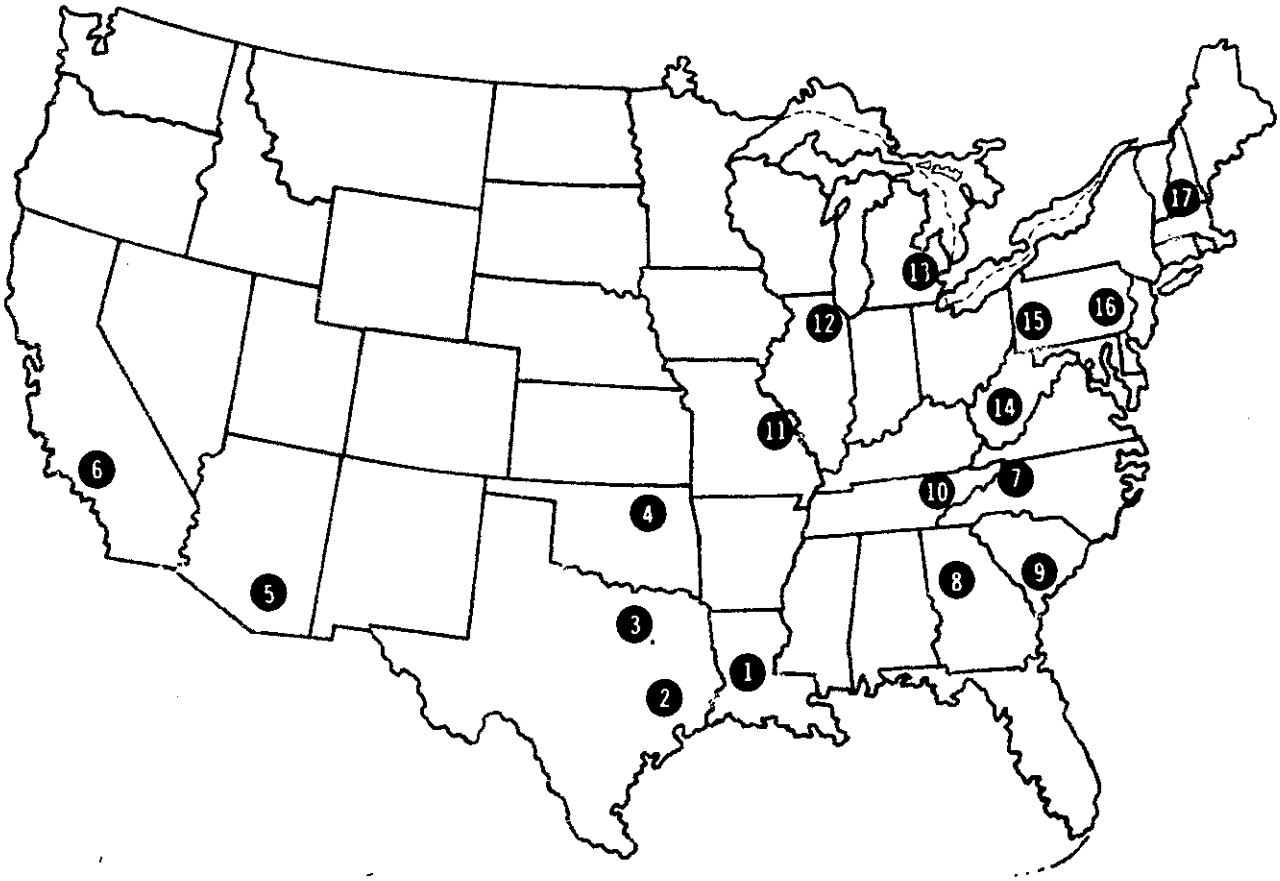
*NOTE: Consult Spring Selection Chart before ordering Springs to determine actual quantities required in view of pressure setting potential in each spring range.

RECOMMENDED SPARE PARTS
1980 & 1982 PORTABLES

Class I	Qty. Parts/Size, Type & Material Valves in Service	Need Probability Coverage
1. Disc Assembly	1/1	
2. Adj. Ring Pin	1/1	
3. Gaskets	1 Set/1	
3A. Cap		
3B. Adj. Ring Pin		
3C. Bonnet		
CLASS II		
5. Spindle	*1/5	
6. Guide	1/5	85%
CLASS III		
7. Adj. Ring	1/5	
8. Spring	1/5	95%
9. Spring Washers	1/5	
10. Adj. Screw	1/5	
CLASS IV		
11. Adj. Screw Locknut	1/5	
12. Cap (Specify Screwed, Packed, Plain)	1/5	
13. Release Nut (Used on Packed or Plain Lever Only)	1/5	99%
14. Release Locknut (Used on Packed or Plain Lever Only)	1/5	

*NOTE: Consult Spring Selection Chart before ordering Springs to determine actual quantities required in view of pressure setting potential in each spring range.

Notes



THE DRESSER FIELD SERVICE ORGANIZATION IS UNEQUALED.

For prompt field service, please call Dresser Industrial Valve Operation Service Department, Alexandria, Louisiana.

All Hours. Manager, Field Service (318) 640-6055.

LOCATION OF SERVICE MEN

1 Alexandria, LA	7 Winston-Salem, NC	13 Detroit, MI
2 Houston, TX	8 Atlanta, GA	14 Charleston, WVA
3 Dallas, TX	9 Charleston, SC	15 Pittsburgh, PA
4 Tulsa, OK	10 Knoxville, TN	16 Philadelphia, PA
5 Tuscon, AZ	11 St. Louis, MO	17 Nashua, NH
6 Los Angeles, CA	12 Chicago, IL	

MANUFACTURER'S FIELD SERVICE & REPAIR PROGRAM

Field Service

Process industries expect and demand service on a moment's notice. CONSOLIDATED® Field Service can be depended upon for prompt response, even in extreme off-hour emergency situations.

Dresser Industrial Valve Operation maintains the largest and most competent field service staff in the industry. Service Engineers are located at strategic points throughout the United States to respond to customer's requirements for service. Each Service Engineer is factory trained and long experienced in servicing Safety Relief Valves. Our Service Engineers restore disc and nozzle critical dimensions which affect valve performance, and are capable of modernizing valves in the field.

It is highly recommended that the professional talents of a Dresser Field Service Engineer be employed to make final adjustments during the initial setting of all CONSOLIDATED® Safety Relief Valves.

All Field Service Engineers' activities are coordinated from the Alexandria, Louisiana, Field Service and Repair Office. Upon receipt of a purchase order number authorizing the trip, the man is dispatched.

Contact: Field Service Department
Field Service Manager
(318) 640-6055

Factory Repair Facilities

If downtime permits, it may be desirable to return the valves to the factory for repair or modernizing. The factory at Alexandria, Louisiana, maintains a complete CONSOLIDATED® REPAIR CENTER. In addition to factory production parts stock, the repair center maintains its own service parts stock room. Most important, this enables return shipment of repaired valves within forty-eight (48) hours after receipt of customer's purchase order.

Contact: Repair Department
Repair Manager
(318) 640-6058

Pick-Up & Delivery Service

To serve customers emergency requirements, our own pick-up and delivery service is available within a 250 mile radius from Alexandria, La., and Houston, TX.

Service Warrantly

Both factory and field repaired valves carry a warranty which covers workmanship and new parts installed during repair, for a period of one year from date of repair completion. Contact the manager, field service if you suspect a warranty problem.

Product Repair By Unauthorized Sources

Dresser Industrial Valve Operation has authorized no out side repair companied, contractors, nor individuals to perform warranty repair service on new products, field or factory repaired products of its manufacture. Therefore, customers contracting such repair service from unauthorized sources must do so at their own risk. Likewise if any Dresser valve product fails to perform within the scope of its design, we must be notified and given the opportunity to inspect and correct the product. We will accept no back-charges for unauthorized repair sources performing corrective repairs on our products.

CONSOLIDATED®

Division Headquarters
12700 Northborough, Suite 620
Houston, Texas 77067
Telephone (713) 580-1556
Telex 58-6423

Alexandria Operations
Highway 71 North
P.O. Box 1430
Alexandria, La. 71301
Telephone (318) 640-2250
Telex 58-6423

Domestic Sales Headquarters
12700 Northborough, Suite 620
Houston, Texas 77067
Telephone (713) 580-1556
Telex 58-6423

Northern Region
3201 North Wolf Road
Franklin Park, Illinois 60131
Telephone (312) 625-5700
Telex 72-1452

Southern Region
Mailing
P.O. Box 1407
Houston, Texas 77001
Telephone (713) 972-5526
Telex 79-4586
Shipping
Dresser Center
10205 Westheimer, Suite 961
Houston, Texas 77042

Pacific Region
3931 MacArthur Blvd., Suite 202
Newport Beach, California 92660
Telephone (714) 752-0455
(213) 770-2057
Telex 183-539

INDUSTRIAL VALVE DIVISION | DRESSER

ALEXANDRIA, LOUISIANA

International Sales Headquarters
12700 Northborough, Suite 620
Houston, Texas 77067
Telephone (713) 580-1556
Telex 58-6423

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Industrial Products Division
Mississauga Service Centre
6688 Kitimat Road
Mississauga, Ontario L5N 1P8
Telephone (416) 826-8411
Telex 97654

Dresser Canada, Inc.
Industrial Products Division
Cambridge Plant
200 Avenue Road
Cambridge, Ontario N1R 5V7
Telephone (519) 621-3200
Telex 59322

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Dresser Industrial Valve Operations - Europe
Badenerstrasse 156
P.O. Box 369
CH-8021 Zurich, Switzerland
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Telex 54389

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7-4 Nishi Shinbashi 2-chome
Minato-Ku, Tokyo 105 Japan
Telephone (03) 501-7781/8
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South Africa
Dresser South Africa (Pty.), Ltd.
Industrial Valve Operations
Kelvin & Rigger Roads
Spartan
Kempton Park 1620
P.O. Box 739
Transvaal, South Africa
Telephone 970-1427/8
Telex 8-6425

United Kingdom
Dewrance & Company, Ltd.
Trevithick Works
East Gillibrands Estate
P.O. Box 108
Skelmersdale, Lancashire
England WN8 9TU
Telephone (44) 695-24234
Telex 627039