

Consolidated®

INSTALLATION AND START-UP INSTRUCTIONS

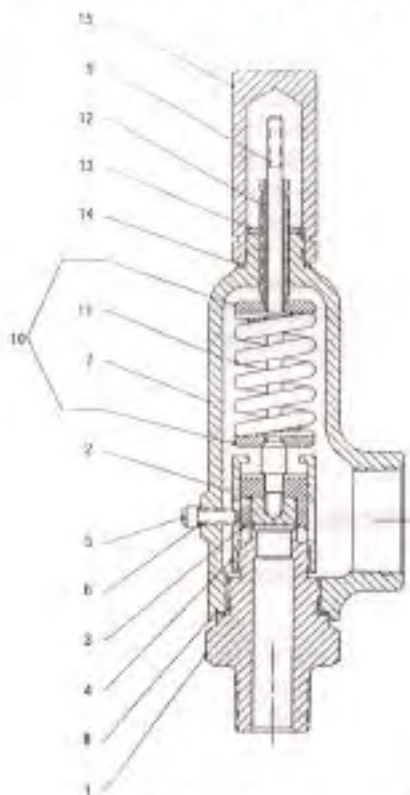
For more detailed instructions, consult the appropriate Dresser manual.

Consolidated® Safety Relief Valve Series 1990 and Series 3990

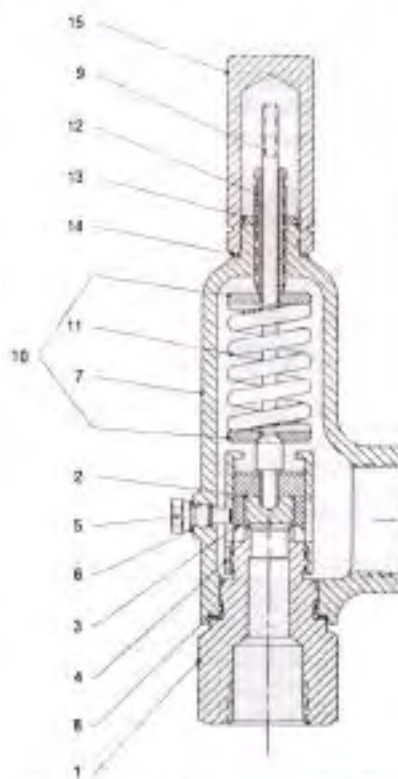
Design Options Include:

O-Ring Seat Seal (XDA), except for Type 3999;
Liquid Trim (XLS); and combination O-Ring Seat Seal
and Liquid Trim (XDL), except for Type 3999

THESE INSTRUCTIONS
ARE INTENDED FOR
INSTALLATION AND
START UP ONLY,
AND NOT FOR THE
MAINTENANCE
OF THE VALVE.

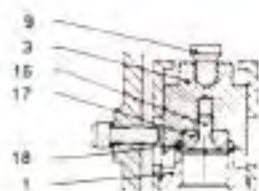


TYPES 1990, 1993, 3990 & 3993
FIGURE 1

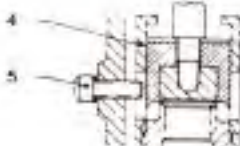


TYPES 1994 H/HP, 1996 H, 1996 H/HP & 3996 H
FIGURE 2

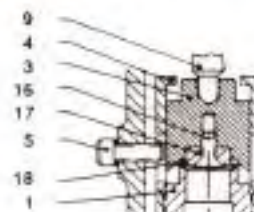
| Part No. | Nomenclature |
|----------|-------------------------|
| 1 | Base |
| 2 | Disc |
| 3 | Disc Holder |
| 4 | Guide |
| 5 | Guide Pin |
| 6 | Guide Pin Gasket |
| 7 | Bonnet |
| 8 | Bonnet Gasket |
| 9 | Spindle |
| 10 | Spring Washer |
| 12 | Adjusting Screw |
| 13 | Adjusting Screw Locknut |
| 14 | Cap Gasket |
| 15 | Screwed Cap |
| 16 | Retainer Lock Screw |
| 17 | O-ring Retainer |
| 18 | O-ring Seat Seal |



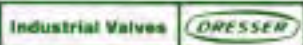
XDA
FIGURE 3A



XLS
FIGURE 3B



XDL
FIGURE 3C



Industrial Valve Operation

Dresser Valve and Controls Division
Alexandria, Louisiana 71309-1430 (USA)

CON-4 ISI
Revised 3/94


i. Safety Notice

Proper installation and start-up is essential to the safe and reliable operation of all valve products. The relevant procedures recommended by Dresser Valve and Controls Division (DVCD), and described in these instructions, are effective methods of performing the required tasks. Some of these procedures require the use of tools specifically designed for an intended purpose. These special tools should be used when, and as, recommended.

It is important to note that these instructions contain various "safety messages" which should be carefully read in order to minimize the risk of personal injury, or the possibility that improper procedures will be followed which may damage the involved DVCD product, or render it unsafe. It is also important to understand that these "safety messages" are *not* exhaustive. DVCD can not possibly know, evaluate, and advise any customer of all of the conceivable ways in which tasks might be performed, or of the possible hazardous consequences of each way. Consequently, DVCD has not undertaken any such broad evaluation and, thus, anyone who uses a procedure and/or tool, which is not recommended by DVCD, or deviates from DVCD recommendations, must be thoroughly satisfied that neither personal safety, nor valve safety, will be jeopardized by the method and/or tools selected. If not so satisfied, contact DVCD (at 318/640-2250) if there are any questions relative to tools/methods. Some of the products manufactured by DVCD may be used in radioactive environments. Consequently, prior to starting any operation in a radioactive environment, the proper "health physics" procedures should be consulted and followed, if applicable.

The installation and start-up of valves and/or valve products may involve proximity to fluids at extremely high pressure and/or temperature. Consequently, every precaution should be taken to prevent injury to personnel during the performance of any procedure. These precautions should consist of, but are not limited to, ear drum

⚠ WARNING



RADIATION AREA
KEEP OUT
RWP REQUIRED FOR ENTRY.

Know nuclear "health physics" procedures, if applicable, to avoid possible severe personal injury or death.

protection, eye protection, and the use of protective clothing. (i.e., gloves, etc.) when personnel are in or around a valve work area. Due to the various circumstances and conditions in which these operations may be performed on DVCD products, and the possible hazardous consequences of each way, DVCD can not possibly evaluate all conditions that might injure personnel or equipment. Nevertheless, DVCD does offer certain safety precautions, shown below, for customer information only.

⚠ CAUTION



Wear necessary protective equipment to avoid possible personal injury.

It is the responsibility of the purchaser or user of DVCD valves/equipment to adequately train all personnel who will be working with the involved valves/equipment. Further, *prior* to working with the involved valves/equipment, personnel who are to perform such work should become thoroughly familiar with the contents of these instructions. Accordingly, should additional copies of these instructions be required, they can be purchased, at a minimal cost, by contacting DVCD (in writing) at P.O. Box 1430, Alexandria, LA 71309-1430, or (telephonically) at 318/640-2250.

ii. Safety Precautions

Follow all plant safety regulations, but **be sure** to observe the following:

- Do **not** stand in front of the discharge side of a safety relief valve when testing or operating.
- Hearing protection should **always** be used when testing or operating a valve.
- Exercise **care** when examining a safety relief valve for visible leakage.

⚠ DANGER



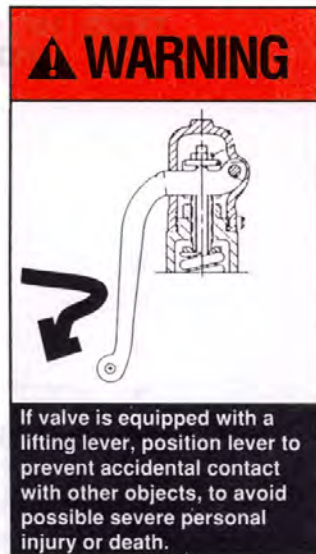
Stand clear of discharge side of valve, when testing or operating, to avoid severe personal injury or death.

- **Never** install a safety relief valve in a horizontal position. Safety 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.



- When removing a safety relief valve for disassembly, stand clear and/or wear protective clothing to prevent exposure to splatter of any corrosive process medium which may have been trapped inside the valve. Ensure the valve is isolated from system pressure before valve is removed.
- Safety relief valves should be mounted to **provide adequate access**, 360° around the valve plus overhead, to permit removal for testing and maintenance.

- When a valve is equipped with a lifting lever, the lever should **always** be positioned to avoid accidental contact, by other equipment or personnel, which might cause the valve to lift accidentally.



For more detailed instructions, consult the appropriate Dresser manual.

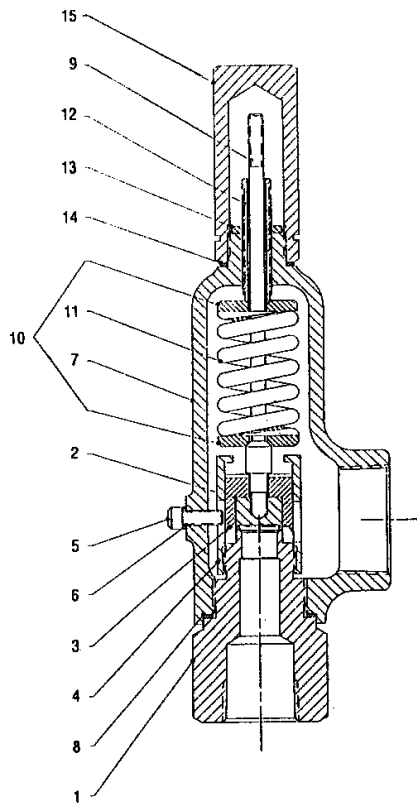
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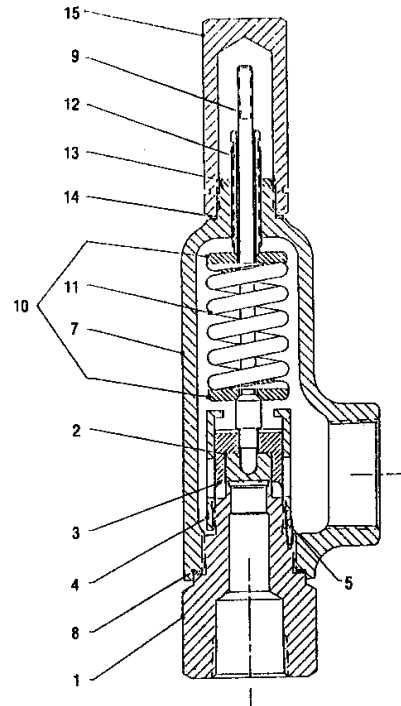
I. Introduction

The Consolidated® Series 1990 and Series 3990 portable pressure relief valves are designed to meet ASME Section VIII requirements for fixed blowdown pressure relief valves and liquid relief valves. They may be used for various media such as air, liquids, process steam and hydrocarbons; and may serve as either a safety valve or a relief valve depending upon the application. Design features and nomenclature for the various types of valves, and "typical" design options, are provided in the figures (and on the pages) identified below:

- Types 1990, 1993, 3990 and 3993 in Figure 1 (on the front cover).
- Types 1994 H/HP, 1996 H, 1996 H/HP and 3996 H in Figure 2 (on the front cover).
- "Typical" design options as follows:
 - ▲ O-Ring Seat Seal (XDA), applicable to all valve types **except** Type 3999, in Figure 3A (on the front cover)
 - ▲ Liquid Trim (XLS) in Figure 3B (on the front cover)
 - ▲ Combination O-ring Seat Seal and Liquid Trim (XDL), applicable to all valve types **except** Type 3999, in Figure 3C (on the front cover)
- Types 1995/HP, 1996 and 3996 in Figure 4 (on page 2).
- Types 1997, 1998, 3997 and 3998 in Figure 5 (on page 2).
- Type 3999 in Figure 6 (on page 2).

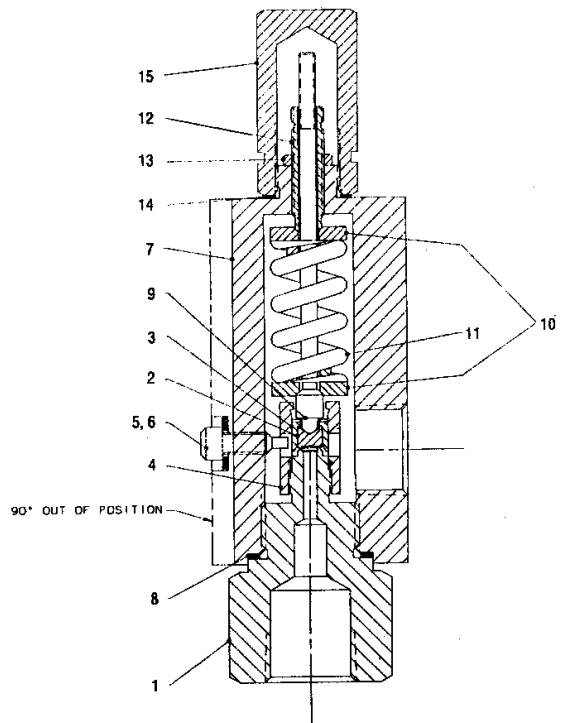


TYPES 1995/HP, 1996 & 3996
FIGURE 4



TYPES 1997, 1998, 3997 & 3998
FIGURE 5

| Part No. | Nomenclature |
|----------|-------------------------|
| 1 | Base |
| 2 | Disc |
| 3 | Disc Holder |
| 4 | Guide |
| 5 | Guide Pin |
| 6 | Guide Pin Gasket |
| 7 | Bonnet |
| 8 | Bonnet Gasket |
| 9 | Spindle |
| 10 | Spring Washers |
| 11 | Spring |
| 12 | Adjusting Screw |
| 13 | Adjusting Screw Locknut |
| 14 | Cap Gasket |
| 15 | Screwed Cap |



TYPE 3999
FIGURE 6

II. Handling, Storage & Preinstallation

Handling

Never lift the full weight of the valve by the lifting lever (if the valve is so equipped).

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. While hoisting to the installation, care should be taken to prevent bumping the valve against steel structures and other objects.



B. Storage

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.

Protectors and sealing plugs (both inlet and outlet) should not be removed until the valve is ready to be installed.

C. Preinstallation

When safety relief valves are uncrated and the protectors or sealing plugs have been removed (immediately prior to installation), **meticulous care should be exercised to prevent dirt and other foreign materials from entering the inlet and outlet ports.**



III. Recommended Installation Practices

A. Mounting Position

Safety relief valves should only be mounted in a vertical upright position (per API RP520). Installing a safety relief valve in other than a vertical position (± 1 degree) will adversely affect its operation in varying degrees as a result of induced misalignment of moving parts.

A stop valve may be placed between the pressure vessel and its relief valve only 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. The pressure drop from the vessel to the safety relief valve shall not exceed 3% of the valve's set pressure, when flowing at full capacity.

The inlet and outlet ports, and sealing faces, of the valve and all connecting piping must be free from dirt, sediment and scale.

Safety relief valves should be located for easy access and/or removal so that servicing can be properly performed. Sufficient working space should be provided around, and above, the valve.

B. Inlet Piping

The inlet piping to the valve should be short and direct from the vessel or equipment being protected. The connection to the vessel should be provided with a radius to permit smooth flow to the valve. Sharp corners should be avoided. If this is not practical, then the inlet should be bored at least one additional pipe diameter. In any event, the pressure drop from the vessel to the valve should not exceed 3% of valve set pressure when the valve is flowing full capacity. In no event should the inlet piping be smaller in diameter than the inlet connection of the valve. Excessive pressure loss at the inlet of a pressure relief valve in gas, vapor, or flashing-liquid service will cause extremely rapid opening and closing of the valve, which is known as "chattering". Chattering will result in lowered capacity and damage to the seating surfaces. The most desirable installation is that in which the nominal size of the inlet piping is the same as, or greater than, the nominal size of the valve inlet, and in which the length does not exceed the face-to-face dimensions of a standard tee of the required pressure class.



Safety relief valve inlets should not be located at the end of a long, horizontal pipe through which there is normally no flow. Foreign matter may accumulate, or liquid may be trapped, and may interfere with the operation of the valve, or be the cause of more frequent valve maintenance.

Safety relief valve inlets should not be located where excessive turbulence is present such as near elbows, tees, bends, orifice plates, or throttling valves.



Section VIII of the ASME Boiler and Pressure Vessel Code requires that the design of the inlet connection consider stress conditions induced by reaction forces during valve operation, by external loading, by vibration and by loads due to thermal expansion of discharge piping.

1. The determination of reaction forces during valve discharge is the responsibility of the vessel and/or piping designer. DVCD publishes certain technical information about reaction forces under various fluid flow conditions, but assumes no liability for the calculations and design of the inlet piping.
2. External loading by poorly designed discharge piping and support systems can be the cause of excessive stresses and distortions in the valve, as well as the inlet piping. The stresses set up in the valve may cause malfunctioning or leakage of the valve. Forced alignment of the discharge piping will also induce such stresses. Discharge piping should be independently supported and carefully aligned.
3. Vibrations in the inlet piping system may cause valve seat leakage and/or fatigue failure of the piping. These vibrations may cause the disc seat to slide back and forth across the nozzle seat and result in damage to the seating surfaces. Vibration may also cause separation of the seating surfaces and premature wear to certain valve parts. High-frequency vibrations are more detrimental to pressure relief valve tightness than low-frequency movements. This effect can be minimized by providing a larger difference between the operating pressure of the system and the seat pressure of the valve, particularly under high-frequency conditions.
4. Temperature changes in the discharge piping may be caused by fluid flowing from the discharge of the valve, prolonged exposure to the sun, or heat radiated from nearby equipment. Any change in temperature of the discharge piping will cause a change

in the length of the piping. The resulting change in length may cause stresses which will be transmitted to the pressure relief valve and its inlet piping. Stresses caused by thermal changes in the discharge piping can be avoided by proper support, anchoring or provision for flexibility of the discharge piping. **Fixed supports should not be used.**

C. Outlet Piping

Alignment of the internal parts of a safety relief valve is important to ensure proper operation. Although the valve body will withstand a considerable mechanical load, unsupported discharge piping consisting of more than a companion flange, long radius elbow and a short vertical pipe is not recommended. Care should be taken to ensure thermal expansion of piping and support system does not produce strains in a valve. Spring supports are recommended where this may be the case. The discharge piping should be designed to allow for vessel expansion as well as expansion of the discharge pipe itself. This is particularly important on long distance lines.

Consideration should be given to discharge pipe movement resulting from wind loads, since a continual oscillation of the discharge piping introduces in stress distortion in the valve body, and the resultant movement of the internal parts may cause leakage. Remember that, where possible, drains should be piped away to prevent the collection of water or corrosive liquid in the valve body, and attention should be given to the support of the drainage piping.

As a final point, it is important to ensure that the discharge piping size is never less than the size of the valve outlet, and the discharge piping must be designed to limit variable backpressure to a maximum of 10% of the valve set pressure.

IV. Start-Up Instructions

A. General Information

Before putting a Series 1990 or 3990 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 may be more convenient to set the valve, and check seat tightness, on a test stand. In some places, the use of a test stand may even be required by law; therefore, for detailed "Test Stand Instructions", consult DVCD "Installation, Operation and Maintenance Manual," CON-4.)

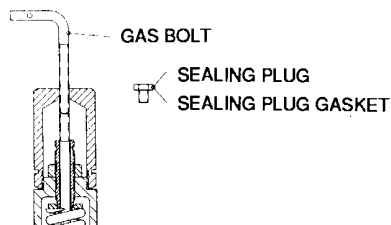
B. Specific Steps

During initial start-up, and after the system is stabilized, proceed as follows:

1. Inspect the valve nameplate to confirm that the correct type valve has been installed to meet application requirements, pressure requirements, etc
2. Inspect for binding and/or stress.
3. Inspect for seat leakage, if possible.
4. Inspect seals to verify that they are intact.
5. Inspect mechanical joints for leakage.
6. Inspect system for vibration and/or turbulence.

V. Hydrostatic Testing and Gagging

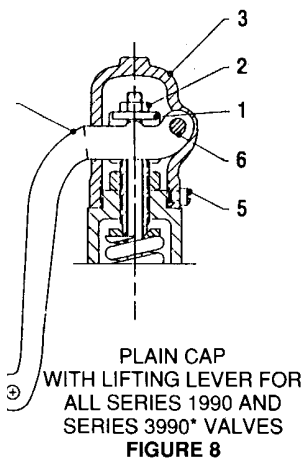
When hydrostatic testing is required after installation of a safety relief valve, a test gag must be used (see Figure 7, below). Very little force (i.e., fingertight pressure) on the test gag is sufficient to hold hydrostatic pressures. **Too much force applied to the gag may bend the spindle and damage the seat.** After a 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 gear.)



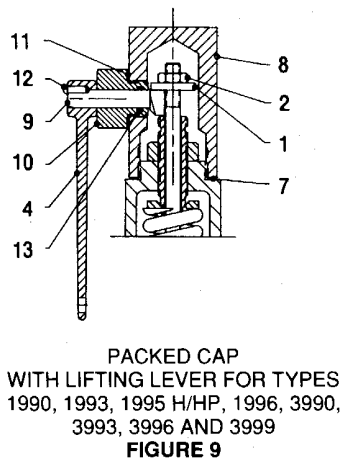
TYPICAL CAP WITH GAG
FIGURE 7

VI. Manual Popping of the Valve

Consolidated Safety Relief Valves are furnished, when so ordered, with packed or plain lifting levers for hand popping, or with an air operated lifting device for remote control. (See Figures 8-10, below).

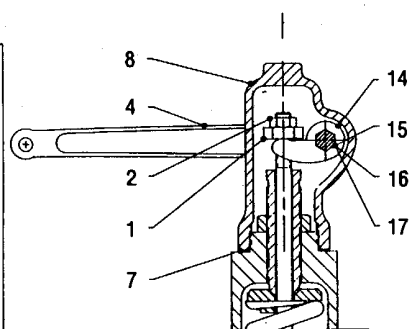


PLAIN CAP
WITH LIFTING LEVER FOR
ALL SERIES 1990 AND
SERIES 3990* VALVES
FIGURE 8



PACKED CAP
WITH LIFTING LEVER FOR TYPES
1990, 1993, 1995 H/HP, 1996, 3990,
3993, 3996 AND 3999
FIGURE 9

| Part No. | Nomenclature |
|----------|-----------------|
| 1 | Release Nut |
| 2 | Release Locknut |
| 3 | Plain Cap |
| 4 | Lifting Lever |
| 5 | Cap Screw |
| 6 | Lever Pin |
| 7 | Cap Gasket |
| 8 | Packed Cap |
| 9 | Cam Shaft |
| 10 | Bushing |
| 11 | Bushing Gasket |
| 12 | Drive Screw |
| 13 | O-ring |
| 14 | Lifting Fork |
| 15 | Lifting Shaft |
| 16 | Packing |
| 17 | Packing Nut |



PACKED CAP WITH LIFTING
LEVER FOR TYPES 1994 H/HP,
1996 H, 1996 H/HP, 1997, 1998,
3996 H, 3997 AND 3998
FIGURE 10

*Plain cap with lifting lever
not available for valve type 3999.

When the valve is to be opened by hand, the pressure at the valve inlet should be at least 75% of the valve's set pressure. 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.

VII. Manufacturer's Field Service & Repair Program

A. Factory Setting Vs. Field Setting

Every CONSOLIDATED® Safety Relief Valve is set and adjusted before shipment from the factory, or at an authorized facility. However, it must be recognized that actual field operating conditions may vary considerably from factory or authorized facility test conditions.

Conditions beyond the manufacturer's control that affect safety relief valve operation are:

1. Quality of media being discharged.
2. Discharge piping stresses and back pressure.
3. Ambient temperature.
4. Shipping or storage damage.
5. Improper gagging.
6. Damage due to foreign material in the media.

Final safety relief valve adjustments made on the actual installation are the best means of insuring that the valves perform in compliance with the ASME Code and/or other applicable code requirements.

B. Field Service

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

DVCD 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. DVCD Service Engineers restore disc and nozzle critical dimensions which effect valve performance, and are capable of modernizing valves in the field.

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

Contact: Field Service Dept., Field Service Supv.,
(318) 640-6055

C. 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. The Repair Department is staffed to provide rapid repair that meets customer needs.

Contact: Repair Dept., Mgr. Valve Repair,
(318) 640-6058.

For more detailed instructions, consult the appropriate Dresser manual.

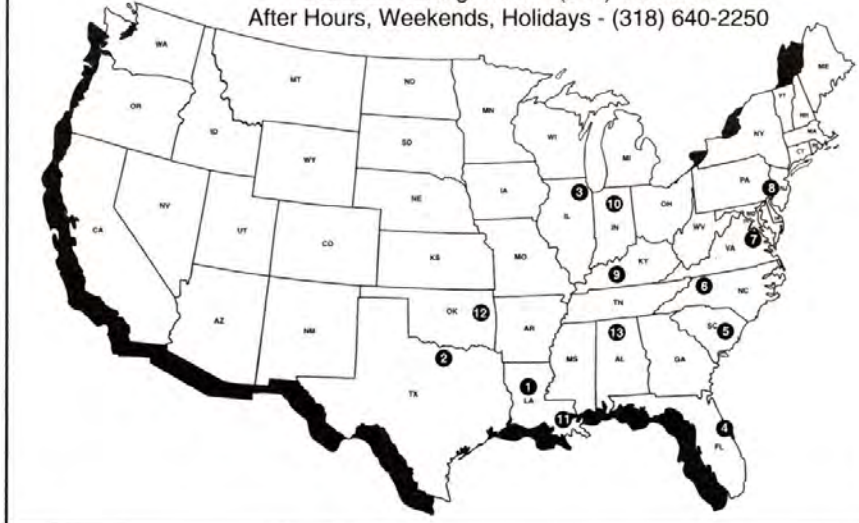
Service Department

Location of Service Engineers

| | |
|-------------------------|----|
| Alexandria, LA | 1 |
| Dallas, TX | 2 |
| Chicago, IL..... | 3 |
| Jacksonville, FL | 4 |
| Charleston, SC | 5 |
| Winston-Salem, NC | 6 |
| Richmond, VA..... | 7 |
| Philadelphia, PA | 8 |
| Maysville, KY | 9 |
| Crawfordsville, IN..... | 10 |
| New Orleans, LA..... | 11 |
| Tulsa, OK..... | 12 |
| Huntsville, AL..... | 13 |

THE DRESSER FIELD SERVICE ORGANIZATION IS UNEQUALED

For prompt field service, please call Dresser Valve and Controls Division Service Department, Alexandria, Louisiana.
Normal Working Hours - (318) 640-6055
After Hours, Weekends, Holidays - (318) 640-2250



Sales Office Locations

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Alexandria Operation

La. Highway 3225 at U.S. Hwy. 167 North, P.O.Box 1430, Alexandria, LA 71309-1430
Telephone (318) 640-2250, Telex 586423, Rapifax (318) 640-6222

Northern Region

3201 North Wolf Road, Franklin Park, Illinois 60131, Telephone (708) 451-3913
Rapifax (708) 451-3997

Southern Region

16503 Park Row, Houston, Texas 77084, Telephone (713) 579-8720
Rapifax (713) 579-7844

CANADA

Dresser Canada, Inc., Valve & Controls Division, 5010 North Service Road
Burlington, Ontario, L7L 5R5 Canada
Telephone (905) 335-3529, Rapifax (905) 336-7628

JAPAN

Dresser Japan, Ltd., Industrial Valve Operation, Room 405, Maersk Bldg., 18,
Nihon-Odori, Naka-Ku., Yokohama 231 Japan, Telephone (011-81) 45-651-5601
Rapifax (011-81) 45-651-5606

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Masonellan Internacional S.A. de C.V., Av. Henry Ford No. 114, Apartado Postal 572
54030 Tlalnepantla, Mexico, Telephone (011-525) 310-9863
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Dresser Al Rushaid Valve & Instrument Co., Ltd., P.O.Box 10145
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Dresser Limited, Valve & Controls Division, P.O. Box 2234, 16 Edendale Road
Eastleigh, Edenvale 1610, Transvaal, South Africa, Telephone (011-27) 11-452-1550/1-7
Rapifax (011-27) 11-452-2903

SWITZERLAND

Dresser Europe, S.A., Industrial Valve Operation, Badernerstrasse 156, P.O. Box 369
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Telex (845) 812429, Rapifax (011-411) 241-4218

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Skelmersdale, Lancashire, WN8 9TU England, Telephone (011-44) 695-24234
Telex (851) 627039, Rapifax (011-44) 695-20175

Masonellan Division Dresser U.K., Ltd., Controls House, Riverside Way
Uxbridge, Middlesex, UB8 2YF England, Telephone (011-44) 895-258161
Telex (851) 935174, Rapifax (011-44) 895-234318

VENEZUELA

RIESE & CIA S.A., Apartado 372, Caracas, Venezuela, Telephone (011-582) 541-3812/ 541-38
Telex (395) 24796, Rapifax (011-582) 545-2702

Note: Numbers in () are codes to be used for calling from the U.S.A.

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5M/3-94



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Dresser Valve and Controls Division
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