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CROSBY

Installation, Operating and Maintenance Instructions for Crosby Style HC-HCA Safety Valves

STYLE HC-HCA STEAM SAFETY VALVE
IS-V-3147

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Attachments

STYLE HC-HCA STEAM SAFETY VALVE

1. Description of Valve

1.1
Typical design of the Crosby Style HC-HCA safety valve is shown in Figures 1 and 2. The drawing shows the safety valve assembled in cross-section, and covers the essential elements of the valve. Approved drawings supplied with the valves should be used when installation and/or specific information is required.

1.2
Inside the body (1) is housed the upper portion of the nozzle (2), nozzle ring (3), and the adjusting ring (8). The disc insert (35) is held in place in the disc holder (5) by the disc insert pin (36). The nozzle ring and adjusting ring are held in place by the nozzle ring set screw (4) and the adjusting ring set screw (9), which are threaded into the body.

1.3
The guide (7) is retained between the body (1) and the bonnet (20) by the bonnet studs (30) and bonnet stud nuts (31).

1.4
The bonnet (20) contains the spring (13), spring washer (14), and the spindle assembly (10), the lower end of which is positioned on the disc bushing (6) in the disc holder (5).

1.5
The adjusting bolt (15) is locked in place by the adjusting bolt nut (16) on top of the bonnet within the cap.

1.6
Manual lifting means is provided by the lever (17), lever pin (18), forked lever (22), forked lever pin (23) and spindle nut (12).

2. Preparation of Valves for Shipment

2.1
All Crosby high capacity safety valves equipped with hydrostatic test plugs are shipped from the Factory in two parts - valve body and valve superstructure. For welded inlet valves, this facilitates handling before and during welding, internal gas purging during welding, if required, and stress relieving procedures after welding.

2.2
All safety valves equipped with hydrostatic test plugs are prepared for shipment as outlined below.

2.2.1
The valve, pictured in Figure 1, is tested (as a complete assembly) for set pressure and tightness.

2.2.2
The spring set compression is held by two blocks under the lower spring washer as illustrated in Figures 1 and 2.

2.2.3
The valve superstructure is removed from the valve body and the two portions are boxed and shipped separately. Each portion, ready for shipment, is illustrated in Figures 3 and 4.

2.2.4
Figure 3 shows the valve body as shipped to the installation site. It is boxed separately from the valve superstructure and is tagged as follows if it has a welded inlet.

INSTALL AND/OR WELD IN PLACE AS REQUIRED - PREPARE FOR HYDROSTATIC TEST. SEE INSTRUCTION - HYDROSTATIC PLUG IN PLACE - INSTALL O-RING AND BACKUP RING PRIOR TO HYDROSTATIC TEST

2.2.5
Figure 4 shows the valve superstructure as shipped to the installation site. It is boxed separately from the valve body and is tagged as follows:

HOLD FOR ASSEMBLY AFTER HYDROSTATIC TEST

2.2.6
Attached to the superstructure and in small boxes are the following:

2.2.6.1 Nozzle Ring

2.2.6.2 Nozzle Ring Set Screw

2.2.6.3 Guide Ring Set Screw

2.2.6.4 O-Ring (for hydrostatic test)

2.2.6.5 Backup Ring (for hydrostatic test)

2.2.6.6 Seal wires

2.2.6.7 Hydrostatic Test Plug Pin

2.2.7
When the parts described in Paragraphs 2.2.6.1 through 2.2.6.7 are removed, be sure that the identification of parts to valve number is maintained and that the parts are stored in a recorded allocated area to facilitate recovery.

2.2.8
If the valve body has a flanged inlet, it is tagged as follows:

PREPARE FOR HYDROSTATIC TEST. SEE INSTRUCTION - HYDROSTATIC PLUG IN PLACE - INSTALL O-RING AND BACKUP RING PRIOR TO HYDROSTATIC TEST

3. Preparing the Valve for Service (Initial Installation)

3.1. Storage

3.1.1
Safety valves are often on the job site months before they are installed. Unless they are properly stored and protected, their performance may be seriously affected. Rough handling may damage flanges or cause misalignment of the valve parts. It is best to leave valves in their shipment cases and store them in a dry place under cover until they are to be used.

3.2 Installation

3.2.1
Inlet Piping

3.2.1.1
Many valves are damaged when first placed in service because of failure to clean the connections properly before installation. It is essential that the valve inlet, the vessel and the line on which the valve is mounted be thoroughly cleaned of all foreign matter.

3.2.1.2
Safety valves should be mounted in a vertical position, directly on the pressure vessel; the nozzle should have a well-rounded approach that provides smooth, unobstructed flow between the vessel and the valve. A safety valve should never be installed on a fitting having an inside diameter smaller than the inlet connection of the valve, as restricted flow can cause faulty valve operation.

3.2.2 Outlet Piping

3.2.2.1
Discharge piping should be simple and direct. Where possible, a short vertical pipe discharging into the atmosphere is the most desirable type of outlet piping and affords little trouble.

3.2.2.2
Discharge piping should be designed so as not to impose any loading on the valve. Excessive discharge piping may cause seat leakage or faulty valve operation. The inside diameter of the discharge pipe must never be less than that of the valve outlet.

3.2.2.3
Valve bodies are provided with pipe thread openings for drains. These should be connected to prevent any accumulation of fluid in the valve body. In addition, it is recommended that discharge piping also be drained to prevent any accumulation of fluid.

3.3 Welding of Body

3.3.1
The valve body should be welded to the boiler in accordance with applicable Code requirements. The protective cover (Figure 3) should be left in place until ready for the hydrostatic test of the unit. If visual inspection is necessary, the cover may be removed, but should be replaced.

3.4 Hydrostatic Testing

3.4.1
Instructions for hydrostatic testing are covered in Crosby Instruction Manual IS-V-3105.

3.5 Initial Valve Assembly

3.5.1 Cleaning and Lubrication
All parts have been thoroughly cleaned prior to initial assembly and the following areas have been lubricated at the Factory before and during assembly and should be cleaned and relubricated as required. Recommended lubricants are Never-Seez, manufactured by the Never-Seez Corp., and Molykote-G, manufactured by the Dow Corning Company.

3.5.2 Lubrication Points (Reference Figure 1)

3.5.2.1 Spindle point threads (when present)

3.5.2.2 Spindle ball

3.5.2.3 Spindle rod threads for spindle nut

3.5.2.4 Spring washers at spindle and adjusting bolt bearing surface.

3.5.2.5 Adjusting bolt and bonnet threads

3.5.2.6 Set screw threads

3.5.2.7 All studs and nuts

3.5.3 Initial Field Assembly Procedures

IT IS RECOMMENDED THAT ON NEW INSTALLATIONS UPON COMPLETION OF ALL HYDROSTATIC TESTS A CROSBY SERVICE ENGINEER BE PRESENT FOR ASSEMBLY OF THE SAFETY VALVES (SEE SECTION 8).

3.5.3.1
The following instructions should be followed: Check valve Identification Numbers and allot the proper valve superstructure (see Figure 3 and 4) to each valve body. Figure 1 shows the location of Valve Identification Number.

3.5.3.2
The valve superstructure assembly is illustrated in Figure 4 and consists of the bonnet, adjusting bolt, spring subassembly, spindle, disc holder, guide ring, guide, disc insert pin and disc insert - all of which are shipped as an assembly. The nozzle ring and set screws are packaged together and attached to the superstructure.

CAUTION
EACH VALVE SUPERSTRUCTURE, NOZZLE RING AND SET SCREW IS IDENTIFIED AND MATCHED TO A SPECIFIC VALVE BODY BY A TAG NUMBER AND SHOULD BE ASSEMBLED ACCORDINGLY. ALTHOUGH ALL PARTS HAVE BEEN THOROUGHLY CLEANED, INSPECTED, LUBRICATED AND PROTECTED FOR SHIPMENT, THE PARTS PRIOR TO INSTALLATION SHOULD BE INSPECTED FOR EVIDENCE OF FOREIGN MATTER OR DAMAGE. SPECIAL ATTENTION SHOULD BE GIVEN TO THE SEATING SURFACES OF THE DISC INSERT AND NOZZLE. THESE SEATS SHOULD BE FREE FROM SURFACE DAMAGE. IF CLEANING AND/OR REPAIR IS NECESSARY, REFER TO SECTION 6.3, REPAIR PROCEDURE.

3.5.4 Assembly of Valve (Spring Compression Retained) - Reference Figures 1,3 and 4

3.5.4.1 Remove the body protective cover

3.5.4.2
Take nozzle ring and set screws from package. Match the set screws to the body and bonnet markings.

3.5.4.3
Thread the nozzle ring onto the nozzle leaving the nozzle ring 1/16" above the nozzle seating surface.

3.5.4.4
Remove protective covering from guide (7), disc holder (3) etc. Make sure that the seat on the nozzle (2) and on the disc insert (35) are clean and undamaged.

3.5.4.5
Remove the lever pin (18), lever (17), forked lever pin (23) forked lever (22) and cap (25). Do not remove spindle nut (12).

CAUTION
LIFT THE VALVE SUPERSTRUCTURE SO THAT THE SPINDLE IS IN THE VERTICAL POSITION, INSPECT AND CLEAN THE GUIDE-TO-BONNET FIT AND THE BODY-TO-GUIDE FIT. POSITION THE SUPERSTRUCTURE SO THAT THE VALVE IDENTIFICATION NUMBER STAMPED ON THE BONNET IS OPPOSITE THE OUTLET (SEE FIGURE 1).

3.5.4.6
Lower the valve superstructure slowly, carefully align the guide with the body bowl.

CAUTION
DO NOT PERMIT ANY ROCKING MOTION OF THE SPINDLE, OR ANY PART WHILE LOWERING THE SUPERSTRUCTURE INTO THE BODY. ANY ROCKING MOTION COULD DAMAGE SEATS.

After superstructure is in place in body inspect to be sure it is fully seated in body.

IMPORTANT
THE NOZZLE RING SHOULD NOW BE LOWERED INTO VALVE SEATING SURFACE AS FOLLOWS: LIFT UP SPINDLE (APPROXIMATELY 3/16"). WITH THE SPINDLE IN THE LIFTED POSITION, PLACE A SCREWDRIVER IN THE NOZZLE RING SET SCREW HOLE AND THEN TURN THE NOZZLE RING TO THE LEFT (CLOCKWISE) UNTIL THE TOP EDGE OF THE NOZZLE RING IS BELOW NOZZLE SEATING SURFACE. THE LOCATION CAN BE CHECKED BY LOOKING IN THROUGH THE ADJUSTING RING SET SCREW HOLE WHILE SHINING A LIGHT THROUGH THE NOZZLE RING SET SCREW HOLE. LOWER THE SPINDLE ASSEMBLY SLOWLY UNTIL IT BOTTOMS. ROTATE THE SPINDLE CLOCKWISE SEVERAL REVOLUTIONS TO MAKE SURE THAT THE SPINDLE IS FULLY SEATED ON THE DISC HOLDER AND THREADS OF THE SPINDLE ARE NOT ENGAGED. THE NOZZLE AND DISC INSERT SEATING SURFACES ARE NOW IN INTIMATE CONTACT.

3.5.4.7
Install the bonnet stud nuts (31) on bonnet studs (30) and tighten uniformly.

3.5.4.8
It is now necessary to remove the spacer blocks under the lower spring washer, thereby transferring the spring load to the valve seats. This is accomplished by using the mechanical or hydraulic jacking device. The thrust bearing shown in Figure 8 should be used for disassembly and assembly of valves with the maximum pressure ratings shown and as outlined in Paragraph 6.2.2.3.

3.5.4.8.1 Mechanical Jacking Device
When using the mechanical jacking device (reference Figure 9) install the jacking device per Paragraphs 6.2.3.1.2 through 6.2.3.1.8 and raise the lower spring washer per Paragraph 6.2.3.1.8. The spacer blocks may now be removed and the spring load transferred to the valve seats by reversing the procedure outlined in Paragraphs 6.2.3.1.2 through 6.2.3.1.8.

3.5.4.8.2 Hydraulic Jacking Device
When using the hydraulic jacking device (reference Figure 10) install the jacking device per Paragraphs 6.2.3.2.2 through 6.2.3.2.5 and raise the lower spring washer per Paragraph 6.2.3.2.5. The spacer blocks may now be removed and the spring load transferred to the valve seats by reversing the procedure outlined in Paragraphs 6.2.3.2.2 through 6.2.3.2.5.

3.5.4.9
Set the nozzle ring (3) and adjusting ring (8) by following the procedure for locating rings discussed in Paragraphs 3.5.5.1 and 3.5.5.2. Lock set screws (4 and 9) in place, making sure that the proper set screws are installed and engaged in a notch and lock wire in place.

3.5.4.10
Install the spindle nut (12), spindle nut cotter (28), cap (25) and lifting gear assembly before tightening the cap set screw (27). Be sure that the forked lever (22) is free to move from 1/16" to 1/8" before coming into contact with the spindle nut. If travel is excessive, turn the spindle nut clockwise or counterclockwise to increase the lever travel. Be sure spindle nut cotter (28) is installed after the final adjustment.

3.5.5 Setting of Rings

3.5.5.1
The nozzle ring (3) (lower ring) setting is obtained by removing the lifting gear and reading the numbers stamped on the machined surface of the bonnet where the lifting gear sits. For example, NR-15 means set the nozzle ring fifteen (15) notches below contact with the disc holder as shown in Figure 5.

3.5.5.2
The adjusting ring (8) (guide upper ring) setting is obtained in the same manner as the nozzle ring explained in Paragraph 3.5.5.1. For example, GR +30 means thirty (30) notches above Level position. Level is when the

bottom of the adjusting ring is even (level) with the bottom of the disc holder. This position is illustrated in Figure 6. With the valve already on the system, level can be obtained by inserting a metal rod with a hook on the end through the lower set screw hole and feeling the position of the ring in relation to the disc holder.

4. Description of Operation

4.1 Correct Operation

The valve should open with a sharp pop at the pressure for which it is set with practically no "simmer" or "warn" and remain open, relieving full capacity at 3% overpressure. As pressure decays below the popping pressure the valve will remain open until a pressure approximately 4% below the set pressure is reached and the valve will close sharply.

4.2

Nozzle ring (4) is primarily for insuring good sharp opening action. Raising the nozzle ring (bringing closer to the face of the disc) increases popping power and eliminates "simmer" or "warn."

4.3

Adjusting ring (8) is primarily for controlling blowdown. Raising the ring reduces the reactive pressures against the disc holder and reduces blowdown. Lowering the ring increases the reactive pressures against the disc holder and increases the blowdown.

4.4 Opening

The sharp opening is produced by two stages of reaction working together to produce a continuous pop.

4.4.1

The initial lift is produced when the steam pressure under the disc exceeds the spring pressure. To assist in starting the popping, a small jet of steam escapes between the valve seats and is deflected by a small angle on the nozzle ring (Figure 7A). This escaping steam acts on the face of the disc holder causing an unbalance and the valve to pop. As the disc moves vertically, steam begins to react against the (upper) adjusting ring and to push the disc up to a high lift (Figure 7B). The reaction of the deflected steam pushes against the underside of the disc and lifts it still higher on an accumulation of pressure.

4.5 Closing

As the boiler pressure drops, the valve disc should settle to a moderate lift and close sharply.

5. Set Pressure Testing and Adjustment

The set pressure of a safety valve may be checked by the following two methods with the valve on the system:

5.1 Set Pressure Testing on System

5.1.1 Air Set Pressure Device

The first method is through the use of an Air Set Pressure Device. This allows set pressure testing of the safety valves on the system at pressures below normal system operating pressures. This method is described in Crosby Test Procedure No. T-1652-4, a copy of which can be obtained upon request from Crosby Valve & Gage Company's Service Office (see Paragraph 8).

5.1.2 System Pressure

The second method of set pressure testing is by raising the system pressure and popping the valve. Set pressure testing using this method will establish the valve set and closing pressure (blowdown). Setting the valve with the air set pressure device is recommended prior to raising the system pressure for popping pressure testing. This allows the set point to be established without raising and lowering system pressure several times to establish the valve set pressure. Prior to set pressure testing and raising the system pressure, the following items should be checked:

5.1.2.1

A pressure gage with known accuracy should be located on the system being tested.

5.1.2.2

Outlet piping should be anchored sufficiently to prevent any vibrations while the valve is discharging; it should be direct and there should be no obstructions to restrict the safety valve discharging.

5.1.2.3

Nozzle ring and adjusting ring should be set per Paragraph 3.5.4.9

5.1.2.4

Set screws should be locked into the body and lock wired and the tapped holes for drains in the body should be connected to the drain.

5.1.2.5

Lifting gear should be securely fastened to the valve to assist personnel testing the valve. A rope may be attached through the hole provided in the lever (17) should mechanical lifting be necessary.

5.1.2.6

Communications should be set up between control room and the system being tested and personnel in the test area.

CAUTION

ALL SAFETY VALVES ON THE SYSTEM EXCEPT THE VALVE WHICH IS TO BE POPPED SHOULD BE GAGGED. SYSTEM PRESSURE SHOULD BE 70% OF VALVE SET PRESSURE BEFORE GAGGING. THIS IS TO PREVENT ADDED LOADS FROM BEING APPLIED TO THE SPINDLE DUE TO THERMAL EXPANSION. GAGGING MUST BE DONE WITH CARE NOT TO OVERLOAD THE SPINDLE SINCE CONSIDERABLE DAMAGE MAY OCCUR TO THE VALVE SPINDLE AND OTHER INTERNALS. HOWEVER, A MINIMUM FORCE SHOULD BE APPLIED TO INSURE THAT THE VALVE WILL NOT OPEN.

5.1.2.7
Raise system pressure until the valve pops.

5.1.2.8
Record the popping and reseating pressure (pressure at which the valve closes sharply).

5.1.2.9
If the valve pops before set pressure is reached, or if it does not pop at the nameplate set pressure, the following steps for set pressure adjustment should be taken.

CAUTION
ADJUSTMENTS SHOULD NOT BE MADE UNTIL THE PRESSURE IS 10 TO 20% BELOW THE ACTUAL POPPING PRESSURE OF THE VALVE. THIS PRECAUTION SHOULD BE TAKEN TO AVOID POSSIBLE DAMAGE OF INTERNAL PARTS. THE ADJUSTING BOLT (15) SHOULD NEVER BE TURNED WHEN THE VESSEL PRESSURE IS NEAR THE SET PRESSURE OF THE VALVE.

5.1.2.10
Remove the lifting gear (forked lever pin (23), forked lever (22) and cap) and lever assembly (25, 17 and 18).

5.1.2.11
The popping pressure may now be adjusted as follows:

5.1.2.11.1
Loosen the adjusting bolt locknut.

5.1.2.11.2
If the valve has popped before the set pressure stamped on the valve nameplate, an increase in set pressure is necessary. This is obtained by turning the adjusting bolt clockwise (down). If the valve popped above the nameplate set pressure, decrease set pressure by turning the adjusting bolt counterclockwise (up).

5.1.2.11.3
After each adjustment the locknut should be securely tightened to prevent loosening of the bolt and the lifting gear reinstalled.

5.1.3 Nozzle Ring and Guide Ring Adjustment

5.1.3.1
The nozzle ring location and guide ring location are determined at the Factory, and their locations are stamped on the valve bonnet where the cap is seated. However, if the desired blowdown was not obtained, it will be necessary to adjust the rings. See Paragraph 3.5.5.1 and 3.5.5.2 for Factory method of setting rings. The following steps should be taken.

CAUTION
NEVER MAKE ANY RING ADJUSTMENTS WITH THE VESSEL UNDER PRESSURE WITHOUT GAGGING THE VALVE PROPERLY. CARE SHOULD BE TAKEN TO USE ONLY SUFFICIENT TORQUE ON THE GAGE TO HOLD THE VALVE CLOSED. OVERGAGGING MAY DAMAGE THE VALVE INTERNALS.

5.1.3.1.1 Adjusting Ring Adjustment
The adjusting ring (8) is the principal blowdown control ring in the valve. To change the adjusting ring position, remove the adjusting ring set screw (9) from the body (1). Insert a screwdriver or similar tool and engage one of the notches (these can be seen through the set screw hole.) The adjusting ring can then be moved to the right or left as desired. NOTE: Moving the adjusting ring to the right (counterclockwise) raises it and decreases the blowdown. The adjusting ring should never be moved more than ten notches either way without retesting the valve. After each adjustment always replace, tighten and lock wire the set screw being careful that its point fits in the notch without making contact with the ring.

5.1.3.1.2 Nozzle Ring Adjustment
The nozzle ring (3) is necessary in obtaining the pop action of the valve. This ring setting is carefully determined by Factory test and rarely needs further adjustment. However, in case the adjusting ring (8) adjustment does not give the desired operating characteristics under all conditions of operation, the nozzle ring may be adjusted to control the valve operation for very fine adjustment. The nozzle ring is adjusted by removing the nozzle ring set screw (4) from the valve body (1). Moving the ring to the right (counterclockwise) raises it and results in a strong “pop” action and will increase blowdown. Moving the ring to the left (clockwise) lowers the ring and decreases the blowdown and may result in warn or simmer if lowered too far. The range of adjustment of this ring is limited and it should not be moved more than one notch at a time from its set position. The valve performance should be checked after each adjustment. After each adjustment always replace, tighten and lock wire the set screw, being careful that its point fits in the notch without making contact with the ring.

5.1.3.2
Whenever ring adjustments are changed, a record should be kept of the number of notches and the direction in which the ring was moved. This will make it possible to return to the original setting in case of error.

5.1.3.3
After the valve has been adjusted to open and close at the desired pressures, remove the lifting gear and make sure the adjusting bolt locknut and the set screws are installed properly and tightened. If after testing different ring locations are obtained, restamp the valve bonnet with the new (tested) ring settings. Install the cap, forked lever and forked lever pin per Paragraph 3.5.4.10, making sure there is 1/16" clearance between the spindle nut and forked lever and seal wire cap and set screws.

6. Valve Maintenance
The functioning and service life of a safety valve depends primarily upon methods used in its maintenance. For this reason, the following recommended steps for maintenance should be followed:

6.1 General Information

6.1.1
When possible, remove the valve from the system before dismantling (flanged inlet). In any case, there should be no system pressure when a valve is either dismantled in place or removed for shop repair.

6.1.2
Nozzle and guide ring set screws are custom fitted to each valve and are not to be interchanged.

6.1.3
The spring washers are fitted to each end of the spring. The spring and washers are to be kept intact as a unit.

6.1.4
Before disassembly, spare parts and service equipment (i.e., lapping compound, lapping blocks, jacking gear) should be available.

6.2 Disassembly

6.2.1 Removal of the Lifting Gear

6.2.1.1
Remove the forked lever pin (23), forked lever (22), cap (25), spindle nut cotter (28) and spindle nut (12) - Figure 1.

6.2.2 Recording of Ring Settings

6.2.2.1
Remove the nozzle ring set screw (4) and verify location - see Paragraph 3.5.5.1.

6.2.2.2
Remove the adjusting (guide) ring set screw (7) and verify location see Paragraph 3.5.5.2.

6.2.3 Disassembly Retaining Spring Compression
If the valve is to be reconditioned without retesting, the original set pressure can be retained by use of a jacking device as shown in Figures 9 or 10. This device is a service tool that can be obtained from Crosby Valve & Gage Company (see Section 8).

6.2.3.1
Disassembly Retaining Spring Compression with Mechanical Jacking Device (Refer to Figure 9)

6.2.3.1.1
Measure from bottom face of bottom spring washer to bonnet flange top face and record dimension. Cut two (2) pieces of bar stock 1/8" longer than recorded used per Paragraphs 6.2.3.1.9 through 6.2.3.2.6

6.2.3.1.2
Lubricate the spindle (11) thread with “Never-Seez”, “Molykote-G”, or equivalent, and install the spindle lifter (2) on the spindle (11).

6.2.3.1.3
Lubricate the thrust bearing (5, 6 and 7) with suitable bearing grease and install each part into the housing.

6.2.3.1.4
The bottom thrust washer (7) is guided into position on its outside diameter. Install the cage (6) on the bottom thrust washer (7). Place the top thrust washer (5) on top of the cage.

6.2.3.1.5
Install the housing (1) on top of the valve bonnet (13), taking care to insure that the key (8) locates in the keyway slot in the spindle lifter (2).

6.2.3.1.6
If the jacking device has been properly installed, approximately 1/2" of the keyway should be visible. The spindle lifter (2) must be screwed (clockwise) onto the valve spindle (1) until the proper length of keyway is visible.

CAUTION
IF THE VALVE IS JACKED WITHOUT THE PROPER AMOUNT OF KEYWAY VISIBLE, THE JACKING DEVICE CAN BE SERIOUSLY DAMAGED.

6.2.3.1.7
Lubricate the spindle lifter (2) external threads and screw the operating nut (4) onto the spindle lifter (2) until it contacts the thrust bearing.

6.2.3.1.8
Rotating the operating nut (4) clockwise raises the valve spindle thereby raising the lower spring washer and compressing the spring.

6.2.3.1.9
After the spring load has been taken up and the valve has been jacked approximately 1/8", place spacer blocks under the lower spring washer. See Figure 1 and Paragraph 6.2.3.1.1. Reversing the procedure discussed in Paragraph 6.2.3.1.8 will unjack the valve allowing the spring load to rest on the spacer blocks.

6.2.3.1.10
The jacking device can now be removed by reversing Paragraphs 6.2.3.1.7 and 6.2.3.1.8. The spindle nut may now be installed to hold the spindle in position during disassembly. If desired, the jacking device may be kept in place.

6.2.3.1.11
Using suitable lifting straps - cables - carefully lift the superstructure straight up and out of the body.

CAUTION
DO NOT PERMIT ANY ROCKING MOTION OF THE SPINDLE OR ANY PARTS WHILE LIFTING THE SUPERSTRUCTURE OUT OF THE BODY. ANY ROCKING MOTION COULD DAMAGE THE SEATS.

6.2.3.1.12
Lay the superstructure down so that the spindle is in the horizontal position. Care must be exercised to prevent the parts from being damaged.

6.2.3.1.13
With the superstructure laying down, remove the spindle nut or jacking device from on the spindle. You can now carefully slide the internals - see Figure 1 - disc holder (5), disc insert (35), guide (7), guide ring (8) and spindle (10) as an assembly from the spring (13) and bonnet (20).

6.2.3.2
Disassembly Retaining Spring Compression Using Hydraulic Jacking Device (Refer to Figure No. 10)

6.2.3.2.1
Measure from bottom face of bottom spring washer to bonnet flange top face and record dimension. These spacer blocks will be used per Paragraphs 6.2.3.1.9 and 6.2.3.2.6.

6.2.3.2.2
Install the bonnet spacer (5) on bonnet (21). Position jacking device assembly by lifting over spindle (14) and lowering down onto bonnet spacer (5).

CAUTION
THE PISTON (2) SHOULD BE SEATED WITHIN HOUSING (1) BEFORE CONTINUING. THIS SEATED POSITION IS REACHED WHEN THE FIRST NOTCH ON THE PISTON (2) IS LEVEL WITH OR BELOW THE TOP OF THE HOUSING (1) AS INDICATED IN FIGURE 10.

6.2.3.2.3
Lubricate the spindle threads with "Never-Seez", "Molykote-G" or equivalent. Thread spindle adapter until it comes in contact with the jacking device assembly.

6.2.3.2.4
Attach hand-operated hydraulic pump (7) and hose (8)

6.2.3.2.5
To raise the valve spindle, pressure is applied to the jacking device assembly with the hand-operated hydraulic pump. This activates the piston (2) which raises the lower spring washer compressing the spring.

CAUTION
THIS DEVICE HAS A LIMITED PISTON STROKE THAT SHOULD NOT BE EXCEEDED. IF THE PISTON STROKE IS EXCEEDED, THE SECOND NOTCH ON PISTON (2) WILL BE ABOVE THE TOP OF THE HOUSING (1) AND HYDRAULIC FLUID WILL FLOW FROM THE BLEED HOLE, LOCATED IN THE HOUSING. IF HYDRAULIC FLUID IS FLOWING FROM THE BLEED HOLE BUT PISTON STROKE HAS NOT BEEN EXCEEDED, THE O-RING (3) AND THE BACKUP RING (4) SHOULD BE INSPECTED FOR WEAR OR DAMAGE AND REPLACED IF NECESSARY.

6.2.3.2.6
After the spring load has been taken up and the valve has been jacked approximately 1/8", place spacer blocks under the lower spring washer. See Figure 1 and Paragraph 6.2.3.1.1.

6.2.3.2.7
The jacking device can now be removed by releasing pressure in the pump and reversing Paragraphs 6.2.3.2.2 and 6.2.3.2.3.

6.2.3.2.8
Thread the spindle nut on the spindle to hold the spindle in position during disassembly or leave the jacking device in place. Remove adjusting ring set screw (9) (Figure 1) nozzle ring set screw (4), loosen and remove the bonnet stud nuts.

6.2.3.2.9
Using suitable lifting straps - cables - carefully lift the superstructure straight up and out of the body.

CAUTION
DO NOT PERMIT ANY ROCKING MOTION OF THE SPINDLE OR ANY PARTS WHILE LIFTING THE SUPERSTRUCTURE OUT OF THE BODY. ANY ROCKING MOTION COULD DAMAGE THE SEATS.

6.2.3.2.10
Lay the superstructure down so that the spindle is in the horizontal position. Care must be exercised to prevent the parts from being damaged.

6.2.3.2.11
With the superstructure laying down, remove the spindle nut or jacking device from the spindle. You can now carefully slide the internals, see Figure 1, disc holder (5), disc insert (35), guide (7), guide ring (8) and spindle (10) as an assembly from the spring (13) and bonnet (20).

6.2.3.3 Disassembly Using Thrust Bearing
If the pressure rating of the valve does not exceed that shown in the following table for the valve orifice size, an alternate jacking arrangement as shown in Figure 8 may be used for the purpose of removing the two (2) steel blocks.

Orifice	Maximum Pressure Rating - psig
G	5000
H	5000
J	2500
K	2000
K_2	1500
M	1200
M_2	1200
P	700

6.2.3.3.1
Place the thrust bearing on top of the adjusting bolt. Place special nut on spindle and screw down against the top of the thrust bearing. Lubricate threads and bearing surfaces with Coppermol, Never-Seez, Molykote-G or equivalent.

6.2.3.3.2
Tighten the special nut slightly, making sure that the *adjusting bolt, spindle and spring assembly do not turn with the special nut.* Continue turning of the special nut until removal of the steel blocks beneath the spring can be effected. Remove the special nut and thrust bearing and assemble cap assembly.

6.2.4 Disassembly Without Retaining Spring Compression
If it is desired to completely disassemble the valve and not retain the spring compression, the following procedure should be used (see Figure 1).

6.2.4.1
Remove adjusting ring set screw (9) and nozzle ring set screw (4) and verify ring locations per Section 3.5.5.

6.2.4.2
Make a mark on the side of the adjusting bolt head and another directly below this mark on the machined surface of the bonnet top. Measure the distance from the top of the adjusting bolt to the machined bonnet surface between these marks and record this measurement. This measurement will be necessary when the valve is reassembled.

6.2.4.3
Release spring tension by loosening the adjusting bolt locknut (16) and then the adjusting bolt (15).

CAUTION
NEVER LOOSEN BONNET STUD NUTS BEFORE RELEASING SPRING TENSION WITH THE ADJUSTING BOLT.

6.2.4.4
Loosen and remove bonnet stud nuts (31).

6.2.4.5
Using suitable lifting straps - cables - carefully lift the spring (13) and bonnet assembly straight up and over the spindle.

CAUTION
WHEN LIFTING THIS ASSEMBLY, STRAP THE SPRING TO THE BONNET TO PREVENT IT FROM FALLING OUT FROM BETWEEN THE BONNET STRUTS.

6.2.4.6
The internals, disc holder (5), disc insert (35), guide (7), guide ring (8) and spindle (10) can now be removed from the valve body (1) by lifting the spindle.

6.2.4.7
Should overhead space negate the disassembly described in Paragraphs 6.2.4.5 and 6.2.4.6, the disassembly can be accomplished in the same manner as Paragraphs 6.2.3.1.11 through 6.2.3.1.15.

6.3 Repair Procedure

6.3.1 Disassembly of Internal Structure

6.3.1.1
Slide the guide (7) and guide ring (8) off the spindle (10) as an assembly, and unscrew the guide ring (8) from the guide (7).

6.3.1.2
Remove the disc insert cotter pin (36) and the disc insert (35).

6.3.1.3
Remove the spindle (10) from the disc holder (5) by removing the clip ring (11) or by unscrewing the spindle (10) from the disc holder (5) depending on which series valve is being worked on.

6.3.1.4
Unscrew the nozzle ring (3) from the nozzle.

6.3.1.5
All the parts should be cleaned thoroughly, paying special attention to guiding surfaces and the seats should be lapped per Section 6.3.3.

6.3.1.6
Reassemble the internal structure by reversing Paragraphs 6.3.1.1 through 6.3.1.3.

6.3.2
If replacement parts are required, refer to Paragraph 7

6.3.3 Lapping or Refurbishing of Valve Seats
Good seating surface on the nozzle (2) and disc insert (35) are of the greatest importance when reconditioning the safety valves. The seats should be flat and free from surface scratches. If the valve nozzle seat cannot be refinished by lapping, remachining may be necessary. Refer to Crosby Instruction No. I-1153 or contact the Crosby Service Manager.

6.3.3.1 Lapping Block
This is made of a special grade of annealed cast iron, perfectly flat on both sides. It is essential that it remain flat to produce a truly flat seating surface. In checking the lapping block and for restoring flatness after use, a lapping block reconditioner should be used.

6.3.3.2 Lapping Block Reconditioner
This is also made of a special grade of annealed cast iron, machined and lapped on the side which has small squares. This is the surface on which blocks are reconditioned.

6.3.3.3 Lapping Compounds
The following lapping compounds, or their commercial equivalent, are suggested:

Abrasive	Grit Size	Average Micron Size	Description	Mfg. Trade Name or Equivalent
Silicon Carbide	320	31	Medium coarse	U.S. Products No. 2F Crystolon
Silicon Carbide	400	22	Medium	U.S. Products No. 3F Crystolon
Silicon Carbide	600	16	Fine	U.S. Products No. A-600 Crystolon
Hard Aluminia or Aluminum Oxide	900	9	Polish	U.S. Products No. 38-900-A

Experience has proven that three grades of compound - medium, fine and polish - will properly condition almost any damaged valve seat unless, of course, remachining to establish the seat contour is necessary. A medium coarse compound may be used for fast cutting as a first operation after machining if desired.

6.3.3.4 Lapping Procedures
Different individuals have different methods of lapping valve seats, but certain essential steps must be taken to get satisfactory results. The following procedure is suggested for lapping of valve seats:

6.3.3.4.1
Never lap the disc insert against the nozzle. Lap each part separately against a cast iron lapping block of the proper size. These blocks hold the lapping compound in their surface pores, but must be recharged and reconditioned frequently.

6.3.3.4.2
Check the lapping block frequently on a good lapping block conditioner to make certain that it is perfectly flat on both sides.

6.3.3.4.3
If considerable lapping is required, spread a thin coat of medium lapping compound on the block. After lapping with this compound, lap again with a fine compound using a new lapping block surface. Unless much lapping is called for, the first step can be omitted. Next, lap again using a polish compound.

6.3.3.4.4
Lap the block against the seat. Never rotate the block continuously, but use an oscillating movement.

6.3.3.4.5
When all the nicks and marks have disappeared, remove all the compound from the block and seat. Apply polish compound to another block and lap the seat with this. As the lapping nears completion only the compound left in the pores of the block should be present. This should give a very smooth finish. If scratches appear the cause is probably dirty lapping compound. These scratches should be removed by using compound free of foreign material.

6.3.3.4.6
Extreme care should be taken throughout to make certain that the seats are kept flat.

6.3.3.5 Micro-Finishing of Valve Seats (Optional)
Some valve seats such as Stellite should be lapped to a micro-finish using special compounds and the following lapping procedure. Prior to micro-finishing, the valve seats should be lapped flat and to a fine surface finish in accordance with Paragraph 6.3.3.4.5. The lapping compound PDH-6 is used in conjunction with a lapping and cleaning thinner PDH-27 and should be used as described in the following procedure:

6.3.3.5.1
Clean lapping block using acetone or apply cleaning thinner PDH-27, then wipe with a clean, dry cloth or Kimwipe (by Kimberly-Clark or equivalent) prior to applying lapping compound.

6.3.3.5.2
Apply dots of PDH-6 on the lapping block approximately 1/2 to 1" apart (not less than four per block), circumferentially on the face of the lapping block and then apply a drop of lapping thinner PDH-27 to each dot of compound.

6.3.3.5.3
Lap the valve seat, keeping the lapping block against the seat and applying slight downward pressure. During the operation, the lapping compound may begin to get stiff and movement of the lapping block more difficult; remove lap from the lapped surface and add a few drops of lapping thinner PDH-27 to the lapping block, replace on surface being lapped and continue to rotate exerting no downward pressure.

CAUTION
THE LAPPING COMPOUND CUTS VERY QUICKLY AND THEREFORE THE LAPPING BLOCK MUST BE CHECKED PERIODICALLY TO BE SURE THAT THE BLOCK IS FLAT AND THAT A GROOVE IS NOT WORN IN THE LAPPING BLOCK DUE TO THE LAPPING OPERATION. WHILE LAPPING, THE LAPPING BLOCK SHOULD SLIDE SMOOTHLY OVER THE SURFACE BEING LAPPED. INDICATIONS OF ROUGHNESS IN LAPPING ARE INDICATIVE OF CONTAMINATED COMPOUND. THE LAPPING BLOCK AND SEATING SURFACE SHOULD BE THOROUGHLY RECLEANED WITH THINNER (PDH-27) AND THE LAPPING OPERATION REPEATED.

6.3.3.5.4
Continue this for approximately one minute, then remove the lapping block and clean lapped surface and the block with thinner PDH-27 and wipe with a clean, dry, soft cloth or Kimwipe (by Kimberly-Clark or equivalent).

6.3.3.5.5
If the surface is still in an unsatisfactory condition, change lapping block and repeat the above process until a satisfactory surface is obtained.

6.3.3.5.6
After final lapping, clean the seating area with PDH-27 and then with acetone and wipe clean with cotton.

6.4 Valve Assembly

6.4.1
To reassemble the valve retaining spring compression, reverse the procedure in Sections 6.2.3.1 or 6.2.3.2.

6.4.2
To reassemble the valve without retaining spring compression, reverse the procedure in Section 6.2.4.

7. Spare Parts

7.1
Crosby recommends spare parts as shown on the outline drawing, Figure 1.

7.1.1
When ordering spare parts, the valve assembly number should be given together with part number and valve size and style. On the valve nameplate (location of nameplate shown in Figures 1 and 2), the valve assembly number is shown as Shop Number. Any Crosby Branch Office or Representative can expedite your spare parts requirements.

8. Field Service Recommendations

8.1
Crosby operates an extensive field service organization capable of adjusting setting and maintaining Crosby Valves worldwide. Service Engineers are located throughout the United States for fast response to our customers' needs. Service Engineers are Factory trained and are long experienced in servicing safety valves. It is strongly recommended that on new installations a Crosby Service Engineer be present for assembly and testing of safety valves.

8.1.1
Field Service Engineers are coordinated through the Wrentham, Massachusetts office. Contact: Field Service Department, Service Manager, Crosby Valve Inc, 43 Kendrick Street, Wrentham, Massachusetts 02093, (508) 384-3121, Telex 92443.

8.2 Service Equipment Available

8.2.1
All service equipment mentioned in this instruction is available for purchase or rental and any Crosby Branch Office, Representative or Service Manager can expedite your service equipment requirements.

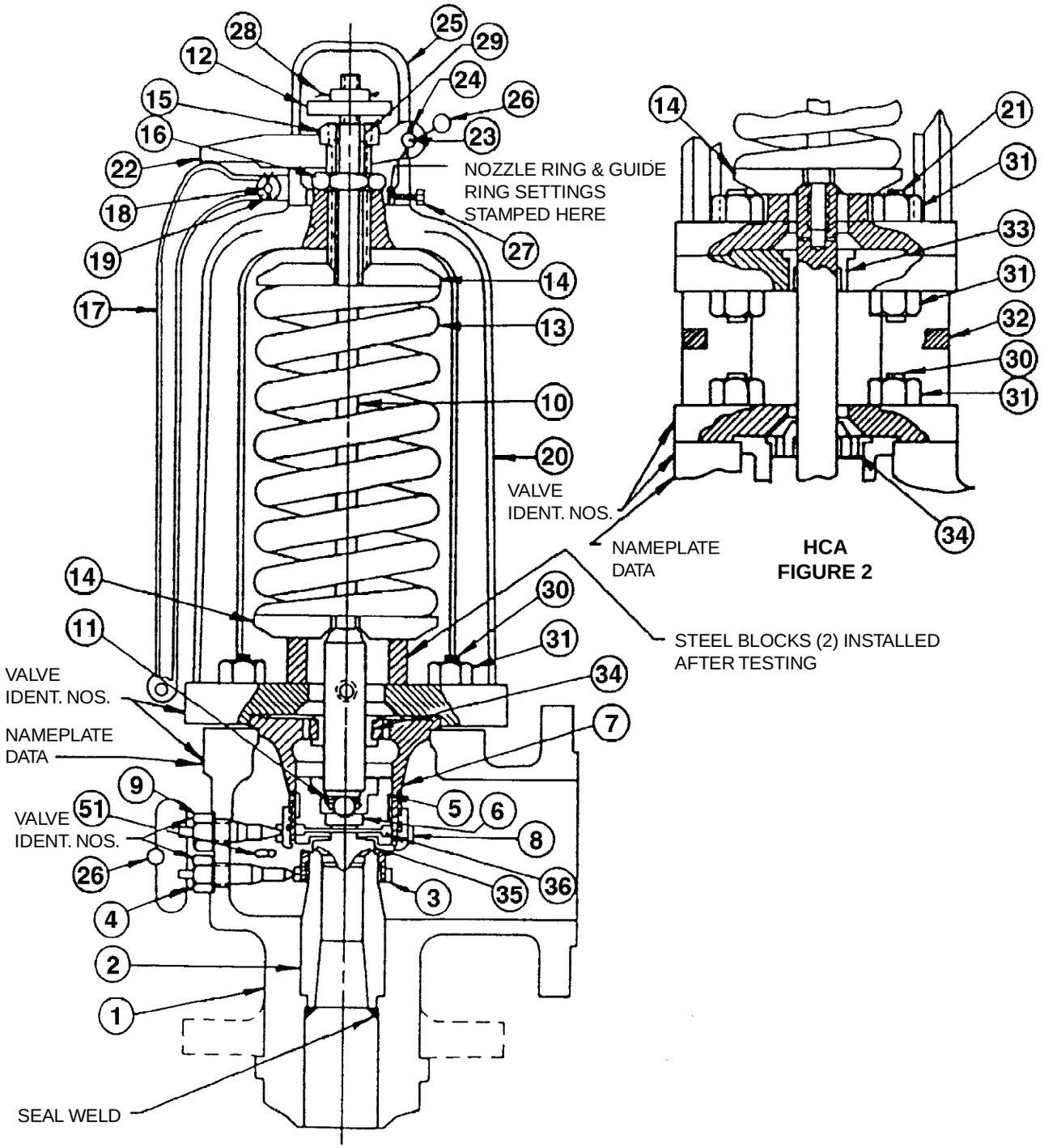
NOMENCLATURE OF VALVE PARTS TO BE USED WITH FIGURES 1 & 2

ITEM NO.	DESCRIPTION
1	Body
2	Nozzle
* 3	Nozzle Ring
* 4	Nozzle Ring Set Screw
* 5	Disc Holder
6	Disc Bushing
* 7	Guide
* 8	Adjusting Ring
* 9	Adjusting Ring Set Screw
* 10	Spindle
* 11	Clip Ring
12	Spindle Nut
13	Spring
14	Spring Washer
15	Adjusting Bolt
16	Adjusting Bolt Lock Nut
17	Lever
18	Lever Pin
* 19	Cotter Pin
20	Bonnet
* 21	Stud
22	Forked Lever
23	Forked Lever Pin
* 24	Cotter Pin
25	Cap
26	Seal
27	Cap Screw
* 28	Spindle Nut Cotter Pin
29	Adjusting Bolt Bushing
30	Stud
* 31	Nut
32	Cooling Spool
33	Cooling Spool Bearing
34	Guide Bearing
* 35	Disc Insert
* 36	Disc Insert Cotter

*Recommended Spare Parts

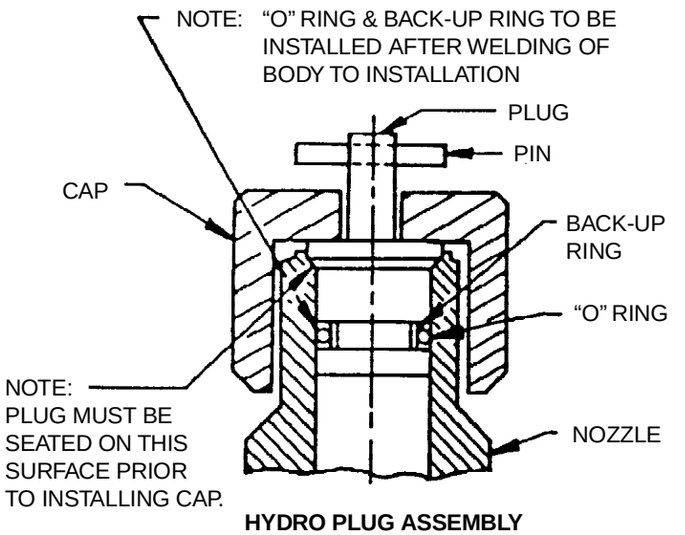
FIGURES 1A & 2A

ILLUSTRATIONS OF HC-HCA VALVE ASSEMBLY



FIGURES 1 & 2

VALVE BODY AS SHIPPED AND VALVE SUPERSTRUCTURE AS SHIPPED



HYDRO PLUG ASSEMBLY

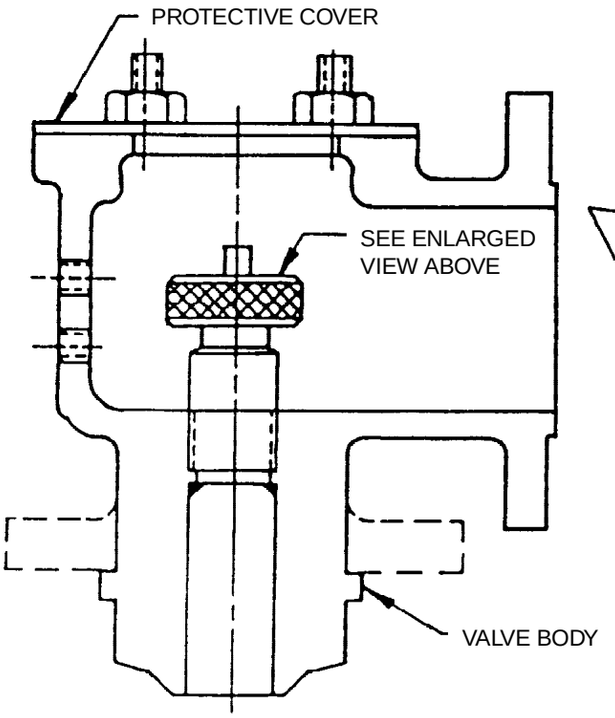


FIGURE 3

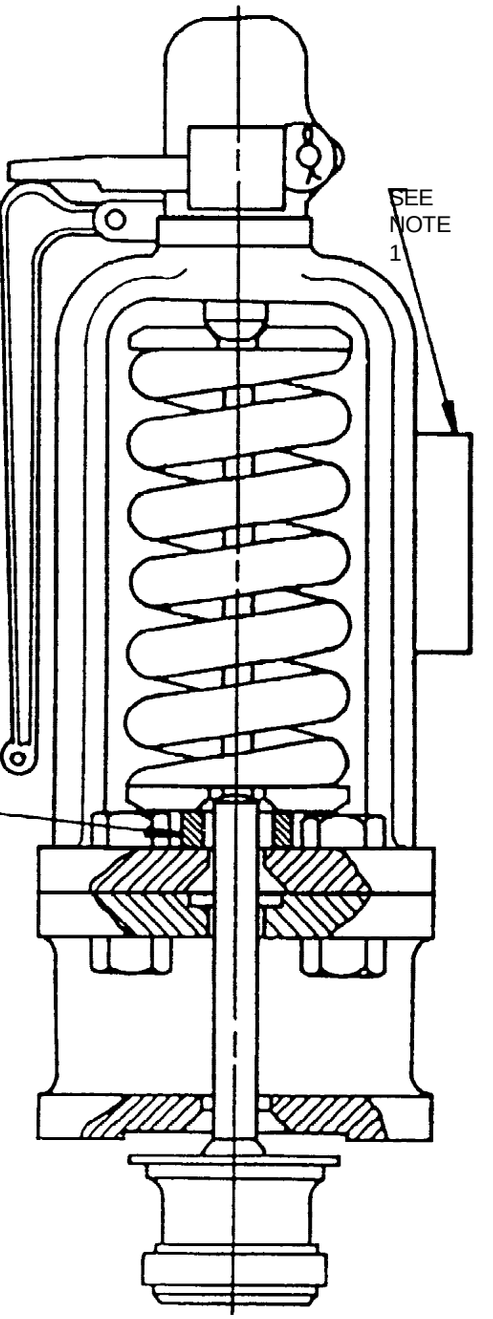


FIGURE 4

VALVE BODY TAGGED AS FOLLOWS:

1. WELD BODY IN PLACE AS REQUIRED.
2. PREPARE FOR HYDROSTATIC TEST - SEE INSTRUCTIONS.
3. HYDROSTATIC PLUG IN PLACE INSTALL "O" RING & BACK-UP RING PRIOR TO HYDROSTATIC TEST.

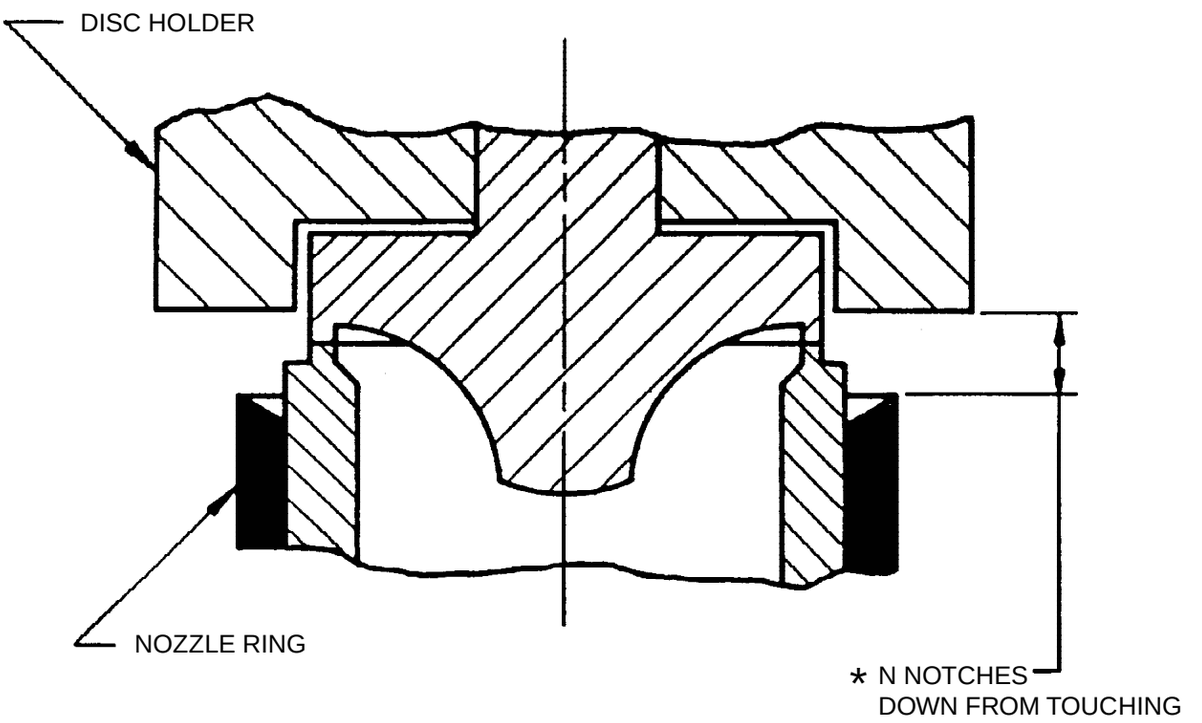
VALVE SUPERSTRUCTURE TAGGED AS FOLLOWS

1. HOLD FOR VALVE ASSEMBLY AFTER HYDROSTATIC TEST.

NOTE: 1. BOX CONTAINING NOZZLE RING, "O" RING & BACK-UP RING & SET SCREWS.

FIGURES 3 & 4

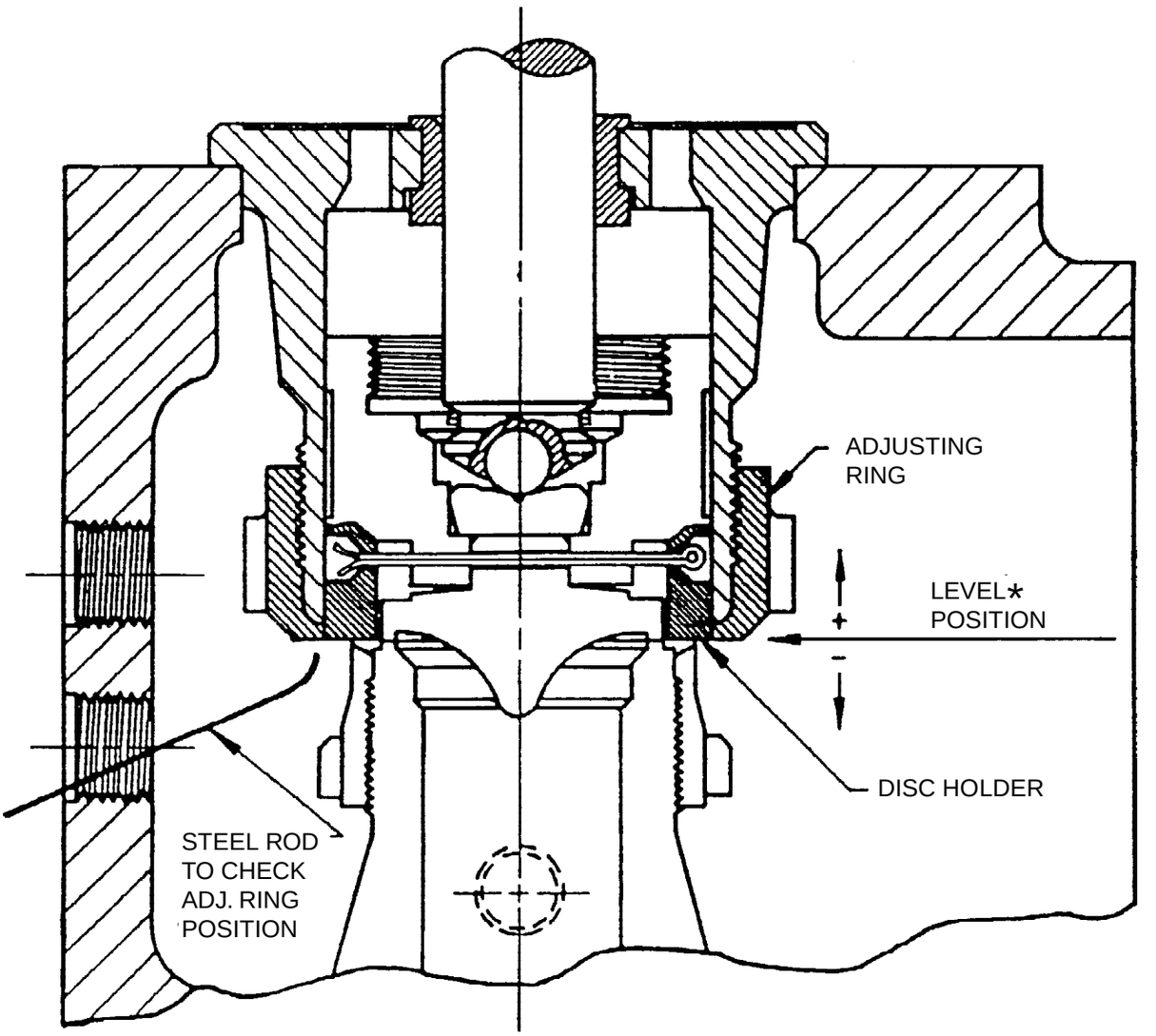
ILLUSTRATION OF NOZZLE RING SETTING



* N = FACTORY SETTING
STAMPED ON BONNET

FIGURE 5

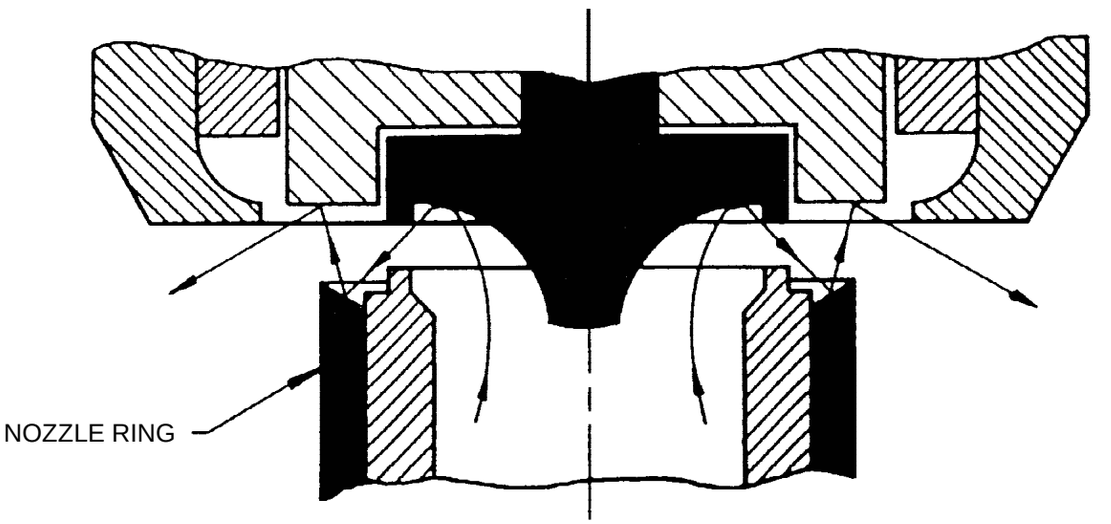
ILLUSTRATION OF GUIDE RING LEVEL WITH DISC HOLDER



* FACTORY SETTING OF ADJUSTING RING POSITION (+OR-) NOTCHES FROM LEVEL STAMPED ON BONNET

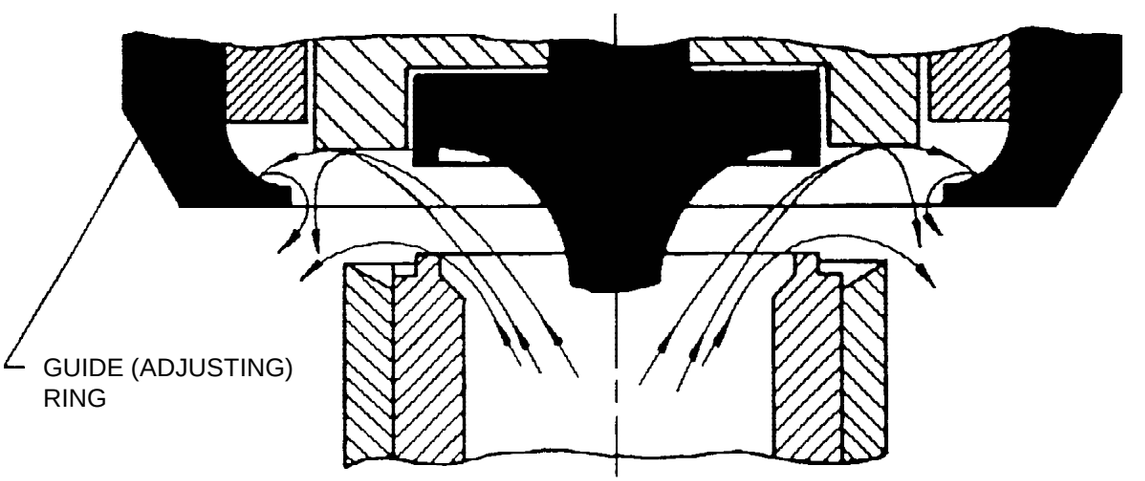
FIGURE 6

EFFECT OF NOZZLE RING



(7A)

EFFECT OF GUIDE RING



(7B)

FIGURES 7A & 7B

THRUST BEARING & MANUAL JACKING DEVICES

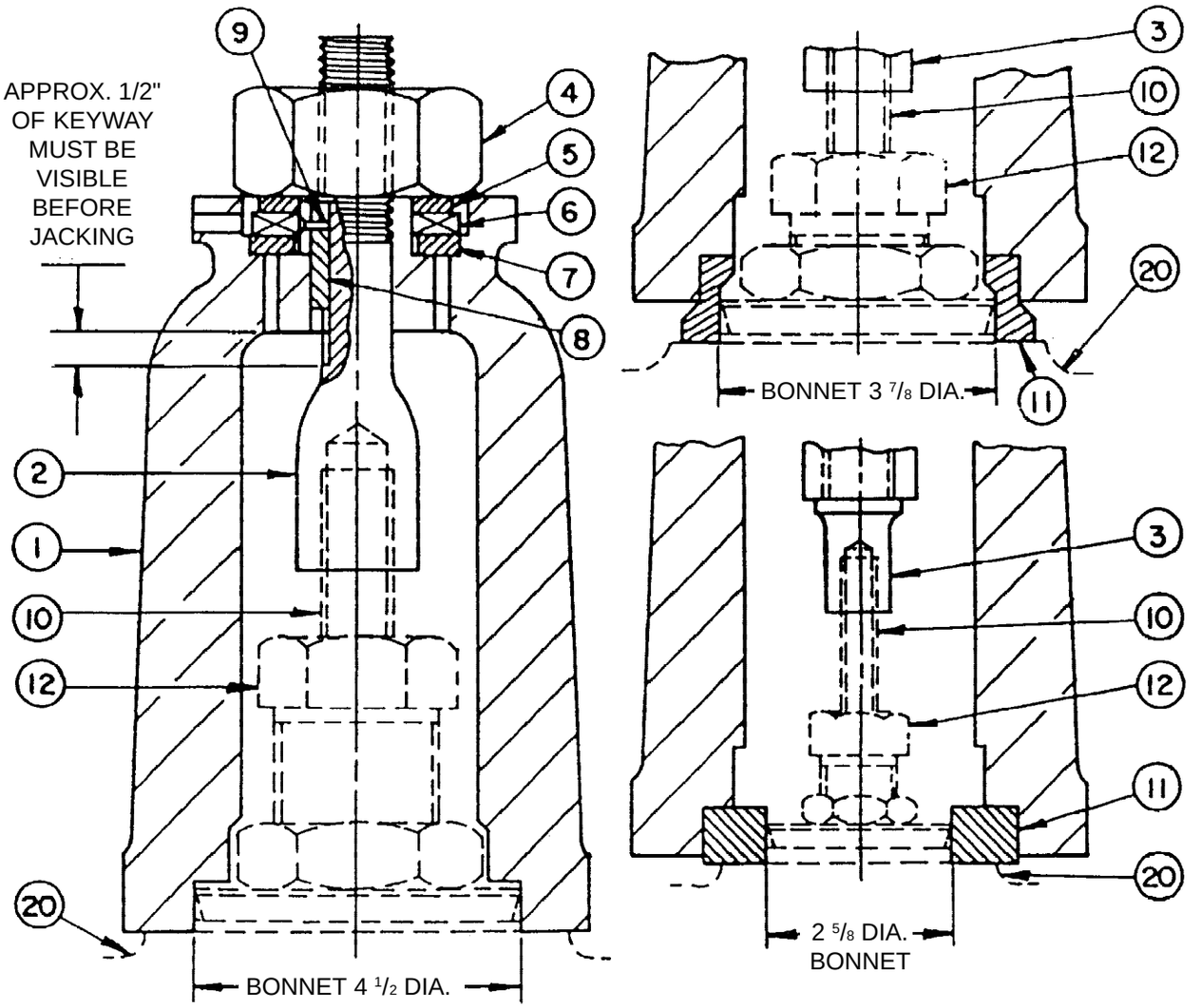


FIGURE 9

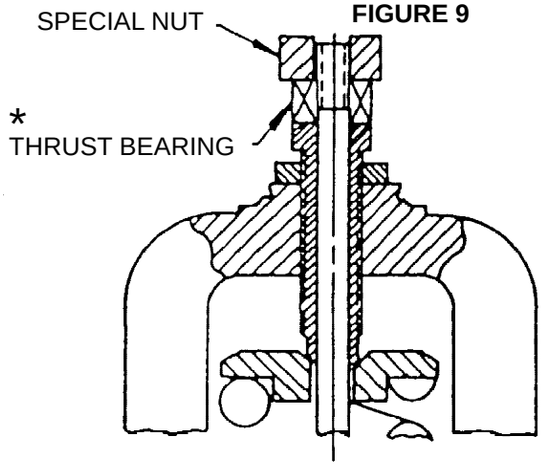


FIGURE 8

1 HOUSING	8 KEY
2 SPINDLE LIFTER	9 SCREW
3 THREAD ADAPTER	10 VALVE SPINDLE
4 OPERATING NUT	11 SPACER
5 TOP THRUST WASHER	12 ADJUSTING BOLT
6 CAGE	20 BONNET
7 BOTTOM THRUST WASHER	

ANDREWS BEARING #505 OR EQUIVALENT LOAD RATING 16,700 LBS. AT 10 R.P.M.

FIGURES 8 & 9

TABULATION OF CROSBY PART NUMBER FOR MANUAL JACKING DEVICE FOR CROSBY HC AND HCA VALVES

ASSEMBLY SA-50546 IS ALWAYS REQUIRED.
SPACER AND ADAPTER ARE REQUIRED WHERE CROSBY PART NUMBERS ARE SHOWN

REFERENCE FIGURE 9

VALVE STYLE	NAME	G	H	J	K	K2	M & M2
HC-2 ( ) HCA-2 ( )	ASSEMBLY SPACER ADAPTER	———	———	———	———	———	———
HC-3 ( ) HCA-3 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83440	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437
HC-4 ( ) HCA-4 ( )	ASSEMBLY SPACER ADAPTER	———	———	———	———	———	———
HC-5 ( ) HCA-5 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83440	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437
HC-6 ( ) HCA-6 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83440	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437
HC-7 ( ) HCA-7 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437
HC-8 ( ) HCA-8 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437	SA-50546 83435 83437
HC-9 ( ) HCA-9 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83441	SA-50546 83436 83439	SA-50546 83436 83439	SA-50546 83435 83437	SA-50546 83435 83437
HC-10 ( ) HC-11 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83436 83441	SA-50546 83436 83439	SA-50546 83435 83438	———	SA-50546	SA-50546

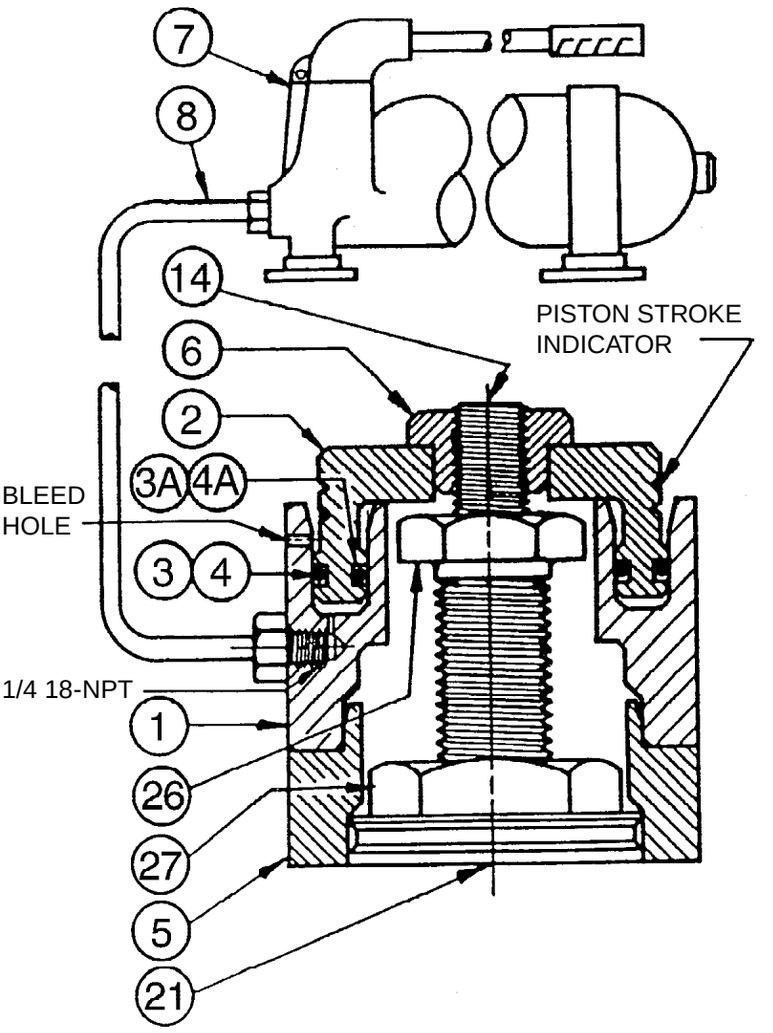
VALVE STYLE	NAME	P	Q	R	T
HC-2 ( ) HCA-2 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83435 83437	SA-50546 83435 83438	SA-50546	SA-50546
HC-3 ( ) HCA-3 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83435 83437	SA-50546 83435 83438	SA-50546	———
HC-4 ( ) HCA-4 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83435 83437	SA-50546	SA-50546	———
HC-5 ( ) HCA-5 ( )	ASSEMBLY SPACER ADAPTER	SA-50546 83435 83437	SA-50546	SA-50546	———
HC-6 ( ) HCA-6 ( )	ASSEMBLY SPACER ADAPTER	———	SA-50546	SA-50546	———

FIGURE 9A

HYDRAULIC JACKING DEVICE

(1) HOUSING
(2) PISTON
* (3) “O” RING
* (3A) “O” RING
* (4) BACK-UP RING
* (4A) BACK-UP RING
(5) BONNET SPACER
(6) SPINDLE ADAPTER
(7) HYDRAULIC PUMP
* (8) 1/4" HOSE
(14) VALVE SPINDLE
(21) BONNET
(26) ADJUSTING BOLT
(27) ADJUSTING BOLT NUT

*RECOMMENDED SPARE PART



NOTES - ASSEMBLY SA 55848 CONSISTS OF PC. NOS. 1,2,3,3A,4,4A,7,8.
SPACER (PC. NO. 5) & ADAPTER (PC. NO. 6) MUST BE SELECTED FROM FIGURE 10A.
ASSEMBLY SA 52980 CONSISTS OF PC. NOS. 1,2,3,3A,4,4A

FIGURE 10

TABULATION OF CROSBY PART NUMBERS FOR HYDRAULIC JACKING DEVICE FOR CROSBY HC AND HCA VALVES

ASSEMBLY SA-52980 IS ALWAYS REQUIRED
SPACER AND ADAPTER ARE REQUIRED WHERE CROSBY PART NUMBERS ARE SHOWN

REFERENCE FIGURE 10

VALVE STYLE	NAME	G	H	J	K	K2	M & M2
HC-HCA 2 ( )	———	———	———	———	———	———	———
HC-HCA 3 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 83550	86418 82893	86418 82893	——— 83508
HC-HCA 4 ( )	———	———	———	———	———	———	———
HC-HCA 5 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 83550	86418 82893	86418 82893	——— 83508
HC-HCA 6 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 83550	86418 82893	86418 82893	——— 83508
HC-HCA 7 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 82892	86418 82893	——— 83508	——— 83508
HC-HCA 8 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 82893	86418 82893	——— 83508	——— 83508
HC-HCA 9 ( )	SPACER ADAPTER	86418 83551	86418 83551	86418 82893	86418 82893	——— 83508	——— 83508
HC-10, 11 ( )	SPACER ADAPTER	86418 83551	86418 82393	——— 83507	———	86419 83509	86419 83509

VALVE STYLE	NAME	P	Q	R	T
HC-HCA 2 ( )	SPACER ADAPTER	——— 83508	——— 83507	86419 83509	86419 83509
HC-HCA 3 ( )	SPACER ADAPTER	——— 83508	——— 83507	86419 83509	———
HC-HCA 4 ( )	SPACER ADAPTER	——— 83508	86419 83509	86419 83509	———
HC-HCA 5 ( )	SPACER ADAPTER	——— 83508	86419 83509	86419 83509	———
HC-HCA 6 ( )	SPACER ADAPTER	——— 83508	86419 83509	86419 83509	———

FIGURE 10A

Crosby Products

- Pressure Relief Valves for Air, Steam, Vapor and Liquid Service - Spring Loaded and Pilot Operated
- Safety Valves for Fossil and Nuclear Power Plants
- QuickCross™ crossover valves for continuous flow operations.
- Pressure/Vacuum Relief Valves for Sanitary, Beverage, Food and Pharmaceutical Industries
- Valves for Chlorine, Bromine, Fluorine and other corrosive services
- Valve Test Benches and Silencers
- Set Pressure Verification Device (SPVD) and Valve Position Indication (VPI) Systems
- Comprehensive Test Facilities for Air, Steam and Water
- Valve Service, Repair and Reconditioning, and Training

Ask for Crosby's Condensed Catalog

Replacement Spare Parts Ordering Information

FMC-Crosby recommends that a sufficient inventory of spare parts be maintained to support process requirements. Always be sure to use genuine FMC-Crosby parts to ensure continued product performance and warranty.

Parts

To order parts, the following information should always be included:

1. Quantity
2. Part name, i.e., (disc insert)
3. Size, style, type and valve number
4. Shop and/or serial number
5. Original purchase order number (if the nameplate has been destroyed).

Note: The size, style, shop number, set pressure and serial number can always be found on the valve nameplate.

Springs with Washers

To order springs with washers, the required valve set pressure must also be specified in addition to the other parts information. Should back pressure (fixed or variable) or elevated temperature exist during operation, also specify these conditions.

WARRANTY

Crosby Valve Inc., Crosby Valve and Engineering Company, Limited, Crosby Services International Ltd., Crosby Valve Pte. Ltd., Crosby Valve Ltd. or Crosby Valve Sales and Service Corporation (collectively "Crosby") hereby warrants that the goods delivered under contract will be free from defect in material and workmanship for a period of 18 months from shipment or 12 months from installation, whichever is earlier. Within this period, any of our products claimed defective may be returned to our factory after written notification to and authorization by us, and if found to be defective after examination by us, the products will be repaired or replaced free of charge, F.O.B. our factory. Such defects shall be exclusive of the effects of corrosion, erosion, normal wear or improper handling or storage.

Crosby makes no representation, warranty or guarantee, express or implied, with regard to our products except as specifically stated. When in doubt as to the proper application of any particular product, you are invited to contact your nearest CROSBY office or representative. We cannot otherwise be responsible for the selection of unsuitable equipment. Suitability of the material and product for the use contemplated by the buyer shall be the sole responsibility of the buyer.

Except as specifically set forth above and for warranty of title, CROSBY MAKES NO WARRANTY, EXPRESS OR IMPLIED, OF ANY KIND INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event will CROSBY be liable for incidental or consequential damages.

WARNING

The Product is a safety related component intended for use in critical applications. The improper application, installation or maintenance of the Product or the use of parts or components not manufactured by Crosby may result in a failure of the Product. The advice of a qualified engineer should be sought prior to any use of the Product.

Any installation, maintenance, adjustment, repair or test performed on the Product must be done in accordance with the requirements of all applicable Codes and Standards.

The information, specifications and technical data (the "Specifications") contained in this document are subject to change without notice. Crosby does not warrant that the Specifications are current and assumes no responsibility for the use or misuse thereof. The Purchaser should verify that there have been no changes to the Specifications prior to use.

Crosby Valve Inc.

CROSBY

An FMC Corporation subsidiary

USA Operations

Executive and Sales Headquarters and Manufacturing Plant

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