

Bermad 400E-4DC

Pneumatically Pressure Control On Off Deluge Valve

Installation

Operation

Maintenance



Application Engineering

Bermad

1. Safety First

BERMAD believes that the safety of personnel working with and around our equipment is the most important consideration. Please read all safety information below and from any other relevant source before attempting to perform any maintenance function.

Comply with all approved and established precautions for working with your type of equipment and/or environment.

Authorized personnel should perform all maintenance tasks.

Prior to performing a procedure, read it through to the end and understand it. If anything is not clear, ask the appropriate authority.

When performing a procedure, follow the steps in succession without omission.

2. Description

The BERMAD Model 400E-4DC pressure controlled Deluge valve is suitable for systems that include pneumatic release system and a piping system with a wide variety of open nozzles. Combining a pressure control feature, the model 400E-4DC is recommended for a system that requires pressure control.

The BERMAD Model 400E-4DC requires a pneumatic release system, equipped with thermostatic releases, and/or fixed temperature releases and pneumatic pressure supply system.

The model 400E-4DC trim may also use a hydraulic release system with thermostatic releases and/or fixed temperature releases.

The specific trim for the pneumatically pressure controlled Deluge Valve Type 4DC includes a PORV Pneumatic Actuator (6B fig.1), normally held closed by pressure maintained in the pneumatic release system, a #2-UL Pressure Reducing Pilot Valve (2R fig.1) and a Manual Emergency Release (15B fig.1).

In fire conditions, the release device on the control trim releases the pressure from the upper chamber, allowing the Deluge Valve (1 fig.1) to modulate open allowing water to flow into the system at the preset pressure. Water flows from any open nozzles and to alarm devices. The Deluge Valve with Pressure Reducing Trim is recommended where it is necessary to guard against over-pressure while maintaining a preset discharge pressure during system operation. This feature allows regulation of total system demand and can be used to limit excess flow from deluge systems with high-pressure water supply, or to reduce outlet pressure to a constant value according to the system component pressure rating and design, regardless of changes in the deluge valve inlet pressure.

This feature is also recommended where a reduction of pressure surges and/or water hammer is desired.

Deluge Systems are commonly used where it is desirable to simultaneously spray water from all open sprinklers and/or nozzles while the system is operating.

In the SET position, the line pressure supplied to the main valve's control chamber via the priming line, and through a Check Valve, an Accelerator with a priming restriction is trapped by the Check Valve, by the closed PORV and by a closed Manual Emergency Release. The trapped pressure holds the main valve's diaphragm and plug against the valve seat, sealing it drip tight and keeping the system piping dry.

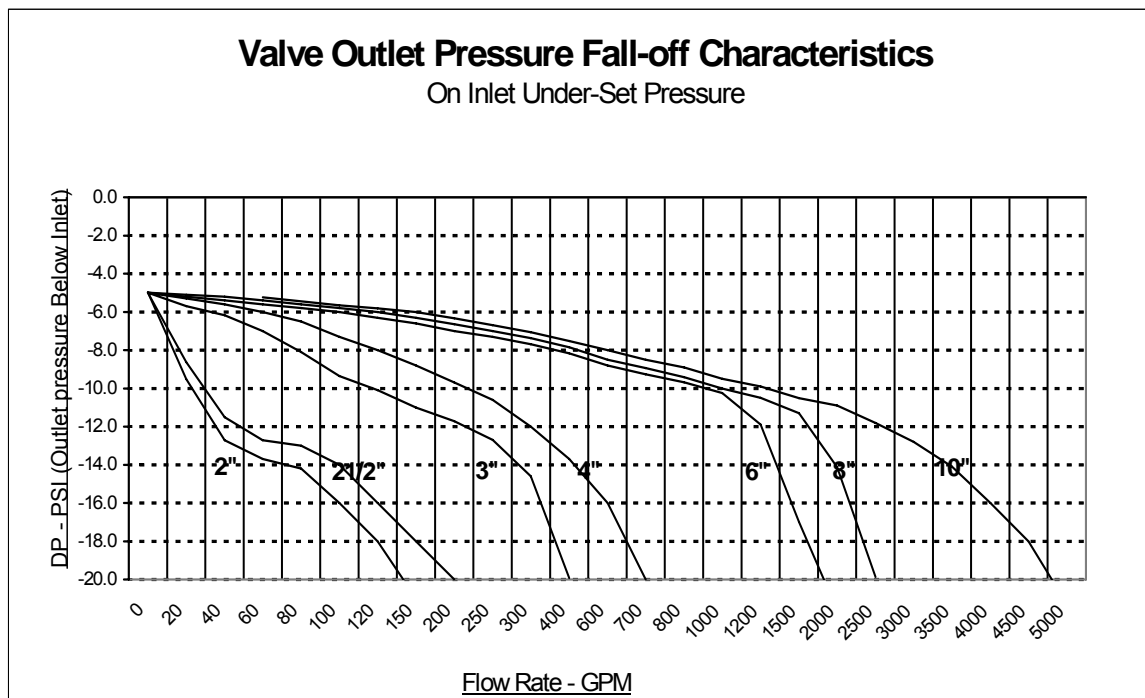
Under FIRE condition, pneumatic pressure is lost causing the PORV valve to open. Pressure is then released from the main valve's control chamber to the downstream, through the Pressure Reducing (PR) Pilot and the open PORV. Should system pressure rise above PR pilot setting, the PR pilot throttles, thereby enabling pressure to accumulate in the valve control chamber. This causes the 400E-4DC to throttle closed, decreasing system pressure to PR pilot setting. The Manual Emergency Release (15B fig.1) overrides the PORV pilot, causing the 400E-4DC to open.

Flow and Pressure for Models 400E-2MC 2C, 3C, 3DC, 4C, 4DC, 5C, 5DC, 6C & 6DC

| Valves sizes | 2" | 2½" | 3" | 4" | 6" | 8" | 10" |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Rated Inlet Pressure | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Outlet Pressure Adjusting Range [psi (bar)] | 30-165 (2-11.5) | 30-165 (2-11.5) | 30-165 (2-11.5) | 30-165 (2-11.5) | 30-165 (2-11.5) | 30-165 (2-11.5) | 30-165 (2-11.5) |
| Minimum Flow-Rate [GPM (m³/hr)] | 44 (10) | 50 (11.5) | 110 (25) | 180 (401) | 400 (91) | 450 (102) | 660 (150) |
| Maximum Flow-Rate [GPM (m³/hr)] | 150 (34) | 270 (61) | 450 (102) | 700 (159) | 1600 (363) | 3500 (795) | 5000 (1136) |

Attainable outlet pressure at inlet under-pressure

The following chart indicates the attainable outlet pressure available when the inlet pressure falls below the intended outlet pressure setting.



3. Australian Standard SSL

BERMAD 400E-4DC Deluge Valve is Australian Standard SSL when installed with specific components & accessories.

4. Installation

Subject to all other instructions, drawings and technical specifications, which describe the BERMAD 400E-4DC Deluge Valve, install in their proper positions the components comprising the Deluge Trim Package, according to the drawing relevant to the specific type, hereby enclosed.

- 4.1. Allow enough room around the valve assembly for any adjustments and future maintenance/disassembly work.
- 4.2. Before the valve is installed, flush the pipeline to remove any dirt, scale, debris, etc. Failure to do this might result in the valve being inoperable.
- 4.3. Install the valve in the pipeline with the valve flow arrow on the body casting in the proper direction. Ensure that the valve is positioned so that the cover/actuator can be easily removed for future maintenance.
- 4.4. Ensure that all other components are positioned correctly as per the appropriate drawing.
- 4.5. The water supply priming line must be connected to the upstream of the system control valve.
- 4.6. Subject to all other instructions, drawings and technical specifications, which describe Bermad Deluge Valve, install in their proper positions the components comprising the Deluge Trim Package, according to the drawing relevant to the specific type, hereby enclosed.
- 4.7. Install also the additional accessories, which appear in the drawing and which must be installed as shown in the schematic drawing.
- 4.8. Install a pneumatic pressure supply system; see "Pneumatic System Pressure Requirements" below.
- 4.9. Pneumatic System Pressure Requirements:

A regulated supply of pressurized air or nitrogen is required to maintain a pneumatic pressure supply system, See "Placing in Service" section below prior to connecting the air supply to the system.

The Pneumatic system shall use a clean, dependable and continuous (24 hours a day, 7 days a week) compressed-air source using an independent air compressor or an Air Maintenance Device supplied by an dry nitrogen-gas supply or external high Air pressure source.

NOTE: Any event of an air supply failure, slow leakage of air from the pneumatic system, will result in activation of the PORV, causing the Deluge Valve to open. Water will then flow from any open sprinklers and/or spray nozzles on the system and the Alarm will operate.

NOTES:

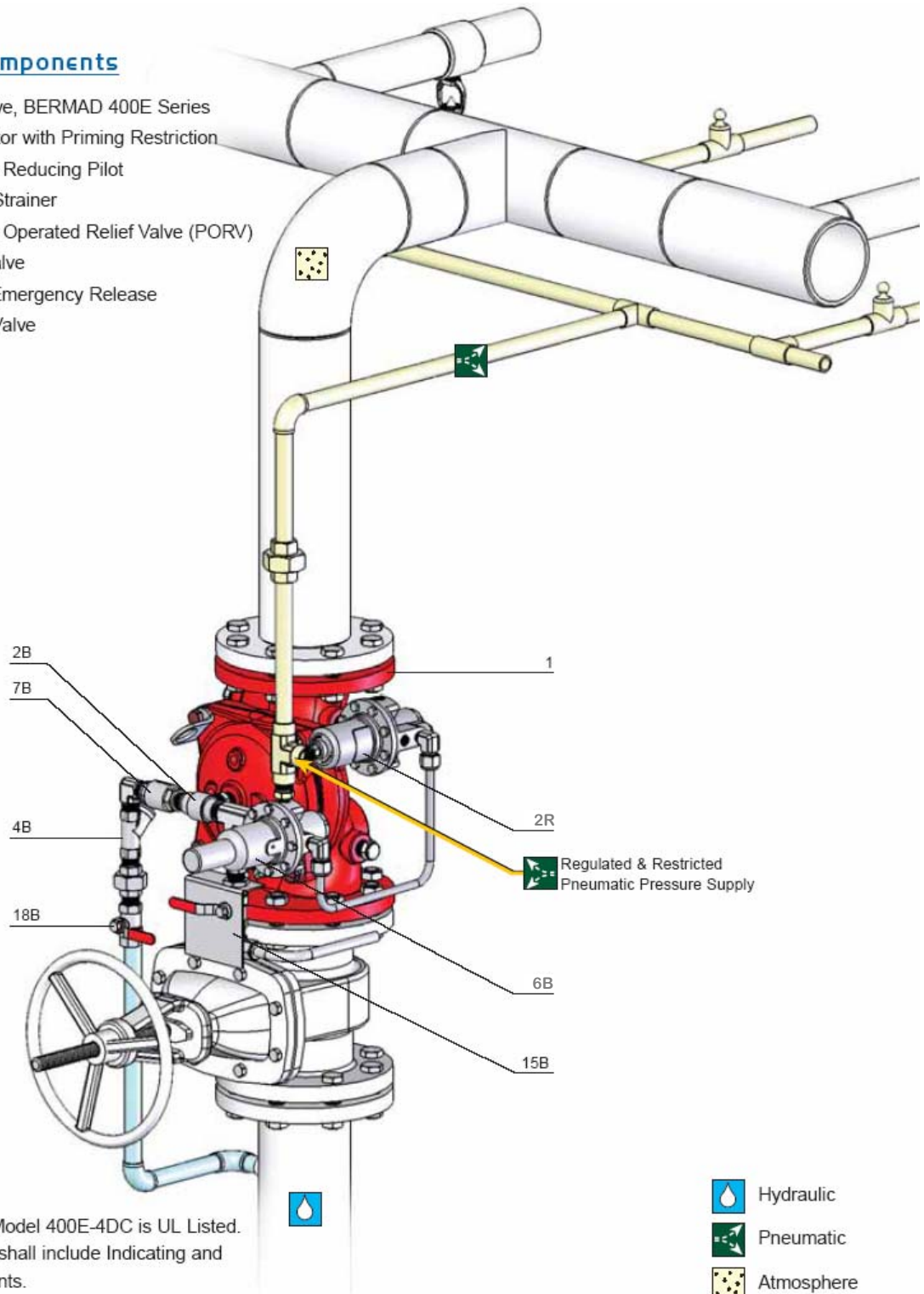
- Any deviation in trim size or arrangement may adversely affect the proper operation of the Deluge Valve.
- All initiating devices (detectors), indicating appliances, releasing devices, pilot line actuation devices (such as thermostatic releases, and/or fixed temperature releases), as well as the system control panel, must be compatible for use with the particular Deluge System. Refer to NFPA 13 or the applicable installation standards, codes and authorities having jurisdiction.

WARNING: The Deluge Valve and trim must be installed only in areas where they will not be subjected to freezing temperatures.




Figure 1: Installation Drawing

System Components

- 1 - Main Valve, BERMAD 400E Series
- 2B - Accelerator with Priming Restriction
- 2R - Pressure Reducing Pilot
- 4B - Priming Strainer
- 6B - Pressure Operated Relief Valve (PORV)
- 7B - Check Valve
- 15B - Manual Emergency Release
- 18B - Priming Valve



Note
 The BERMAD Model 400E-4DC is UL Listed.
 The installation shall include Indicating and
 Drain Components.

-  Hydraulic
-  Pneumatic
-  Atmosphere

5. Equivalent Length

Deluge Valve Equivalent Length Value (Steel Pipe), for use in hydraulically calculated systems

| Valve Size | Equivalent Length Value Meter (Ft) |
|------------|---------------------------------------|
| 2" | 9.1 (30) of 2" pipe |
| 2½" | 12.1 (40) of 2½" pipe |
| 3" | 13.7 (45) of 3" pipe |
| 4" | 14 (46) of 4" pipe |
| 6" | 27.4 (90) of 6" pipe |
| 8" | 45.7 (150) of 8" pipe |

6. Optional Equipment

- 6.1 If required, provide an Alarm Pressure Switch, to either activate an electric alarm, or shut down desired equipment. Connect it according to manufacturer instructions.
- 6.2 If required, provide a Water Motor Alarm, it shall be assembled and installed according to instructions with in its package.
- 6.3 It is a recommended practice to provide an "Inspector's Test Connection" on the hydraulic release system. The inspector's Test Connection should be equipped with a ball valve (normally locked closed) capable of being opened to simulate the opening of a release.

7. Placing in Service/Resetting the System

- 7.1 Check the entire release system for leaks. Replace any fused thermostatic release, fixed-temperature-release heads. Check the emergency release.
- 7.2 Make certain release handle is returned to the CLOSED position.
- 7.3 Operate pneumatic pressure supply system, allowing release system pressure to build up to a range of 20 to 30 psi (1.4 barg to 2.0 barg). Check the entire system for leaks.
Note: Any automatic air or nitrogen pressure supply must feed the system through an orifice restriction. If a low air pressure alarm is utilized, test it by dropping the release line pressure. Restore pressure after the test.
- 7.4 Open the priming-line valve (18B fig.1) and allow pressurized water to fill the top chamber of the Deluge Valve.
- 7.5 When the top chamber pressure gauge indicates full service-line pressure and pressure is no longer rising, open the isolating valve slowly. No water should flow into the system.
- 7.6 Depress the Drip Check and drain any water from the system side of the Deluge Valve.
- 7.7 The system is now in service.

The system is now operational and in a standby mode.
Ensure that the following Set Conditions are met.

Set Conditions (Normal Conditions)

| Item | Status |
|--------------------------------|--|
| All Main Isolating Valves | OPEN and sealed with tamperproof seals |
| All Manual Releases | CLOSE position and sealed |
| Alarm Shut-Off Valve | OPEN position |
| Priming Ball Valve (18B fig.1) | OPEN |
| Control-Chamber Gauge | OPEN gauge valve, the Pressure Gauge indicates rate of pressure in Control-Chamber |
| Upstream Pressure Gauge | OPEN gauge valve, the Pressure Gauge indicates the upstream supply pressure to the Deluge Valve |
| Drip-Check Device | VENTED : Push the knob to confirm that there is no leakage. |
| Control Panel & Detections | Are in service and its stand-by position. |
| Releasing Devices | CLOSED with no leaking |

8. Removing the System from Service

WARNING: When taking deluge system out of service, a fire patrol should be established in the system area. If automatic fire-alarm signaling equipment is utilized, the proper authority should be notified that the system is being removed from service. The insuring body and owner representative should also be notified when the system is being taken out of service.

9. Removing Instructions

Type 4DC Trim Configuration

- 9.1 Shut off the main supply valve.
- 9.2 Priming-line valve (18B fig.1) to the Deluge Valve should be closed.
- 9.3 Open all drain valves.
- 9.4 Release the water pressure from the top chamber by pulling the emergency release (15B fig.1).
- 9.5 Shut off air or nitrogen-supply to the release system.
- 9.6 Release air or nitrogen pressure from release system. This may be accomplished by tripping a release or opening a test valve in the release system (if utilized).
- 9.7 Place "Fire Protection System out of Service" signs in the area protected by the system.

10. Operation

In the Set position: System water supply pressure enters the top chamber of the Deluge Valve through the restricted priming line and is trapped in the top chamber of the Deluge Valve by check valve (7B fig.1), releasing device in the hydraulic release system and/or a normally held closed PORV Pneumatic Actuator (6B fig.1).

The pressure trapping is done by the check valve which prevents high pressure back flow, on the one hand, the closed PORV and the closed hydraulic releasing device, on the other hand.

The PORV (6B fig.1) is held closed by pressure maintained in the pneumatic release system. The pressure in the top chamber holds the Deluge Valve seal disc closed, keeping the outlet of the deluge valve and system piping dry.

In fire conditions, when a releasing device (such as fixed temperature release heads and/or thermostatic release) operates, pressure in the pneumatic release system drops below the set point, causing the PORV to open. When the PORV opens, or the hydraulic releasing device opens, pressure is released from the top chamber faster than it is supplied through the restricted orifice. The Deluge Valve seal disc opens to allow water to flow through the piping into the system and alarm devices. Water will flow from any open sprinklers and/or spray nozzles on the system. When the PORV operates, it continually vents the top chamber to prevent the deluge valve from resetting. The Bermad Deluge Valve can be reset only after the system is taken out of service, and the outlet of the deluge valve and associated trim piping are depressurized and drained.

11. Manual Operation

Whenever the handle of the Manual Emergency Release (15B fig.1) is pulled, pressure is released from the top chamber, the Deluge Valve will open, and water will flow into system piping and alarm devices.

Note: The Manual Emergency Release (15B fig.1) overrides the PR pilot, causing the 400E-5DC to open fully.

Air Supply Troubles

Any event of an air supply failure, slow leakage of air from the pneumatic release system, and/or failure to restore air supply to the pneumatic release system, will result in activation of the Pneumatic PORV, causing the Deluge Valve to open. Similarly, if the release system is activated due to mechanical damage or malfunction, the Deluge Valve will open. Water will flow from any open sprinklers and/or spray nozzles on the system. Water Motor Alarm will be set off.

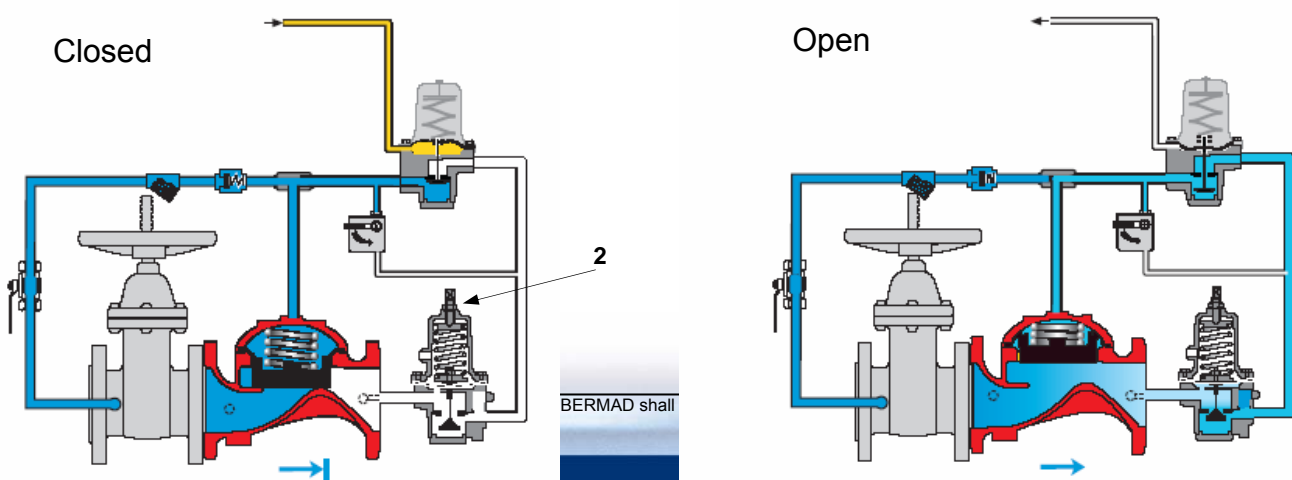
Normal Conditions

1. All main control valves are **open** and sealed with tamperproof seals.
2. The alarm shut off valve is in the OPEN position.
3. The priming-line valve (18B fig.1) is OPEN.
4. The top chamber gauge valve should be OPEN and gauge should indicate rate of pressure in the top chamber.
5. Upstream pressure gauge valve is OPEN. The gauge should reflect the upstream supply pressure to the Deluge Valve.

Pneumatic Release System

1. The Pneumatic Release System Pressure Gauge should indicate 20 to 30 psi (1.4 barg to 2.0 barg).
2. Pneumatic pressure supply system (including its dehydrator) is functioning properly.
3. Automatic air or nitrogen-supply is ON, compressor is ON.

Figure 2: Operation Drawing



12. Maintenance and Inspection Test

- 12.1 Warning: Do not turn off the water supply to make repairs without placing a roving fire patrol in the area covered by the system. The patrol should continue until the system is back in service.
- 12.2 Prior to turning off any valves or activating any alarms, notify local security guards and the central alarm station, if used, so that a false alarm will not be signaled.
- 12.3 If an abnormal condition is found to exist in any of the following inspections or testing procedures, consult Abnormal Conditions for possible cause and corrective action.
- 12.4 See NFPA Pamphlet No.25.

Readjusting

The pilot valve is factory pre-set according to the stated demands of the customer. The pre-set pressure settings are clearly indicated on the pilot valve tag.

If readjustment to either the pressure or valve response is required, follow the following steps.

1. Ensure that there is minimum flow through the main valve.(for Pilot setting flow rate see Table1, item Minimum flow rate for pilot setting.)
2. Free the tension between the adjusting screw on the pressure reducing pilot valve (2 in figure 2) and the fastening nut by turning the fastening nut counterclockwise.
3. By alternately turning the adjusting screw on the pilot valve a half turn and then reading the downstream pressure, gradually adjust the pressure:
 - Counterclockwise to decrease (-) the downstream pressure
 - Clockwise to increase (+) the downstream pressure.

13. Weekly Inspection

- 13.1 The system should be checked for normal condition.
- 13.2 Observe the upstream pressure gauge: it should indicate that the normal supply of water pressure to the Deluge Valve is maintained.

14. Monthly Inspection and Test

- 14.1 Complete Weekly Inspection.
- 14.2 Test the water-motor alarm or electric alarm (optional) by turning the alarm test valve to the open position. The alarm should sound. Turn to close position.
- 14.3 Depress the Drip Check to release accumulation.(Significant water accumulation on the system side may indicate a sealing problem).

15. Annual Inspection and Test

- 15.1 Complete Weekly, Monthly and Semi-Annual inspections.
- 15.2 Place the system out of service (See instructions above).
- 15.3 Trip the release-line system, clean all strainers (4B fig.1), and priming-line restriction.
- 15.4 The interior of the Deluge Valve should be inspected and cleaned.
- 15.5 The interior of the PORV (6B fig.1), including its diaphragm and seal, should be inspected and cleaned.
- 15.6 Place the system back in service.
- 15.7 See instructions "Placing the System in Service".
- 15.8 The Deluge Valve, trim, auxiliary devices and manual release must be activated at full flow.
Note: The system will be flooded! Take all necessary precautions to drain water and prevent damage in the area protected by the Deluge system.
- 15.9 Trip test the deluge system by decreasing pressure in the pneumatic release system. Reset system.
- 15.10 The manual emergency release handle (15B fig.1) is to be pulled and tested. The Deluge Valve should open and discharge water.
- 15.11 Observe pressure on upstream Pressure Gauge while full flow is on. Inspect all nozzles in the system. Take all additional measures as required by NFPA 25 "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems."

16. Abnormal Conditions

16.1 Alarm Pressure Switch Fails to Sound

- A. Clean the alarm-line strainer.
- B. Test for obstructions in the alarm test line.
- C. Make certain the water-motor alarm is free to operate.

16.2 False Trip

Check for any of the following possible causes:

- A. Plugged priming-line, priming restriction, or priming strainer (4B fig.1).
- B. Malfunctioning or leaking release system.
- C. PORV (6B fig.1) out of order.
- D. Deluge air orifice assembly plugged.
- E. Inadequate pressure supply on release system (pneumatic).

16.3 Leakage through Deluge Valve

Check for any of the following possible causes:

- A. Partially plugged priming restriction.
- B. Inadequate pressure supply on release system (Pneumatic).
- C. Leaking release system.
- D. Damaged deluge valve seat.

16.4 Deluge Valve Will Not Reset

Check for any of the following possible causes:

- A. An open main control valve.
- B. Release system not properly drained.
- C. Closed priming valve (18B fig.1).
- D. Damaged deluge valve seat.
- E. Foreign object lodged between seal disc and valve seat.

16.5 Difficulty in Performance

Where difficulty in performance is experienced, the manufacturer or his authorized representative should be contacted if any field adjustment is to be made.