SPENCE ENGINEERING COMPANY, INC.
Walden, New York 12586

INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS for SPENCE BACK PRESSURE REGULATORS EQUIPPED WITH Q-SERIES PILOTS

SCOPE

These instructions cover regulators equipped with Q-Series (Q, Q5) Pilots and E-Series (E, E2, E5) or C-Series (C20, C34) Main Valves.

INTENDED PURPOSE

These regulators are designed to maintain a constant back pressure by discharging excess flow to a lower system pressure or atmosphere.

The EQ-Series are intended primarily for steam service and provide dead-end shutoff.

The C20Q-Series are intended for steam or liquid service and do not provide dead-end shutoff.

The C34Q-Series are intended for liquid service only and provide dead-end shutoff.

A Spence Back Pressure Regulator is not a safety valve and should never be used as such.

INSTALLATION

Install the Main Valve in a straight run of horizontal pipe (See Figure 1). The diaphragm chamber must be down and the flow arrow pointing in the direction of flow. Carefully clear the piping system of foreign matter at assembly. Provide a three-valve bypass to facilitate inspection of the regulator. Install a strainer ahead of the regulator.

Mount the Q-Series Pilot on either side of the Main Valve using the 1/4" blind nipple and union provided (See Figure 2). Install fittings provided in their proper locations. These fittings, vital to the operation of the regulator, must be properly installed and unobstructed.

Install a 1/2" control pipe with gate valve to connect the Pilot to the selected control point in the back pressure pipe. The control pipe transmits the back pressure signal to the Pilot and also provides the small amount of fluid required to operate the Main Valve. The control pipe should be as short as practical and must connect to the back pressure pipe at a point of minimum turbulence. Avoid selecting a control point near a turn or enlargement in pipe size. On steam service, install the control pipe so that a water leg or pocket will not occur. Install a float and thermostatic trap, if necessary, for drainage.

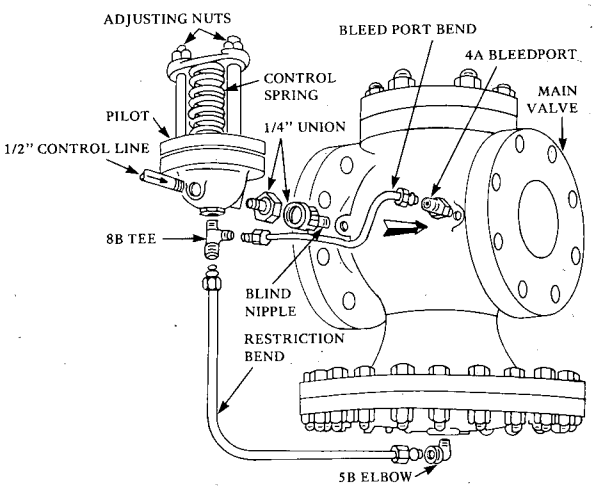

Figure 2: Pilot and Fittings Installation

Insulation may be applied to the upper portion of the Main Valve (globe and flanges). Do not insulate the diaphragm chamber, condensation chamber (if supplied) or any part of the Pilot.

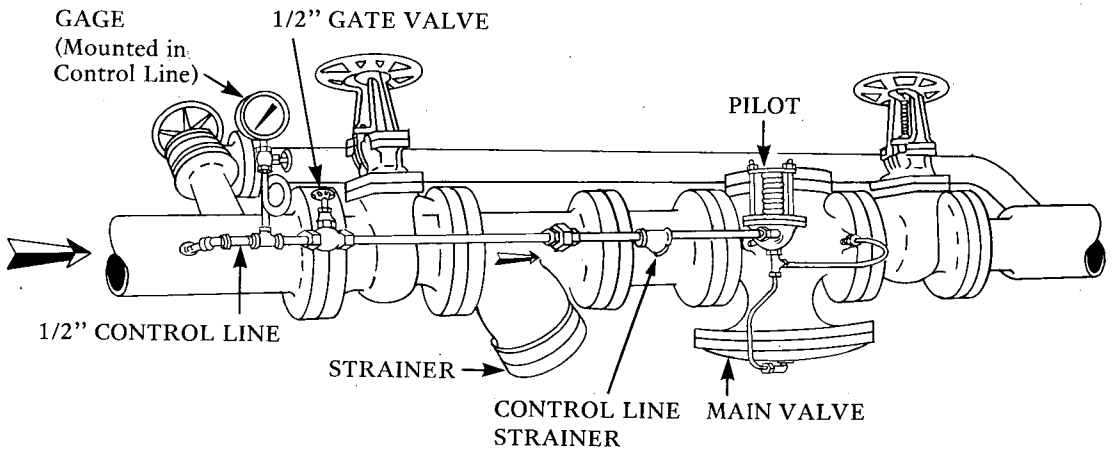

Figure 1: Installation of Back Pressure Regulator with 3-valve bypass and strainers.

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OPERATING CYCLE

1. Main Valve is normally closed.
2. Control line transmits same pressure to pilot diaphragm that exists in inlet (back pressure) pipe.
3. Increase of pressure in control line causes Pilot to open.
4. Fluid passing through Pilot fills connecting tubing. Orifice coupling (No. 4A bleedport) restricts flow and builds pressure under main valve diaphragm, opening the Main Valve.
5. Opening of Main Valve relieves pressure in inlet pipe and control line, relaxing pressure on the pilot diaphragm.
6. As pressure at pilot diaphragm approaches a balance with control spring force, the regulator is under throttling operation.
7. If pressure at Pilot is less than the force of the control spring, the Pilot closes and allows the Main Valve to close until an increase in back pressure occurs.

START-UP PROCEDURE

1. Use the bypass valve to regulate the flow at normal back pressure.
2. Open the control pipe valve. Open the outlet stop valve wide.
3. Crack open the inlet stop valve. Put a small amount of compression on pilot control spring to close Pilot.
4. Gradually open the inlet stop valve and choke down on the bypass until the regulator is on the line.
5. Turn the control spring nuts slowly and evenly until the desired back pressure is reached. Compressing the pilot control spring increases the back pressure.

MAINTENANCE

1. Under normal conditions, periodic dismantling of the regulator is not recommended. A valve kept relatively free of dirt will function for years with minimal attention.
2. The following inspections should be made after the first ten days of operation and twice a year thereafter:
   a. Check the No. 4A bleedport restriction for dirt accumulation. Clean as required.
   b. Check Pilot for dirt accumulations on the upper surface of its pressure plate. Clean as required.
   c. Inspect all joints for leakage. Keep bolts and fittings tight. Never allow a leak to persist.

DISMANTLING

1. Pilot
   a. Remove compression on control spring.
   b. Remove diaphragm bolts and lift off cowl and diaphragm. As the diaphragm is lifted, the disc will be drawn out from its seat.
2. Main Valve
   a. Remove top flange.
   b. Attach adjustable pressure source as shown in Figure 3. Apply about 30 psig (10 psig for E2) to jack open valve.
   c. Lift out balance or dashpot cylinder if your valve is so equipped.
   d. Remove stem nuts after applying penetrating oil to threads.
   e. Lift out piston, if so equipped.
   f. Lift out disc.
   g. Remove diaphragm loading pressure.
   h. Remove diaphragm bolts. Hood, diaphragms, main spring and stem will drop from valve.

GRINDING IN (Metal seat and disc only.)

1. Seats and discs never require more than a light touch-up using very fine (400 Grit) compound. Heavy grinding will damage the metal-to-metal seal.
2. The pilot disc is slotted for rotation with a screw driver.
3. Main Valves are ground in with the main spring removed, and one stem nut installed.
4. After grinding, disassemble and clean all parts with kerosene or trichloroethane.

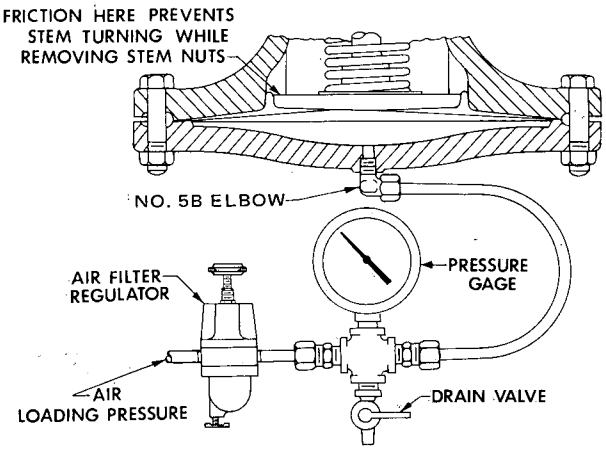

Figure 3: Air Loading Arrangement for Removing Stem Nuts.

TROUBLE SHOOTING GUIDE

A. Erratic Operation
   1. Partial clogging of No. 4A fitting. (Check fitting.)
   2. Steam service only: Water pocket in 1/2" control line. (Provide for proper drainage.)
   3. Binding Pilot. (Dismantle Pilot and check for scale or dirt buildup.)

B. Excessive Back Pressure or Failure to Open
   1. Inlet or outlet stop valve not fully open. (Check.)
   2. Control pipe valve not open. (Check.)
   3. Clogged strainer. (Blow down strainer.)
   4. Pilot improperly adjusted. (check adjustment.)
   5. Missing No. 4A fitting. (Check orifice.)
   6. Main valve diaphragm broken. (Use auxiliary pressure to load diaphragm. If valve does not open with 30 psig - 10 psig for E2 -, then diaphragm is broken.)

C. Low Back Pressure or Failure to Close
   1. Bypass valve leaking. (Check.)
   2. Pilot improperly adjusted. (Check adjustment.)
   3. Clogged No. 4A fitting. (Check orifice.)
   4. Main Valve or Pilot Valve hung open. Pinpoint problem by closing control pipe valve tight.
      a. If back pressure rises, Pilot is hung open. (Dismantle and clear.)
      b. If back pressure does not rise, Main Valve is hung open. (Dismantle and clear.)