

Be Careful when Piping 2/3-Way Control Valves

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Recently we received a frantic call from a company which had purchased a large number of our 3-way valves for installation on a chilled water system feeding FCUs for a new hotel project, complaining that our valves were defective and were not effectively controlling the temperature in the rooms.

Upon investigation, our engineer noticed that the water connections to the valves were wrongly made by the installing engineer, who obviously had not taken the trouble to read the installation instructions enclosed with each valve.

This is how a typical valve was installed, see *Figure 1*, instead of how it should have been installed as per our instructions, see *Figure 2*.

After making the piping changes, temperature control was acceptable

and the customer convinced that our valves were not to blame for the problem.

Valve port configurations, as detailed hereunder, vary with valve types and some times with manufacturers also. It is important to understand valve port configuration while making pipe connections to avoid mistake like above.

Commonly used control valves in HVAC applications can be categorized into two types, based on

spindle movement

- Linear types - include Globe valves
- Rotary types - include Ball valves, Rotary Shoe/Slipper valves, and flapper valves

These valves can be further categorized as two-port or three-port valves

- Two-port valves restrict the fluid passing through them

- Three-port valves mix or divert the fluid passing through them. A mixing valve has two inlets and one outlet whereas a diverting valve has one inlet and two outlets.

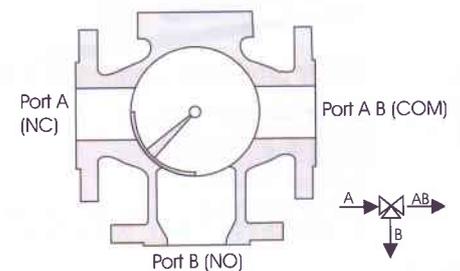


Figure 6 : Rotating Shoe / Slipper Valve

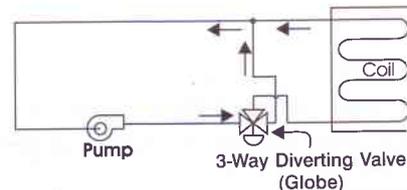


Figure 3 : Piping connections with Globe type 3-way diverting valve.

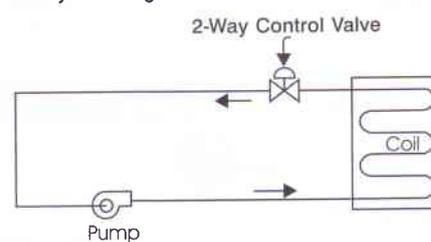


Figure 4 : Piping connections with 2-way control valve.

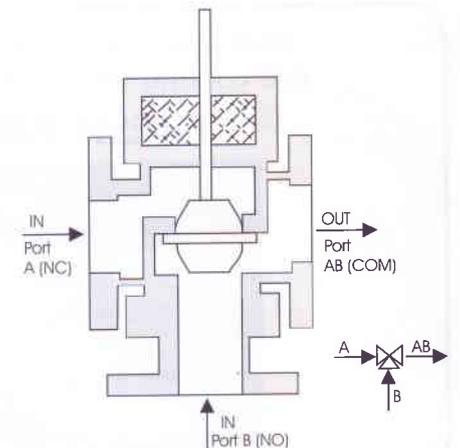


Figure 7 : 3-Way Mixing Valve

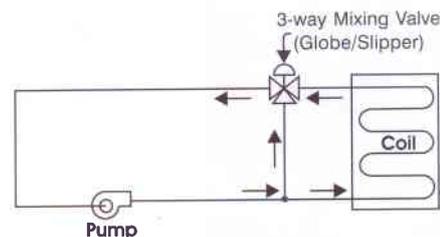


Figure 1: Piping connections with Globe or Slipper type 3-way mixing valve.

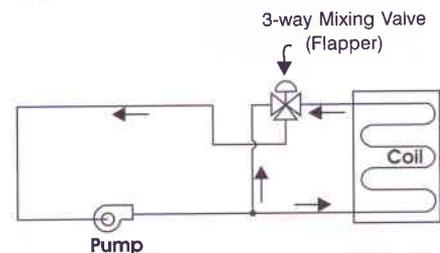


Figure 2: Piping connections with Flapper type 3-way mixing valve.

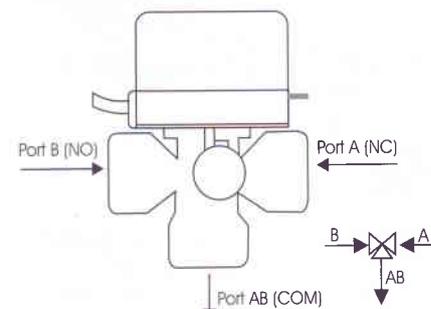


Figure 5 : Flapper Valve (FCU)

Figures 5-9 describe schematic construction details and port configurations of different valves.

Figures 1-4 show piping connection of 2-way and 3-way valves to a

About the Author

Amrish Chopra is a mechanical engineer with 30 years experience in HVAC. For 20 years he has been involved in HVAC controls, first representing Staefa Control Systems and then in his own manufacturing company Anergy Instruments. He is a member of ISHRAE and ASHRAE.

continued on page 138

continued from page 136

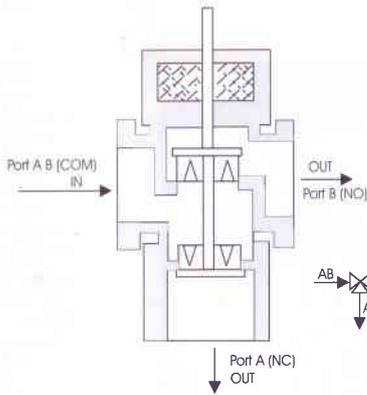


Figure 8 : 3-Way Diverting Valve

cooling/heating coil and in both cases the valves modulate flow through the coil to vary the capacity. With 2-way valves, flow through the circulation system is variable while with 3-way valves, it remains constant.

Rotary valves can often be used both in mixing and diverting applications whereas linear valves are specifically designed for mixing or diverting application. Due to their construction, mixing type globe valves are less expensive than diverting types and thus are more common

Mixing valves are installed on the coil outlet. 2-way valves may be installed on the coil inlet or outlet but as a general practice they are also installed on coil outlet. Installation of valves on coil outlet keeps the coil full of water and under positive pressure at all times

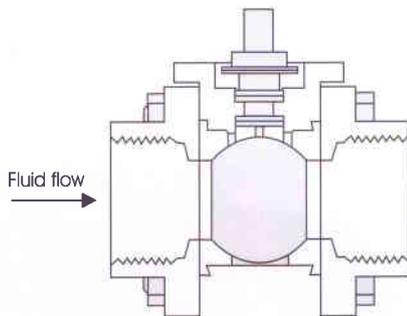


Figure 9 : Ball Valve

The exit port of the mixing valve and the inlet port of the diverting valve are called the *common* port, typically labeled AB or C (for common). It is also called constant volume port. Its amount of opening is fixed, is not changed by the movement of internal mechanism within the valve when the opening of other ports is varied.

One port of mixing, as well diverting valves is normally open – open when valve is not energized, to the common port and is labeled NO or B (for *bypass*). In globe type mixing valves it is generally the bottom port.

The other port is normally closed to the common port and is labeled NC or A.

Some valves, like the flapper valve used with fan-coil units, are designed with centre port as common port with water exiting left and right.

It is possible, depending on the valve construction, to convert a 3-way valve to a 2-way valve by blanking-off the NO or B (*bypass*) port. ❖