



*Flowserve – Anchor Darling
Bonnet Over-Pressurization*

Bonnet Over-Pressurization

Problem

When a bolted bonnet or pressure seal gate valve is closed with the system full, some liquid is trapped in the body/bonnet cavity above the disc/seat ring seals. Generally this is of little consequence. However, when the line is heated, the entrapped liquid expands, creating a build-up of pressure in the body/bonnet cavity (See Figure 1).

Should this pressure exceed the yield strength of the body/bonnet materials, the valve parts will distort. The result is excessive leakage or inability to cycle the valve. Under extreme conditions, valves have ruptured.

Solution

When conditions are anticipated that could result in over-pressurization of a bolted or pressure seal bonnet, one of the following solutions should be applied:

1) The upstream disc of the gate valve can be provided with a small drain hole to allow the liquid between the wedges to flow from the cavity. The valve is now uni-directional as indicated by the flow arrow and should be installed accordingly (Figures 2 and 3).

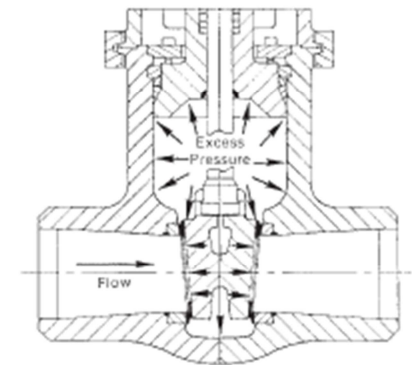
- 2) Install a pressure relief valve in the bonnet to automatically relieve the bonnet pressure (Figure 4).
- 3) Install a manual vent valve in the bonnet to be opened during system heat-up to relieve pressure (Figure 4).
- 4) Install an external bypass line, with a manual valve, from the bonnet to the upstream side to the valve. Manually open the bypass valve during heat-up to relieve pressure (Figure 5).

All of the above solutions have been utilized in the past. However, the drilling of the upstream disc (Solution 1) is the most economical. Selection of the method to be used must take into consideration the application of the valve and the system in which it is installed.

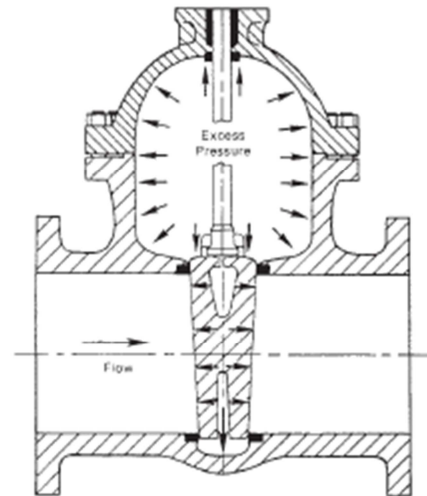
Applications:

- All Gate valve installations

Figure 1 – Over-Pressurization of Bonnet Cavity
Bolted Bonnet



Pressure Seal



Bonnet Over-Pressurization

Figure 2 – Correct Drilling

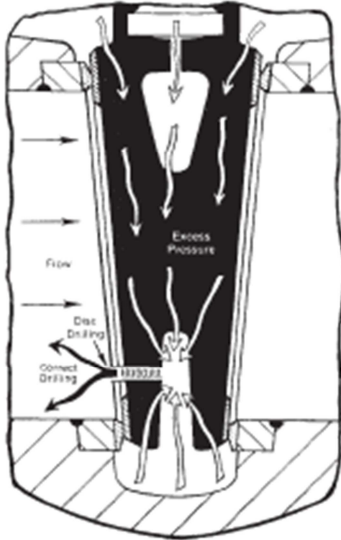


Figure 4 – Manual Vent or Safety Relief Valve

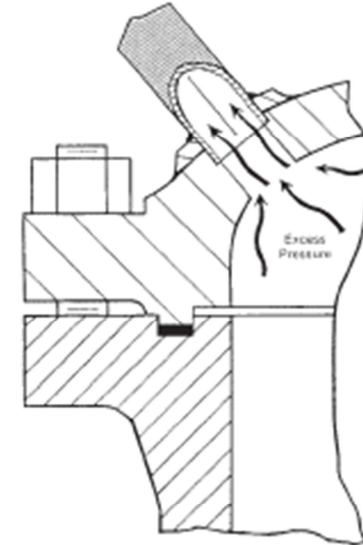


Figure 3 – Incorrect Drilling

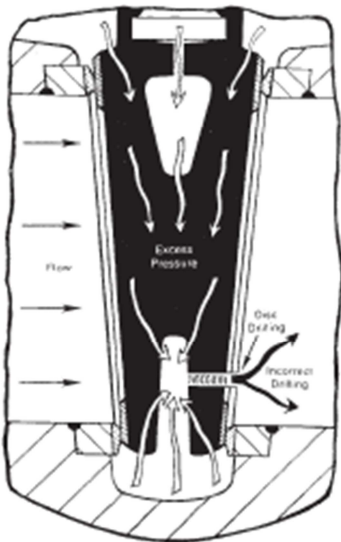
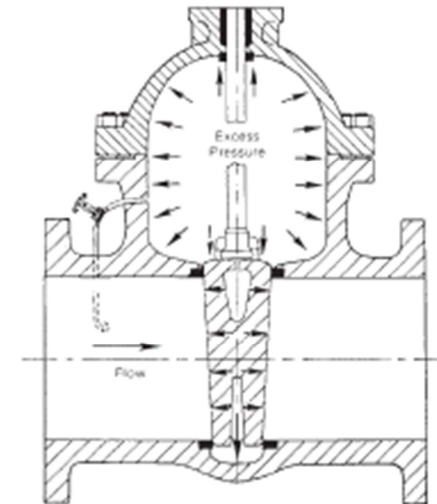


Figure 5 – Manual External Bypass





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