BREACH CONTROL VALVES

INTRODUCTION

Breach Control Valves (aka Breach Valves and ABCV's – Automatic Breach Control Valves) are designed to automatically isolate portions of distribution piping when a catastrophic downstream breach or line break occurs. Breach Control Valves are typically installed in commercial water distribution systems, such as potable water service or chilled water circulation. They are also utilized in the petrol-chemical industries.

When strategically located on a water distribution system, they can isolate damaged portion and allow for continued service of upstream sections until piping can be repaired. Breach Control Valves first crossed over into fire protection systems after studies from the September 11, 2001 attacks on the World Trade Center Towers. Findings included how the severed sprinkler risers resulted in a loss of firefighting water supplies, contributing to a loss of the buildings.

Since then multiple buildings throughout the United States and other countries have implemented Breach Control Valves on their fire protection systems based on their threat assessments. Manufactures of these valves claim the valves are especially well-suited for high-rise building sprinkler systems because of their vulnerability to failure should a line break occur in the top floors of a building, where gravity can cause fire water reserves to quickly drain.

POSITION

There are no consensus documents (IBC, NFPA, FM Data Sheets, etc.) that provide guidance on how to design Breach Control Valves because none have been UL Listed / FM Approved for use on a fire protection system. NFPA 13 Edition 2019 Section 7.1.1.2: Unless the requirements of 7.1.1.3, 7.1.1.4, or 7.1.1.5 are met, all materials and devices essential to successful system operation shall be listed. Similarly, the FM Data Sheets want FM Approved equipment on fire protection systems.

Based on the aforementioned information, AXA XL Risk Consulting does not recommend the use of Breach Control Valves unless they are UL Listed / FM Approved for use on fire protection systems and design considerations are included in the applicable consensus documents and/or equipment listings. When non-listed Breach Control Valves are found on existing client locations the valve set points must be evaluated to insure they will not impair the water supply to fire protection systems under normal circumstances.

DISCUSSION

Multiple design approaches have been taken by AHJ's who have approved the use of Breach Control Valves in their jurisdiction. The New York City Department of Buildings (NYC DOB) is currently accepting the use of Breach Control Valves based on the flow of the most hydraulically remote area of the sprinkler system plus 20%. Cla-Val is silent on how to implement their valves on fire protection systems. Bermad suggests a 140% factor of safety based on the determined flow but is silent on how the flow should be determined.

Until a uniform approach is available, Breach Control Valves should be evaluated by AXA XL Risk Consultant as follows:

Sprinkler Systems:

Request hydraulic calculations be completed on the least hydraulically remote area of the system (closest to the riser) using the available water supply to determine the actual water flow over the required demand area. This concept is the same as used by NFPA 16 for Foam-Water Sprinkler systems. Chapter 7 Section 7.10.2.2: Two sets of hydraulic calculations shall be provided, as follows: (1) Actual calculated demand flow and pressure based on the most hydraulically demanding condition, balanced to the available water supply (2) Actual calculated demand flow and pressure based on the least hydraulically demanding design area, balanced to the available water supply. Remember to account for Pressure Reducing Valves (PRV's) if they are provided as they will limit the pressure the system will see and affect the overall flow of the system.

Use the Freeman Formula to determine the flow from a catastrophic breach as follows:

$$Q = CD^2\sqrt{P}C_d$$

Where:

Q = Flow gpm (L/min)

C = 29.84 (0.0666)

D = Inside pipe diameter in. (mm)

P = Pressure psi (bar)

C_d = Nozzle coefficient (see PRC12.0.1 Figure 3)

Based on a catastrophic breach of this example system, 1,437 gpm can be expected. This may be used as a basis for sizing the Breach Control Valve and determining a set point.

Make sure the Breach Control Valve is set above the flow in Part A and below the flow in Part B with a factor of safety reasonable for the determined flows. Reference the valve cut sheet to verify the valve is operating within its design parameters for the required flow. In some cases, a larger valve may be necessary to achieve the desired result.

Valves that can auto-reset are preferred, this is an option for Bermad valves.

Hose connections should not be permitted downstream of a sprinkler Breach Control Valves.

Main Risers:

Use a minimum hose demand of 500 gpm regardless of occupancy requirements. The fire department will pressurize the system and pull a minimum of two (2) fire hoses for most fires. Consult with the responding fire department to verify if more than 500 gpm may be required if any doubt exists.

Use the highest sprinkler demand downstream of the valve as determined in "Sprinkler Systems Part A".

Use the Freeman Formula provided in "Sprinkler Systems Part B" to determine the anticipated flow from a catastrophic breach.

Make sure the Breach Control Valve is set above the combined flows determined in Parts A and B, but below the flow determined in Part C with a factor of safety reasonable for the determined flows.

Reference the valve cut sheet to verify the valve is operating within its design parameters for the required flow. In some cases, a larger valve may be necessary to achieve the desired result.

Provide a manual bypass for each valve and pre-plan with the fire department.

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Due to fire pumps being required to run at 150% capacity for annual flow testing an appropriately placed test header between the discharge side of the fire pumps check and isolation valves is suggested if the Breach Control Valve is set below 150% of the fire pump rating.