Preaction System

The preaction system is similar to a dry pipe system. It has a similar valve, and in general the same pipe, fittings, alarm initiating devices, and automatic sprinklers. In addition to the sprinkler system, however, the preaction system incorporates a detection system. Preaction systems areusually less cost-effective than the dry pipe systems and require additional maintenance and testing as well as maintenance and testing of the detection system.

There are many types of detectors and detection systems that can be used with the preaction systems. It is in the system designer's best interest to work closely with the owner and the architect to utilize the type of detection system that is appropriate for each specific area or system. An example of such an area is the data or computer room, where the products of combustion can do as much damage to sensitive equipment as the thermal damage from a fire or the resultant application of water. In these rooms, an air sampling detection system may be more appropriate than smoke detectors. The air sampling system may detect particles of combustion before the human eye or nose does and can send signals or warnings before there is actual smoke damage or a fire or before water is necessary.

A preaction system can be designed to operate as a dry system – non-interlocked, or more commonly they are designed to operate in conjunction with a detection system. These include single-interlocked and double-interlocked systems. The preaction system can be installed in areas or buildings where either wet or dry systems are appropriate based on temperatures, but where accidental discharge of water might be a critical issue, such as in areas that are protecting valuables, irreplaceable articles, freezers, or computer or data centers.

As defined by NFPA, a non-interlocked preaction system allows water into the piping when either the heat responsive element of an automatic sprinkler operates or when a detection device associated with the preaction system operates. Water will be discharged as soon as it reaches the open automatic sprinkler or the piping will fill with water if the detection device operated first; in an actual fire condition, when the heat responsive element of the automatic sprinkler operates, the water will be discharged on the fire.

The advantages of a non-interlocked preaction system include the following:

- It provides fire detection as well as automatic sprinkler protection.
- If the detection system operates first, it alerts the building occupants, allowing time to investigate the cause.
- The system might operate more quickly than a dry system if the detection activates the preaction valve before the heat responsive element of the automatic sprinkler operates.

Disadvantages of a non-interlocked system include the following:

- It is more expensive than a dry system.
- It operates like a dry system if an automatic sprinkler operates, either because it is supposed to or because it has been damaged.

A single-interlocked preaction system allows water into the piping after the operation of a detection device, but will not allow water to enter the system if an automatic sprinkler operates or is accidentally damaged and broken or if a pipe or fitting is damaged or broken.

Advantages of a single-interlocked system:

- The preaction valve does not operate and water does not flow if a pipe, fitting, or automatic sprinkler breaks.
- If the detection system false alarms, the piping will fill with water, but as long as the heat responsive elements of the sprinklers have not operated water will not flow out of the piping.
- If a detection signal or alarm is initiated, it may be possible to determine the cause and shut down sensitive equipment before an automatic sprinkler operates.

Disadvantages of a single-interlocked system:

- It is more expensive than a non-interlocked system.
- There can be a delay in water delivery in a fire condition, allowing the fire to grow.
- In areas that are not subject to freezing, but contain equipment that is sensitive to water, false detection alarms will fill the piping with water that will have to be drained. If the area has a suspended ceiling, each of the sprinklers will be supplied by a vertical 1" pipe called a drop, and every one of the drops would need to be individually drained.
- In areas subject to freezing, false detection alarms will fill the piping with water; then it must be drained and all of the moisture removed before it freezes.

The double-interlocked preaction system is normally found where accidental water discharge is a significant concern and allows water into the piping only after both the heat responsive element of the automatic sprinkler and the detection device has operated. A variation of this system is a cross-zoned, double-interlock preaction system. In this type of preaction system two different detectors or detection zones must operate and the heat responsive element of the automatic sprinkler must operate before water is allowed to enter the piping.

Advantages of the double-interlock preaction system:

- The preaction valve does not operate and water does not flow if a pipe, fitting, or automatic sprinkler breaks.
- If the detection system false alarms, the valve does not operate and water does not fill the piping.
- If a detection signal or alarm is initiated, it may be possible to determine the cause and shut down sensitive equipment before an automatic sprinkler operates.

Disadvantages:

- It is more expensive than a single-interlock system.
- There can be a significant delay in water delivery in a fire condition over the non- and single-interlocked systems. The delay would be equivalent to that of a dry pipe sprinkler system.
- There are additional costs of equipment and maintenance over the other types of sprinkler systems.

Design issues relative to the use of preaction systems include the following:

- What type of preaction system is appropriate for the specific conditions of the project?
- What is the optimal detection system for the area or process that is being protected?
- Are the pipe type, the fittings, the pipe joining methods and the appropriate gaskets determined?
- Will supervisory air be required?
- Will the system design deliver water to the open or operating sprinklers in accordance with NFPA requirements?
- Is the detection system integrated and will it be commissioned properly?