DRY CHEMICAL EXTINGUISHING SYSTEMS

INTRODUCTION

National Fire Protection Association (NFPA) documents describe a level of fire protection agreed on by persons representing a variety of interests. The guidance in these documents does not reflect unique conditions or special considerations, such as system performance under adverse conditions. Nor does NFPA guidance reflect the increased system reliability that AXA XL Risk Consulting recommends for high valued properties.

This PRC Guideline takes a position on the provisions of NFPA 17 that AXA XL Risk Consulting believes require clarification or changes. To understand the position, this PRC Guideline must be read with a copy of NFPA 17. The provisions of the NFPA document are not repeated.

POSITION

General

NFPA 17 is limited to dry chemical extinguishing systems. Wet chemical extinguishing systems are covered in NFPA 17A. Portable equipment is covered in NFPA 10.

Dry chemical systems consist of solid particles suspended in either dry nitrogen or carbon dioxide. The systems may be of the stored pressure type systems or the stored gas systems. Different types of dry chemicals must never be mixed because the potential for them to react or solidify.

The most common dry chemicals used are:

- **Ordinary (BC)**: Sodium bicarbonate; Base.
- **Purple K (BC)**: Potassium bicarbonate is twice as effective as sodium bicarbonate (corrosive to Aluminum); Base.
- **Multi-purpose (ABC)**: Mono-ammonium phosphate (corrosive to steel); Acid.

There are several listed pre-engineered systems that are mostly used for the following:

- Restaurant hoods, ducts and cooking appliances that conform to UL 300. Sodium bicarbonate and potassium bicarbonate systems have been used on frying equipment because they react with oil to form a soap (saponify) that prevents re-ignition. However, recent retesting to the UL 300 Standard has resulted in little success. See PRC.9.2.7 regarding deep fat fryers.
- Small paint dip tanks.
- Small paint spray booths.
- Quenching oil tanks.

- Paint lockers.
- Cotton mill openers, pickers, and blenders using sodium bicarbonate. It penetrates into the fibers much better than other dry chemicals.
- Surface and underground mobile equipment.

In addition to the limitations stated in NFPA 17, do not use dry chemical agents on:

- Precision metal operations
- Flow coating operations
- Cleanrooms
- Food production lines
- Computer rooms

Because of the damage to equipment and downtime for cleaning and maintenance after a dry chemical system trip, consider other ways to protect these hazards.

Although dry chemical extinguishing agents are effective for flammable or combustible liquids and combustible gases, they have several disadvantages:

- Fire reflash potential
- Accelerated corrosion
- Insulates electrical contacts
- Clean-up issues
- Abrasion to motor windings

One of the causes of failure of dry chemical extinguishing systems is the agent is not expelled during discharge. This can be from caking or packing of the chemical. Caking and packing are two different phenomena. Caking is attributed to moisture. Packing occurs by mechanical vibration. Steps have been taken over the years to reduce these problems. Additives, such as metallic stearates, tricalcium phosphate and silicones, make dry chemical free flowing and nonhygroscopic.

Textile Equipment

Even though multipurpose dry chemical is meant to be used on Class A fuels, sodium bicarbonate-based dry chemical has been found to be more effective on cotton fiber and lint. This is because the sodium bicarbonate-based dry chemical can penetrate into loose cotton fiber and reach the borrowing deep-seated fire.

Special Considerations

All piped fuel supplies or power to the protected hazard shall be shut down on system operation. Use shutoff devices that require manual resetting.

The dry chemical and the gas will separate in the piping system unless necessary precautions are taken.

Safety Requirements

Although dry chemical is not considered a health hazard, it temporarily obscures vision and causes coughing and breathing discomfort. Therefore, arrange all occupied protected areas with a pre-discharge alarm and a time delay of approximately 20 s for immediate area evacuation.

Methods Of Actuation

Provide automatically operated systems with manual override. Install the emergency means of system operation completely independent of the electric control unit. See PRC.13.0.3.

Detection Devices

Use only listed automatic devices. See PRC.13.0.1 regarding requirements for detection and control. Fusible links must be located in an area of direct flame impingement.

Supervision

Provide electrical or pneumatic supervision, as appropriate, for the detection, actuation and alarm systems.

Connect the systems to a listed alarm system that provides trouble, supervisory, and actuation alarms.

Monitor the pressure in stored gas systems. In cartridge type systems using CO_2, the cylinders must be weighed periodically because CO_2 exists as both a liquid and a gas. Gas pressure can leak out, leaving the system inoperable. Any amount of CO_2 will still show an adequate pressure.

Reserve Supply

Since dry chemical offers little flash back protection, a connected reserve is mandatory.

Even with a connected reserve, provide approved automatic sprinkler protection in accordance with NFPA 13 for area protection in case the system fails to control or extinguish the fire.

Discharge Duration

Local application systems should discharge within 30 s.

Hose Connections

Dry chemical can be applied simultaneously with AFFF foam systems. This method of protection maintains the advantage of fast knockdown from the dry chemical while the foam protects against flashback.

Plans

Submitted plans for pre-engineered systems with multiple nozzles should contain an isometric drawing of the actual installation. Details should include pipe sizes and lengths. The application must be within the parameters of the manufacturer's design manual for the proposed system. See PRC.13.0.2 for requirements regarding plan submittals.

Submittals for engineered systems must provide complete details such as:

- Application rate
- Quantities of dry chemical
- Piping layout
- Nozzle details
- Wiring diagram

Acceptance procedures require that dry chemical systems be reviewed in the local AXA XL Risk Consulting Plan Review office in accordance with PRC.1.3.0.2.

Approval Of Installations

Functional testing of all equipment is required. Perform actual discharge tests on all engineered systems. Test pre-engineered system configurations that were not tested as part of the listing process or are not shown in the manufacturer's equipment manuals. The contractor must certify that the completed installation meets the listing and approval requirements. See PRC.13.0.5 and PRC.13.0.5.A regarding acceptance testing.

Maintenance

Provide a service contract with the manufacturer's representative to ensure the system is properly maintained. See PRC.13.0.4 for periodic testing requirements.

If fusible elements are used to actuate the system, change them annually or more often if they become loaded. Examine cable lines for caked or carbonized grease that could impede the operation of the system.