UPGRADING LOW PRESSURE CARBON DIOXIDE SYSTEMS

INTRODUCTION

A number of older model low-pressure carbon dioxide systems have failed when called upon to operate. The two fundamental causes have been broken actuating piping and degraded detection circuit wiring. The latter causes the main fuse to blow, removing electrical power from the system. A positive feature in some of these occurrences has been the availability of carbon dioxide hose connections, which were used for manual fire fighting.

POSITION

Design, install, maintain and test all new or renovated low-pressure carbon dioxide systems according to both NFPA 12 and PRC.13.3.1.

Evaluate existing installations to determine if there is a major property or business interruption loss potential. When appropriate, upgrade or retrofit an existing installation.

Upgrade the electrical portion of existing low-pressure carbon dioxide systems that protect critical hazards with a listed control panel designed for release device service to monitor the detectors and actuate the system. Retrofit noncritical low pressure systems by providing:

- Supervision of all electric detection, actuation and alarm circuits.
- A separately fused detection circuit with a much lower amperage fuse than the main panel fuse. The main circuit will then remain in service if the detection circuit fails.
- A fused detection circuit based on a fuse rated at 115% of the current drawn by the timer motor on the PBT (push-button timer) station.
- Isolation of both sides of the detection circuit once the control panel starts to operate the system, thus ensuring continued operation should the detection circuit fail.

Supervise the pneumatic portion of all pneumatic detection, actuation, and alarm devices and controls. Use schedule 80 metallic pipe to protect actuating lines from mechanical damage.

Provide an emergency means of operating system discharge valves. Locate this emergency means outside the immediate fire area and clearly identify it.

Provide accessible, adequate carbon dioxide hose connections for any local application portion of the hazard.

Under the maximum reliability scheme, when electrical circuits involving detection or actuating circuits are directly exposed by fire, all wiring associated with achieving actuation must be capable of withstanding an open flame of 2000°F (1093°C) for a minimum of 10 min.

Where circuits are not directly exposed by fire, use the following:

- Mineral-insulated, metal-sheathed cable, Type MI.
- Power Limited Fire-Protective Signaling cable, with a temperature rating of at least 221°F (105°C), installed in intermediate steel conduit or rigid steel conduit.

DISCUSSION

Many low-pressure systems are used to protect large hazards with substantial loss potential, such as aluminum rolling mills. Such hazards are usually in sprinklered facilities protected by a combination of carbon dioxide and deluge sprinkler system backup.

When a low pressure carbon dioxide system is used without deluge backup, the protection system must be capable of delivering protection with extreme reliability. Such a system should have reliable discharge capability and a manual means of doing everything the automatic electrical system is capable of doing.

The use of dual (parallel) discharge valves, such that both valves operate simultaneously with either valve capable of discharging the required flowrate, vastly improves system reliability.

The pneumatic manual system can be arranged to provide the following functions normally accomplished by the electrical operated control unit:

- Complete supervision;
- Pre-discharge alarm by pneumatic horn;
- Time delay for evacuation during pre-alarm;
- Total operation of system from one manual release station;
- Timed discharge;
- Spurt capability - deadman-type;
- Remote actuation of timed and spurt discharge.