SUBFLOOR PROTECTION

Application Profile

TYPICAL INDUSTRIES SERVED

- Telecommunication
- Computer Operations
- Control Rooms
- Internet Data Centers
- Data Storage/Processing

INTRODUCTION

Data centers, telecommunication facilities, internet services, control rooms, and other like facilities consist of similar characteristics that present major fire hazards. In particular, the spaces beneath raised floors pose as much of a fire hazard as does the numerous pieces of computer equipment situated on the raised floors.

Underneath the raised floor there is often extensive cabling, with PVC insulation, which occupies much of the space. This area, beneath the raised floor, houses cabling for business networks, distributes cooling air to the equipment, but most importantly, is the key location within a computer room facility that can rapidly expose high asset equipment to a fire.

Traditionally, computer room facilities have been protected with fixed fire protection systems. Gaseous agents like Halon 1301 and HFC-227ea suppression systems, protecting both the areas underneath the raised floor and above the raised floor, are the most common method of fire protection for Class C electrical hazards, A Fike CO_2 system is a solution when facilities elect to utilize pre-action sprinkler systems for the space above the raised floor. Zero protection underneath he raised floor poses a major threat to high asset equipment.

Based on historical accident data, in combination with site-specific data, such as the mass and arrangement of cabling, the probability of a fire occurring in a computer room subfloor or similar location is likely. A fire in such a facility, particularly under the raised floor, could result in a substantial amount of downtime, which results in lost revenue. Fire protection in control rooms and data center subfloors is a necessity, due to the inherent fire risk. Quite often control rooms, data centers, and other similar facilities opt to use pre-action sprinkler systems to protect the space above the raised floor. Sprinkler systems do not provide adequate fire protection in spaces beneath raised floors, therefore carbon dioxide should be implemented as the fire extinguishing system.

The purpose of this application profile is to provide an understanding of the possible hazards associated with subfloor areas and protection solutions utilizing Fike's Carbon Dioxide Extinguishing Systems. This document is intended to be a guideline and is not applicable to all situations. Fike's Carbon Dioxide Design, Installation, and Maintenance Manual and NFPA 12 shall be referred to when designing CO_2 systems. If you have any questions, please contact the Fike Protection Systems group, or our regional sales manager in your area.

THE PROBLEM: ELECTRICAL FIRE AND ENCLOSURE INTEGRITY

Even though telecommunication equipment requires flammability tests on components, wiring and subassemblies, fires still occur and have been reported. Fires beneath raised floors are mainly caused by the abundant amount of cabling encountering a short circuit. Subfloor debris present from construction or improper maintenance also presents a fire hazard.

The biggest challenge when protecting areas beneath a raised floor with a gaseous agent like HFC-227ea, is maintaining the concentration level for the required period of time. It has been very difficult when using gaseous agents due to low concentration percentages and rapid discharge rates, which made a loss of agent from a non-sealed area more critical.

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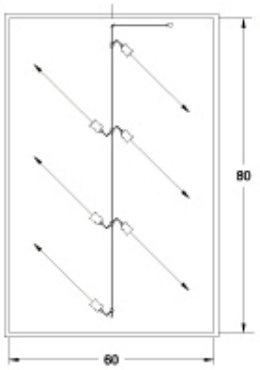
THE SOLUTION: DEEP-SEATED ELECTRICAL HAZARD

Carbon dioxide has a high ratio of expansion, which facilitates rapid discharge and allows for three-dimensional penetration of the entire subfloor area. When designed properly, CO_2 systems will not damage sensitive electrical equipment, nor does it have residual clean up associated with its use as a fire extinguishing agent. Because CO_2 gas is approximately 1.5 times heavier than air, little leakage will occur when the system is properly designed. Because of it's weight, if leakage does occur into the space above the raised floor, it will remain near the floor area. Carbon dioxide safety precautions should still be addressed to prevent risk to personnel. A plan should be made to exhaust the carbon dioxide gas after a system discharge - one that will not ventilate it to an occupied space.

NFPA classified spaces beneath raised floors as a miscellaneous electrical hazard. Per NFPA, the minimum design concentration shall be 50% by volume, however due to potential problems of excessive leakage that can be attributed to perforated floor tiles or discharge turbulence, it is recommended that additional carbon dioxide agent be added as compensation.

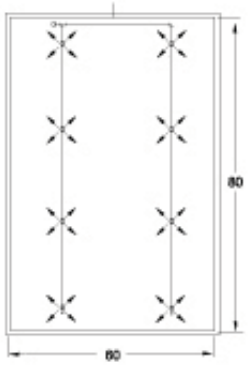
To prevent excessive CO_2 agent loss and allow complete mixing of the agent, it is crucial to provide a low velocity discharge. There are two nozzle options when protecting areas beneath raised floors: "S" type nozzle and "Radial" nozzle.

"S" Type Nozzle: Where a potential for abundant leakage is present, the "S" type nozzle is the preferred discharge nozzle. The "S" nozzle will provide a soft, uniform discharge pattern and also allow proper agent circulation. This is achieved by installing the nozzles in a back-to-back fashion and mounting them horizontally. The "S" nozzle is best suited when only the space beneath the raised floor is being protected.



This illustration shows a typical subfloor system using "S" nozzles. The recommended flow rate for "S" nozzles used in subfloor spaces is 35-45 pounds (10.6-13.7 kg) per minute. This will provide a low velocity and moderate discharge preventing damage to loose equipment or floor tiles. It is recommended that nozzles be installed at least 20 feet (6.1 m) from cable runs, walls, and obstructions.

Radial Nozzles: Radial nozzles are the nozzle of choice when the area above the raised floor is protected with a gaseous agent and when the subfloor area is more tightly sealed. The 180° Radial nozzles can be positioned around the perimeter when protecting smaller subfloor spaces. Larger subfloor spaces are protected with the 360° Radial nozzle, the recommended flow rate is 80-100 pounds (36.2-45.3 kg) per minute. Spacing should not exceed 20 feet (6.1 m) from the wall and 20 feet (6.1 m) apart. The nozzle should be installed so the agent will hit the wall at an angle and not directly into the wall. The adjacent illustration shows a typical subfloor using 360° Radial nozzles.

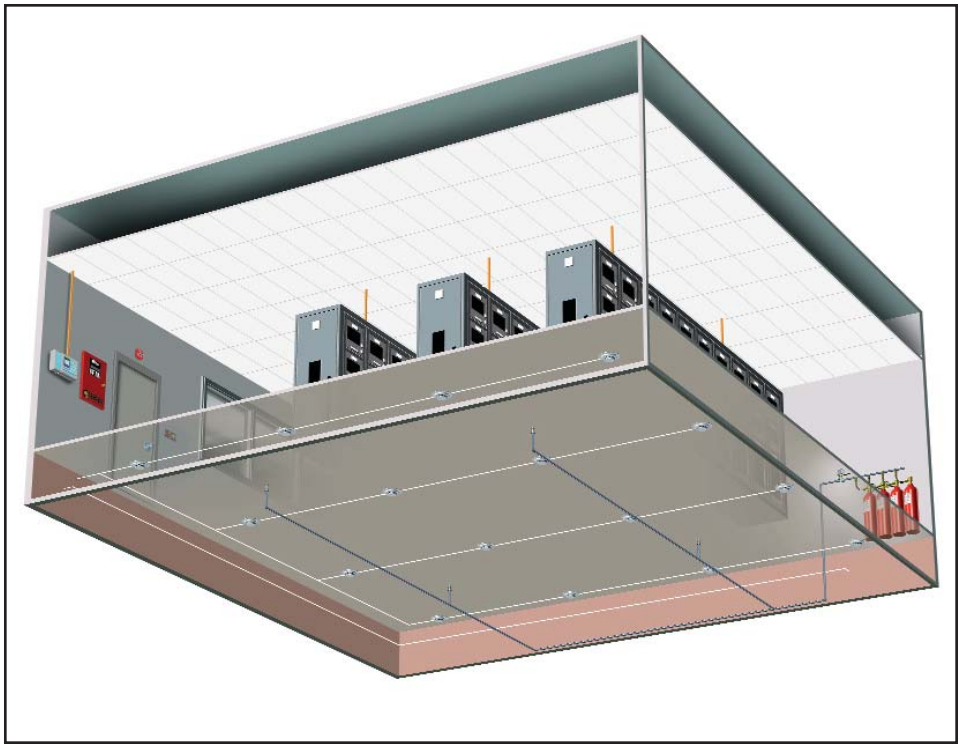


DETECTION AND CONTROLS

The uses of standard smoke detection together with manual release stations have commonly been utilized to release the carbon dioxide extinguishing systems. Spaces beneath raised floors often experience many air changes per hour, which presents a difficult detection design. Fike Protection Systems should be contacted for assistance on designing a detection system for these areas.

Air sampling, like the VESDA® Aspirating Smoke Detection System, is now an option for detecting fires in its earliest stages. Air is continuously drawn into a piping network and transported to a detection chamber where very sensitive receivers detect smoke. Air sampling units will prevent nuisance alarms and most importantly prevent false activation of the CO_2 extinguishing system.

A Fike Carbon Dioxide Extinguishing System protecting space underneath the raised floor is shown in the illustration below.



"Space Beneath a Raised Floor" protect by a
Fike Carbon Dioxide Extinguishing System