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RELERA'S Data Center Fire Control Program

INTRODUCTION
Security and safety are two of the greatest reasons customers use RELERA's Internet data centers and co-location facilities. The damage to our customers' mission critical e-business operations and hosted applications that could result from a fire would be devastating, so we have spared no expense to ensure our customers never have to worry about such a situation.

To provide an idea just how seriously we take this issue, this paper will outline RELERA's fire control program, including fire prevention, real-time identification of potential fire conditions, detection of a fire and fire suppression. We also will address why RELERA opted to use a water sprinkler system for fire suppression instead of the gas fire suppression systems preferred by much of the industry. Additionally, we will discuss RELERA's solution to the issue of emergency power off (EPO) switches, an electrical design feature often associated with fire control systems, which often plays a detrimental role in the day-to-day operations of a data center.

AN OUNCE OF PREVENTION

RELERA's fire control program begins with prevention. RELERA strictly controls the type and amount of potentially combustible materials that enter a data center and on-site technicians are explicitly directed to eliminate as much of these materials as possible from the Internet Data Center (IDC). Customers may not leave packing materials, cardboard boxes and similar materials in their space in the IDC. A tour of any one of our IDCs will show very little combustible material – no fuel, no fire.

STOPPED BEFORE THEY BEGIN!

The best fire detection systems identify the potential for fire and provide alerts well before a fire can begin.

RELERA uses an "incipient fire detection" (IFD) system, which identifies within the IDC any condition under which a fire could occur. The IFD is comprised of a series of tubes and collectors located under the raised floor in front of all customer racks. This system samples 1.5 liters of air looking for particles at a sub-micron level. Based on the "cloud chamber" principal, air samples are expanded with a burst of water in the control unit and a laser is passed through the sample.

The system is so sensitive that holding a common hair dryer on a piece of cabling will raise its temperature sufficiently to cause and alert, and it can reliably discriminate between dust and other airborne particles so as to eliminate false alarms.

If carbon, the primary component in smoke, is detected, an alarm sounds in the IDC control room, giving IDC staff adequate time to investigate the zone with CO_2 fire extinguishers. If the source cannot be located visually, or by the smell of burning materials, the technicians use an infrared gun, the size of a hair dryer, to scan a customer's equipment and the surrounding area for hot spots — the precursor to flame.

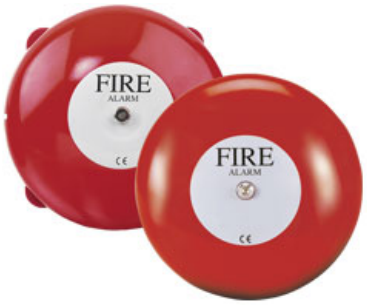
Most often, these sources are power supplies going bad or a circuit board inside a piece of equipment is severely overheating. Once the source is located, the technician takes immediate action to prevent the situation from developing into an actual fire.

THE NEXT LINE OF DEFENSE

Backing up the IFD are dozens of smoke detectors, which are installed at 12-foot regular intervals in the ceiling of each data center. Much like home smoke detectors, these devices sound an audible alarm when visible smoke is detected, as well as electronically alerting the IDC staff.

SUPPRESSION SYSTEM

For actual fire suppression, RELERA uses a dry, pre-action, double-interlock sprinkler system, which are designed for applications, such as refrigerated areas, that require a maximum degree of protection against accidental activation. "Dry" simply means the overhead sprinkler pipes are filled with compressed air and have no standing water in them to leak inadvertently on sensitive electronic equipment.



Should, for some reason, the IFD fails to detect fire potential or the situation develops faster than the on-site technicians are able to respond, the activation sequence of the sprinkler system is as follows:

1. Smoke from a fire activates a smoke detector, which alerts the IDC staff through the fire control monitoring system. At this point, the sprinkler system is not activated, nor is an alarm forwarded to the fire department. This gives the IDC staff a chance to discover the origin of the smoke and to respond to the problem.

2. If the smoke continues to build and spread through the data center, a second smoke detector will sound. This generates audio and visual alarms, as well as alarms on the monitoring system, and sends an alert to the local fire department. At this point, the sprinkler system becomes "armed," meaning a water valve is automatically opened, but the water is held back from entering the sprinkler system by the compressed air in the pipes.

3. The sprinkler system is activated when the high temperature of a fire melts the fuse of a sprinkler head. The compressed air is immediately vented through the sprinkler head and water flows through the sprinkler onto the fire. RELERA utilizes this zone-based sprinkler system in its IDCs to minimize the potential water damage to surrounding equipment that could be caused if the entire sprinkler system were activated.

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WHAT, NO GAS?

Many IDC operators advertise they use the latest in gas fire suppression systems, which they claim are the best-of-breed approach to fire control in a data center environment. After extensive research, we've concluded the risk to IDC operations outweighed any potential benefits.

On the whole, it appears that any kind of fire suppression system disrupts IDC operations more often through accidental discharge and false alarms than actual fires do. Since fires can happen, building codes wisely require a suppression system of an approved type be installed. Thus, our design goal was to produce a system that is least likely to be subject to accidental discharges and, if they do occur, would be limited in scope.

For example, unlike the dry sprinkler system, which puts water on only the localized area around the fire source, a gas suppression system discharges into the whole IDC all at once. This shuts off power and, thus, all IDC operations until the fire department clears the center for re-start. Additionally, gas systems begin their release sequence immediately after the second smoke detector is activated, while the sprinkler system holds until the high temperature fuse on a sprinkler head is activated. This enables the IDC staff to assess the severity of the situation – or identify a false alarm, and take corrective action before the suppression system is activated and operations for all IDC customers are halted.

Additionally, in some fire detection and suppression systems, water is released through the entire facility. RELERA eliminated this possibility by implementing our zoned water distribution system.

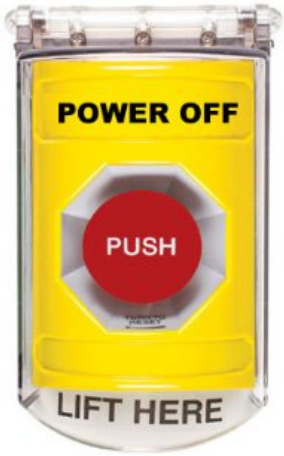
In short, our design improves RELERA's reliability and limits disruptions to customers should a real or false alarm occurs.

ELIMINATION OF EMERGENCY POWER OFF SWITCH ACCIDENTS

An emergency power off (EPO) switch is a master electrical switch located near the main exit for the IDC. When activated, it disconnects the facility from all electrical power sources, including public utilities, batteries and generators. Typically, it is tied into the fire control system and is activated when a gas suppression system is discharged.

EPO switches are typically installed near exit doors. This location allows for easy access by facility occupants and fire personnel. These switches are usually large red buttons that are frequently confused with loading dock door opening switches. Therefore, you can understand why there is the potential for accidental activation of the EPO switch, which is a major cause of data center outages.

Additionally, accidental activation of the EPO switch can result from the switch being bumped by a passerby or simply through the good intentions of an untrained or panicky staff.



In the event a gas suppression system discharges, activation of the EPO switch will shut down mission-critical equipment that would otherwise have been able to continue uninterrupted.

To avoid any of these scenarios, RELERA's electrical system design eliminates the need (and the code requirement) for an EPO switch. This, in turn, eliminates a potential source of power outages, increasing the overall reliability of the IDC.

SUMMARY

As part of RELERA's mission to accelerate our client's business by providing highly reliable, high-performance Internet infrastructure, data centers and managed hosting solutions to business clients in "edge-of-the-Internet" markets, we have utilized best-in-class technology and engineering to create the safest possible environment for our customers.

RELERA's fire control program begins with data center procedures that, to a large extent, eliminate the fuel required for a fire. The next line of defense is the incipient fire detection (IFD) system that identifies potential fire conditions in real time and provides alerts to IDC staff to help them assess the situation. A double layer of conventional smoke detectors, which manage the dry, pre-action, double-interlock sprinkler system, provides back-up to the IFD.

A minimum of two smoke alarms must activate and a sprinkler head fuse must melt before water is released onto a fire. When this action takes place, water is only released in the immediate vicinity of the fire. During normal operations, the sprinkler system pipes are filled with compressed air to prevent unintentional leaking onto equipment.

RELERA has also incorporated unique design and engineering features that eliminate the need for, and subsequent risks with, a gas suppression system as well as an emergency power off switch.

For our clients, this system eliminates one the most nagging concerns our information-driven customers grapple with each day: the safety and security of their data and applications.

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