

How to Choose a Fire Suppression System for Your Server Room, Data Center or NOC

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Looking to install a new fire suppression system? Replacing an old Halon system? Or, perhaps upgrading your old system? This can be a daunting task. Today, fire suppression systems come in a variety of chemical compounds, an array of both basic and sophisticated notification devices, and a variety of sizes. I will introduce you to the many dramatic changes passed by the National Fire Protection Association, due in large part to innovative firms searching for better and inexpensive ways to protect computers and other electronic equipment.

Innovation is usually the result of changes in the way business is conducted. Reasons why new and innovative fire suppression systems are being developed include the following:

- § Water sprinkler systems can cause catastrophic damage in a computer environment.
- § Older fire suppression systems may not be environmentally friendly.
- § Today's computer server environment is much more compact. A significant increase in storage capacity alone has allowed a significant decrease in the amount of space required to house computer equipment, telecommunications, and server equipment.
- § Older systems and subsequent technologies may be too expensive to purchase and install.

The number of smaller companies has increased throughout the world, dictating a change in the way we protect our essential data and equipment. A significant number of firms lease space in office complexes. Over ninety percent of firms that lease space find it too expensive to purchase and install most systems. And, most firms do not want to install a system that becomes a permanent fixture which cannot be removed when a lease expires, additional space is required, or a firm needs to expand or downsize.

Now there is a way to replace older fire suppression systems, update existing equipment, replace sprinkler heads, and purchase the protection you need for your critical data and computer systems. Now you can increase or decrease a fire suppression system without a major expense. New systems can be uninstalled and reinstalled because they are not permanent fixtures. Your investment can travel with you just like your data center or server room equipment.

The evolution of fire detection and suppression systems has been dramatic. There are fire suppression agents that are toxic when inhaled and those that are certified "green." You can choose from a clean agent gas, water or aerosol. Some systems require a floating floor and significant space to reside, while others mount on available wall space.

There are systems that require little cleanup (the clean agent gasses), and those that need a whole cleaning crew and a few days worth of elbow grease. That leads to – you guessed it – server down time. From minimal to extensive, in the case of even the smallest fire, some systems can leave you twiddling your thumbs until you are back in business. Next step – recharging your fire suppression system, and the time and costs associated with that process.

I hope to simplify things here. I have been advising companies on computer room fire suppression for many years. This first hand experience of selling fire suppression system solutions for most size rooms and enclosures has shown many firms the benefits of utilizing newer technology when protecting valuable assets.

Let's start by summarizing the features of each type of automatic fire suppression system used in most data centers, NOCs and server rooms today. This can be best depicted in a chart format (see Table 1). Then, I'll get into specifics that you will want to consider before choosing fire suppression equipment and a fire suppression company.

First, Understand the Types of Fires You Could Encounter

The National Fire Protection Association has classified fires into four types, determined by the materials or fuel being burned:

- Type A: Fires with combustible materials as its source, such as wood, cloth, paper, rubber, and many plastics
- Type B: Fires in flammable liquids, oils, greases, tars, oil-base paints, lacquers, and flammable gases
- Type C: Fires that involve electrical equipment
- Type D: Fires with ignitable metals as its fuel source

In a typical server room fire, a combination of Types A, B and C can be found. An effective fire suppression system will be rated for all three types.

Often the source of a fire in a server room is not detected until after the fire has been extinguished. Therefore, installing a system that can handle A, B & C Types is a safeguard against an unexpected disaster.

Substances Used in Fire Suppression: Gas, Water and Aerosol

1. Gaseous or Clean Agent Fire Suppression

Gasses used in fire suppression systems are typically Halon, CO₂ or environmentally-friendly clean agents such as Inergen®. These gases do not extinguish a fire by smothering it, but rather by displacing oxygen or inhibiting a chemical reaction that is essential to the fire's survival.

The popular fire suppressant **Halon** is so detrimental to the environment that both Europe and the United States banned manufacturing of the gas in 1995. It is mentioned here only because many Halon systems installed before the ban was enacted are still in operation.

Table 1: Fire Suppression Systems at a Glance - Characteristics of Each Fire Suppression Solution

	Carbon Dioxide	Water	Inergen®	FE - 227, ENCARO-25	Aerosol (Aero-K®)
Agent Type	Invisible pressurized CO ₂	Water sprinkler or water mist	Inert gas (52% nitrogen, 40% argon and 8% carbon dioxide)	Liquefied compressed gas	Potassium-based aerosol using pyrotechnic-based chemistry
Toxicity (GWP = Global Warming Potential ODP = Ozone Depletion Potential)	GWP = 1.0 ODP = 0	GWP = 0 ODP = 0	GWP = 0 ODP = 0	ODP=0 GWP=2900	GWP = 0 ODP = 0 Environmentally friendly, non-toxic
Cost of Installation	\$\$\$\$	\$\$\$	\$\$\$	\$\$\$\$	\$\$
Space required for Installation	Piping and floor space required	Piping and sprinkler head installation required	Large space and weight requirements for storage tanks	Piping and floor space required.	Wall space required. No piping, minimal space and weight requirements
Clean Up	None	Potentially extensive	None	None	Vent with fan, minor residue on surfaces requires dusting
Unique Features	<ul style="list-style-type: none"> § Displaces oxygen in the environment § Toxic. Not safe to breathe upon discharge § Must pass an air integrity test/room must be pressurized § Not intended for Class A fires 	<ul style="list-style-type: none"> § Flooding effective for class A fires only § Can damage electrical equipment beyond repair 	<ul style="list-style-type: none"> § Breaks down in the presence of heat. § Extinguishes fires by reducing the oxygen level § After discharge pressure must be relieved to avoid damage to the enclosure. § Does not create a fog. § Breathable during discharge 	<ul style="list-style-type: none"> § Must pass an air integrity test/room must be pressurized § Free of residue § Non-corrosive § Low toxicity § Non flammable 	<ul style="list-style-type: none"> § Room integrity test not required § Uses a fire-suppressing aerosol of extremely small particles of potassium compounds suspended in carrier gasses § Non corrosive, non toxic
Effectiveness	Very	Dependent upon fire type	Very	Very	Very

Source: The ODP and GWP values are from Table 1-5 and 1-6 of *The Scientific Assessment of Ozone Depletion, 2002*, a report of the World Meteorological Association's Global Ozone Research and Monitoring Project. All GWP values represent global warming potential over a 100-year time horizon.

The U.S. Environmental Protection Agency (US EPA) encourages the use of non-ozone depleting fire suppression agent alternatives, and in 1990, the US EPA established its Significant New Alternatives Policy (SNAP) to evaluate new chemicals and technologies for the replacement of ozone depleting substances. As a result, many companies are installing alternative clean agents that are environmentally friendly.

Clean agents derive their name from the simple idea that they do not leave any residue after discharge. This feature makes them ideal for electronics and eliminates cleanup worries.

Another gas used in fire suppression, **CO₂**, is harmful when inhaled at high concentrations (greater than 5% by volume, or 50,000 ppm). The current threshold limit value (TLV) or maximum level that is considered safe for healthy adults for an eight-hour work day is 0.5% (5,000 ppm). For this reason, your facility must be vacated before the system discharges.

Unlike CO₂, **Inergen[®]** is non-toxic. However, a discharge of Inergen[®] results in an approximate 3% concentration of carbon dioxide. While initially breathable, it is recommended that the environment be evacuated. Since it is not a liquid under pressure, Inergen[®] requires significant storage space. After a discharge, the environment becomes highly pressurized which could cause damage if not released in a timely manner.

Gas fire suppression systems typically consist of the agent (gas), agent storage containers, agent release valves, fire detectors and warning mechanisms, agent piping, and agent dispersion nozzles. With most gas agents, the environment must be pressurized in order to contain the agent. Installation is complex and costly, and the reward is realized only after discharge, as clean up is as simple as venting the room.

2. Water-Based Fire Suppression

Water Mist Fire Suppression Systems resulted from the evolution from standard sprinklers designed for flooding fires. Much lighter than their older counterpart, water mist systems are effective on Type A and B fires and result in less damage than traditional water-based systems. Still, water mist systems are not ideal for server rooms due to the Type C electrical fires common to this environment. Clean up and safety issues are also a concern when faced with wet or damp electronics. Although effective in the right situations, water mist systems must often be augmented with other fire suppression systems in order to ensure complete coverage in the event of a fire. After discharge, expect down time of a few weeks for a sprinkler system and less with water mist. Often with a sprinkler system, you are unable to take it with you if you are in a lease or are planning to move to new facilities. This could make a big difference in your consideration of a water-based system.

3. Aerosol Fire Suppression

The newest technology in fire suppression, Aerosol Extinguishing Technology, was officially approved and effective in 2005 by the National Fire Protection Association. A clean agent with no post combustion byproducts, aerosols such as the brand Aero-K[®] do not replace the oxygen as CO₂ does, do not produce Hydrofluoric Acid (HF) after the fire, and have no environmental impact.

The aerosol consists of ultra-fine particles that are expelled via generators. Upon discharge, the substance creates a fog of suspended particles. Non-toxic and non-corrosive, the agent remains suspended in the environment for up to 60 minutes, virtually eliminating any possibility of reignition. After discharge and a 10-minute hold time, clean up includes venting the room and a light dusting of the surfaces.

Unlike gaseous systems, which operate at pressure and often require extensive piping, aerosol generators are very cost effective to install and maintain and have minimal space and weight requirements. The generators that dispense the aerosol are available in a variety of sizes to accommodate any size environment.

Select A Fire Suppression System with Dependable Safety Features

Safety features can save time, money, equipment, and most importantly, lives. Here are some features that your fire suppression system must have in order to prevent either premature discharge or the opposite – activation delay – when a new fire is either noticed or accidentally started by human error.

Lock Out/Abort Switch – This feature is essential for instances when a service person is in the protected environment and creates smoke, for example from soldering. A lock out/abort switch lets you disable the system with a key to avoid an accidental discharge. Should a threatening fire start while the system is disabled, a worker can use a fire extinguisher for a localized fire or arm the system and use the manual pull station.

Manual Pull Station – If a fire is inadvertently started, or is noticed by someone in the room, the manual pull station allows for immediate discharge without waiting for the system to detect smoke.

Choose a Fire Suppression Company That Will Customize a System to your Unique Needs

Aside from superior customer service, look for a fire suppression company that will make your needs their top priority. The company that bids your fire detection and suppression installation will want to know the size of your room and particular characteristics of your room. This will determine the amount of agent, piping, system space and weight requirements.

A good fire suppression company will consider such factors as the length of time you expect to occupy your current space. If you intend to move within a few years, you'll want to know if the system can be transferred to your new facility and reinstalled cost-effectively. Don't forget to ask about the costs associated with recharging the system, should the system discharge.

You'll also want to discuss how the system can be expanded if the size of your computer room increases due to growth. And, in the opposite scenario, will you be able to reduce the scale of the system if you downsize?

Each state, city, or municipality has a fire code that must be considered when evaluating the options. Some agencies require sprinklers and others will allow a clean agent system in lieu of sprinklers. Factors such as the type of building construction often impact the codes and requirements. Select a fire suppression installation company that asks all of the right questions about your fire code and other unique requirements such as UL certification for fire suppression equipment.

Fire Suppression Costs

Costs are typically estimated based on the size of the room. This determines the amount of agent needed to put out a fire as well as the equipment and delivery mechanisms required. The agent concentration levels differ depending on the class of fire expected. Make sure you ask about the costs of maintaining the system on a yearly basis and also the life expectancy of the agent/systems so that you are prepared should you need to update periodically for optimal effectiveness.

An Automatic Fire Suppression System Can Lower Your Insurance Premium

If you don't currently have a fire suppression system, consider the insurance cost savings. Insurance companies sometimes offer a Loss Control Survey that, when completed, may offer rate reductions for installing a waterless or dry chemical fire suppression system. A call to your agent and some comparative shopping will give you an idea of what you'll save – typically in the range of 10%-15%. Don't forget to take the tax deduction. With a 10-year shelf life, a product such as Aero-K[®] can be depreciated over its full useful life.