**(ADDED TO PAPER)**

**Installations of Fire Alarm systems used today**

When building commercial buildings there exists many different companies that provide fire safety systems. These systems come in many different configurations with different components that can be added to provide different features. The key task for all of these different systems is to identify an emergency in a timely manner and give notice to all of the buildings’ occupants of this emergency. Advanced systems also allergy the fire emergency organizations so fire fighters can address the emergency as quickly as possible. These fire alarm systems provide a way of identifying a developing fire emergency through both manual methods and automated methods. These systems then all have the task of alerting all building occupants that they need to evacuate the building and remove themselves from danger. After these two basic tasks have been completed, the stage of optional and additional processes can be added. This is where the different companies and components come in. A common function is the transmission of an emergency notification signal to the fire department and other emergency response organizations. More advances systems may even shut down electrical processes throughout the building, air conditioning equipment and other systems that may be more vulnerable to fire emergencies or deemed dangerous and may make fires worse. Automatic suppression systems such as water sprinklers can also be added. Below we will describe these different components that can be added to current fire alarm safety systems.

**Fire Alarm System Components**

**Control Panels**

Todays systems generally have a central control panel. The control panel is responsible to keeping track of the various alarm input devices that are installed throughout the building. This includes both manual and automatic sensors. The control panel also has the task of sending signals to the various output devices installed throughout the building. These output devices can include bells, warning lights, emergency telephone calls, and horns. Control panels can range greatly in complexity. They could be as simple as panels with only one area to keep track of with inputs and outputs all from this one zone. They could also be very complicated controlling very advanced systems encompassing multiple floors of multiple buildings throughout an industrial complex. When choosing a control panel, the decision comes down to deciding between two general fire alarm systems. These are conventional systems and addressable systems. These two systems are covered in a later section of this document.

**Fire Sensors and Detectors**

The first and most basic type of fire detectors available are manual sensors. People have the ability to sense many different aspects of a fire emergency. This includes heat and flames themselves in addition to smoke and odors. This is also obviously the cheapest way of detecting if there is a fire emergency because advanced sensors and systems do not need to be purchases. For this reason, most fire alarm systems that can be purchased today come with the installation of manual alarm devices. These devices are used by whoever detects the fire emergency.

Unfortunately, there are the obvious risks associated with only using human input for fire detection. A person needs to be present at the time of the emergency in order for this system to be of any use. The person needs to also remember to pull the alarm in the event of an emergency. A person’s ability to act in the event of an emergency in not something that would want to be relied on. Lastly, this system relies on a person’s ability to detect an emergency in a timely manner. For these reasons, a large assortment of automatic fire emergency detection devices has been developed. These devices are meant to mimic a person’s natural senses. There are devices that mimic a person’s sense of touch by measuring heat. There are also devices that mimic a person’s sense of smell by measuring chemicals, smoke and odors. Flame detectors are also made to mimic a person’s sense of sight. A current and effective installation of a fire system would use these types of devices in order to best detect emergencies and protect building inhabitants. These manual fire detection systems are generally connected directly to manual alarm stations. Pull switches are connected directly to alarm systems so that users to not have to scream throughout a large commercial building. The key issue with these systems, as discussed earlier, is that this is not an effective system if the structure is unoccupied. These systems also open the building up to false alarms by kids that are looking to have fun or criminals.

The first type of automated sensor used in commercial buildings was the thermal detector. These units are usually set to go off when a room reaches a designated temperature. This temperature is commonly set between 135 and 165 degrees Fahrenheit. Temperature alarms also can go off rate of change of temperature instead of a preset temperature. These types of alarms go off when the temperature of a room heats up an abnormally fast rate. Thermal detectors can be highly reliable and resistant to false positive alarms. The temperature of a room rarely heats up to a high temperature or heats up at a abnormally fast rate if there is not an emergency present in the room. These alarms do have a major downside however. Since these alarms do not function until a certain heat condition has been reaches, this provides for the opportunity of a lot of damage to the room before the sensor goes off.

The second type of automated sensor used in commercial buildings is the smoke detector. These devices are effective because they are designed to detect smoke which usually occurs in the early stages of a fire emergency. Most of these devices use a type of light sensing system that detects if there is smoke by sensing the disruption in a light beam caused by smoke. Smoke alarms are usually installed in the same manner as thermal detectors. They are usually installed either on ceilings or high on walls in hallways. Because of a smoke detectors ability to detect a fire in its early stages, they can allow enough time for fire emergency personnel and response teams to reach a fire emergency in a timely manor. This can help to prevent damage to the building as well as help to get occupants out of the building before it is too late. For this reason, they are usually preferred over thermal detectors when choosing between the two systems. There does exist downsides to smoke detectors, however. They are usually more expensive to install in high quantities throughout an entire building. When it comes to fire safety, however, cost should take a back seat to people’s lives. The other disadvantage to smoke detectors is that they are prone to false positives. They can go off because of a simple cigarette or burned food when cooking. A professional installer should be able to install these devices to limit the chance of false readings.



The last type of automated sensor that is used in commercial installations of fire alarm systems is the flame detector. Just how the thermal sensor imitates the sense of touch and the smoke detector imitates the sense of smell, the flame detector imitates a person’s sense of sight. These devices use line of sight to detect flames and operate on either infrared or ultraviolet signals. These devices look for a high level of radiant energy and alerts a fire alarm panel of an emergency. These devices are very reliable as there are very few things that could produce the radiant energy of a fire without there actually being a fire. These devices are usually installed in high priority manufacturing environments. The major disadvantage to these systems is that they can be very expensive to install and labor intensive to keep operating at top efficiency. Another major disadvantage is that they must be looking directly at the place where a fire will occur. For these reasons, flame detectors are generally relegated strictly to manufacturing environments where corporations need the high quality systems in areas where fires can be expected.

Figure X3302 Multispectrum Infrared Hydrogen Flame Detector from Det-Tronics