



CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

Uncovering the Veil of Smoke

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You know what they say, knowledge is power. In this case knowing about fires and the dangers they bring can not only empower you to make safer choices but could help save your life.

Dangers of Smoke

Many people know that smoke is hazardous, but some of the reasons why may surprise you. One of the more well-known perils is that smoke may contain toxins such as carbon dioxide and carbon monoxide as well as other particulates, which are not pleasant to inhale. Your body will let you know this by coughing, wheezing and if exposed for too long, incapacitation. Smoke also limits your visibility, which not only hinders your ability to identify exits and hazards, but individuals tend to move slower when they can't see where they are going, which keeps them in danger for longer. Smoke also can get extremely hot, which may cause serious burns to people engulfed in hot smoke. All of these hazards can lead to permanent injuries or death so be careful, flames aren't the only thing you need to watch out for in a fire.

What is Smoke?

Before we get into how to control smoke, let's talk about what smoke is and some of its properties. Smoke is a product of combustion made of airborne solid and liquid particulates along with gasses, including the air that gets mixed in. The composition of smoke will vary slightly based on the substance undergoing pyrolysis and can contain dangerous, toxic gasses. It naturally moves from areas of high pressure to areas of low pressure. The buoyancy of a gas depends on both its molecular weight



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and its temperature, this means hot smoke is more buoyant and will rise from the flames towards the ceiling much like you would see in a fireplace. These properties are important to keep in mind when we go over the control methods. When smoke rises from combustion it is a turbulent air flow and mixes with the surrounding air, this cools the smoke and also increases the volume of smoke/air mixture. This cooling can cause smoke to travel to lower areas of a building if uncontrolled.

Why Smoke Control Systems?

Smoke in an occupied building is not something anyone wants, but if a fire does occur and smoke is created there are reasons why we want to manage where it goes. Smoke management systems are in place for a number of reasons. First of all, if a fire is occurring inside a building, all of the occupants of that building want to get out as soon as possible. These systems help diverge smoke from the paths of egress, allowing occupants to see where they are going and do so without getting burnt by smoke, choking on the smoke or becoming incapacitated. The management systems are also in place to aid the firefighters who may be going into the buildings, helping them in many of the same ways as the occupants. Another reason why many choose to have these systems installed is to mitigate any damage done to the building by smoke and heat.

Smoke Control Systems

Now that we know what smoke is, how dangerous it can be, let us discuss some of the different methods used to control it. The methods are compartmentalization, dilution, pressurization and buoyancy. Compartmentalization uses barriers, such as walls, doors, floors and smoke curtains to help isolate fire, heat and smoke from the rest of the occupied building. Dilution is the process of diluting, or reducing the concentration of smoke that has entered spaces remote from the fire by supplying outside air. Pressurization systems use mechanical fans to push clean air into stairwells, elevators and smoke control rooms, this makes those areas pressurized or



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high pressure areas. Since smoke moves from areas of high pressure to areas of low pressure this keeps those areas free from smoke. Smoke management systems that utilize buoyancy are used mostly for spaces with tall ceilings like malls, atria or large halls, and there are two version, powered and unpowered. The unpowered system relies on the large volume of space above the occupants, because the space is so large it takes a while to fill up with smoke. This allows enough time for evacuation while the smoke is filling up. The powered systems use a large fan to try to dispel the smoke out of the top of the large area at the same rate that the smoke is being produced by the fire, even if this is not accomplished the fan will help give the occupants more time to evacuate.

Now that you know a little more about smoke, the dangers they pose, what can be done to control smoke and why we do it, you can make smarter decisions if you are ever in a building fire scenario. For additional information on smoke control systems or smoke and heat venting please see NFPA 92, NFPA 204 and the NFPA Fire Protection Handbook.

Sources: NFPA Fire Protection Handbook®, 20th edition. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169.

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