The Flame Spread

Board of Certified Fire Protection Specialists

The School Fire

By Daniel B. C. Gardiner, CFPS
Flame Spread Senior Writer
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On December 30, 2008, a fire in a storage closet at the Shelton Connecticut high school left a portion of the school severely damaged. Firefighters from more than five communities converged on the school at about 1 p.m. to fight the fire that quickly spread to other parts of the facility.

It took about 45 minutes to put out the fire. An investigation into the fire by the city's police department and Fire Marshal's office determined the fire was accidental; that someone smoking in the building threw a cigarette into a plastic wastebasket.

The fire tool place soon after a $27 million expansion project was completed. The school was fire sprinklered only in the new or renovated portions. Interestingly, months prior to the fire, inquires were made as to why the entire school, not just the renovated portion, was not fire sprinklered.

The fire sprinkler issue became a political debate (what else is new). Finally, the State Fire Marshal was asked to determine if the code required the entire school to be fire sprinklered, or just the new portions. The fire didn't wait for an answer. Now the community is facing a multi-million dollar loss, and a closed school.

At least one of the school board members has shown their ignorance multiple times, being quoted in the newspapers saying, "fire sprinklers would not have made a difference". He went on to say that "fire sprinklering schools would cost millions of dollars!" Well, one thing is definitely known; if his school was fully fire sprinklered, school would be in session right after the fire, and there would not be a multi-million dollar price tag for clean-up and repair!

Pay for sprinklers or pay for fire damage; you make the call!

Anyone that went to school in the 1950's remembers how fire doors and fire alarms were installed almost overnight following the Our Lady of the Angles School fire in Chicago. The fire occurred on December 1, 1958 and killed 93-children and 3-nuns. You can find writings about this fire that indicate fire codes were immediately changed based on the Chicago tragedy. Well, since fire sprinklers weren't universally required in all schools after that fire, we must assume the real lesson had not been learned.

The Our Lady of the Angles School fire took place fifty years after the Lakeview Elementary School fire in North Collinwood, OH. That March 4, 1908 fire killed 172 children and 2 teachers. Only 194 of the 366-students escaped the blaze. The others were trapped inside the rear first-floor exit, and by the time fire fighters arrived, nothing could be done to save them. More information on that school fire is available at http://www.deadohio.com/collinwood.htm

One would think with the Lakeview elementary school fire in the history books, that the installation of fire sprinklers in schools 50-years later would be routine. Unfortunately, this is not the case.

Now we have had a fire in a high school following a $27,000,000 renovation, but the high school remained largely non-fire sprinklered. Fortunately, no one was killed; this was just one of many non-fatal school fires that occur in the U. S. annually.

Do we need a large death toll in addition to the property damage in order to see the value of installing fire sprinklers?

In the aftermath of the fire, The Shelton Connecticut School Board had to wrestle with issues of where to put the high school students that have been displaced by the closet fire in their partially fire sprinklered school.

While some school board members remained in denial, others asked; "why did we do this to ourselves?" In this case, the board had been informed and still made a bad, foolish, costly, and dangerous decision.

The Exit Sign
By Daniel B. C. Gardiner, CFPS
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For as long as anyone can remember, the exit sign has been a beacon to persons in buildings looking for the way out. It is a simple sign, sometimes lighted from within that silently announces an avenue of safety starts here.

Exit signs have evolved over the years, now most are lighted, first by incessant bulbs, then florescent bulbs, now LED's. New generations of exit signs now glow in the dark and need no electricity. Some exit signs are part of a system that includes sounds "walk this way for the exit". Once having only red letters, now exit signs come with bright green letters.

So imagine my surprise when I stopped in a local Subway Sandwich shop for a quick bite of lunch. The shop is housed in half of an old hot dog stand that has been closed since the 1960's. Single story, it has seating for twelve. Two thirds of the shop is for employees making a variety of sandwiches and hot soups.

The public area of the sandwich shop can't be any larger than 600 SF, with large windows on two sides. The entrance/exit is in the middle of the wall that faces the parking lot.

Well, above the door is an internally lighted exit sign with battery backup. There also is a fire evacuation alarm pull station next to the exit. My question is why?

A look at the fire codes in Connecticut, and in the specific jurisdiction where the sandwich shop is located, indicates that as long as the exit is readily identifiable, there need not be an exit sign. There also is nothing in any of these codes to require this small business to have a fire evacuation alarm with a pull station. So what happened?

This is obviously a case of some fire or building inspector doing what they think is right, regardless of the code. They couldn't care less that the small sandwich shop owner has to spend several hundred dollars on something that is totally not required.

Being code compliant is different from being code official compliant, and is generally less expensive. The next time this small business owner is mandated to install something by any inspector; he would be wise to get it in writing with the code sections attached.

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He retired as the Fire Chief of Fairfield Connecticut after a career of over 30-years. He remains a Nationally Certified, Fire Officer II, Fire Instructor II, and Certified Fire Protection Specialist. He currently is a member of the Certified Fire Protection Specialist Board of Directors, serving his fourth term. He is a former president of the Fire Department Safety Officers Association, as well as the International Society of Fire Service Instructors.

Chief Gardiner holds a Bachelor's Degree in Fire Science and holds two Masters Degrees, one in Public Administration and one in Fire Science Technology, and speaks nationally on fire fighter safety, fire department operations, fire service finance, fire department training, and futuristic fire suppression and fire protection issues.

American Society of Safety Engineers Recognize CFPS for Professional Membership

Des Plaines, IL (June 19, 2007) — the American Society of Safety Engineers (ASSE) recently announced they will be accepting the Certified Fire

Protection Specialist (CFPS) credential for members and new member applicants who have a bachelor's degree and five years of safety, health and environmental (SH&E) experience for Professional Membership in the Society.

In addition, ASSE Professional Members can be or have a Professional Engineer (P.E.) registration, Certified Safety Physicist (CSP), Certified Industrial Hygienist (CIH), Certified Health Professional (CHP), Certified Hazardous Materials Manager (CHMM), Certified Professional Environmental Auditor (CPEA), Canadian Registered Safety Professional (CRSP), Chartered Fellow of the Institution of Occupational Safety and Health (CFIOSH), or Chartered Member of the Institution of Occupational Safety and Health (CMIOSH) credentials. Along with these, one must have five years of safety experience and a bachelor's degree from an accredited college or university.

Founded in 1911, the Des Plaines, IL-based ASSE is the largest and oldest professional safety organization and is committed to protecting people, property and the environment. Its more than 30,000 occupational safety, health and environmental professional members manage, supervise, research and consult on safety, health, transportation and environmental issues in all industries, government, labor and education.

For more information on membership check ASSE's website at http://www.asse.org or contact customer service at customerservice@asse.org

SMOKE CONTROL SYSTEMS – Part I
By Chris Butts, SET, CFPS

Smoke has long been recognized as the leading cause of death from fire. Controlling smoke is an inherent feature of fire protection. When required by Building Codes or local Authorities, Smoke Control Systems can reduce the smoke risk to building occupants.

A Smoke Control System is comprised of passive methods, active methods, or a combination of both. Passive methods, also referred to as static, include compartmentalization by means of Smoke Barriers. This method does not require the use of devices to cause air flow. Active methods, also referred to as dynamic, require mechanical systems to cause air flow to create pressure differences between Barriers.

The purpose of a Smoke Control System is primarily life safety. Its function is to provide a tenable environment for safe and timely egress of occupants, away from the fire and associated hazardous conditions, through the building to a safe public way outside the building. It can also be used to provide a safe and tenable area of refuge inside the building, or a combination of both. These provisions are generally not designed to preserve contents, provide for timely restoration of building operations, or to assist in fire suppression or any type of overhaul activity.

A Smoke Control System is a sub-set of a building's over-all Smoke Management System. It is only one factor of a building's polynomial fire protection equation. In this respect, it is sometimes used to reduce property loss from smoke damage, such as high-value equipment, and to aid firefighters both during and after the fire.

A Smoke Control System can be effective to control where smoke will migrate and where it will not. In doing so, the occupants of a building are afforded a greater degree of protection from smoke exposure. This fire protection feature can aid in reducing injuries and deaths related to smoke.

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ESFR (Early Suppression Fast Response) Terminology Clarification
By Tom Varney CFPS

ESFR sprinkler systems with placard information in the following format has caused some confusion on how to interpret this and make a comparison to NFPA 13 requirements. A placard may be found with the following information.

1.23gpm/ft² over the most remote 1200ft²
Sprinkler Head K factor is 14.2

This is much different than the terminology of 12 heads @ an end head pressure of X psi, which is in NFPA 13 and is needed for ESFR adequacy analysis. This information can easily be converted into terminology that is recognized and can be used in conjunction with NFPA 13.

All ESFR sprinkler systems are designed for the most remote 12 sprinkler heads. The 1200ft² figure signifies that the sprinkler head spacing is 100ft². This figure is obtained by taking 1200/12.

Utilizing the 100ft² and multiplying it by the 1.23gpm/ft² figure above results in 123gpm. This is the amount of water flowing from one (1) ESFR sprinkler head. The 123gpm figure will be the Q part of the following formula, **$Q=K\sqrt{P}$.**

Using the formula $Q=K\sqrt{P}$ where:

Q = the flow from one sprinkler head or 123gpm in this example.

K = the K factor of the sprinkler head for the system. In this case the K factor is 14.2.

Other ESFR sprinkler head K factors do exist so you do need to confirm the K factor of the sprinkler head used as it does affect the analysis.

P = the end head pressure of the sprinkler system, which in this case needs to be solved for.

Solving for P

$Q=K\sqrt{P}$ or $123gpm=14.2\sqrt{P}$ or $123/14.2=\sqrt{P}$ or $8.66=\sqrt{P}$ or $P=8.66^2$ = 75psi

Conclusion

Information given in the format of 1.23gpm/ft² over the most remote1200ft², K factor of the sprinkler head is 14.2 can be converted to 12 heads at an end head pressure of 75psi, which can be utilized with the tables in NFPA 13.

Focus on What Caused the Disaster, Not the Fire.
By Daniel B. C. Gardiner, CFPS

It was after the 1970's publication of the well regarded report by the National Commission on Fire Prevention and Control America Burning, fire departments, all over the country, realized they had a responsibility for fire prevention. In the minority report, Dr. Anne Phillips, in a brilliant analysis wrote that fire fighters must become fire preventers.

In the ensuing 25 years, many but not all fire departments adopted the philosophy of fire prevention. Some progressive fire departments hired fire safety educators. Many fire prevention programs sprouted up all over the country. We in the fire Service moved from Fire Prevention Week with Smokey the Bear and Stop Drop & Roll being our only fire prevention focus, to the use of smoke alarms to provide life saving warning to humans, fire inspections to identify and mitigate high fire risk conditions, and fire sprinklers to save lives & reduce the severity of fire damage.

Fire inspections have increased. Fire origin and cause investigations now get top priority especially when someone is killed. Many jurisdictions have updated their codes and ordinances to require early warning systems, and in the most progressive environments; automatic fire sprinklers are now mandated. Still, thousands of people die annually in residential fires.

In the United States between February 6, 2007 and February 11, 2007 there were six fires that killed 28-people; of that number, 19 children and 9 adults. Over a 30-day period in early 2007, 65-people were killed in fires. As this article is being written, there is news of a fire in New York City where nine children and one adult died in a residential fire. The fire, which raged for two hours, ignited near a mattress in the building's basement, most likely from a space heater or an overloaded power strip, officials said. The home had two smoke alarms, but neither had batteries.

To his credit; New York City mayor Mike Bloomberg said that the tragedy of that fatal fire could have been avoided if the two smoke alarms had batteries!

So far, it has been impossible to eliminate scenarios like the candle from setting fire to the curtains, the space heater being too close to the overstuffed chair, and the smoker falling asleep with the lighted cigarette subsequently setting the chair or mattress on fire.

Perhaps it is time to shift focus to early warning & home escape! No, we can't give up on fire prevention; but we need to adjust our priorities. Early detection and warning, coupled with automatic extinguishment will virtually eliminate the overwhelming majority of fire deaths. This focus, at least gives the occupants a chance to escape with their lives. It certainly could have made a difference in all the fatal fires previously mentioned in this article.

We live in a time when over a thousand jurisdictions in the United States now require automatic fire sprinklers in new dwellings, thus eliminating the residential fire death potential, and the fire fighter death and injury potential as well. We also live, and die, in a time when most local, state and federal politicians won't consider a mandatory smoke alarm requirement which covers all homes, including existing dwellings because it may impose a cost on residents, albeit a small one, or because it may cause an inconvenience to the residents they serve. .

Fire departments seem to be afraid to perform voluntary smoke alarm surveys of single and two family dwellings citing "nobody will let us in the home" or "the courts won't let us do that". This assertion of course is false. In the early nineties, the Fairfield (CT) Fire Department performed a complete survey of the town's 22,000 plus, single and two family dwellings.

Over fifty percent of the homes were in violation of the local smoke alarm requirements that were enacted in 1981. The survey revealed that 7,341 dwellings needed additional alarms, 1,766 had non-working alarms, and 855 contained no alarms at all!

The survey was done 7 days a week, day and evenings. Fire fighters attempted to enter 4,464 dwellings on six separate occasions; however, entry was not made due to no one being home. There were only 1,073 dwelling occupants (4.77%) who were unwise enough to deny the survey teams entry. One such dwelling had a fatal fire less than six months after the survey team tried to enter the home.

The National Fallen Firefighters Foundation has identified a number of items that hopefully will reduce firefighter deaths. Those items are:

- Public education and fire prevention should be included in fire department mission statements.
- A data collection system should be established, and incidents should receive a thorough investigation.
- Every firefighter should have training in public education and fire prevention.
- Personnel responsible for code enforcement should possess proper credentials.

These are great goals and should be pursued; but to reduce the chance of a fatal fire and to reduce the number of times firefighters have to go into a

burning building looking for occupants; these elements don't cut it.

Purchasing more gear, more trucks, having a variety of fire fighter safety initiatives and conducting general fire prevention activities are failing us. To eliminate fire deaths, we must strongly emphasize early warning and home escape**;** plain & simple! And for those of us in the advanced stages of fire protection; install automatic sprinklers in anything that is built!

McDonalds: A Burning Problem
Daniel B.C. Gardiner, CFPS

It is going to be a long wait at the drive-thru for anyone who frequents the Drum Hill Chelmsford, MA McDonald's on Drum Hill, after a fire started in a new heating unit causing more than $1 million in damage.

Fire Capt. James Boermeester said it was not immediately clear how long the McDonald's would remain closed, but said the fire and smoke damage would force owners to at least replace the entire roof. "Whether or not they bulldoze the whole building will probably be up to the insurance company," he said.

Drum Hill Road was closed as fire fighters stretched fire hoses across it. The fire was under control quickly once attacking the fire from the interior, firefighters pulled down ceilings inside the building to find the flames, which were not initially visible. Twenty-two firefighters battled the blaze.

Fire officials said the restaurant was old enough that it predated laws requiring sprinklers and smoke alarms, and only had fire-suppression systems for the deep fryers. "It was built before they were needed," they said.

Back in February of 2001, it became apparent that McDonalds was a problem. On Feb 4, 2001 the Pennsville, PA fire department was alerted to a building fire at a typical stand-alone McDonald's restaurant.

The first arriving officer advised the dispatcher (command center) of a working fire and requested a second alarm. Engine 7 located 3 blocks from the incident, was the first arriving unit and attempted an interior attack. Heavy thick smoke was pouring out the doors.

Even after aggressive interior attack and ventilation, conditions deteriorated quickly, and the evacuation was sounded and defensive operations took place.

Within five minutes of the evacuation, fire was already blowing through the roof and interior was fully involved. Within ten minutes, there was a partial roof collapse into the structure due to fire/heat damage and a HVAC unit.

The fire was incredibly fast moving with no chance of getting it in control with an interior attack due to the rapid deterioration inside the structure. Upon realization of this, the fire department promptly evacuated and went into a defensive mode.

The February 2001 fire certainly wasn't the first McDonalds to catch fire, obviously it wasn't the last. There have been many, since a February 14, 2000, early morning fire in a Houston, TX McDonalds took the lives of two Houston Fire fighters.

The Houston McDonalds alarm was sounded at 4:31 a.m. the first engine arrived on scene at 4:39 a.m. and reported fire showing on the roof near the back of the building. The front of the building was untouched by fire. As is the custom of the Houston Fire Department, the crew made an aggressive interior attack of the building via a side entrance and proceeded toward the rear in search of the seat of the fire. Fire fighters entered the building and began the interior attack and initial search. More units arrived and joined in the operation. A short time later, a portion of the roof bearing a large air

conditioning unit collapsed, causing firefighters to become disoriented.
Evacuation sirens and an announcement to assume defensive operations sounded shortly before the collapse.

While no one was in the McDonald's at the time of the blaze, fire department officials have said they presume that buildings are occupied and interior attacks are the norm if conditions dictate such actions. About 90 fire fighters manning dozens of units eventually responded to the three-alarm blaze. The fire was brought under control in less than an hour, officials said.

No one died in the February 4, 2001 Pennsylvania McDonalds fire, but it is apparent that McDonalds must "step up to the plate" and remove their fire fighter killer buildings from our cities and towns, as all national chains should do.

Bravery and Enthusiasm Don't Trump Early Warning & Escape!
By Daniel B. C. Gardiner, CFPS

According to a local Connecticut newspaper, firefighters recently rescued an elderly woman from a fire in her home using a thermal imaging camera. The firefighters found the victim in the doorway between the dining and living rooms. Rescuers removed the unconscious victim from her burning condo and revived her by administering oxygen. According to a hospital spokesman; she was transported to the local burn center in critical condition and her condition has been upgraded to serious.

"Because of the fast action of firefighters, we definitely saved a life," said the fire chief. According to the Fire Department's incident report, firefighters received the alarm at 11:10 a.m. and arrived at the scene at 11:16 a.m. "When we arrived, there was heavy fire coming out the rear windows and it was issuing heavy smoke," firefighters said.

According to firefighters, the rescue team entered through the front door, carrying hand tools and the thermal imaging camera. The camera essentially "looks through smoke" by sensing body heat, he said. "If there's a warm body on the floor, it picks that up on the cool carpet." When the rescue team located the victim, whom was unconscious and had "shallow breath," personnel immediately removed her from the house and hooked her up to oxygen, which helped her to regain consciousness.

Rescuers also found that a pet cat had died, apparently from smoke inhalation. It took about 45 minutes to extinguish the fire. The fire appears to have originated in the bedroom and the cause is still under investigation. According to the fire report, the home suffered about $225,000 in damage. "The place isn't livable," said the Fire Chief. While several engines responded to the fire, area fire departments sent an apparatus to cover the jurisdiction's stations during the alarm.

Some important facts missing from the newspaper story were that to control this fire it took 4-engine companies, 1-truck company, 1-rescue company, a variety of lesser fire vehicles and over twenty firefighters, the actual fire was confined to only one room, and that the condominium was missing working smoke alarms, despite a state law and a local ordinance requiring them.

There is no question that the firefighters acted very bravely and saved the life of the lone occupant. However if there had been working smoke alarms in the home, the occupant and her cat probably would have been able to walk out of the front door without assistance, and the fire department would have been called while the fire was still in the beginning stages. Certainly fewer resources would have been required of the fire department, and there would have been less danger (risk) to all concerned.

The firefighters will undoubtedly receive bravery citations from the fire department; as they should. The fire administration should also receive a citation; the booby prize for not being brave enough

to fight for fire sprinklers in new construction, and a silver cluster on the booby prize for not enforcing their own smoke alarm ordinance which saves people before they get trapped by fire and smoke.

Bravery and enthusiasm do not trump early warning and escape! Fire departments should be doing everything possible to ensure that all homes have working smoke alarms or fire alarm systems; this fire department isn't!

Builders Beware

By: Michael Himes M.S., CSP, CFPS

After many years in private industry and the insurance industry, it still amazes me how many contractors and manufacturers are not aware of NFPA's guidelines pertaining to building construction. They do not understand how they interface with insurance companies and also the rating companies such as ISO (Insurance Service Organization).

The 3 most common mistakes I see are with the construction are lack of details in flammable liquid storage rooms, improper construction of firewalls, and improper understanding of sprinkler systems as they relate to building occupancies and required protection.

When flammable and combustible liquids are stored improperly they become a significant fire hazard. When large volumes are involved the most common solution is to construct a flammable liquid storage room. However, flammable liquid storage rooms are often constructed incorrectly. There are several considerations and variable requirements dependant on the class of materials being stored. However, the most common construction mistakes I observe are lack of a blow-out wall, lack of adequate spill containment and lack of proper bonding and grounding.

Flammable liquid storage rooms must be designed with interior walls capable of withstanding an explosion. If vapors build up within the explosion limits and are ignited the exterior wall must be the 'weakest' construction design to allow the force of the explosion to exhaust outside of the building. This is necessary to protect occupants and interior structures and contents of the building. Sometimes builders and owners have such a lack of understanding, these rooms are built within the interior areas of the building. In this case they cannot construct a safe blow out wall.

The rooms often lack an adequate berm or containment system for the volume of fluids in the room. Each room must provide adequate available storage or remote containment system to contain the maximum amount of liquids that can and or will be stored in that room if each individual container were compromised and all of the liquids were released. When these containments systems are not designed correctly the reduced fire potential created by the use of a flammable liquid storage room is greatly compromised.

The last major area is the lack of bonding and grounding. When flammable and combustible liquids travel through a pipe or through the air, static charges are accumulated. Grounding and bonding is necessary during the transfer of Class I flammable liquids to prevent a static spark from igniting the flammable vapors. Bonding eliminates the potential for static discharge between two containers. The containers must be connected together via a bonding wire. Grounding eliminates the static discharge between the source and the ground. Then the primary container should be connected to source directly in the ground, possibly a water pipe or building source such as a bus bar. Generally, this is a misunderstood concept. They do not seem to realize the explosion potential from vapors created by these liquids.

Keep in mind flammable liquid storage is very complex and there are many other key construction guidelines that must be followed. These are the most common mistakes I have observed.

Improper firewall construction in general building constructing and design is another common area of deficiency. I recently came across a new building "specifically designed" for a woodworking occupancy. The building is a pre-engineered steel frame, steel clad structure. The manufacturing portion of the building is protected by a hydraulically calculated wet pipe sprinkler system properly designed for this occupancy. After construction of the original building the manufacturer built a non sprinkled cold storage building next to the existing building and then connected the buildings with an unsprinkeled breezeway so his employees would not have to drive forklifts outside during inclement weather. (All the buildings and breezeway are identical construction). The same contractor built this entire complex based on local building codes and approval from the local building inspector.

The structure was designed and built with a "firewall" at the opening of the breezeway to create separation from the sprinklered and nonsprinklered sections. The local code allowed the following: The opening was protected with a very nice 3 hour rated roll up fire door connected to a fusible link. The door was installed with the proper fire rated hardware and framing. However, the supporting wall was constructed on studs covered with a $5/8^{th}$ layer of sheetrock and a flammable insulating material. The contractor did not construct a parapet walls.

Now the insured has a building constructed to "local codes" that the insurance companies and ISO will not consider sprinklered. This is due to lack of proper firewall construction. The manufacturing area has the proper sprinkler system but the 'firewall' does not create the proper separation due to length of the breezeway and the fact that the breezeway and cold storage areas are not sprinklered. This resulted in an unsprinklered area in excess of 50% of the total building space. Since the firewall is constructed of studs with flammable insulation and not a self supporting concrete structure it will most likely fail in a fire. It also does not have a parapet above it to prevent flame spread over the wall either.

Finally, improper sprinkler protection is a major ongoing problem. Generally new buildings are designed with the proper system to match the occupancy. However, when property investment companies build new facilities without a specific tenant, or businesses move to different buildings they forget about evaluating the sprinkler system. The new buildings are usually constructed with a basic ordinary hazard sprinkler system. Many times new tenants are woodworkers, print shops, or warehousing occupancies. Usually these tenants require at least an ordinary II hazard protection system. In these cases, the building owner's and tenants think they have a properly sprinklered building and should receive sprinkler credits on their insurance policy. However, neither is eligible and both become frustrated.

The primary reference of building construction and sprinkler protection used by most property casualty insurance companies and rating organizations are the NFPA guidelines. These three examples clearly demonstrate why building engineers, contractors and owners need to be much more aware of their occupancy hazards and how they are viewed by NFPA. These organizations must do a better job of referencing NFPA guidelines for construction, installations and operations.