Hartford Steam Boiler

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Risk Solutions

Learn From Loss

College Student Housing Fire

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A fire occurred on a cold February morning around 9:30 am in a two-story student housing building on the campus of a college. There was no injury to residents or firefighters, however the building was a total loss. The State Fire Marshal's Office (SFMO) launched an investigation for an ignition source and cause, however both were considered to be undetermined. Despite these very big unknowns, there are key points in the SFMO report that could help those who perform prevention and mitigation inspections to learn from this loss.

The building was a single structure of wood frame construction having a pitched standing seam metal roof that created a significantly sized attic space. There were 12 living units per floor in this 2-story building, totaling 24 units. The building had a footprint of approximately 6,000-sq. ft and included a mechanical chase of undescribed size that divided the north and south side rooms. The building age was not provided. There was no installation of automatic sprinkler protection. Local notification was provided by battery powered smoke detectors and manual pull stations.

Key points from the SFMO report include the observation of electrical extension cords used for permanent wiring and the use of electrical heat trace (A.K.A heat tape) in conjunction with foamed insulation to provide freeze protection of water piping. Items of interest in reducing the extent of damage includes the lack of automatic sprinkler protection, insufficient water supply for manual firefighting, and the potential for the omission or neglect of maintenance of a draftstop in the attic. While we cannot assume that any of these conditions caused the fire or would have prevented the total loss, they are worth noting as a learning tool for those responsible for inspecting buildings for property insurance purposes.

Extension Cords

Electrical extension cords used as permanent wiring is a very common code violation and was noted in the SFMO report. Extension cords are often cheaply made or not of the proper size to prevent overheating and ultimately arcing. Use of temporary wiring (A.K.A. extension cords) should not be used as a substitute for permanent wiring. Here is a helpful phrase to remember this concept: Never use temporary wiring for a permanent installation.

Heat Trace

The outside temperature on the morning of the fire was 28-deg. F. Therefore a functional ambient air sensing heat trace system would be expected to have been operating. The NFPA Research Report "Home Fires Involving Heating Equipment 2012-2016" noted heat trace to be the ignition source in an average of 230 fires per year.

There are two key points to note when heat trace is encountered during a property inspection:

1. Heat trace should never overlap itself. The heat created could cause a burn-through and ultimately a short circuit which might serve as a fire ignition source.

2. Some heat trace manufacturers state that thermal insulation around the heat traced pipe is acceptable. If thermal insulation is added, the manufacturers' instructions should be followed and only a nonflammable type insulation, such as fiberglass, should be installed. Foam or vinyl insulation that could catch fire from a failing heat trace should not be allowed to remain.

Automatic Protection

Automatic sprinkler protection was not installed in the building. When considering the installation of automatic sprinkler protection, this occupancy is eligible for a sprinkler design according to NFPA 13 Standard for the Installation of Sprinkler Systems and NFPA 13R Standard for the Installation of Sprinkler Systems In Low-Rise Residential Occupancies. For property insurance purposes, the recommendation to design the system according to NFPA 13 is a much better option and should be encouraged. NFPA 13R is principally a design standard for life safety while NFPA 13 includes life safety but also property conservation. A properly designed and supplied automatic sprinkler system creates a much greater potential for saving the building from a total loss due to a fire.

Manual Protection

There is no indication from satellite imagery that there was a public or private fire hydrant within 500-ft of building. According to the SFMO, firefighters were attacking the flames from inside the building when they encountered a water pressure drop to 30-psi. The decision was then made to only take a "defensive stand" which means that efforts to save the building will not be the focus of firefighting efforts, rather they will be directed at the prevention of fire from spreading to other buildings in the area. The SFMO report noted only the water pressure drop, however it is likely that the water supply flow rate or gallons per minute (GPM) was also severely low. It is often said in the firefighting community that "It's GPMs that put out fires". When hydrants are a significant distance from the fire, long lengths of firefighting hoses are subjected to substantial friction losses resulting in less pressure and flow available at the firefighter's nozzle. Ideally, a fire hydrant located just beyond the potential collapse zone of a building is best with regard to friction loss. Hydrants over 500-ft from the fire have questionable effectiveness for the standard 2-1/2 inch fabric-covered flexible fire hose. At any building, the availability and quality of a firefighting water supply should be evaluated and rectified if found potentially deficient. Availability is determined by distance between a building and a fire hydrant as well as conditions such as railroad tracks, steep incline, access blockages, etc. Quality is evaluated by testing hydrant flow rates at sufficient intervals during times of high usage such as summer months. Only by evaluating the availability and quality of firefighting water supply can actions be initiated to correct a potential deficiency.

Draftstop

The first person to call-in the fire saw smoke from the eaves on the north side of the building. However, when the fire truck arrived, within 6-minutes, smoke from both the north and south eaves was observed. This building had an attic space of approximately 6,000-square feet and the overall building construction was reported to be wood frame. Under these conditions, model building codes require that draftstops be installed so that attic areas do not exceed 3,000 square feet. A draftstop is a continuous membrane, usually fire rated sheetrock, used to subdivide an attic space to resist the passage of smoke and heat. The codes require that after installation, the draftstop(s) must be properly maintained. A draftstop was not addressed in the SFMO report, however smoke issuing from the attic at both ends of the building early in the fire raises the question as to the installation and/or the maintenance of a draftstop. For those who inspect buildings, one should verify that a draftstop is properly installed and that it is sufficiently maintained.

Allowed self-closing door with automatic latch in the draftstop wall of an attic.

"Unapproved" opening in a draftstop wall.

Conclusions

The ignition source and cause of the fire was not identified by the SFMO report. However there are lessons to be learned that can help those responsible for the care of a building as well as those who perform inspections. In building service areas, evaluate electrical systems since electricity is one of the most common ignition sources in building fires. Mitigating the effects of fire with automatic sprinkler protection and correctly installed and maintained draftstops should be a consideration for any building but is especially important to those with combustible construction and contents. Finally, a readily available firefighting water supply of sufficient quality is essential for there to be any chance of preventing a total loss of a building.

References

NFPA 13® Standard for the Installation of Sprinkler Systems

NFPA 13R® Standard for the Installation of Sprinkler Systems In Low-Rise Residential Occupancies

NFIRS and NFPA Fire Experience Survey, 2012-2016

International Building Code (2015 ed.) Section 718.4.1

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