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RiskTopics

Fire Prevention for Residential Wood Frame Construction
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Fires in wood frame construction are a major contributor to large losses each year. Single family fires have resulted in losses as high as $22 million.

Introduction

Once a fire starts in a wood frame structure, the risk of a total loss is very high. According to Zurich's Builder's Risk Claims Data from 2010 through 2015, fire accounts for 8% of losses by frequency, but 32% by severity. In most cases, construction related fires can be prevented or limited by developing and implementing effective fire safety plans.

Discussion

Fire can be caused by many different activities, including arson, hot work or open flames, electrical distribution, smoking, cooking or even oily rags. Very few construction fires are a result of natural causes such as lightening, but instead are most often caused by human action. Property damage costs can be high but fires can also cause personal injury or even death, business interruption, additional labor and damage to a builder's professional reputation.

- Construction techniques can contribute to a fire's rapid spread – for example, attic and soffit vents draw in large quantities of fresh air, permit exterior fire to quickly enter the attic space, and burn easily in the truss space, and exterior finishes that readily ignite or melt away and expose unprotected wood sheathing can enable exterior fires to quickly race up the building's surface.
- Sources of Ignition and Fuel
    - Hot Work
    - Portable/Temporary Heaters
    - Smoking
    - Electrical Fires

- Cartons, paper wrap and other combustible materials
- Scrap lumber and boards, debris and trash
- Construction material storage
- Dry brush and grasses
- Flammable liquids such as paint, thinners, stains and gasoline
- Temporary Electrical Power
- Internal combustion powered equipment, especially when used around flammable materials and during refueling.

- Other causes of fires on construction sites:
  - Wildfires
  - Spontaneous combustion of oily rags
- Fire Department availability may be limited in some areas, especially in rural areas where a single custom home may be being built. Slow response times can be another issue in rural areas.
- Lack of active fire hydrants on or near the site may inhibit the fire department's ability to fight large fires. If an adequate water supply is not available onsite, the fire department must shuttle trucks to an alternate water source which greatly reduces the efficiency and ability to fight the fire.
- Arson is one of the leading causes of construction fires and one of the most difficult to combat.

Guidance

Fire prevention management starts before the project begins. A fire protection plan should be developed for the project that is suitable for the project scope and type. The plan should consider fire prevention, protection, inspection and training. Some things to consider are:

- Fire Department Access & Fire Hydrant Availability – Are there active fire hydrants located in the area where the home is being built? Access should be provided at the beginning of construction and maintained throughout the project. The new project address, fire department access, and hydrant locations (along with the rest of the fire safety plan) should be communicated with the local responding fire department so they are familiar with the site. If the project is located in an area where there is not a fire department nearby or the fire department is volunteer, notify the fire department of the project so they are aware of the project, values, water availability and access to the site. If no fire hydrants are available, consider alternate water sources such as private hydrants, large multi-gallon tanks stored onsite for Fire Department use, ponds, etc. For pond usage, take into consideration freezing and drought conditions.

- Fire extinguishers shall be provided for each project in accordance with OSHA 1926:
    - A fire extinguisher, rated not less than 2A, shall be provided for each 3,000 square feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet. A minimum of one fire extinguisher should be provided per floor.
    - A fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the jobsite.
    - Be sure to train workers on how to operate fire extinguishers.
    - Confirm fire extinguishers have been inspected, are up to date and are fully charged.
- Manage Sources of Ignition and Fuel
    - Remove the following from the building daily:
        - Cartons, paper wrap and other combustible materials
        - Scrap lumber and boards
        - Debris and trash
        - Sweep floors with sawdust accumulation
    - Construction material storage should be kept at least 20 feet away from the building
    - Dry brush and grasses should be eliminated from at least a 20 foot perimeter around the building.
    - Trash chutes should be of non-combustible construction and should have adequate clearance above the dumpster to ensure trash chutes do not become plugged. Kick outs may be required to divert material away from the building.
    - The dumpster should be dumped at the end of each workday or located 35 feet away from the structure.
    - Flammable liquids such as paint, thinners, stains and gasoline should be removed and properly stored at the end of each workday. Any waste should be safely removed and disposed of.
    - Oily rags should be stored in a "listed disposal container" per NFPA 241, 5.4.3, OSHA 1926.25(c) and OSHSA 1926.252.
    - Temporary electrical power should be managed and inspected. Cords and exterior boxes should be exterior rated, cords should be inspected for damage and missing ground pins. Non-compliant cords should be removed and replaced. Any temporary lighting should be properly guarded and should not be in contact with any combustible material.
    - Internal combustion powered equipment should never be permitted to be used inside the structure. Per OSHA 1926, a fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the jobsite, especially when used around flammable materials and during refueling.

- Construction Practices
    - Combustible and scrap clean up at day end.
    - Project personnel should be trained on the proper use of fire extinguishing equipment on an annual basis, and high hazard operations (such as fire watch personnel) should have actual practical experience with putting out fires through practice fires at a training facility.
    - Make sure emergency egress is provided in case of an emergency.
    - Site visitors should be educated on any fire safety rules including smoking policies.
- Hot work is a leading cause of fires in wood frame construction and should be avoided whenever possible. Hot work includes abrasive cutting, welding, brazing, soldering, grinding, pipe thawing or torch applied roofing operations. Hot work control procedures should include items such as shielding and protecting combustibles, posting a trained fire watch (with communications immediately available to call the fire department for assistance) and providing dedicated portable fire extinguishers. Hot work permits should be used whenever performing hot work in a wood frame structure. For additional information, see the Zurich Risk Topic on Hot Work and NFPA 51B.
- Portable Heating/Drying Devices
    - Keep warming barrels at least 50 feet away from the building.
    - Keep portable heaters a safe distance (per manufacturer's instructions) from combustible materials and construction.
    - Place portable heaters on noncombustible flooring or base.
    - Secure portable heaters to prevent them from being knocked over. Install an overhead cut-off.
    - Keep high-intensity lamps for light or heat firmly secured and kept clear of combustible materials (must be rated for combustible construction).
    - Check temporary electrical equipment daily for condition or possible overloading.
    - Any equipment used for temporary heating should be inspected daily and monitored throughout each shift to ensure the equipment is operating properly, the heater has not been moved, and that no combustible materials have been moved into the area. Equipment should be used per manufacturer guidelines only. Temporary heaters should be monitored 24/7 while operational. Fueling equipment should be located outside of the building or structure under construction.
- Asphalt and tar kettles should not permitted on the roofs of wood frame buildings and should be located at least 35 feet from combustible materials. The heating of asphalt roofing material above 260 degrees Celsius or within 14 degrees Celsius of the material's flash point should be prohibited. A kettle operator should be within 25 feet of the tar kettle at all times.

- Site security should be included as part of a fire prevention program. Site security may protect against arson and also be an early warning should a fire occur on a project. Security may include fencing, lighting, guard service, cameras and alarms.
- No smoking should be permitted within wood frame construction. Smoking should be permitted only in designated areas, if at all. Designated areas should be separated from any combustible materials. Where smoking is permitted, safe receptacles for discarded smoking materials should be provided. Post "NO SMOKING" signs in all areas where smoking is not permitted.
- Other Considerations
    - Develop an Emergency Action Plan to address identification and reporting of fires, fire evacuation and emergency contacts.
    - Review safety precautions with all workers.
    - Conduct a Safety Tour of the building site at the end of each day to check for items such as smoldering fires, that portable heaters are shut off, that unused electrical equipment is turned off, and for removal of combustible waste and debris including oily rags, and securement of doors and fencing.

Conclusion

Fires on construction sites are major contributors to large losses each year and are more common on residential construction sites than builders may think. Home building is susceptible to fires due to the typical wood frame construction. Temporary heating, hot work and smoking are common fire hazards on home sites. However, proper planning, written controls and follow up can help reduce many construction fire exposures . Along with the information provided in this Risk Topic and others that can be provided by Zurich, there are many online sources to reference including NFPA.org, NAHB.org and OSHA.gov.

References

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