BUILDINGS UNDER CONSTRUCTION AND RENOVATION

INTRODUCTION

Buildings under construction and undergoing major renovations can pose a substantial fire risk as well as wind and earthquake damage depending upon the state of completion. There have been numerous famous buildings under construction, while most of them were in residential buildings, commercial buildings came in second. On April 4, 2021 a fire broke out on the 65th floor of a high-rise building under construction in Moscow, Russia. On June 7, 2019 fire broke out in a high-rise in Warsaw, Poland while the building was under construction. These fires spread because of the combustible material in the building. Some famous buildings that caught on fire while renovation include the Notre Dame, Paris, France fire on April 15, 2019, Battersea Arts Centre, London, England fire on March 15, 2015, One Meridian Plaza, Philadelphia, Pennsylvania, fire on February 23, 1991. These fires started because precautions were not taken

In February 2020, the Fire Protection Research Foundation (FPRF) published a report, *Fires in Structures under Construction or Renovation*. This report was based on the reports filed by the fire departments in the United States in the National Fire Incident Reporting System (NFIRS). The FPRF report states between 2013 and 2017, local fire departments responded to an estimated average of 3,840 fire in structures under construction with an estimated $304 million property damage and 2,580 fires in structures under renovations with an estimated $104 million property damage per year.

While cooking equipment at the construction site constituted 22% of the fires, it caused only 3% of the property damage. Electrical distribution and lighting equipment and intentional set fires were second (16%) and fourth (11%) in the leading cause respectively they caused 42%and 32% respectively the property damage. Sixty percent (60%) of these fires occurred between noon and midnight accounting for 41% of the property damage. The highest percent of fire occurred amount between 4:00 PM and 8:00 PM (24%). The highest amount of property damage (31%) occurred between midnight and 4:00 AM.

The leading causes for fires for buildings under renovation are electrical distribution and lighting equipment (23%), heating equipment (15%), and intentional set fires (12%). These fires represented 47% of the property damage. Electrical distribution and lighting equipment was the leading cause for the property damage, accounted for 26% and torch, burner, or soldering iron accounted was the second highest cause of property damage, accounting for 22% of the fires. Intentionally set fires accounted for 12% of the fires and 11% of the property damage. As with the buildings under construction, 59% of these fires occurred between noon and midnight accounting for 51% of the property damage. The highest percent of fire occurred amount between 4:00 PM and 8:00 PM (22%). The highest amount of property damage (23%) occurred between midnight and 4:00 AM.

As stated in the FPRF report, most of these fires were in residential occupancies (76%), 24% were in commercial and industrial occupancies. These property damage estimates did not include the

demolition and removal of the existing structure and rebuilding the structure. In the case of One Meridian Plaza in Philadelphia, the fire occurred in 1991 and the building sat vacant due to structural problems as a result of the fire, the building was finally taken down in 1997. A new building was built on the site starting in 2006.

POSITION

Follow the recommendation found in NFPA 241 *Standard for Safeguarding Construction, Alteration, and Demolition Operations*.

On all buildings under construction and for buildings being renovated assign a Fire Protection Program Manager (FPPM) and an alternate to develop, manage, and implement a fire safety program based on the owner's responsibility section of NFPA 241. The FPPM should also be the point of contact for first responders. The NFPA has an online training series for the FPPM Register for the Fire Prevention Program Manager Online Training Series (nfpa.org).

The fire safety program should include sections, as applicable on:

- Housekeeping
- Site security
- Preplan with the local fire department/brigade
- Plan to have fire protection equipment online as the construction/renovations progress
- Evaluating special hazards, including hot work, for proper protection
- Reporting of an alarm
- Inspection, testing and maintenance of alarm and protection systems including hydrants
- Keeping the site accessible for emergency vehicles
- Inspect temporary heating and lighting equipment

Separate construction related buildings (trailers and sheds) from the buildings under construction or renovation. See NFPA 241 for the suggested distances. Provide at least one extinguisher in the construction related buildings.

At the end of each work shift, remove all combustible waste and debris. Schedule frequent trash removal. Do not allow trash to be burnt inside the building.

Limit the amount of combustible construction material in the building to one shift. Where trash shuts are used to remove waste, use noncombustible material. If combustible material is used to construct the shuts, install temporary sprinkler protection over the shut.

Store flammable and combustible liquids and flammable gases outdoors, in a fenced in area, away from the building. Keep the storage area free of vegetation, debris, and combustible material. Post "NO SMOKING" signs around the fenced area.

Refuel all portable equipment outside, away from the building. Use only listed or approved safety containers.

Any cooking at the site should be outside in a trailer or shed, not in the building under construction or renovation.

Prohibit the use of temporary cooking equipment and unauthorized space heaters.

Install fencing around the construction site and provide adequate lighting. If possible have roaming security guards on site after working hours.

Install sprinklers and place them in service as soon as practicable. Use temporary connections if necessary. Any valves should be visually inspected daily to verify the sprinkler system is in service. Don't allow combustible equipment to be installed until the sprinkler system has been tested.

If practicable, install a temporary standpipe system with hose connections and a fire department connection as the building is being constructed.

Supervise any hot work. Inspect the equipment to make sure it is in good condition. Inspect the location were the work is being performed to make sure it is free of combustibles. Provide a fire watch in accordance with PRC.1.9.0.

Use tarpaulins that have been flameproof or made of flame-resistant material in accordance with NFPA 701 *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films* Test Method 2.

DISCUSSION

While the FPRF published report, *Fires in Structures under Construction or Renovation* deals numbers and cases of fires in the U.S., similar results can be found around the world.

The recovery time after a fire, depending on the size can take from a couple months to many years. The Notre-Dame de Paris fire broke out on April 15, 2019, estimates are that the complete restoration will take in excess of 20 years. On August 24, 2006 a fire broke out at the Trinity Cathedral in Saint Petersburg, Russia, while the cathedral was under reconstruction causing a lot of damage. The restoration of the Cathedral was completed in 2010.

The FPRF report showed the leading cause of cooking fires if the confined fire or open fire. The main electrical distribution and lighting equipment fires were caused by the wiring. The heating equipment fires dealt with the space heaters.