Fire Engineering®

Construction Concerns: Combustible Cladding

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By Gregory Havel

For www.fireengineering.com

Photos 1-2 by Natalie Oxford.
Photos 3-6 by author.

On Wednesday, June 14, 2017, In London, England, the Grenfell Tower apartment building burned. As of June 27, 2017, the number of fire fatalities was 79 (although an official number is not expected until 2018).

According to the news services, the Grenfell Tower was 24 stories high containing 120 units of publicly subsidized housing. It was home to about 500 people and was built in 1974 with a single exit stairway. It had been extensively renovated in 2016, including the installation of aluminum composite panels (ACP) on the exterior of the building.

The fire started in a fourth-floor apartment just before 1:00 a.m. local time in a faulty refrigerator that was reported to have exploded. The fire then became a room contents fire, which self-ventilated by breaking a window, thus exposing the aluminum composite panels to enough heat for ignition. Once the ACP began to burn, the fire spread rapidly vertically and horizontally and broke into nearly all apartments through the windows.

Photo 1 shows the burning building at 4:45 a.m. after nearly four hours of firefighting.

(1)

Photo 2 shows the building at 6:00 a.m. after nearly five hours of firefighting. Many injured people had received medical treatment and had been released, although others were still hospitalized.

(2)

According to the British news services, the ACP were manufactured by Reynobond®, a U.S. corporation, of polyethylene plastic with a sheet of aluminum bonded to each face. These panels are usually attached to aluminum channels that are fastened to the building wall, leaving a cavity that is sometimes partially filled with insulation. As of June 27, 2017, I have been unable to determine whether insulation was used in the wall cavity at Grenfell Towers and, if insulated, whether it was combustible or noncombustible.

According to the British news services, the same brand of ACP was involved in a similar fire in Melbourne, Australia, in 2014 and in other recent fires in Europe and Asia.

This type of ACP is widely used in North America as an attractive, weather-resistant exterior finish on convenience stores, low-rise buildings, and many automotive dealership manufacturers (photo 3). This material is available in durable finishes in many colors including mirror-polished metal, and can be formed into special shapes that reduce the number of seams and joints in the building's face (photo 4).

(3)

(4)

Aluminum composite panels (ACP) are advertised as “Safety Class A rating per ASTM E84”, with flame spread of <25 and smoke developed at <450.

American Society for Testing and Materials (ASTM) E84—16, *Standard Test Method for Surface Burning Characteristics of Building Materials;* Underwriters Laboratories (UL) 723, Standard for Safety Test for Surface Burning Characteristics of Building Materials; National Fire Protection Association (NFPA) 255, Standard Method of Test of Surface Burning Characteristics of Building Materials; and ULC (UL Canada) S102, *Standard Method of Test of Surface Burning Characteristics of Building Materials,* describe the same test procedure by using an apparatus called a Steiner Tunnel. This apparatus was first developed by A. J. Steiner at Underwriters Laboratories in 1922.

The classification of materials tested, compared to the standard of red oak, is usually stated as the following:

- Class A: Flame spread 0-25; smoke developed 0-450.
- Class B: Flame spread 26-75; smoke developed 0-450.

- Class C: Flame spread 76-200; smoke developed 0-450.

In the 1880s, the National Board of Fire Underwriters, an organization of fire and property insurance companies, published a specification for mill (heavy timber or Type IV) construction) based on major fire losses in the United States. One of the requirements was a noncombustible exterior of brick or stone masonry. This requirement carried over into the building and fire codes for other types of buildings including fire resistive (Type I), noncombustible (Type II), and ordinary (Type III or “brick and joist”).

Another of the requirements was an automatic fire sprinkler system (the Grenfell Tower had none.)

The fire service, fire code administrators, and building and fire code developers are forgetting the lessons learned by fire departments and fire insurance companies over the past 150 years and the solutions to the problems that were proposed—and proved effective—in protecting lives in buildings.

Some of the materials that are in use today such as masonry, concrete, and heavy timber with no concealed spaces (photo 5) would be easily recognized by fire protection engineers and fire chiefs from the late 19th century.

(5)

Other materials such as fire-retardant-treated plastics (photo 6); metal-plastic composites; and use of combustible materials in places where the building codes do not permit, recognize, and question as we should. These newer materials are creating a fire problem throughout the world, resulting in room-and-contents fires that expand beyond the capability of fire departments by the time they arrive.

(6)

Simply because a material that is combustible passed a flame spread rating test in a laboratory does not make its fire resistance equal to the noncombustible materials and fire-resistive assemblies with more than 100 years of proven history.

Further complicating the issue is that some building materials like polymers that have a Class A flame spread rating (less than or equal to 25 when compared to red oak in a horizontal position in the ASTM E84 test), may have a much higher flame spread rate when installed in a vertical position like the aluminum composite panels at Grenfell Tower.

It is time for the fire service to take a more active part in building and fire code development with the insurance underwriters. For the education of the fire service, the successors to the National Board of Fire Underwriters should post a Web page with free access that includes the early reports and historical documents such as the 1880 specification for mill construction, early editions of fire codes, information on submitting comments on building and fire code revisions, and applying to become members of the committees that draft and revise the standards. These historic materials should be required reading for anyone wishing to become qualified as a fire officer, fire protection specialist, or insurance underwriter.

Having so many buildings with the potential to become the next Grenfell Tower should not stop us from preventing this from happening again. We owe this to the future of the fire service and to our society. Life is fragile at best; when we allow building construction that is a recipe for disaster, we also make it cheap.

For more detailed information on the Grenfell Tower fire, do an Internet search for "Grenfell Tower" and "Grenfell Tower fire."

For more detailed information on the building materials involved in the Grenfell Tower, do an Internet search for "aluminum composite panel," "ACP," and "Reynobond®."

For more detailed information on the building material tests described above, visit www.nfpa.org and log-in for free read-only access or use the login from your fire department's or technical college's National Fire Code subscription. Look for NFPA 255 and 285.

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