Article for Commercial Architect

HEADLINE: Three Transbay Neighborhood Buildings Support Occupants' Passive Life Safety

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In a city famous for its beautiful light, the deadliest firestorms in California's state history brought an eerie post-apocalyptic shade of orange to San Francisco's skies earlier this year. High wind and hot temperatures from Northern California wildfires cast many parts of the area in hazy, dusk-like shades of red. As fire has been a perennial threat to San Francisco since the city's earliest days, the building codes that govern perimeter fire barriers are particularly rigorous.

Three new skyscrapers adding beauty and interest to San Francisco's skyline – 181 Fremont, Park Tower at Transbay and Salesforce Tower – are supporting life safety for their occupants through carefully planned perimeter fire barriers. Simply defined, the perimeter fire barrier system is a compilation of installed materials, that when tested to ASTM E2307 conditions (the Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using the Intermediate-Scale, Multi-Story Test Apparatus) must remain securely in place for the time period equal to the fire-resistance of the floor assembly.

While building code requirements are straight-forward, the unique design elements that contribute to a building's architectural aesthetic typically present challenges when it comes to specifying materials for the perimeter fire containment system. Various design elements such as curved spandrels, angular symmetry and complex curtain walls in the three buildings, presented unique concerns for team members collaborating on the perimeter fire containment systems supporting occupants' life safety.

However, not every building material in the perimeter fire containment system was difficult to specify. All three buildings contain Thermafiber® Firespan® and Safing mineral wool Insulation to support passive life safety systems. The fire-resistant properties of mineral wool insulation make it a natural choice for passive fire containment. Fire tested to ASTM E119, Thermafiber® has been shown to withstand temperatures well above 2000° Fahrenheit.

Another life safety consideration was the height of all three buildings. Sadly, skyscrapers around the world have been the target of terrorist attacks. Addressing potential liability risk that could arise in the event of a terrorist attack was an important consideration in selecting the insulating material used. In 2017, Thermafiber® became the first building insulation to earn the U.S. Department of Homeland Security's "Safety Act" designation. The designation provides architects with protection against liability related to acts of terrorism. The Safety Act also protects several related parties involved in perimeter fire containment systems including curtain wall manufacturers and fire-stopping contractors.

Below, we look at each building's perimeter fire containment system and how the insulation and curtain wall teams collaborated to honor the design aesthetic while complying with codes.

181 Fremont

Completed in 2018, the mixed-use skyscraper towering 802 feet into San Francisco's skyline houses office space on lower levels with luxury condominiums above. But it is the building's intriguing curtain wall featuring a complex lap-shingle profile and large diagonal columns that presents a unique angle of the façade at every intersection. The complexity of the curtain wall and geometry of the building necessitated a highly customized approach to the perimeter fire containment assembly system.

Thermafiber Insolutions® collaborated with curtain wall manufacturer and contractor Benson Industries to secure the third-party engineering judgments required to address San Francisco's building codes while honoring the building's unique geometry. 181 Fremont's intersecting angles required a robust anchoring system to attach the insulation to the curtain wall. In addition, the differentiated spaces between where the wall and edge of the floor slab intersect on each floor presented the team with additional challenges to curtail "leapfrog" spread of fire up the sides of the building. Section 715.4 of the International Building Code requires that the void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly be protected. The unique design of 181 Fremont required each and every floor to be evaluated in terms of the perimeter fire containment barrier assembly and informed a proprietary Impasse® mechanical fastening assembly.

Components of the perimeter fire containment assembly system include Thermafiber® FireSpan® 90 Firestopping Insulation, Thermafiber® Safing Fire Containment Insulation and the Thermafiber Impasse® Insulation Hanger System. Formulated to secure the insulation in a manner that would not dislodge and cause early failure in the event of a fire, the hanger system supports the natural fire-resistant properties of mineral wool insulation. From a sustainability perspective, the 70% minimum recycled content in Thermafiber® insulation products contributed valuable LEED ® credits toward a LEED® Platinum targeted energy label.

Park Tower at Transbay

Also completed in 2018, the 43-floor office building pre-certified for LEED® Gold Design presented an unusual challenge for a West Coast skyscraper. The building's design featured a back pan assembly installed on the inside surface of the spandrel façade. Back pans are much more widely used in the Midwest and Eastern regions of the U.S. to address moisture management challenges. Typically, the choice of moisture management systems is left to mechanical engineers and the various analysts who address the thermal, vapor and air movement aspects of a building. However, use of a back pan was important to preserve the architect's design and ensure insulation would not be visible in some parts of the building.

As Thermafiber Insolutions® and Benson Industries evaluated options for perimeter fire containment assemblies, it became clear that only a few assemblies for back pans were listed. Among the options available, none would meet the construction details required for the building's facade. While the available options could be adapted to work within the design of Park Tower at Transbay, doing so would be cost-prohibitive for the façade manufacturer.

Faced with this dilemma, the teams donated materials and expertise to develop an alternative assembly design that would comply with building codes. The next challenge was testing the assembly in time to

avoid any construction delays. The collaboration resulted in a new system (CW-D-1037) that was tested and approved in less than a year. Again, recycled content in Thermafiber® FireSpan® 90 and Thermafiber® Safing Fire Containment Insulation contributed points to help Park Tower at Transbay achieve pre-certified LEED Gold.

Salesforce Tower

San Francisco's tallest structure, Salesforce Tower, is also the tallest building West of the Mississippi. The building soars to 1,070 feet accommodating 61 floors and enclosing 1.4 million square feet. The square geometry is offset by rounded corners composed of insulated glass panels and the top third of the building tapers to a perforated-metal screen at the building's pinnacle. In addition to helping conceal mechanical equipment visible during the day, at night the scrim provides a backdrop for illuminated public art.

As with 181 Fremont, design details required new ways of thinking about the perimeter fire containment system. While the rounded corners of Salesforce Tower contribute to the building's visual interest, team members found that, no listed assembly met the needs of the arced façade. Additional evaluation found variances such as the wider spandrel opening, curved curtain wall and the radius details at the corners of the building that presented special concerns when specifying the assembly. To address these conditions, Thermafiber drew from a repository of test data dating back to the 1960s, as well as third-party and internal test data, specific to the conditions. The evaluation was further supported by running a parallel engineering analysis with a third-party engineering firm.

From a review perspective, Salesforce Tower's perimeter fire containment assembly system was supported by reviewed drawings and engineering judgments provided by Thermafiber Insolutions®. Products used in the assembly system include Thermafiber® FireSpan 90 curtain wall insulation, Thermafiber® Safing fire containment insulation and the Thermafiber® Impasse® patented insulation hanger system. The recycled nature of these insulation products helped the building achieve outstanding floor-to-floor fire separation in compliance with building code requirements while also contributing to valuable LEED® credits targeting LEED® Platinum certification.

Critical Insights About Engineering Judgments

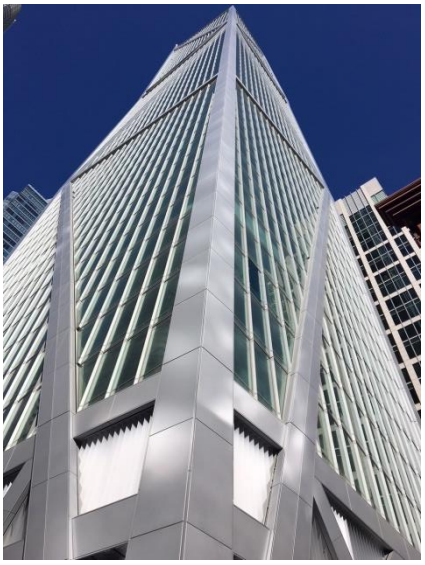
While every building has unique nuances, some takeaways are clear when it comes to perimeter fire containment barriers. For more than a half-century, Thermafiber® has pioneered perimeter fire barrier systems. Along the way some critical components for engineering judgments relevant to perimeter fire containment have arisen and these considerations factored into the judgments at 181 Fremont, Transbay Park and Salesforce Tower.

Engineering judgments must be specific and represent conditions unique to the building. The engineering judgment must address every detail of the curtain wall construction to support the hourly fire-resistance rendered. Collaboration between the curtain wall manufacturer and the perimeter fire containment assembly team is critical to identifying potential challenges and achieving desired performance. The International Firestop Council (IFC) has provided recommendations on writing

engineering judgments titled “Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments.” The guide places a strong focus on the importance of assemblies addressing specific conditions and configurations within the building.

Fire is a threat to building occupants regardless of region. In the event of a multi-story building fire, the integrity of the building design and proper installation of the firestopping system represent the first line of defense. Such a high burden of responsibility places pressure on architects and firestop contractors to properly install code-compliant perimeter fire containment systems. Collaboration between AEC and firestop parties along with a tight focus on specific conditions relative to the perimeter fire containment system and engineering judgments can help support life safety and comply with codes.

(For editor’s consideration: Source for building data: The Skyscraper Center.com)



Above left: 181 Fremont: The unique design of 181 Fremont required each and every floor to be evaluated in terms of the perimeter fire containment barrier assembly and informed a proprietary Impasse® mechanical fastening assembly.

Above right: Salesforce Tower required a customized approach to perimeter fire containment. Thermafiber drew from a repository of test data dating back to the 1960s, as well as third-party and internal test data.

Above: The SAFETY Act designation provides architects with protection against liability related to acts of terrorism.

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