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ON THE COVER

The Parks at Walter Reed is a transformative 26.71-ha (66-acre) site in Washington, D.C., featuring The Hartley (shown) and Clover at the Parks—two six-story LEED Gold mixed-use facilities. Designed by Torti Gallas + Partners, these buildings effectively manage stormwater and achieve a specific green area ratio. With 7,822 m^2 (84,200 sf) of roofing and approximately 4,775 m^2 (51,400 sf) of green roofing, they embody sustainable design and community renewal.
See article on page 17.

Photo courtesy Carlisle SynTec

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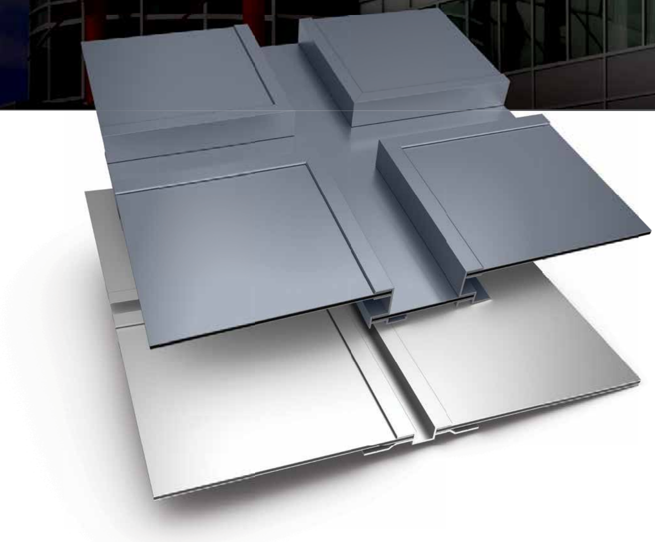

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The 2024 CSI National Conference Scholarship Recipients Share Their Experience


Patrick Abaga


Ashley Houghton, CSI-EP, CDT


Jillian Lopez, CSI

The CSI Foundation scholarship program provided three aspiring professionals with the opportunity to attend the 2024 CSI National Conference that took place in Houston, Texas.

We had a chance to catch up with them to learn more about their conference experience and how the scholarship program impacted them and their careers.

What has this scholarship enabled you to do that you might not have been able to do without it?

Patrick Abaga, CSI-EP: Earning this CSI scholarship has enabled me to stand out as a young professional in my workplace. I distinguished myself by attending the CSI National Conference and sharing insights with colleagues at all levels. The conference also broadened my view of spec writing and its impact on my field, leading me to become a more active CSI member beyond pursuing the CDT certification. Additionally, attending has removed my fear of networking and connecting with industry professionals.

Ashley Houghton, CSI-EP, CDT: This scholarship enabled me to attend a conference I typically wouldn't have considered attending. It also pushed me professionally and learn from excellent experts on how they're shaping and striving for better in our industry.

Jillian Lopez, CSI: I'm a student of architectural graphics engineering and have had the opportunity to design some residential additions within my family business. I also do construction management and work with developers to get through rezoning. Earning this scholarship opened the door to many connections and knowledge I wouldn't have otherwise been exposed to.

How was your experience at the CSI National Conference?

Abaga: Overall, my experience at the CSI National Conference was amazing. I met individuals interested in my personal development who offered to mentor me. I believed this conference would set the stage for my future professional interactions—and it did. Speaking with others about CSI and its impact on their careers has opened new ways of viewing my own.

Houghton: The CSI National Conference sparked a fire in me to push myself further at the start of my career. This conference shifted my mindset positively, looking toward hope and problem-solving instead of the troubles ahead.

Lopez: The conference offered a wealth of knowledge not only in the learning sessions but also through networking. It's incredible how many people from across the country and different industry sectors come together. Everyone I met was kind and eager to share their perspectives and knowledge. Sessions and presentations covered topics from fireproofing to expansion joints, cement, and even the economic state of the construction industry. There was truly something for everyone. Since the conference, I've applied some of the knowledge gained in my daily work.

What would you say to donors who help make these scholarships possible?

Abaga: Your contribution matters. At this stage in my career, I needed to start thinking about the path I wanted my career to take and building relationships to help achieve my goals. Thank you for making that possible. It's wonderful that donors create these opportunities for emerging professionals. I hope to one day support the next generation in their careers.

Lopez: Thank you to the donors who have made these experiences possible. As a single mom early in my career, I wouldn't have been able to invest in this on my own. I have a huge amount of gratitude for the organization.

What does being a part of the CSI community mean to you?

Houghton: Being a part of the CSI community means having a network of kind-hearted, hard-working, and resourceful people I know are there to help. The CSI community is among the most positive professional organizations I've seen. The desire to not hoard but share knowledge is rooted deeply in this community, and I love how passionate the leaders in CSI are. I truly believe everyone in this community works hard and has the mindset to build a successful future.

The CSI Foundation is committed to empowering more aspiring professionals like Patrick, Ashley, and Jillian to expand their knowledge and network. You can also help by supporting the CSI scholarship program. Learn more or contribute by visiting csiresources.org/institute/foundation **CS**

Closed-cell Spray Polyurethane Foam

Shrinkage and How to Manage it

By Rachel Lynde, P.E., Niklas Vigener, P.E., Spenser Simis

Photos courtesy Simpson Gumpertz & Heger (SGH) and Nate Holyoke Builders

CLOSED-CELL SPRAY POLYURETHANE FOAM (ccSPF) INSULATION IS USED IN EXTERIOR ROOF AND WALL ASSEMBLIES TO EFFECTIVELY COMBINE AIR/VAPOR/THERMAL BARRIER AND SOMETIMES WEATHER BARRIER (FIGURE 1, PAGE 10). A CRITICAL ASPECT OF CCSPF IS IT CAN UNDERGO POST-INSTALLATION DIMENSIONAL CHANGES THAT ARE PROBLEMATIC WHEN THEY RESULT IN BREACHES OF THE INTENDED BARRIERS. THIS ARTICLE DISCUSSES CONDITIONS THAT LEAD TO CCSPF SHRINKAGE AND SEPARATION FROM SUBSTRATES AND STRATEGIES TO MITIGATE THEM.

ccSPF is always combined with other functional components of the wall or roof assembly (*e.g.* water barrier, structural framing, ignition barrier, etc.) to create an effective, durable, and building code-compliant assembly. These components and their effect on building performance are outside the scope of this article. Similarly, open-cell spray polyurethane foam (ocSPF) is used in building envelope assemblies as an air and thermal barrier. It has different performance and technical characteristics than ccSPF and is also not addressed here.

ccSPF shrinkage and common installation defects

The chemical reaction that creates two-component ccSPF is the process of isocyanates (from one component) combining with polyols (from the second component) to create polyurethane that, with the help of a blowing agent, creates the ccSPF cell structure.[1] Water is part of one component, making moisture control critical during application. ccSPF components are pre-heated, but the chemical reaction is exothermic, resulting in the release of heat. The chemical composition of these components


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Figure 1

An example of closed-cell spray polyurethane foam (ccSPF) installation is at the underside of the roof sheathing.

Figure 2

Example of cracking and shrinkage in closed-cell spray polyurethane foam (ccSPF) at a wood rafter.

Figure 3

Large crack in closed-cell spray polyurethane foam (ccSPF) caused by loss of adhesion at roof rafter.

varies by manufacturer and includes admixtures that modify various properties, including reaction time, color, and ccSPF cell size.[2] During application, the ccSPF expands rapidly when the components are mixed during application, then shrinks as it cools, producing tensile and shear stresses on bonding surfaces. After hardening and curing, unrestrained ccSPF will shrink slightly (approximately 10 percent per manufacturer's testing), inducing more shrinkage forces in cured ccSPF.

Like any material, ccSPF also undergoes thermal movement in service in response to in-service temperature variations. If the ccSPF is unrestrained, the shrinkage component of the cycle may result in separation from surrounding materials with different geometries and expansion coefficients, and the growth component of the cycle may result in compressive loads on surrounding materials (Figure 2). Shrinkage cracks sometimes do not appear until well after installation and after the foam has been covered. So repairs (*e.g.* respraying), while workable, are often impractical given the pace of construction.

Designers and installers understand and compensate for these effects by sequencing installation to account for initial expansion (*e.g.* through installation in thin layers or alternating strips), compartmentalizing ccSPF installation between framing bays to limit large expanses that can cause splitting when shrinkage occurs, and by ensuring strong and uniform substrate bond that prevents delamination of the ccSPF from the substrate and evenly distributes strain.

Consequences of ccSPF shrinkage

The cracks and separations caused by ccSPF shrinkage are especially problematic where the ccSPF is a component of the building's air barrier (Figure 3). Air barriers require perfect continuity because even minor holidays allow rapid movement of conditioned air across the building enclosure, especially under differential pressure.[3] This air movement dramatically reduces thermal energy efficiency. In any building subject to variable temperature and relative humidity (RH) conditions between inside and outside (particularly mechanically humidified buildings), moisture-laden air can travel through breaches in the air barrier to colder regions within the enclosure assembly, where condensation can occur. The resultant moisture accumulation and material deterioration are particularly destructive in wood-framed or light-gauge steel construction and without drying potential (Figure 4 and 5, page 11).

Strategies to limit ccSPF shrinkage and separation from substrates

The following steps, which the designer of the ccSPF assembly should anticipate, can limit the impact of ccSPF shrinkage:

Substrate cleaning

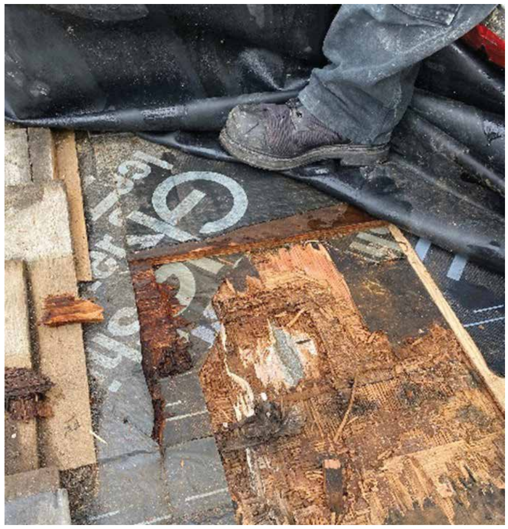
Substrate materials with coatings or contaminants that interfere with adhesion (*e.g.* light-gauge steel framing coated with rust inhibitors, cast-in-place concrete covered with form release agents) require diligent cleaning, not just because these coatings may interfere with adhesion but because they can be chemically incompatible with the ccSPF. The effectiveness of the substrate cleaning must be evaluated using adhesion tests on ccSPF sample installations.

Mechanical restraint

Substrate materials with very smooth surfaces (*e.g.* dimension lumber, laminated veneer lumber [LVL], architectural aluminum, stainless steel, and many air barrier membranes), even if they are free of contaminants, require roughening by mechanical means or the addition of a mechanically attached interference device that engages and restrains the ccSPF (Figure 6, page 12). Rigid lath used in stucco or tile construction is suited for this application and provides a physical bond substrate that holds the ccSPF in tight contact with the substrate to prevent shrinkage movement. The authors have had a satisfactory experience with metal (expanded or welded-mesh galvanized steel, welded-stainless steel) or fiberglass lath. All lath types must be furred to stand it off the substrate and allow the ccSPF to completely engulf the lath during installation and effect a tight bond to both lath and substrate (Figure 7, page 12). The lath should be installed on all substrates that do not provide sufficient bond and where lath shrinkage will cause breaches in the air barrier. Washered fasteners or staples are required to engage the lath, and fastener spacing must be sufficient to prevent bowing and lath displacement.

Adding the lath is important at air barrier membrane tie-ins along the perimeter of doors, windows, storefronts, and curtain walls (Figure 8, page 12). The ccSPF can bond tenaciously but unpredictably to some air barrier membranes. When it shrinks, the resulting force can overcome the adhesion of the membrane and pull it away from the substrate, opening up gaps in the air barrier. This effect is observable and sufficient to delaminate membranes in even very small expanses of ccSPF.

Figure 4



Plywood sheathing deterioration caused by condensation related to air leakage through cracks and shrinkage in closed-cell spray polyurethane foam (ccSPF).

Figure 5

Closed-cell spray polyurethane foam (ccSPF) shrinkage visible from top side of roofing after removal of deteriorated plywood sheathing.

Installation technique

During ccSPF installation over the lath, the nozzle should be pointed perpendicular to the substrate, and the ccSPF should be applied in a side-to-side motion so it penetrates through and encapsulates the lath and thoroughly wets the surface below. This is especially important if the lath has small openings, such as galvanized expanded lath. When the nozzle is held at an angle, the ccSPF penetrating under the lath cannot create the expansion pressure needed to fill the space behind the lath. If the application angle is too shallow, the ccSPF may glance off the lath completely, causing a continuous void space under the lath.

Installation conditions

Temperature

Ambient installation temperature and surface temperature affect the post-installation behavior of the ccSPF. Manufacturers list minimum ambient

Figure 6

Metal lath against masonry substrate with closed-cell spray polyurethane foam (ccSPF) partially installed.

Figure 7

Furred metal lath installed against wood framing held in place with washered fasteners.

Figure 8

Metal lath was installed on new wood roof framing members, and closed-cell spray polyurethane foam (ccSPF) was installed from the top side after the deteriorated roof sheathing was removed (Figure 4, page 11).

temperatures, which may require temporary heat if the building's permanent heating system is not yet functional, or temporary enclosures along with temporary heat if the ccSPF will be installed from the exterior (Figure 9, page 13). In addition to ambient temperature, manufacturers stipulate minimum substrate temperatures (typically around -6 C [20 F]). To provide contractors with installation flexibility, manufacturers formulate different material grades for different ambient temperature ranges and for different substrate temperatures, offering several different formulations. These requirements require vigilant field review because, for example, ambient temperatures and surface temperatures of the interior side of a roof or wall can vary within the same building. Because using different ccSPF formulations on the same building is typically impractical, the installer must manage the temperatures of interior spaces and substrates using supplemental heating and installation timing. The surface temperature must be checked using a handheld infrared thermometer to confirm appropriate installation conditions. Note that the temperature of heat-sink substrate materials, such as concrete, usually cannot be elevated sufficiently with interior heat; instead, select a ccSPF grade matched to this condition.

Relative humidity

Ambient humidity awareness and control are also important, and ccSPF must not be installed if the ambient temperature is near (typically within five percent) the dewpoint. Similar to adhesive or sealant installation, this requirement is intended to limit the risk of poor substrate bond when a thin layer of condensation or dew is present on the substrate. As for the substrate and ambient temperature, this requires either vigilant review or environmental controls, such as portable dryers or dehumidifiers, because the impact of a thin layer of dew on ccSPF bond is difficult to spot during application and defective bond is not apparent until test cuts and adhesion testing are performed.

Substrate moisture

High-moisture-content building materials, such as pressure-treated lumber or green concrete, can challenge ccSPF adhesion. Such adhesion problems may not manifest themselves until the installation is complete, and they could occur even if the substrate is surface-dry and has acceptable adhesion immediately following installation. Mitigating these adhesion problems without providing mechanical attachment is beyond the scope of this article. For wood framing, and as a starting point, the authors recommend confirming the moisture level of any wood framing is below 18 percent using a moisture meter. Framing lumber leaves the kiln at 19 percent but often sits exposed and re-absorbs moisture before the building is dried in. In this case, after the building is enclosed, portable dehumidifiers are set up and run for several days to several weeks before ccSPF installation is required to reduce the moisture level of the framing lumber.

Pre- and post-installation quality control measures

The following quality assurance and control measures are intended to guard against ccSPF adhesive failure and should be discussed and reviewed in a pre-installation meeting:

Detail review—Before installation, review the design to assess conditions that are vulnerable to ccSPF shrinkage or adhesion issues. These include fenestration tie-ins with sheet membrane, substrate materials with potentially high moisture content, smooth substrates to which the ccSPF may not bond, and areas that inadvertently invite very thick ccSPF applications. Identify materials with potentially high moisture content and anticipate mitigation strategies.

Applicator training/experience—ccSPF is a relatively mature technology, and reputable manufacturers provide product-specific applicator training. This training covers planning and quality assurance aspects such as product mixing and application, equipment checks and maintenance, pre-installation review and testing, and appropriate product selection for anticipated environmental and substrate conditions. Appropriate training and job experience increase the applicator's successful installation capability.

Figure 9

Temporary interior conditioning for closed-cell spray polyurethane foam (ccSPF) installation.

Use fresh component materials—Check manufacturing dates on component materials and verify how long open containers have been stored.

ADDITIONAL **INFORMATION**

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Key Takeaways

Closed-cell spray polyurethane foam (ccSPF) insulation effectively combines air, vapor, and thermal barriers in building envelopes. However, post-installation dimensional changes, such as shrinkage and separation from substrates, can lead to breaches in air barriers, reducing energy efficiency and causing moisture issues. This article highlights conditions contributing to ccSPF shrinkage, including temperature variations, moisture content, and improper substrate preparation. Strategies to mitigate these challenges include meticulous substrate cleaning, mechanical restraint through lath installation, and adherence to precise application techniques under controlled environmental conditions. Quality control measures are essential, such as adhesion testing, monitoring ambient conditions, and ensuring applicator expertise.

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Substrate bond
Thermal barrier
Vapor permeability

More than two weeks of storage after opening can degrade components and installed ccSPF quality.

Sample installations and adhesion testing—Using the specified materials, perform sample installation and adhesion testing on the project's actual substrate to assess substrate quality and required surface preparation.

Check ambient conditions and substrate moisture—At the beginning of each work phase, check the dewpoint, ambient RH, ambient temperature, and substrate temperature to confirm they are in the recommended range for the ccSPF product. Confirm the moisture content of porous substrate materials.

In-production checks—Keep in mind that substrate and ambient conditions vary, and the ccSPF mixing and dispensing equipment require set-up and adjustment at the beginning of each workday. Anticipate changes in these conditions and perform regular in-production checks to confirm acceptable adhesion. These checks should include test cuts that demonstrate the ccSPF bonds tenaciously. With strong adhesion, a ccSPF sample cannot be removed intact from the substrate but fails cohesively, with a portion of the ccSPF remaining bonded and requiring mechanical removal.

Conclusion

ccSPF insulation combines the functions of air, vapor, and thermal barriers and, when responsibly used, gives designers and builders design flexibility to conceive efficient and durable envelope designs. Its material properties and installation process can create challenges, including the potential for post-installation shrinkage, inadequate substrate bond, and vulnerability to adverse environmental conditions during installation. These challenges must be anticipated and managed during design, project planning, and construction. **CS**

Notes

[1] See the article "Troubleshooting Spray-Foam Insulation" *The Journal of Light Construction* at jlconline.com/how-to/insulation/troubleshooting-spray-foam-insulation_o

[2] Read the article "Spray-Foam Problems" Fine Home Building (October/November 2016), pages 46-49.

[3] Learn more by reading "Sealed Attics Exposed to Two Years of Weathering in a Hot and Humid Climate" ASHRAE Transactions, (2016) vol. XXX, Part Z.

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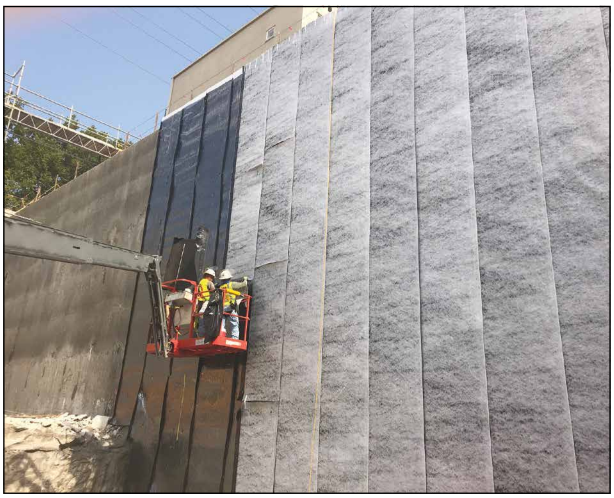

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Rain Check

How Green Roofs Manage Stormwater Runoff

By Chris Kann

Photos courtesy Carlisle SynTec

EFFECTIVELY MANAGING STORMWATER RUNOFF CAN BE COMPLEX AND CHALLENGING FOR URBAN PLANNERS AND DEVELOPERS. IN WASHINGTON, D.C., WHERE THE CITY IS SUSCEPTIBLE TO THE NEGATIVE IMPACTS OF STORMWATER RUNOFF AND SEWER OVERFLOW EVENTS, MANAGING STORMWATER RUNOFF IS CRITICAL FOR PROTECTING PUBLIC HEALTH, THE ENVIRONMENT, AND THE CITY'S INFRASTRUCTURE.

It may be no surprise, then, that in the District of Columbia, where the Department of Energy & Environment is the authority for overseeing stormwater management, there are strict construction requirements for on-site stormwater retention, with the overall goal of reducing the burden on the city sewer system to prevent pollution from reaching natural water bodies. The District's Stormwater Management Regulations stipulates construction sites "achieve retention of the rainfall from a 1.2-inch rainfall event, which is the ninetieth (90th) percentile rainfall event for the District of Columbia, measured for a twenty-four (24)-hour rainfall event with a seventy-two (72)-hour antecedent dry period."

So, when it came to specifying the new roofs at the former Walter Reed Medical Center site in Northwest Washington, managing stormwater collection and runoff was a high priority.

The redevelopment site

The Parks at Walter Reed is a 26.71-ha (66-acre) land development of the historic Walter Reed Army

The first step for installing the green roof was to map out the specific areas on each roof section that would eventually house the growth media. For this, the crew snapped lines and installed an aluminum garden edge, which they secured directly to the thermoplastic polyolefin (TPO) membrane using a membrane primer and 76-mm (3-in.)-wide tape.

Medical Center site, which, when fully developed, will contain 287,999-m^2 (3.1-million sf) of new construction and adaptive reuse of historic structures, including retail, for-rent and for-sale multifamily units, townhomes, offices, healthcare facilities, a school, and a hotel. The development will contain approximately 20,438 m^2 (220,000 sf) of retail, more than 27,871 m^2 (300,000 sf) of office space and ambulatory care, a 200-key hotel and conference center, a top-performing language-immersion school, and 2,787 m^2 (30,000 sf) of space for creative and arts use.

In addition, the project will include nearly 2,100 housing units to serve a diverse range of incomes, providing both rental and homeownership options. It will feature new roads, infrastructure, and nearly 8 ha (20 acres) of parks and plazas, all employing energy-saving and water-conserving technologies.

Two of the sites' new buildings—The Hartley and Clover at the Parks—are six-story mixed-use facilities. Both are stick-built over concrete podiums and have wood roof decks. According to Washington's strict stormwater management system, each had to be designed to treat and manage stormwater and meet a specific green area ratio on-site.

The facilities were designed and specified by the Washington office of the global architectural firm Torti Gallas + Partners and managed by Julian Goldman, associate principal, and Scott Welch, senior principal.

"This is a significant redevelopment project involving mixed-use residential and retail facilities," says Goldman. "The Hartley has a grocery store, fitness center, and pet grooming business at the street level plus 323 apartments above that range in size from studios to three-bedroom units. The building features two interior courtyards: one with a pool and an amenity space and the other with a Zen Garden. The Clover at the Parks building is a 60-unit co-living community comprised of 248 individually rentable bedrooms in two- to five-unit configurations. The facility also includes 2,229 m^2 (24,000 sf) of street-level retail space, a lounge, library, fitness center, conference room, game room, elevated courtyard areas, and a sixth-floor observation deck."

Elite Sheet Metal Works (Elite) of Beltsville, Md., installed the roofing systems on both LEED Gold mixed-use facilities. The two facilities include 7,822 m^2 (84,200 sf) of roofing and approximately 4,775 m^2 (51,400 sf) of vegetative green roofing, which accounted for approximately 61 percent of the total roof area.

Green roofing solution

Since this was new construction, the roofing work had to be completed in sections as construction allowed. In addition, it was a very congested and tight construction area, so the metal contractor had to load the roof several times. Its crew of eight to 12 worked across each facility while the roof was installed.

The roofing installation began amid the COVID-19 pandemic and the related supply chain issues. Securing the materials needed for the project was challenging. Still, in partnership with the roofing system manufacturer based in Carlisle, Pennsylvania, Elite was able to complete installation in a timely fashion.

To keep the roof garden green and growing, the Hartley has a 90,000-gal (340,687-L) cistern in the basement that collects water runoff from the building. That water is pumped back to the roof to a pop-up sprinkler system installed in the garden areas for watering.

The roofing assembly

Both facilities have the same assembly. From the plywood deck up, the roofing assembly consists of a self-adhered vapor and air barrier, a 40-mil membrane composed of 35 mils of self-adhering rubberized asphalt laminated to a 5-mil woven polypropylene film.

"The vapor barrier also acts as a temporary roof, so once that was fully down, the facility was essentially dried-in," says Joe Gretchen, an owner and principal with Elite.

With the vapor barrier down, the crew loose-laid two layers of 66-mm (2.6-in.) polyisocyanurate (polyiso) insulation, with staggered joints to reduce thermal bridging. The insulation was topped and protected by a layer of 1.2- x 2.4-m (4- x 8-ft) sheets of 12.7-mm (0.5-in.) gypsum cover board, which provided a flat and firm substrate for the green roof assembly.

Once the insulation and cover board were in place, an 80-mil white thermoplastic polyolefin (TPO) roofing membrane was installed. The TPO membrane is made with advanced polymerization technology that combines the flexibility of ethylene-propylene (EP) rubber with the heat weldability of polypropylene and offers a weathering package for long-term performance.

The crew fully adhered the membrane with a single-component, low-VOC (<250 g/L), spray-applied aerosol contact adhesive and primer.

After installing the membrane, a cover strip was applied to all the seams in areas designated for overburden installation. This added layer of protection ensures enhanced watertight integrity.

Both rooftops include 762-mm (30-in.) tall parapet walls around the perimeter. To terminate the membrane, the crew mechanically fastened the TPO at the base of the parapet and then welded another section of the membrane at the base, which was secured up and over the top using the single component adhesive. To finish the termination, a shop-fabricated coping cap was installed on top of the parapet wall. A 1-m (3-ft) wide walkway around the perimeter and to the mechanicals allows for periodic roof inspections and maintenance access to the mechanical equipment on the roof.

For the observation deck at Clover at the Parks, a 111.5-m^2 (1,200-sf) plaza paver system was installed utilizing nominal 610- x 610- x 50.8-m (24- x 24- x 2-in.) concrete pavers and adjustable height pedestals. Tables and chairs were placed on top of the plaza paver system for the residents to enjoy the natural space.

Green roof sections

The first step for installing the green roof was to map out the specific areas on each roof section that would eventually house the growth media. For this, the crew snapped lines and installed an aluminum garden edge, which they secured directly to the TPO membrane using a membrane primer and 76-mm (3-in.)-wide tape.

In total, the two facilities include 7,822 m^2 (84,200 sf) of roofing and approximately 4,775 m^2 (51,400 sf) of vegetative green roofing, which accounted for approximately 61 percent of the total roof area.

"Laying out each area and installing the aluminum edge was somewhat time-consuming because we had to be precise with the measurements," says Gretchen. "Plus, we had to build a separate area at the base of the penthouse for a deeper layer of growth media for a green screen."

On the Hartley, a penthouse mechanical enclosure stands about 2-m (7-ft) tall in the center of the roof. The architect designed a 'green screen' installed in front of the structure to increase the green area ratio on the roof and hold climbing vines that would eventually hide the structure from the surrounding buildings. In addition, some mechanical and vent units were in each green area on 0.3-m (1-ft) tall curbs that had to be carefully flashed before they could install the growth media.

Once the green areas were mapped out and the aluminum edging was in place, Elite loose-laid a non-woven polypropylene fabric in each area. The material is designed to resist soil, chemicals, mildew, acids, and alkalis, and protects the TPO membrane below.

The next step was loose laying a drainage composite consisting of non-woven filter fabric bonded to a molded polypropylene core that offers superior filtration and prevents small particles from clogging the drainage channels in the aluminum edging.

A highly absorbent moisture retention blanket is often essential for projects with stringent stormwater management requirements. In this case, to meet the specific stormwater needs of the project, two layers of 25.4-mm (1-in.) thick mineral wool blankets were installed. These layers were designed to optimize water retention and filtration while promoting root growth and fostering healthy vegetation.

A layer of 101.6-mm (4-in.) of growth media was then installed over the top. For this, the crew used an outside service to blow the growth media onto the roof and into each garden area. Then, the crew carefully raked the media to the correct depth and compacted it with a 113-kg (250-lb) roller.

The last step was to install sedum mats, which are pre-grown with 17 different varieties of sedums for applications in most climate zones. The mats were about 1- x 1.98-m (3- x 6.5-ft)-long.

"We first wet down the growth media and then rolled out the mats to fit within the garden areas. The nice thing with the mats is instant vegetative coverage, so the roof looks great from the start," explains Gretchen.

To keep the roof garden green and growing, the Hartley has a 90,000-gal (340,687-L) cistern in the basement that collects water runoff from the building. That water is pumped back to the roof to a pop-up sprinkler system installed in the garden areas for watering. The irrigation system can be activated for sedum maintenance as needed. It also automatically runs after a rain event to contribute to the site's required stormwater treatment capacity.

For the observation deck at Clover at the Parks, a 111.5-m^2 (1,200-sf) plaza paver system was installed utilizing nominal 610- x 610- x 50.8-mm (24- x 24- x 2-in.) concrete pavers and adjustable height pedestals. Elite installed the pavers and pedestals over the same non-woven polypropylene fabric installed in the green roof areas, which provides physical protection to the membrane both during and after the paver system installation. In contrast, the adjustable pedestals ensure a perfectly level assembly. Tables and chairs were placed on top of the plaza paver system so that the residents could enjoy the natural space.

After the installation, the roofing manufacturer issued a single-source 20-year overburden warranty. This warranty, an extension of the roof system warranty, covers the green roof and plaza paver systems, including removal and replacement in case of a claim. Single-source overburden warranties, available exclusively through roofing system manufacturers, offer building owners a single point of contact for any warranty claims, providing peace of mind and protection from unexpected and costly liabilities.

To keep the roof garden green and growing, the Hartley has a 90,000-gal (340,687-L) cistern in the basement that collects water runoff from the building.

The green roofs at the Parks at Walter Reed offer a wide range of benefits for the community and the building. Not only do they help alleviate stormwater runoff, but the green roof can help extend the life of the roofing membrane by protecting it from extreme temperature fluctuations and ultraviolet radiation. In addition, they help reduce the local urban heat island effect since they minimize emissivity and can help lower nearby air temperatures. Lastly, the green roof and plaza paver systems provide a space for residents to gather, enjoy the space, and breathe in the aesthetically pleasing natural beauty of the green roof, which contrasts nicely against the city views of Washington, D.C. **CS**

ADDITIONAL **INFORMATION**

Author

Chris Kann brings more than a decade of experience to his role as product manager for specialty systems and sustainability at Carlisle Construction Materials. Since joining the company in 2010, he has dedicated himself to innovation and sustainability, leveraging his degree in the science of plastics and polymer engineering technology. Throughout his career, Kann has spent considerable time assisting architects, specifiers, consultants, and representatives in the design and implementation of environmentally friendly overburden and building envelope systems.

Key Takeaways

The redevelopment of the Walter Reed Medical Center site in Washington, D.C. includes two mixed-use buildings with green roofs to manage stormwater runoff and meet strict local regulations. The roofs feature a layer of sedum mats, water retention systems, and plaza pavers, enhancing sustainability, reducing heat island effects, and improving community spaces.

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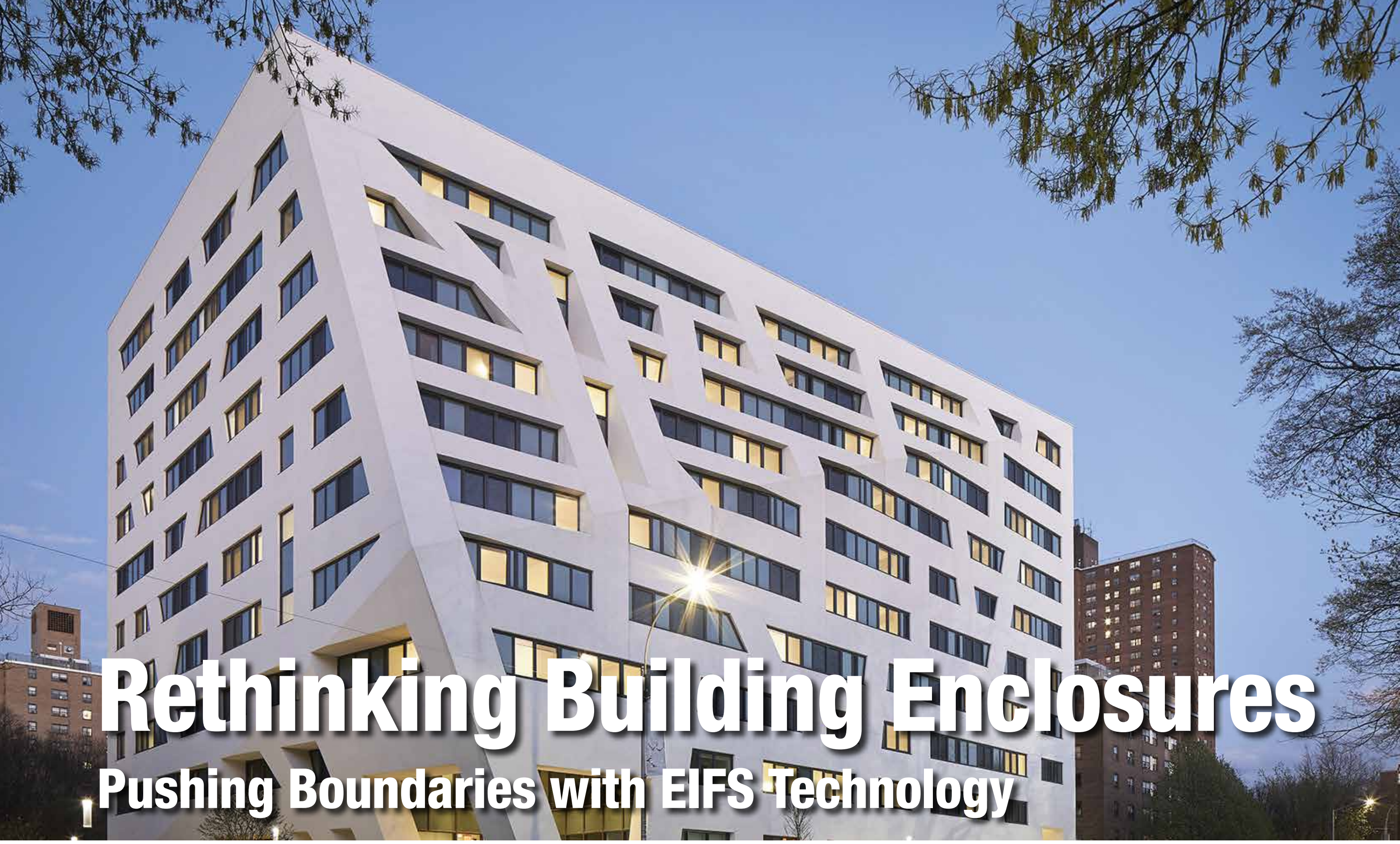

Rethinking Building Enclosures

Pushing Boundaries with EIFS Technology

By Daniel A. Canova

Photos ©Hufton+Crow

THE ATRIUM AT SUMNER, AN 11-STORY AFFORDABLE SENIOR HOUSING PROJECT IN BROOKLYN, N.Y., EXEMPLIFIES HOW EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) CAN BE USED TO ACHIEVE HIGH-PERFORMANCE BUILDING ENCLOSURES. AS A NEW CONSTRUCTION PROJECT UNDER THE NEXTGENERATION NEW YORK CITY HOUSING AUTHORITY (NYCHA) INITIATIVE, THE DEVELOPMENT ALIGNS WITH PASSIVE HOUSE STANDARDS, DELIVERING EXCEPTIONAL ENERGY EFFICIENCY AND SUSTAINABILITY.

This case study explores how EIFS was instrumental in meeting these rigorous performance requirements while addressing the unique design and construction challenges for affordable housing.

Built to the highest energy standards

NextGeneration NYCHA is proactive about creating sustainable carbon-neutral housing. Recognizing the inefficiencies of older buildings under their management, which often have little to no insulation, the initiative set out to construct the Atrium at Sumner to high standards and the highest energy standards globally—Passive House standards.

Passive House is the world's leading standard in energy-efficient construction. The Atrium at Sumner meets many of the Passive House requirements, including the requirements for airtightness and thermal control in the building envelope, through its significant green and energy-efficient features, which include 101.6-mm (4-in.) expanded polystyrene (EPS) insulation. All the EIFS components are adhered, no fasteners are used—eliminating any risk of thermal bridging. All features will result in 60 to 70 percent lower energy consumption for the Atrium at Sumner than for the average New York City apartment building. The physical design of the building also plays a role in energy savings.

EPS insulation, like that used in the Atrium at Sumner project, typically has an R-value of approximately 4 per inch, providing effective thermal resistance. Its closed-cell structure enhances its moisture resistance and long-term thermal performance. Sustainability aspects include its ability to be recycled, lower embodied carbon footprint due its light weight and its energy efficiency over its lifecycle, significantly reducing energy consumption and associated carbon emissions.

Design specifics

The NYCHA chose Studio Libeskind, an international architecture firm headquartered in New York City, for the project. As the Studio's website notes, "We believe that bold design must be realized with sustainable technology," a philosophy that aligns with NYCHA's goals.

Studio Libeskind wanted to create a space that enhanced the residents' quality of life. The design features a dynamic yet rational geometric form punctuated by open and solid elements.

The design team aimed to interact actively with the street and the surrounding context. Bold diagonal lines wrap the building at angles that rise from the ground, creating a folding form that breaks down street-level massing. A glazed entrance lobby creates a transparent and open connection to the street. The residential facility is a courtyard building with corridors facing inward toward a central green public space on the second floor.

The design's folding forms and diagonal lines serve both aesthetic and functional purposes. They visually break down the massing of the building to integrate better with its urban environment and create dynamic interactions with natural light. This design likely enhances the building's thermal performance by optimizing sunlight exposure, aiding in heating during the winter and reducing heat gain during the summer.

"Growing up in social housing in the Bronx gave me a unique perspective on the importance of community and high-quality, affordable housing. I took this insight to task when designing the Atrium at Sumner Houses; I wanted to create a place that felt like home to the residents," says principal design architect Daniel Libeskind. "I hope this project is a powerful example of how good design can positively impact society, especially for those in need."

Studio Libeskind collaborated with many partners to make this vision a reality while meeting the energy efficiency standards required by the NYCHA.

A collaborative process

Studio Libeskind reviewed the details and challenges at the start of the project. Ultimately, it became clear an exterior insulation finishing system (EIFS) system with a limestone finish was the ideal choice, providing the project with a smooth, natural limestone look.

The EIFS included a drainage continuous insulation (c.i.) wall system that integrates an air and water-resistive barrier (AWRB), EPS insulation, and drainage. In other words, it has the five control planes needed to protect a building. The five layers of control are accomplished in an EIFS assembly as follows:

- Vapor control: Water vapour diffusion from areas of high to low vapor pressure must be controlled to minimize condensation within the wall assembly. Materials for each of the control layers in EIFS are specified as vapor-permeable or vapor-impermeable in accordance with recommendations from hygrothermal analysis of the exterior wall assembly.
- Air control: A fluid-applied membrane is the first layer applied in a typical EIFS assembly and must be tied into air control layers in adjacent assemblies to limit the uncontrolled airflow through the exterior wall, reducing condensation and energy loss.
- Water penetration control: The fluid-applied air control membrane in EIFS also serves as a barrier to liquid water and must be flashed to the exterior, designed and installed to prevent liquid water from entering the wall cavity. In a drainage EIFS system, vertical channels in the inboard surface of the insulation provide a reliable route for liquid water to drain to the exterior of the wall assembly.
- Thermal control: Since there is no external cladding and a metal support system is needed, EIFS provides continuous insulation with essentially no thermal bridging.
- Durable water-shedding: The outboard surface of EIFS is coated with functional finish surfaces connected to a resilient lamina to protect and divert water from the wall.

Challenges

On this unique facade, the perimeters of window penetrations are configured with angular profiles oriented to capture sunlight in the winter while allowing sunlight to cascade over the facade in the

On this unique facade, the perimeters of window penetrations are configured with angular profiles oriented to capture sunlight in the winter while allowing sunlight to cascade over the facade in the summer.

summer. As part of this dramatic design, the windowsills are set back into the facade. The setbacks could have made applying basecoats and finishes on the angled profile surfaces difficult. Fortunately, booms and hanging scaffolding helped crews access the hard-to-reach areas.

The integration of angled windows strategically manages sunlight exposure, minimizing heat gain during summer while allowing more natural light and heat during winter. This thoughtful placement contributes to the building's overall energy efficiency and occupant comfort.

Some of the profiles' flat, level surfaces could have led to water intrusion issues and costly repairs if not treated properly. The contractor met this challenge by using an acrylic-based, fiber-reinforced, flexible adhesive and waterproofing basecoat to build a water-resistant surface that sloped away from the building. This basecoat was applied to prepared concrete, masonry, plaster, gypsum, and cement sheathing surfaces at all windowsills and other horizontal surfaces. Once it had dried, a smooth finish was troweled on to achieve the appearance envisioned by the architect.

To prevent water intrusion, the team used an acrylic-based, fiber-reinforced adhesive and waterproofing basecoat to create sloped ledges that shed water effectively. Maintaining the continuity of all five control layers required precise detailing at transitions, including the use of compatible materials and integration techniques to ensure a robust envelope.

The finished project

Construction on the Atrium at Sumner finished in May 2024. The new building features 190 apartments—132 available to senior households earning below or equivalent to 50 percent of the Area Median Income (AMI), 57 reserved for seniors who had formerly experienced homelessness, and one designated for a live-in superintendent. NYCHA residents will be given preference for 33 of the apartments.

The project demonstrates how EIFS can effectively meet and exceed design performance goals, particularly under the stringent Passive House standards. By integrating continuous insulation, AWRBs, and a seamless, durable finish, the system provided a sustainable solution that enhanced energy efficiency, occupant comfort, and long-term durability. **CS**

ADDITIONAL **INFORMATION**

Author

Daniel Canova Sr. has worked in the construction industry for 40 years. His experience and employment has been focused on the exterior building envelope. Canova Sr. is a construction design manager and international design manager for Sto Corp. He is directly responsible for providing sales and technical support for Sto Corp. in all major cities and city centers in the United States. His specific responsibility includes sales and technical support focused on exterior insulated finish systems (EIFS), traditional cement stucco systems, pre-fabricated exterior wall systems, back ventilated rainscreen systems, fluid-applied air and moisture barrier systems, concrete restoration and exterior repair systems, products, and specialized material application equipment.

Key Takeaways

The Atrium at Sumner, an affordable senior housing project by the New York City Housing Authority (NYCHA), prioritizes energy efficiency with Passive House standards. Featuring high-performance exterior insulation and finish systems (EIFS), the building integrates an air—and water-resistant barrier, enhancing insulation and reducing energy use by up to 70 percent.

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Sealing the Sacred

How Advanced Coatings Protect Foundations

By Ron Kelly

Photo ©Davidshenbo/courtesy Dreamstime.com

AFTER 13 YEARS OF CONSTRUCTION, THE BIGGEST HINDU MANDIR (TEMPLE) IN THE WESTERN HEMISPHERE OPENED IN FALL 2023 ON MORE THAN 73 HA (183 ACRES) OF FORMER SOY FARMLAND IN RURAL ROBBINSVILLE, N.J. IT IS NO SURPRISE THAT THIS STRUCTURE WAS BUILT HERE SINCE THIS EAST COAST STATE IS HOME TO ONE OF THE LARGEST POPULATIONS OF HINDUS OUTSIDE OF INDIA.

Standing 58 m (191 ft) at its tallest point and decorated with 10,000 statues, the highly intricate, carved stone Swaminarayan Akshardham is a religious symbol amid fields of green. It is constructed of more than 53,802 m^3 (1.9 million ft^3) of interlocking, load-bearing stone—granite, limestone, marble, sandstone—and other decorative minerals from many countries, including Bulgaria, China, Greece, India, Italy and Turkey.[1]

Unique design

Almost all aspects of the structural measurements, ratios, direction, layout, and aesthetic designs of the Mahamandir (great temple) structure are rooted in the ancient architectural treatises of India called the Shilpa and Sthapathya Shastras. The campus includes the Akshardham (divine abode of God) with a central shrine and 12 sub-shrines with sacred images of deities from across the Indian subcontinent; a canopy plaza with a 14-m (49-ft)-tall bronze statue of Bhagwan Swaminarayan—the temple's supreme god, a welcome center, vegetarian cafe, stepwell, courtyards, fountains, and gardens.

The design focuses on sustainability, preserving the wetlands on and around the site and employing a solar panel farm that produces about one gigawatt of power daily. Heated stone floors provide a comfortable interior environment in the winter under the largest elliptical dome in any mandir.

The interior structure is more than four stories high and comprises 13,499 individual carved stone pieces, majority of which are Italian marble. Virtually every square inch of the mandir is adorned with intricate carvings or inlaid stones, all done by craftspeople in India. The mandap, the building that houses the mandir, is 16-m (55-ft)-tall and has an imposing decorative gate studded with 235 peacocks. The cultural complex is designed to honor Indian culture, heritage, and values.

Waterproofing for the future

The temple's stonework construction coordinator, Bharet Patel, retained Pennsylvania-based Cardinal Group Services, Inc. Joe Markferding, president of Cardinal Group Services, knew his crew would be up to the challenges within the many components of this unique project.

The company was brought on to waterproof the structure's large cement foundation and selected a California-based manufacturer of polyurea, polyurethane coatings and elastomers. They applied a fast-setting, rapid-curing, two-component spray polyurea. Following this, the crew applied a hybrid aliphatic polyurea elastomeric membrane—a flexible, highly durable protective coating formed by combining a UV-resistant aliphatic polyurea with other resin components—to seal below the stonework, pavers, and other finishing materials. Construction also included a hand-applied, two-component polyurethane elastomeric coating for additional below-grade work prior to the many structures on the complex being constructed.

When Patel saw the foundations' durability, which thousands of contractors had walked across for many years of construction, he knew additional waterproofing products from the company would be perfect for other areas of the complex. For example, a waterproof adhesive was used below grade for the ornamental covered walkway on the perimeter surrounding the main temple. Additionally, the flat concrete decks around the temple have liquid-applied urethane coating installed to weatherproof and enhance aesthetic appeal, preserving the structure's beauty for generations.

Waterproofing was done below grade for the foundation walls, sealing masonry surfaces, and retaining walls to prevent water infiltration into the structure. Liquid-applied urethane coating was used because it forms a seamless, leak-free membrane capable of withstanding permanent ponding water conditions. It also protects the surface from impact damage such as cracks and chips while preventing water infiltration.

Sprayfoam roof

Cardinal Group Services' crew worked with a California-based insulation manufacturer to ensure the roof's long-term durability.

The main temple is well-protected and resilient against the environment. The primary roof, which is 929 m^2 (10,000 sf), has 127 mm (5 in.) of thermal insulation and waterproofing. It was then protected with 100 DFT mils of aromatic polyurea base coat. Finally, two coats of UV-reflecting silicone elastomeric roof coating were applied to finish the fire-classified roof assembly.

The benefit of the installed sprayfoam roof system is it provides a seamless and fully adhered field-applied membrane. Spray foam, with its self-flashing around irregular penetrations, over joints, sealing transitions, and build up cants areas offers no pathways for water intrusion. This monolithic membrane allowed the Cardinal Group Services team to build a positive slope, enhance drainage, and eliminate ponding.

The Spray Polyurethane Foam Alliance (SPFA) life cycle assessment (LCA) studies by Ted Michelsen (2004) for the SPF industry concluded that "Spray polyurethane foam roofs have a very favorable 30-year life cycle cost compared to membrane roof systems in most situations; in many situations they will have competitive or lower initial costs, as well."

SPFA's 2018-2023 environmental product declaration (EPD) on hydrofluoroolefins-based (HFOs-based) sprayfoam roofing showed LCA on use phase (B1) 9.05E-03 for GWP100, Intergovernmental Panel on Climate Change (IPCC), AR5 (kg CO2 eq). SPFA also has a new HFO roof foam LCA and EPD publishing in early 2025.

The installed HFO roof foam, with its 6.9 R-value per inch, offers an energy-efficient system with reasonable life cycle paybacks. The high-solids silicone roof coating enhances the building's weather-ability and ponding resistance in the challenging New Jersey winter.

"Ensuring the integrity of the mandir's foundation and roof is critical since hundreds of thousands of worshipers and tourists will visit annually and we cannot close anything for repairs," says Patel.

Longevity

As a symbol of cultural heritage and architectural excellence, the BAPS Shri Swaminarayan Mandir is a testament to the seamless fusion of tradition and innovation. The insulation and waterproofing products and systems ensure the temple's legacy is safeguarded, inspiring admiration and reverence for years to come. **CS**

ADDITIONAL **INFORMATION**

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Key Takeaways

The BAPS Shri Swaminarayan Mandir in Robbinsville, N.J., opened in 2023 as the largest Hindu temple in the Western Hemisphere. Combining traditional Indian architecture with sustainable design, the intricately carved stone temple spans 73 ha (183 acres). Advanced waterproofing, insulation, and solar energy systems ensure its resilience and legacy for generations.

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A WINDOW OF OPPORTUNITY

The Renovation of Indianapolis' Coca-Cola Bottling Plant

By Jeff Kibler

Photos courtesy Weather Shield

THE 1930S-ERA ART DECO INDIANAPOLIS COCA-COLA BOTTLING PLANT EMPLOYED THOUSANDS OF WORKERS THROUGHOUT SOME OF THE NATION'S MOST TURBULENT DECADES—UNTIL THE 1960S, WHEN PLANT OWNERS MOVED THEIR EXPANDING BOTTLING OPERATIONS TO SPEEDWAY, INDIANA, LEAVING BEHIND ONE OF THE CITY'S MOST BELOVED LANDMARKS. AFTER YEARS OF STEADY DETERIORATION, HENDRICKS COMMERCIAL PROPERTIES SAVED THE ARCHITECTURAL GEM FROM RUIN BY INITIATING A GRAND RESTORATION PROJECT FOR THE LONG-NEGLECTED BOTTLEWORKS DISTRICT.

Reviving a historic landmark

As director of preservation for Indianapolis-based RATIO Architects, Dave Kroll and his design team were chosen to transform the fading North Mass Avenue property into a 139-room boutique hotel and garage food hall while resurrecting its past splendor. This anchor project launched the first phase of the anticipated $300-million overhaul.

"We get into buildings that have been around for a long time for good reason—they are well-built and have served a significant and worthwhile purpose in society. We retain as many of the features and materials as possible and replicate what cannot be saved," says Kroll.

The original Coca-Cola Bottling Plant and garages comprised the oldest and most lavish structures in

During the ongoing historical approval process, collaboration was key for any necessary architectural modifications and adjustments.

the Bottleworks complex, and great care was taken to preserve the design's historical integrity. One of the site's most treasured features, the exquisite terra cotta facade, steadily deteriorated due to weathering and neglect. A team of specialty masons made painstaking efforts to repair and restore the exterior to its original grandeur.

Meticulous window restoration process

Julie Zent, historic window specialist for RATIO, took on the intricate task of matching the 150-plus original wood windows that once complimented the plant's decorative exterior. She worked with Dan Kovas of Huntertown, Indiana-based G-2 Architectural Products for nearly two years to orchestrate window design details, specifications, updates, and product delivery. All historical replications were sourced through the author's firm in Wisconsin.

To qualify for historic rehabilitation tax credits and receive local historic district approval, Zent coordinated with three organizations at the local, state, and federal levels—the Indianapolis Historic Preservation Commission (IHPC), the Indiana State Historic Preservation Office (SHPO), and the National Park Service (NPS). The sign-off process required close communication and cooperation since approvals at all three levels were essential.

For a project of this magnitude, the design team had to create models in advance before moving to production. While most of the bottling plant's windows had been discarded in favor of low-cost replacements, some originals remained in the garages.

Combining modern technology with traditional craftsmanship

"Knowing what to do and doing it early was crucial to staying on track. On our first day on-site, Jeff and I were able to get samples of the original window components and get them back to Wisconsin for analysis," says Kovas.

Although deteriorated, they could get accurate dimensions from those windows, eventually allowing them to duplicate the design. This saved time, money, and hassle. If no original units had been left in place, Zent's team would have relied solely on documentation, drawings, and photos to calculate sizes.

During the ongoing historical approval process, Kovas closely collaborated with the author and his firm's team to implement any necessary architectural modifications and adjustments.

"The exciting part of obtaining the artifact samples was enabling the Weather Shield crew to initially create plastic 3D printer replicas of the wood components so the architects could make modifications before we moved into the shop drawing phase," says Kovas. "This added precision to the operation and ultimately accelerated the timeline for approval."

Once the detailed side-by-side shop drawings of the original unit and the proposed replication were finalized, Broderick and his team could create a full-sized mockup in their workshop.

For a project of this magnitude, the design team had to create models in advance before moving to production.

"The multistep process was a combination of modern technology and old-school woodworking," noted Kovas.

A new era for the Bottleworks District

The resulting design included three customized components: brick mold, sash lug, and bottom sill. In addition, the team matched the original exterior Coca-Cola paint color. They also provided several historically accurate stains and colors for the various interior spaces, including a designer stain to match the paneled office spaces.

"The window replication process is complex. Fortunately, our local and state people worked well together to reach a consensus. Discussion on changes often included up to nine people weighing the pros and cons and working towards a resolution," explains Zent.

One of those early discussions occurred at the mockup installation site, where a group of developers, architects, and historical advisors gathered to view the product and compare the details to one of the original units. The side-by-side contrast created a then-and-now visual that displayed the craftsmanship that went into the beautiful replication. Onlookers could see the window as it looked nearly 100 years ago—with modern weatherproofing added to the design.

The window and door manufacturer first produced a mockup, allowing the various contributors time to provide feedback. After minor tweaks were requested, the core design was approved the first time around.

Although the original windows were double-hung, the design team required the sashes to be fixed for climate control. In contrast, the garage windows were designed to be fully functional double-hung units. All specified product directives were completed at the manufacturing plant before shipping.

The manufacturer provided 14 different sizes in four separate configurations. Due to the complexity of the terra cotta restoration, the openings varied in size throughout, resulting in subtle modifications to multiple units.

Installer and entrepreneur Sean Edwards of National Glass & Hardware LLC worked with the window team from the early days of the mockup. His crew carefully removed the old units while working with terra cotta artisans to repair any delicate crumbling components.

"The installation was implemented in phases as different portions of the facade neared completion. We installed the windows in various sizes, which were extremely maneuverable," said Edwards.

In addition to the ornate exterior restoration, the RATIO team also designed the Art Deco interior spaces. As Bottleworks Hotel visitors return from foodie outings or a game of Indy-style duck pin bowling, they will be dazzled by an impeccably refurbished lobby filled with

The resulting design included three customized components: brick mold, sash lug, and bottom sill.

colorful polished tile and shining brass fixtures, evoking an atmosphere of a bygone era.

The aesthetic impact of the design is already turning heads in downtown Indy. The clean lines of the historic window design complement the sparkling terra cotta restoration. The hotel welcomed its first guests on December 15, 2020, while putting the finishing touches on its office spaces.

The nearby garage food halls unveiled 14 restaurants and shops on January 5, 2021. Designed as a marketplace, the 3,344-m^2 (36,000-sf) venue expanded in spring 2021 with additional shops, offices, and increased parking, while also offering live music for an enhanced visitor experience.

As Phase I of the Bottleworks Restoration neared completion, Kroll reflected, "Our duty is to preserve the character of the building while finding innovative ways to create new uses for spaces—windows are an integral part of the authentic design." **CS**

ADDITIONAL **INFORMATION**

Author

As the director of architectural development at Weather Shield Windows & Doors, Jeff Kibler leads a team of internal and external consultants dedicated to supporting the architectural community with tailored solutions for their fenestration needs. He oversees the creation of tools and resources that help architects specify his firm's products and drive commercial sales growth. With more than 30 years of experience in the window and door industry, his background spans product management, marketing, and brand development. He holds a bachelor's degree from the Southern Illinois University School of Architecture.

Key Takeaways

The historic Indianapolis Coca-Cola Bottling Plant was transformed into the Bottleworks Hotel and Food Hall, with a focus on restoring its iconic terra cotta facade. Skilled masons repaired the deteriorated cladding, while more than 150 wood windows were meticulously replicated using modern techniques, blending historic accuracy with weatherproofing. This restoration balanced preservation and innovation, ensuring the building's art deco charm remains a centerpiece of the revitalized Bottleworks District.

MasterFormat No.

08 00 00—Openings
08 50 00—Windows
08 80 00—Glazing

UniFormat No.

B20—Exterior Vertical Enclosures
B2020—Exterior Windows

Keywords

Division 08
Coca-Cola Bottleworks
Bottleworks window restoration
Historic renovations
Bottleworks District

UNDERSTANDING FURNITURE POWER CODES

Guidelines for Safe and Compliant Installation

By Kathleen Neighbors

Photos courtesy Legrand

IN TODAY'S MODERN COMMERCIAL SPACES, ACCESS TO CONVENIENT POWER, CHARGING, AND DATA IS AN ESSENTIAL AMENITY FOR BUSINESSES TO ACCOMMODATE THE DIVERSE NEEDS OF BOTH EMPLOYEES AND PATRONS. WITH THE PROLIFERATION OF ELECTRICAL DEVICES IN DAY-TO-DAY TASKS, THERE IS AN INCREASING DEMAND FOR SEAMLESS ACCESS TO POWER SOURCES WITHOUT COMPROMISING AESTHETICS OR SAFETY.

Power codes refer to the set of regulations and standards governing the design, installation, and use of electrical systems and devices, such as power strips and furniture-mounted outlets, within commercial spaces. These codes ensure power solutions are not only functional but also safe, compliant with national electrical safety standards, and integrated with the overall design of a space.

As businesses grow and evolve, developing a comprehensive understanding of furniture power codes becomes crucial for offering safe, compliant, and high-quality power solutions. Familiarity with these codes enables businesses to implement furniture power solutions that align with design preferences and adhere to strict regulatory standards for electrical safety.

A deep dive into the essential codes governing the installation and use of furniture power devices will provide valuable insights. This includes exploring key UL listings, differentiating various mounting options, understanding overcurrent protection, and addressing best practices regarding daisy chaining. Equipped with this knowledge, professionals can deliver high-quality, safe, and compliant power solutions tailored to the demands of modern commercial environments.

Understanding UL Listings: UL962A versus UL1363

UL962A and UL1363 are two important safety standards established for furniture power products. Although they both apply to furniture power sources, understanding their fundamental differences is essential for appropriate product selection, safety compliance, earning customers' trust, and demonstrating knowledge of industry standards.

- UL962A: Used to evaluate Furniture Power Distribution Units (FPDUs), emphasizing fire resistance and grounding integrity. Compliance with UL962A helps prevent common electrical hazards, such as fires or shocks, encountered in furniture with built-in electrical components.
- UL1363: Pertains to Relocatable Power Taps (RPTs) and focuses on surge protection capability and insulation. It sets specific criteria for construction materials of these devices to help minimize the risk of fire and electrical shock hazards.

The question of daisy chaining

In the context of furniture power, daisy chaining refers to the practice of connecting multiple FPDUs or RPTs in a series. It is often used for convenience, as it allows the reach of a single power source to be extended to various devices without additional outlets.

Despite the convenience, daisy chaining is discouraged by both UL962A and UL1363. Both standards specify these devices should be directly connected to a permanently installed branch circuit receptacle outlet and not be daisy-chained to other FPDUs or RPTs. Educating customers on this furniture power best practice is crucial as it helps prioritize safety and adherence to proper installation practices that prevent dangerous hazards and accidents.

Several brands now offer compliant furniture power solutions specifically listed to be connected.

Differentiating mounting options

FPDUs and RPTs have different applications and characteristics. The main difference is how the devices are intended to be utilized and installed.

- FPDUs are designed for fixed installation within portable or stationary furniture, such as desks, tables, and cabinets. They provide a reliable power supply for cord- and plug-connected devices, seamlessly integrating into the furniture's design. FPDUs are ideal for settings where a permanent, organized power solution is required.
- RPTs are portable and not meant for permanent installation. Commonly used as power strips or extension cords, RPTs are designed for temporary power distribution, allowing them to be easily moved and repositioned as needed. They are versatile solutions for environments where power needs may change frequently or where a fixed installation is impractical.

Overcurrent protection versus surge protection

Safeguarding furniture power sources requires understanding two key concepts: overcurrent and surge protection. Each serves a distinct purpose in protecting electrical systems and devices. Knowing the difference is crucial for choosing the right solutions for any furniture power setup.

- Overcurrent protection safeguards furniture power sources and connected devices from damage caused by excessive current flow. This protection is achieved through devices such as circuit breakers or fuses interrupting the circuit when necessary.
- Surge protection: safeguards electronic devices such as computers and TVs from voltage surges and spikes.

Power codes refer to regulations and standards governing the design, installation, and use of electrical systems and devices within commercial spaces, such as power strips and furniture-mounted outlets.

UL962A and UL1363 require overcurrent protection in specific circumstances, such as products with multiple receptacles and certain conductor gauges.

Furniture power solutions crafted for a connected world

In today's technology-dependent world, designing commercial spaces with configurable and convenient power, data, and charging is more important than ever. Becoming well-versed in furniture power codes will help provide expert guidance to customers, helping them navigate complex installation requirements and select furniture power pieces that integrate seamlessly with new or existing electrical systems. **CS**

ADDITIONAL **INFORMATION**

Author

Kathleen Neighbors is a product manager for furniture power and raceway solutions at Legrand Wiremold. She leads product development and marketing strategy for electrical furniture accessories within the commercial office and hospitality markets.

Key Takeaways

Understanding power codes is essential for ensuring safe, compliant, and effective furniture power solutions in modern commercial spaces. Key standards, such as UL962A and UL1363, provide safety guidelines for various power devices, ensuring they meet important requirements for fire prevention, electrical shock protection, and surge safeguarding. Following best practices, including avoiding daisy chaining and selecting appropriate mounting options and protection measures, is crucial for maintaining safety and ensuring the long-term functionality of power systems.

MasterFormat No.

26 05 00—Common Work Results for Electrical

UniFormat No.

D50—Electrical

Keywords

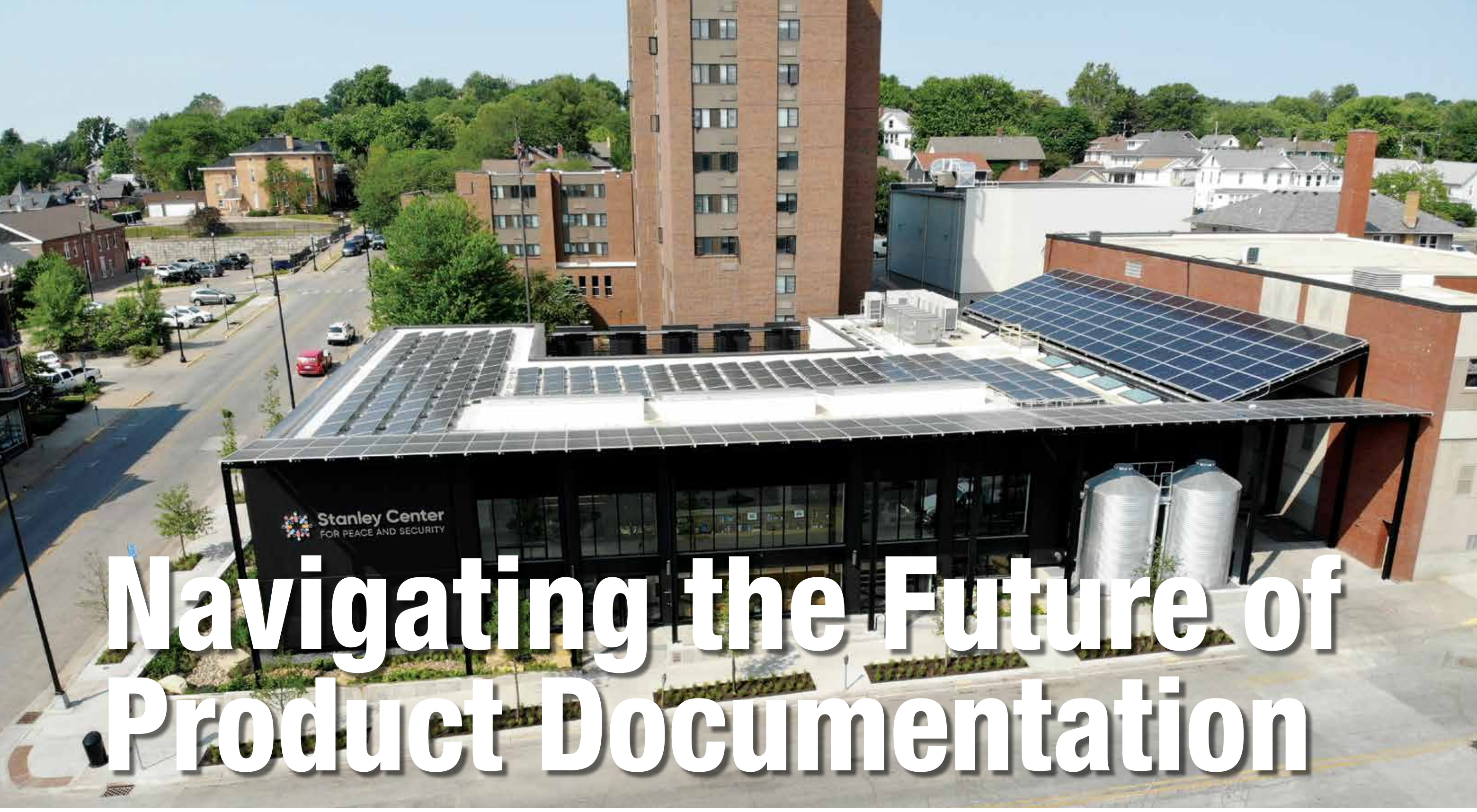
Division 26

Furniture

Power codes

UL1363

UL962A



Navigating the Future of Product Documentation

A Guide for Sustainable Building Decisions

By Jeff Terry

Photos courtesy GAF

IN THE EVER-EVOLVING LANDSCAPE OF SUSTAINABLE CONSTRUCTION, PRODUCT DOCUMENTATION HAS BECOME A CRUCIAL TOOL FOR INFORMED DECISION-MAKING. THIS ARTICLE EXPLORES TWO KEY TYPES OF PRODUCT DOCUMENTATION: ENVIRONMENTAL PRODUCT DECLARATIONS (EPDS) AND HEALTH PRODUCT DECLARATIONS (HPDS).

These documents provide valuable insights into the environmental and health impacts of building materials, respectively. Typically prepared by product manufacturers, both EPDs and HPDs often involve third-party verification to ensure accuracy and credibility. Independent certification bodies play a significant role in this process, particularly for EPDs, which require external validation.

This article will examine these documentation types, their significance in the roofing industry, their evolution, and their role in shaping the future of sustainable construction. It will also highlight a notable marketplace trend: the shift from industry-average EPDs to product-specific declarations. This transition reflects the growing demand for more precise and tailored environmental impact information in the construction sector.

An EPD is a standardized, third-party verification of a product's environmental impacts throughout its lifecycle. This type of documentation was first introduced in the late 1990s to address the growing demand for product transparency, specifically regarding environmental concerns.

EPDs are based on life cycle assessments (LCAs) and provide objective, comparable data on a product's environmental performance, including factors such as global warming potential (GWP), ozone depletion, acidification, and energy use. For example, one roofing manufacturer's product-specific EPDs are critically reviewed and certified by NSF in accordance with ISO 14025, ISO 14044, and ISO 21930.

Today, EPDs have become an essential tool for manufacturers, architects, and builders to communicate and make informed decisions about product selection to reduce the environmental impact of construction projects. The number of published EPDs has grown exponentially in recent years, with approximately 17,000 EPDs published globally by the beginning of 2023.[1]

Similar to EPDs, HPDs are standardized documents that provide transparent information about the potential health impacts of building products. They focus specifically on a product's material contents and associated health implications, helping architects, designers, and building professionals make informed decisions about selecting materials that promote occupant health and wellbeing.

HPDs can also help roofing projects meet sustainability and health-related requirements for green building certifications. LEED, for example, is a globally recognized program that provides a framework for creating healthy, highly efficient, and cost-saving green buildings.

Evolution of EPDs and HPDs in the roofing industry

EPDs and HPDs have gained significant traction in the roofing industry over the past few years, likely driven by the growing emphasis on sustainability and health in commercial construction and the adoption of green building certifications. Roofing manufacturers have responded by increasingly developing and publishing both product-specific and industry-wide EPDs, providing transparent information about the environmental impacts of their products throughout their lifecycle. The evolution of EPDs and HPDs in the roofing industry is marked not by the mere increase in quantity but by their ability to provide architects and owners with actual product and system-specific information, enabling better decision-making related to the full life-cycle impacts of their buildings.

EPDs are particularly valuable for comparing different roofing materials and systems. A specifier might use EPDs to compare the environmental impacts of asphalt shingles, metal roofing, and concrete tiles. These EPDs would provide data on the raw material extraction, manufacturing processes, installation, use phase, and end-of-life scenarios for each roofing option. This information can help architects, builders, and property owners make more sustainable choices based on factors such as embodied carbon, durability, and recyclability of roofing materials. Additionally, EPDs can contribute to achieving green building certifications and meeting sustainability goals in construction projects.

Similarly, HPDs have become more prevalent, offering detailed insights into the material contents and potential health impacts associated with roofing products. This evolution has not only improved transparency in the industry but has also spurred innovation, encouraging roofing manufacturers to develop more sustainable and health-conscious roofing solutions to meet the growing demand for environmentally responsible building materials.

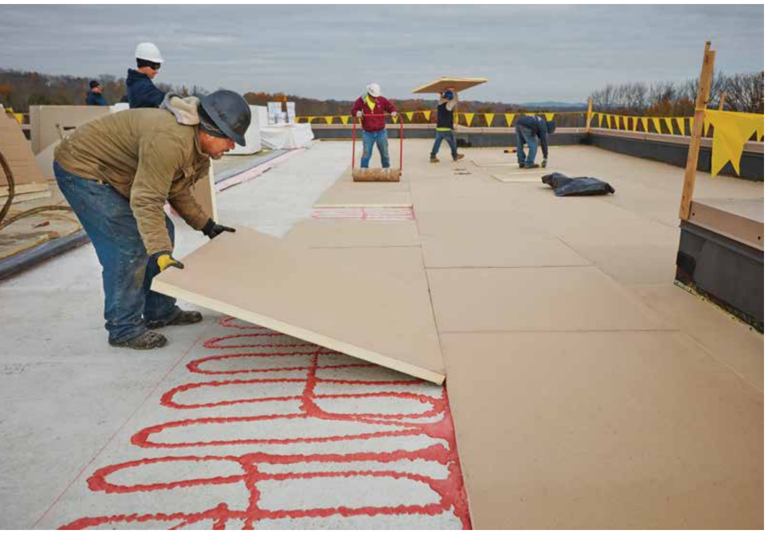
For years, some manufacturing facilities have been committed to recycling or reusing as much waste as possible for years. For example, as part of its sustainability commitments, a manufacturer can pursue certification of recycled content of thermoplastic polyolefin (TPO)—a roofing material for low slope and flat roofs—through a third-party such as GreenCircle Certified. TPO products can include as much as 4 to 10 percent pre-consumer recycled content, which may seem small, but those scraps are put back into the process and represent tons of saved scrap that is ultimately diverted from landfills.

Roofing manufacturers have several opportunities to enhance sustainability and transparency in their products and processes. Companies can pursue third-party certification for recycled content in their TPO, PVC, and polyisocyanurate (polyiso) insulation products. Manufacturers can also expand their product lines to include more items contributing to green building certifications, potentially offering hundreds of Stock-Keeping Units (SKUs) that meet these criteria.

Today, Environmental Product Declarations (EPDs) have become an essential tool for manufacturers, architects, and builders to communicate and make informed decisions about product selection to reduce the environmental impact of construction projects.

The evolution of Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) in the roofing industry is marked not by the mere increase in quantity but by their ability to provide architects and owners with actual product and system-specific information, enabling better decision-making related to the full life-cycle impacts of their buildings.

Tools such as LCA generators can also support ongoing product development efforts and help companies consider product lifecycle when exploring new materials and products. By providing comprehensive and transparent information about the environmental impacts and material contents of their products, manufacturers can address the increasing demand



Product-specific Environmental Product Declarations (EPDs) allow for meaningful comparisons against industry averages and showcase the true environmental benefits of innovative roofing solutions.

for information about sustainable building material options and improve transparency in the roofing industry. These efforts cater to market demands and position companies as leaders in sustainable roofing solutions.

What is next?

The future of product transparency in the roofing industry must focus on widespread adoption and standardization to achieve sustainability goals. Manufacturers should strive to develop EPDs and HPDs for their product portfolios, providing transparent and comparable information about the environmental impacts of their roofing materials.

Product-specific EPDs are critically important in this endeavor. Industry-average EPDs, which are based on LCAs conducted using industry-average data for a product category, are also valuable. However, EPDs alone cannot accurately represent individual products' environmental impacts.

As manufacturers incorporate sustainable improvements and optimize their products' life cycle impacts, product-specific EPDs will become increasingly crucial. Companies can set concrete and clear goals to prioritize transparency through avenues, such as aiming to conduct comprehensive lifecycle assessments for their product portfolio or securing EPDs for all core products. These EPDs allow for meaningful comparisons against industry averages and showcase the true environmental benefits of innovative roofing solutions. Optimized EPDs highlight improvements in full LCAs of a product, representing advancements in mitigating global warming potential, eutrophication, toxicity, end-of-life management, and various other factors.

As concerns around the impacts of climate change grow, these declarations will become increasingly important in guiding the project teams toward more sustainable roofing solutions. **CS**

Notes

[1] To learn more, visit ecochain.com/blog/environmental-product-declaration-epd-basics

ADDITIONAL **INFORMATION**

Author

Jeff Terry is vice president of corporate social responsibility and sustainability at GAF—North America's largest roofing and waterproofing manufacturer. In his role, Terry is responsible for overseeing the company's sustainability and social impact strategies. He helped spearhead the development of GAF's Sustainability Promise and 2030 Planet Goals, reinforcing the company's commitment to reducing its impact and protecting the communities where employees live and work. With more than 30 years of experience in CSR and sustainability, Terry has become a nationally recognized speaker on sustainability issues and has presented at the United Nations, Climate Week and other global conferences. With a strong academic background in applied economics from Clemson University, he continues to advocate for integrating sustainability into core business strategies to foster both economic growth and environmental stewardship.

Key Takeaways

Out of the approximately 42 percent of annual global carbon emissions generated from the built environment, more than 27 percent stem from building operations. The rest is due to the embodied carbon of products and materials used in the building. Understanding the environmental and material health impacts of materials is increasingly important as architects and specifiers look for opportunities to reduce emissions. Environmental Product Declarations (EPDs), Health Product Declarations (HPDs), and other labeling systems have long been a resource and continue evolving to help streamline project decisions to support performance and sustainability.

MasterFormat No.

01 00 00—General Requirements

01 81 13—Sustainable Design Requirements

UniFormat No.

B20—Exterior Vertical Enclosure

Keywords

Division 01

Environmental Product Declarations (EPDs)

Health Product Declarations (HPDs)

Sustainability

Design is in the Process

The Importance of Collaboration

By Sarah Sindian, AIA, NCARB

Photos by Quarterra/courtesy KTGY

DESIGN, LIKE PEOPLE, CAN BE MESSY. THE DREAM OF BECOMING AN ARCHITECT IS GETTING INTO A PRECISE PROFESSION, HONING THAT PERFECT MIX OF CREATIVE AND TECHNICAL SKILLS. BUT THE DAY-TO-DAY WORK IS A LOT OF EMAILING AND PHONE TAG. SOME DAYS, ONE MIGHT SPEND THREE HOURS ON A CONFERENCE CALL ADDRESSING CONSULTANT COORDINATION, ALL WHILE REQUESTS FOR INFORMATION (RFIS) AND CLIENT COMMENTS ACCUMULATE IN THE INBOX. ON OTHER DAYS, ONE MAY FIND THEMSELVES IN A CREATIVE FLOW, MAKING SIGNIFICANT PROGRESS, ONLY TO DISCOVER THAT THE CAREFULLY DEVELOPED UNIT PLAN OR AMENITY SPACE, PREVIOUSLY VETTED, NOW REQUIRES STRUCTURAL REEVALUATION.

The most common obstacles to the design process in the field occur when each consultant or contractor works independently, creating single-purpose plans without consulting each other's work. Mechanical ducts conflict with structural beams, soffits, or ceiling design. Perforations in exterior walls seem to appear where a shear wall needs to go; exhaust and intake vents start to poke through an elegant facade. Conflict happens, but good collaboration puts project teams on the same page early and leads to a well-coordinated set, preventing any late design or construction phase "surprises" along the way.

Transparent, even-handed communication between the architect and consultants is the key to prompt, low-stress design processes. Good collaboration between all the project's moving parts creates a thorough, efficient design that results in a rigorous set of documents, strong returns for the client, and a positive impact on neighborhoods around the project.

Nothing slows the process down more than losing time solving technical problems that could have been found earlier. The challenge for architects lies in the fact that the design of a building encompasses many elements beyond their direct scope. To be effective project leaders, architects must develop a deep understanding of the other professionals who make buildings functional and livable. This includes grasping the fundamentals of mechanical, electrical,

Halcyon House offers a large public courtyard between the buildings, with a dynamic pedestrian bridge connecting the two buildings at podium level and retail at the ground level.

plumbing (MEP) and structural engineering and understanding how MEP and structural consultants think, work, and contribute creatively to the project team. No leader has ever accidentally fallen into an efficient and effective design process. Coordination is a crucial step, but to be successful, architects need to take specific positions in three key areas: leadership, expertise, and execution.

Leadership

All teams need a leader, and the architect often, but not exclusively, fills this role. The architect usually serves as the project team leader and creative partner. Good leaders advocate for their work and that of the designers under them, but they should equally understand and advocate for the consultants' work. As a young architect, the author did not fully appreciate each consultant's role on the team, which limited their ability to tap into those strengths. Early in their career, they realized that leveraging the full potential of their resources required a deeper understanding of what consultants needed to perform at their best. To address this, they began tailoring meeting agendas to include more items framed as questions directed toward the consultants.

Instead of providing directives, questions were posed: What are the best systems for this project? The best designs? The best approaches? By shifting the tone and structure of meetings, consultants became more engaged and invested in the shared vision for the work. This change encouraged consultants to take a more active role throughout the process, driven by a sense of contribution and recognition. Over time, the author learned to fully utilize consultants as valuable resources, maximizing their potential while fostering strong working relationships across the project team.

Establishing trust and rapport at the outset of every new project is a conscious effort. Communication is the key to collaboration, and doing so respectfully is decisive when establishing trust and confidence in the team and aligning goals. Consistently touching base, perhaps weekly, via phone or email, is an effective way to develop rapport and maintain open lines of communication. Respect for one another should be a baseline expectation for everyone on the team. Architects must recognize the experts within each aspect of a project and remain respectful within their own areas of responsibility. The team dynamic benefits when everyone is a valuable contributor to the whole, and there is a unified front and sense of teamwork during the decision-making process.

Strong working relationships with many consultants have been developed at this stage in the author's career. They often begin new projects by contacting a trusted consultant for advice, check-ins, or gathering critical information, including details about space allocation or guidance on approaching specific aspects of the project during schematic design. These technical insights, which could be overlooked, are made possible by knowing the right experts to consult.

Expertise

The work of MEP and structural engineering consultants include all the unseen systems that make buildings work. The electrical raceways within the cavities of the walls and floors, the mechanical units tucked away in closets, the plumbing pipes concealed in floors and walls, and the structural bones that make the building stand. These systems are the heartbeat of the building. All these components require space and specific dimensions that need to be distributed during the initial design phases. Finding space only gets more challenging as the project progresses. Utilitarian spaces such as electrical closets, mechanical fan rooms, and maintenance rooms are always needed but easily overlooked.

In the field of architecture, young professionals often display a strong eagerness to learn about various trades, including MEP, and structural. There is a tendency to dive into research on design systems, study relevant codes, and analyze consultant drawings. However, it becomes clear that knowing every detail is an impossible task. By adopting a collaborative approach within project teams, a framework can be established that enhances communication with consultants. This fosters an environment where consultants feel more invested in the project's vision. As a result, these collaborative relationships are strengthened, leading to a clearer understanding of each individual's expertise and the areas where reliance on consultant partners is essential.

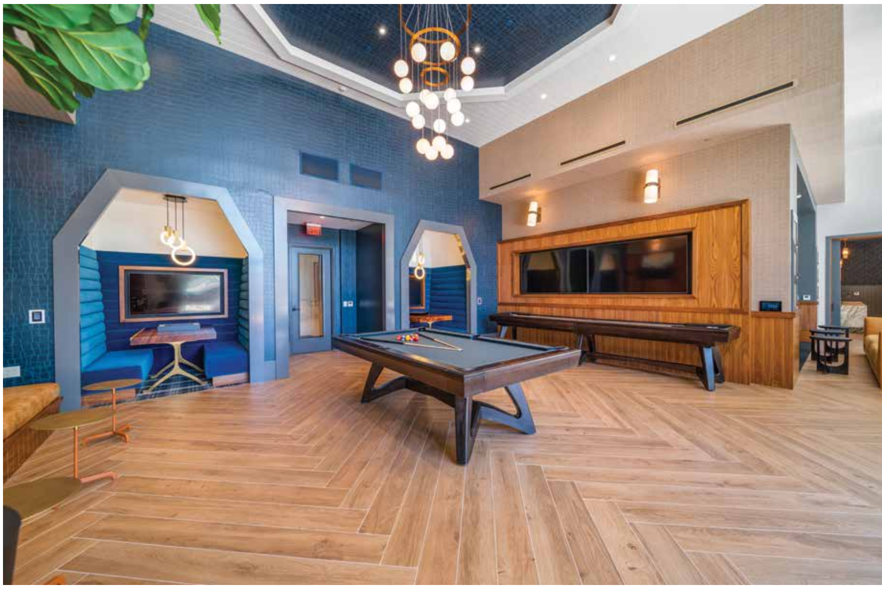
Nothing beats experience in a profession like architecture. Experience is the king of problem-solving, built on a history of lessons learned. Over time, far more has been learned from collaborating with various field trades than could have been gained from books or formal education. There is something special about working alongside people in action, where valuable insights emerge between the lines and through various levels of interaction.

For example, on a project where the design team needed to explore structural design options for a podium building, the size and spacing of structural columns directly impacted the livability of the space, making it essential to address these dimensions early in the process. The team began by laying out the structural concrete columns in alignment with the parking garage on the lower levels. These columns had to extend through to the upper levels, adhering to the code requirements for Type I construction.

The team encountered a problem when the column layout, which worked well for the parking garage below, did not align with the livability of the dwelling units above. Close collaboration with the structural engineer was key to finding solutions that balanced the needs of both the living levels and the parking garage. In some cases, the structural engineer removed a column and added a transfer beam, creating longer spans between columns and minimizing disruptions within the dwelling units. In other instances, columns were repositioned to be concealed within walls or closets rather than occupying central areas like living rooms.

This collaborative approach, supported by open communication and established trust with the structural engineer, allowed the team to design a building with inviting living units and amenity spaces that fostered connection rather than separation. These adjustments were made during the schematic design phase when significant structural changes could be implemented without major impacts on the project timeline.

Halcyon House amenities include sophisticated, upscale spaces with high-end design features.



A variety of luxury amenities includes a community lounge with game tables and quiet seating, offering residents space to work and gather.

Execution

When starting in architecture, the coordination process involved pinning up every floor plan on a board and having each MEP or structural consultant draw their diagrammatic layouts in different-colored markers. While time-consuming, this method allowed changes to be made on paper rather than tearing down and rebuilding walls in the field. Today, with tools such as Bluebeam overlays, the spirit of close collaboration with consultants is still embraced, but with more efficient and digital means of coordination.

In coordination meetings, floor plans from each discipline—architectural, structural, mechanical, plumbing, and electrical—are still overlaid, with each trade assigned a distinct color. This visual approach

Winslow is a contemporary collection of apartments and retail space in San Diego.

Winslow offers amenities such as a resident fireside lounge with professional kitchen, billiards, and social spaces for gathering.

helps identify potential conflicts, such as a mechanical duct intersecting with a structural beam or a plumbing line routing through an electrical subpanel. This streamlined, collaborative process ensures that issues are resolved early, preserving the efficiency and integrity of the design.

While modern design, modeling, and communication tools offer incredible capabilities, software is merely a set of tools to assist in completing tasks. True decision-making is driven by knowledge and experience. While technology can enhance efficiency and effectiveness, relying on it as a crutch can be risky. Ultimately, architects must draw from their expertise to make informed decisions.

Technology has significantly enhanced processes and streamlined workflows. However, it is crucial to emphasize the importance of maintaining full engagement throughout every stage of the design process. Ultimately, it is the architect—not the software—who is responsible for the final decision.

The design process can be quite technical, but even working with technical consultants is an organic, creative process. It involves experience, knowledge, creativity, and the room to follow one's design instincts. Beyond initial design, stitching together the work of the major disciplines is an important part of the architect's role. By adopting a strategic mindset and collaborating with consultants to solve problems during collaborative work sessions, the team achieves better designs that foster active and thriving communities. The MEP and structural professionals, who orchestrate the different systems within a building, serve as vital design partners working together toward a unified goal.

On numerous projects, the structural engineer proactively collaborated with the architect and interior designer. Together, they integrated columns into the layout to ensure they were concealed. Recognizing the potential for flexibility in large amenity spaces, where columns often end up in the middle of the room, collaboration with the structural engineer allowed for small adjustments. By shifting columns a few inches or even a couple of feet, aligning them with architectural elements such as pop-outs or coffered ceilings, ensuring the final construction matched the design intent.

Through this level of collaboration and developing systems that make partnering with consultants more fluid, an instinctive understanding of the disciplines collaborating with has been cultivated. For example, interior designers typically prefer linear diffusers in amenity spaces, structural engineers prioritize stacking bearing walls and require shear walls between windows to be at least 0.762-m (2.5-ft)-wide, and electrical consultants often handle kitchen outlet layouts, necessitating joint problem-solving to meet accessibility standards. This intuitive grasp of details across various specialties results from consistent, thoughtful collaboration with diverse consultants.

Conclusion

Establishing the foundation for strong rapport, coordination, and an effective design workflow takes time. When architects coordinate early and consistently and embrace their roles as project leaders and creative partners, they build the trust and processes necessary for exceptional outcomes. Collaborative design streamlines construction by ensuring that every team member knows how the lines drawn on paper translate into the built environment.

This approach brings significant value to clients, enabling time and cost savings through thoughtful value engineering that preserves the design aesthetic. For example, architects can anticipate and detail projects to minimize concrete formwork, reducing labor and material costs. By acting as team players, architects can also evaluate potential substitutions, giving clients flexibility in their budgets while maintaining the integrity of the design. Such collaboration ensures efficiency, cost-effectiveness, and staying true to design intent.

The construction document (CD) set represents the culmination of the collaborative energy invested throughout the various design phases. A well-coordinated team with open communication and mutual respect for each discipline as an integral part of the whole produces a set of drawings that reflects alignment rather than conflict. The different consultant drawings seamlessly integrate when collaboration is prioritized, showcasing an integrated vision.

Winslow features a private fitness studio.

True collaboration requires stepping outside of oneself—beyond preformed judgments and personal limitations. It creates an environment where diverse opinions and perspectives are welcomed and valued, challenging preconceived notions and sparking new ideas. This openness and shared understanding are where the real magic of the design process happens. **CS**

ADDITIONAL **INFORMATION**

Author

Sarah Sindian brings more than 20 years of experience to KTGY. Since joining KTGY in early 2003, she has managed a variety of projects from single-family dwellings to high-density podium buildings, urban infill residential and mixed-use developments. With work extending from southern to northern California, she understands the complexities associated with differing regions and jurisdictions. Sindian's portfolio includes many successfully built projects that have benefited from her dedication and problem-solving skills.

Key Takeaways

Effective design relies on collaboration and open communication among architects and consultants. By coordinating early and consistently, architects align goals and create cohesive designs. Leveraging consultants' expertise while balancing technical requirements with design intent is essential. Architects must also serve as strategic leaders, fostering trust and building strong working relationships across the team. Software tools streamline coordination but should complement an architect's experience and informed decision-making. Thoughtful value engineering, such as optimizing layouts and reducing material costs, saves time and resources while preserving design quality. Prioritizing collaboration, strategic planning, and mutual respect ensures innovative, cost-effective designs that meet client needs and align with the project vision.

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Flashing—Does It Hold Water?

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The primary function of an effective building enclosure is to provide a physical separation between the conditioned building interior and the surrounding exterior environment. Developing and implementing appropriate strategies for managing air, heat, and moisture loads imposed on the building is critical to ensure the enclosure performs as intended. However, effective bulk water management within the intended wet zone of a drainage wall assembly is often the most critical factor in long-term enclosure performance. Repeated water penetration inboard of the wet/dry line of the assembly can result in a host of moisture-related issues, including deterioration of building materials and biological growth on moisture-sensitive materials.

Vertical enclosure assemblies can be designed to utilize storage, exclusion, and/or drainage strategies for water management. As gravity is a primary mechanism for bulk water transport, dedicated flashing elements are commonly used at horizontal interruptions in the air and water control layers to compartmentalize water within an assembly and direct it to the exterior.

To be effective, a flashing assembly requires proper integration with the water control layers of the surrounding assemblies, continuity for its entire length, adequate slope to promote drainage, and sufficient rigidity or support to ensure that the flashing profile is maintained. Flashings also need to accommodate thermal-related and building movements and be fitted with end dams to prevent the unwanted lateral flow of water. When reliant on supplemental drainage provisions such as weep vents, these should be positioned directly above the flashing to avoid ponding water on the flashing.

The important role of flashings is illustrated by a multi-story addition to a medical facility nearing completion, where widespread water leakage to the building interior was attributed to several as-built conditions; however, the greatest contributor to leakage was determined to be the ineffective through-wall flashings. Systemic flashing issues included poor (or lack of) integration with adjacent control layers or enclosure assemblies, flashing discontinuities, and lack of end dams at terminations. In addition, flashings terminated at the exterior face of the brick-clad drainage wall of the existing adjoining building (rather than being integrated with the water control layer within the existing wall), drainage paths were blocked by sealant, and membrane flashing exhibited signs of deterioration where exposed to the environment. To correct deficiencies, the through-wall flashing assemblies of the addition needed to be replaced prior to building occupancy—a costly endeavor resulting in a significant delay in the project delivery.

Exposed flashing at an exterior building corner, revealing discontinuity of the membrane through-wall flashing, which is adhered to a metal drip edge at one wall and positioned under the drip edge at the opposite wall. Also, note the membrane flashing is exposed beyond the face of the brick. (Unrelated, significant mortar blockage is present in the wall cavity.)

Photos courtesy Wiss, Janney, Elstner Associates (WJE)

A close-up view of the same condition with the drip edge raised. This exposes the membrane flashing below, revealing the corroded relieving angle and sealant blocking the flashing drainage path.

Deficiencies in the through-wall flashing assemblies were ultimately attributed to the limited detail in the project documents (drawings, specifications, and shop drawings), a lack of understanding of how flashings are intended to function effectively, and a failure to identify installation issues during construction. **CS**