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Unitized Curtainwalls

High Rewards with Complex Challenges

Modernization has enveloped most facets of glass production, including the design, fabrication and installation of unitized curtainwalls.

Unitized curtainwalls are popular due to several factors, including fast installation times, improved quality control, design flexibility, minimal occupancy disruption and enhanced energy efficiency. As advantageous as these systems are, designing one from scratch is no simple feat.

"Developing a unitized system may seem like a fairly simple endeavor, but to do it well takes careful forethought and planning," explains Richard Whittington, technical sales consultant at Lakeshore-Ontario-based Erie AP, a YKK AP company. "A well-thought-out system will balance design flexibility, manufacturing, installation and cost. A rushed process could result in unforeseen expenses, a short product life or even product failure in the field."

For officials at Los Angeles-based Giroux Glass, the conceptualization, design and engineering processes are still fresh on their minds. The company launched its unitized curtainwall system in early 2024. The new system's production and assembly occur at the company's 75,000-square-foot facility in Phoenix.

From Design to Creation

To create the system, Giroux's David Diener, design and estimating manager, says a team of specialists from the company's project management, engineering, shop fabrication and field installation departments worked together to design and engineer the curtainwall. The team considered performance and testing standards, glass makeup compatibility, customization options, sunshade and accessory attachments, fabrication efficiency and installation.

YKK AP officials say the LaGuardia Airport—Terminal C/D modernization project in New York proved to be among the company's most unique and challenging projects to date. YKK created a new system family, EF 35 UW, engineered to achieve lofty framing spans and withstand the specified wind and blast loads.

Signature Projects **Mastering Unique Curtainwall Challenges**

The DC Water headquarters' continuous façade is composed of four-foot-wide planar modules, each containing either a lite of glass or a metal panel.

The Axiom Corporate Center features modern all-glass and steel façades, highlighting curves of glass, rounded corners and a striking diagonal "swoosh" running the length of the building.

DC Water headquarters

Richard Whittington of Erie AP, a YKK AP subsidy, says one of the company's most satisfying projects was the DC Water headquarters in Washington, D.C. Whittington states that the building's signature features are its footprint and overall form.

"The floor plan follows a curvilinear or 'serpentine' path with numerous radius changes," he explains. "Most unitized curtainwall panels were unique due to the angle changes. We needed to create dozens of custom extrusions and anchors to accommodate all the angle changes. Each floor cantilever is beyond the previous, creating a slight conical expression. The way the façade 'peels away' from the previous floor requires special attention for the continuity of the air-water seal."

Whittington adds that the curtainwall installation was performed in an atypical top-down sequence to address the building's unique layout. Projected windscreen panels were integrated into the curtainwall on the building's southeastern and southwestern faces to maximize the façade's performance and add an engaging aesthetic quality.

Axiom Corporate Center

Giroux Glass officials say the Axiom Corporate Center in Las Vegas is a great example of how complex the fabrication process is.

Giroux's marketing and public relations director, Andrew Phipps, explains that the project presented several challenges, including canted elevations that transitioned into radiused corners, splayed mullions and a recessed feature that swept through the elevation. He says each element required seamless integration and customization to achieve the desired aesthetic and performance outcomes. Using Arcadia Inc.'s unitized system as the foundation, the project demanded modifications to ensure all components aligned with the intricate design.

"Vital steps in the fabrication process included precise engineering and customization of components combined with careful coordination between teams," says Phipps. "Each fabricated piece had to be meticulously designed, ensuring it fit perfectly within the system while maintaining the structural and performance standards."

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– Richard Whittington, Erie AP (YKK AP)

Whittington says the overall product design process can be divided into seven phases: identifying system purpose and performance requirements; research and inspiration; design and concept development; prototyping; testing; refinement; and production.

Once the design is finalized, systems undergo rigorous performance testing. After achieving success in testing, core teams assess and refine processes, ensuring everything is ready for production.

"[Designing a unitized system] comes down to good coordination across the entire team, including obvious things like accurate and verified dimensions, proper details and connections being specified, and overall product specification/configuration selections that are appropriate for a given application," explains Samuel Keller, vice president of product development at Kalwall Corp. "Beyond that, being transparent upfront about capabilities and limitations, scopes of work, etc. helps to ensure everyone involved understands their roles and responsibilities."

New Hampshire-based Kalwall, which has fabricated unitized panels for years, offers a different take on glass and aluminum fenestration systems. The company fabricates a lightweight, structural, composite fiber-reinforced polymer and aluminum-insulating sandwich panel for low-to-mid-rise construction and retrofits.

"Unlike glass and aluminum unitized curtainwalls, our customers aren't typically deciding between field or shop trade-offs because of limited site access or logistical challenges associated with highrise projects, but rather because unitizing offers better quality control and less installation time," says Keller.

Benefits of Unitization

Diener says the effort, work and time required to create a unitized curtainwall system are ultimately worth it. He explains that unitized curtainwall systems offer significant advantages to clients by streamlining installation, enhancing architectural flexibility and maintaining system performance.

"These fully glazed units are designed for quick and efficient onsite installation, reducing the drying time needed in a building," he says. "This approach supports accelerated construction schedules compared to traditional stick-built curtainwall systems."

Whittington lists several benefits, including:

- Better quality façades due to manufacturing in a controlled factory environment under an established quality assurance and control program;
- Faster enclosure time using less crew;
- Pre-installation of anchors, allowing for rapid building enclosure once unitized panels are delivered;
- Less time with an open building, and dry-in time is reduced from the time of installation;
- Fewer trades or companies are involved; and
- Simplification of the coordination process as more scope is funneled through a single subcontractor.

Precision at Every Step

Marty McKinley, Giroux's vice president of Arizona operations and project operations, says precision is vital in the fabrication and installation process. He explains that it's important to maintain tight tolerances and implement rigorous quality control procedures. This ensures units are field-ready for installation, reducing time spent at the site and preventing future complications.

"To achieve precision, our fabrication team relies on advanced equipment and specialized techniques," explains McKinley. "CNC-controlled machining and cutting tools enable us to fabricate components with exact dimensions, while overhead cranes allow the safe and precise placement of lites. Specialized caulk pumps ensure optimal glass adhesion, providing structural integrity and a flawless finish. Our in-house testing protocols verify that every unit is watertight before leaving our facility." **USG**

Joshua Huff is the senior editor of **USG**lass magazine. Email him at jhuff@glass.com and connect with him on LinkedIn.

Challenges of Unitization

While the benefits are plenty, various challenges encompass the fabrication and installation of unitized curtainwalls. Erie AP's Richard Whittington notes that a lack of planning can doom any project. He explains that long manufacturing phases require careful planning to coordinate field dates with production lead times. He adds that installation also requires specialized labor, which involves working with the systems manufacturer to produce the design and materials.

Additional challenges include:

- Limited installation capabilities in areas with tight access around anchor points. Larger clearances and gaps are required around the perimeter of frames to allow for installation;
- Façades with less repetition or complex geometries can be difficult to unitize as there are few repeating unit types, which increases design and production time; and
- Unitized can be seen as a cost-premium in markets with low labor rates.

Photo: Giroux Glass

A Giroux Glass mockup of unitized curtainwall undergoes water testing to ensure the panels are watertight.