



Bringing Natural Ventilation & Daylight to Urban Multi-Story Parking

BENDHEIM

THE SOLUTION

The specified Bendheim ventilated glass facade was a clear win for the project and design-assist. Created and engineered by Bendheim Wall Systems in collaboration with FitzGerald Associates Architects and Reflection Window + Wall, the custom glass facade accomplished all aesthetic, functional, and budgetary goals, thanks to its unprecedented design flexibility and ease of use. It created an elegant, jewel-like facade, maximized the parking area, and saved the client over \$1 million.

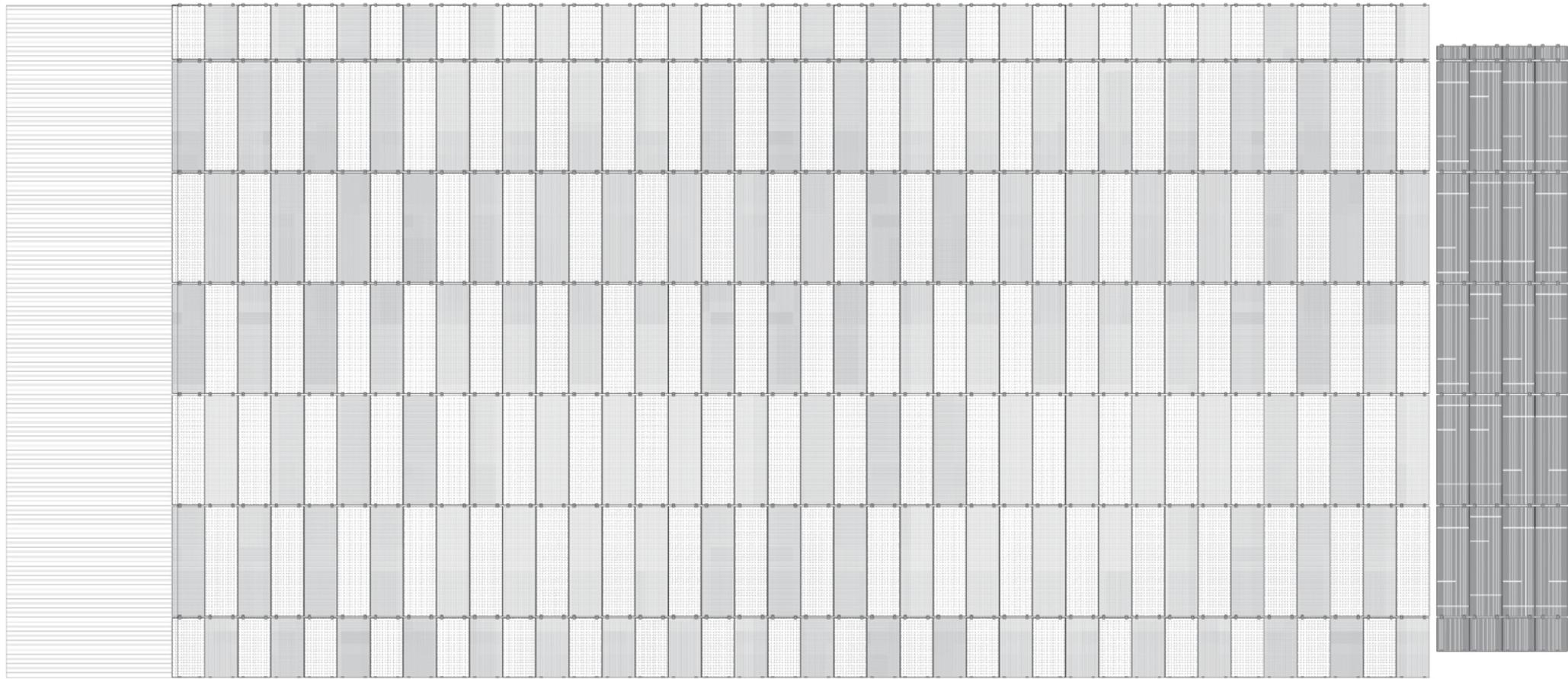
According to Arjang Khorzad, FitzGerald's Senior Associate and lead architect on the project, Bendheim's parking facade system is "a great product." He adds that "the benefit to the project was a more aesthetically-pleasing and interesting system that has not been used in this scale anywhere in Chicago."

Unique to this point-supported system, Bendheim's patented compression fittings (clips) do not require glass drilling or notching, affording greater wall strength, quick assembly, and significant labor cost savings. The fully mechanical attachment method also completely eliminates the need for silicones, mastics, or tapes to install the glass. This adds a level of safety and security for the design professional and building owner alike. The clip system also means the cladding can be easily assembled and disassembled, a key tenet to circular design, which is getting traction in contemporary sustainable architecture.

Bendheim's high-performance glass cladding spans five stories. It comprises two diverse wall designs and approx. 24,000 sq. ft. of light-diffusing glass in several distinct decorative designs. Panels are as large as 3 ft. wide x 10 ft. high, each held by four compression clips – two each at the top and bottom. Individual panels can be glazed and replaced independently of their neighbors.



ELEGANT, JEWEL-
LIKE GLASS FACADE
MAXIMIZED THE PARKING
AREA AND SAVED THE
CLIENT OVER \$1 MILLION



727 West Madison parking structure North elevation, showing the staggered "in-out" panel layout in the front, along with the flat panel layout on the far right.



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THE EXECUTION | DESIGN-ASSIST

“BY THE TIME REFLECTION STARTED INSTALLING THE GLASS, THEY KNEW THE SYSTEM INSIDE AND OUT, BECAUSE THEY WERE INVOLVED IN EVERY STEP OF THE DESIGN PROCESS FROM THE BEGINNING.” – SAID ELIEH, BENDHEIM

Over a period of 4 to 5 months, multiple alternative solutions were considered, based on Bendheim's drawings and 3D models. They were evaluated on feasibility, structural performance, and ease of installation. Approved models were then 3D printed and reevaluated. The Bendheim team used AutoCAD, Inventor, and 3D Max software to create the review drawings and incorporate the approved details into FitzGerald's architectural plans.

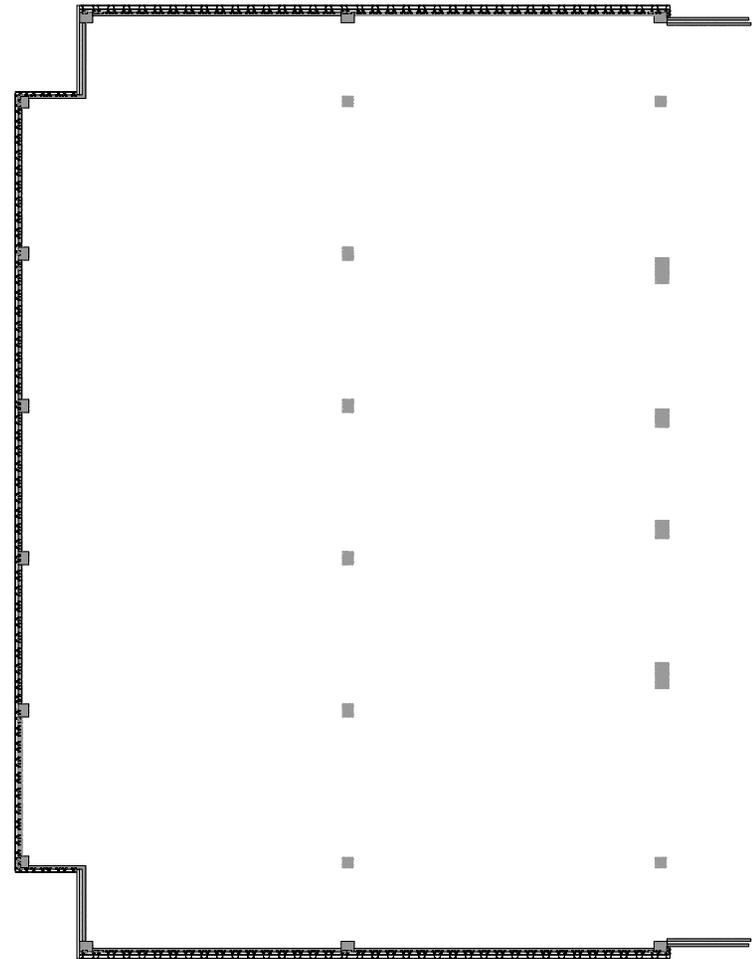
The parking was originally designed with a point-supported glass facade that required structural steel supports every 4 feet. For a short time, a customized, open window-wall system by others was also considered, but it didn't meet the design goals. After budgetary discussions, Bendheim value-engineered the original system, eliminating the steel supports by attaching the glass cladding directly to the concrete walls and slabs through embeds. Face-mounting the glass to the concrete brought the system within the desired cost range. It also made it possible to push the crash walls out and gain an extra foot of space on the perimeter of each floor. The design had aesthetic advantages, too. It eliminated shadow lines behind the glass and created a cleaner, airy appearance.



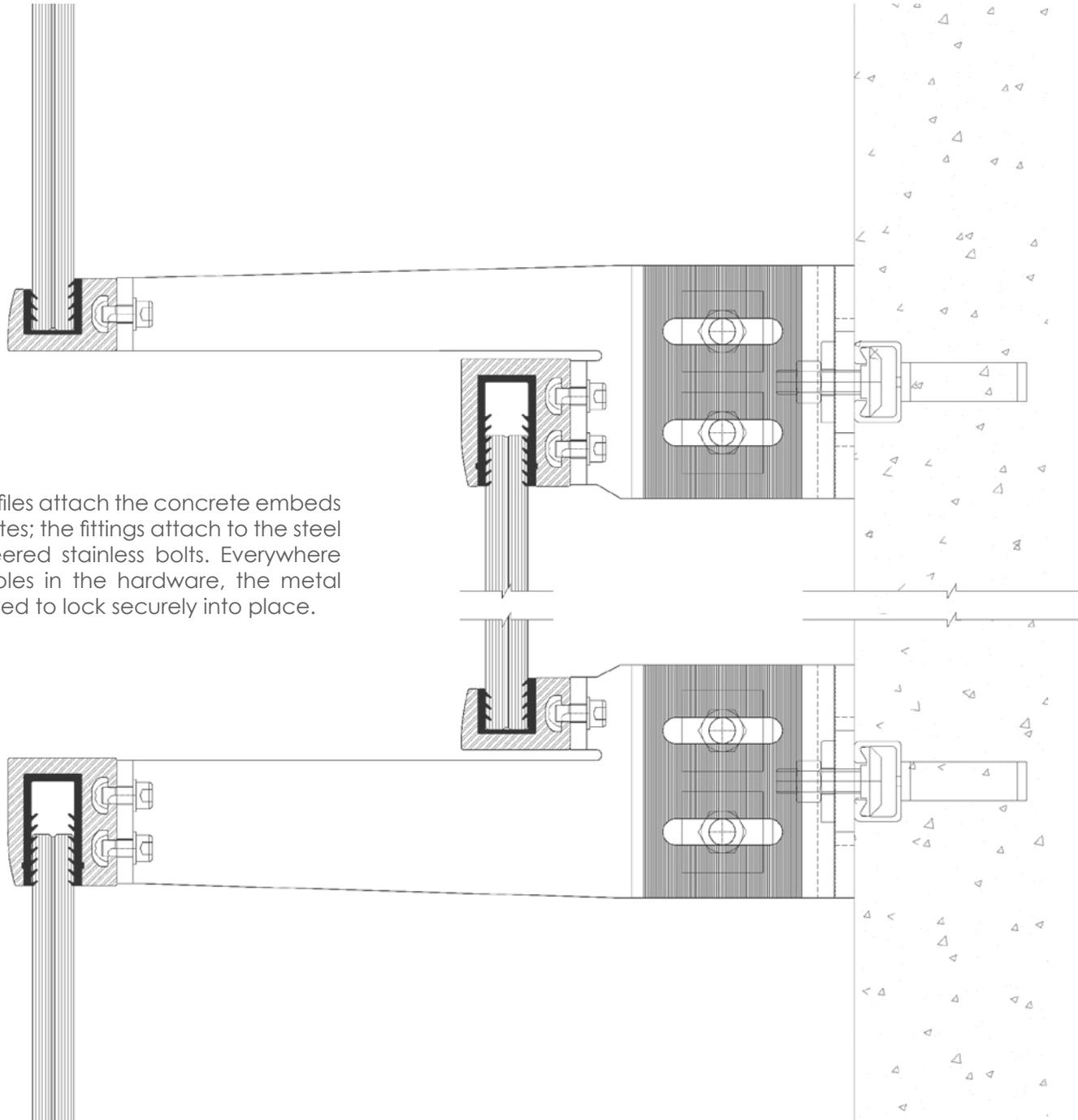
“IT WAS A COORDINATION BETWEEN US AND BENDHEIM, WORKING TOGETHER TO CUSTOM-DESIGN THIS SYSTEM THAT BASICALLY ELIMINATED THE STEEL STRUCTURE BEHIND IT. THAT BROUGHT THE PRICE DOWN AND INSTANTLY MADE IT AFFORDABLE.” – ARJANG KHORZAD, FITZGERALD ASSOCIATES ARCHITECTS

One of the main challenges in realizing this advanced construction detail was coordinating multiple trades to ensure the concrete embeds were positioned exactly as specified to accept the glass system. Bendheim's precise detail drawings and the glazier's diligent project management were critical at this stage. Constant contact between the GC, glazier, and construction crews ensured the success of the smart, money-saving design.

BENDHEIM SUPPLIED THE CUSTOM GLASS, FITTINGS, STEEL PLATES, ENGINEERING, 3D MODELS, RENDERINGS, DETAIL DRAWINGS, AND WARRANTY



727 West Madison parking structure plan view, showing glass system on the north, west, and south elevations.



Detail Drawing: "T" profiles attach the concrete embeds to the custom steel plates; the fittings attach to the steel plates through engineered stainless bolts. Everywhere you see elongated holes in the hardware, the metal components are serrated to lock securely into place.

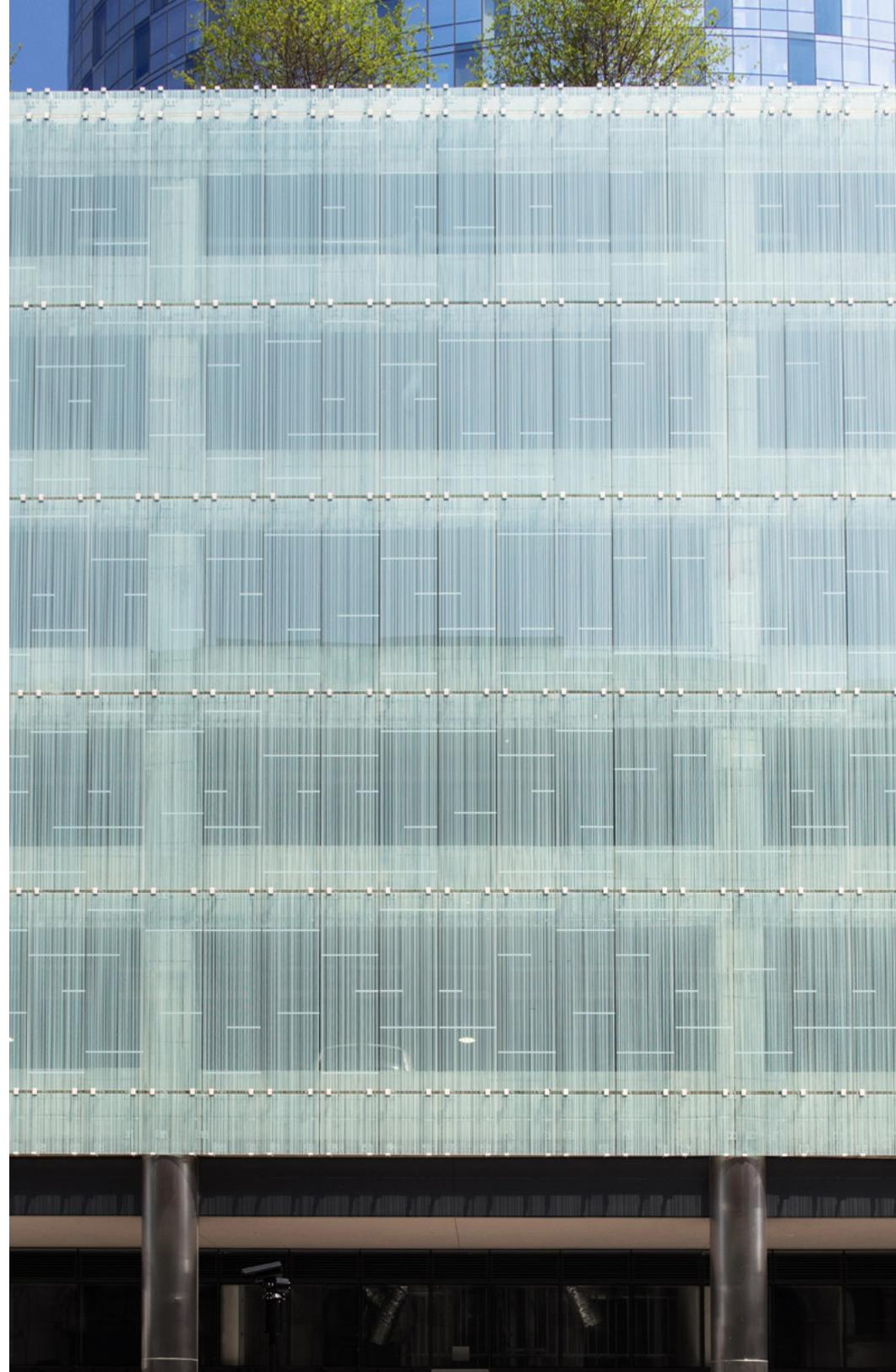


PARKING FACADE SYSTEM

“THIS SYSTEM HAS A LOT OF POTENTIAL. IT IS BEAUTIFUL. THE FITTINGS LOOK REALLY GOOD. AND, THIS KIND OF SLICK GLASS SYSTEM HASN'T BEEN USED FOR A GARAGE OF THIS SCALE, SO IT IS REALLY SPECIAL AND UNIQUE.” – ARJANG KHORZAD, FITZGERALD ASSOCIATES ARCHITECTS

The cladding system incorporates several unique glass designs and 20+ custom metal components. To accommodate the need for two different wall designs (staggered versus flat), Bendheim's standard Wall-F and Wall-H fittings were customized. Aesthetic consistency was achieved by perfectly aligning the clips from wall to wall, as well as sizing them in such a way as to appear proportionate from a distance. The height of the clips was also modified to accommodate the parking structure's +/-1/2" slab movement. The majority of the system customization, however, was handled by steel plates in over a dozen tailored shapes and profiles.

Bendheim's ventilated glass cladding on the north and south sides of the parking structure, facing West Madison Street and the Crown Plaza hotel, respectively, is arranged in a staggered in-and-out fashion. The customized layout creates 8" spacing between panels for maximum natural ventilation. It assures 20% of the facade remains open to the exterior, providing the necessary amount of air flow to



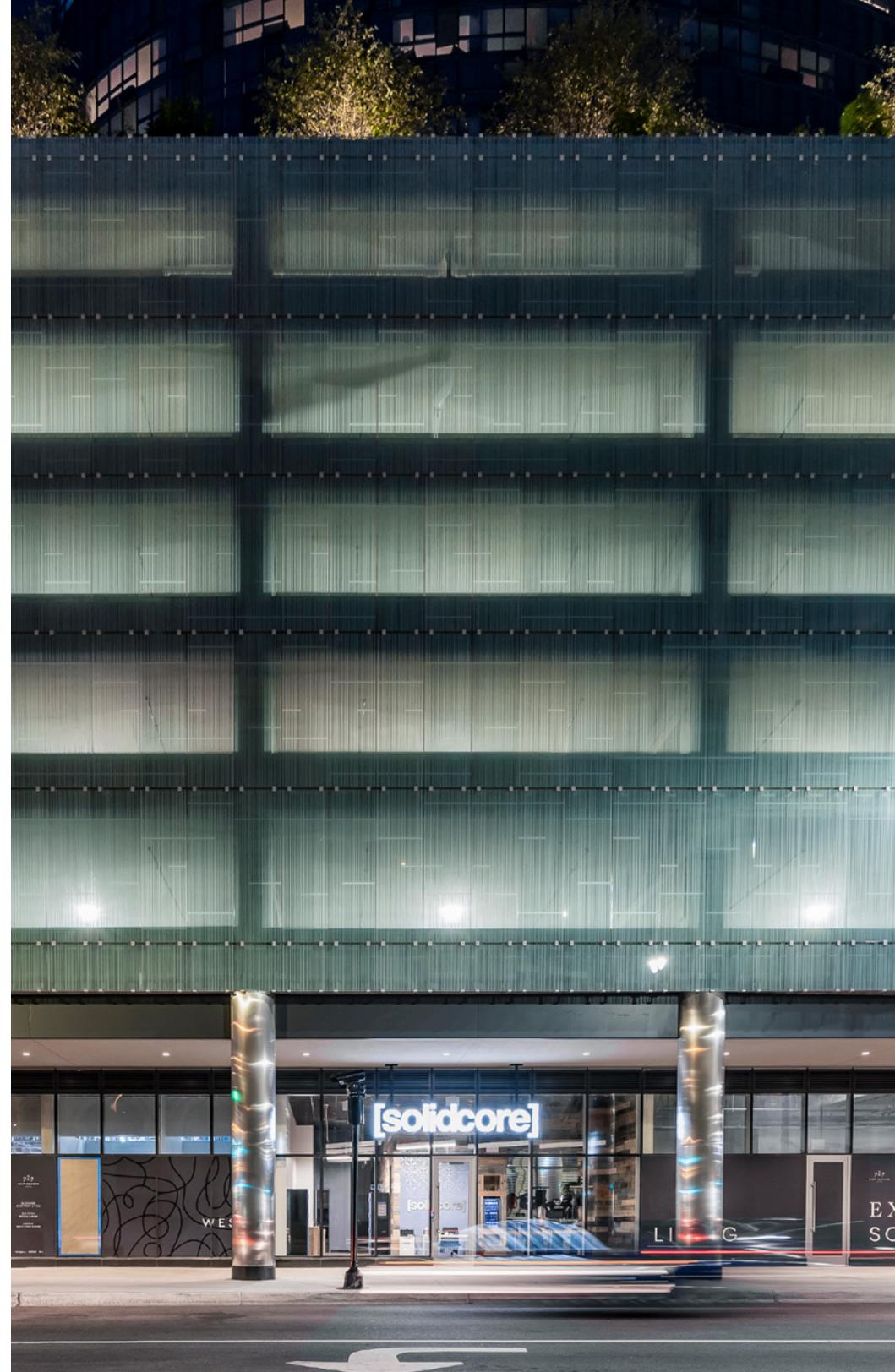
offset the need for a mechanical ventilation system, per Chicago's building code. The precise spacing is achieved through Bendheim's patented aluminum compression fittings and custom-fabricated steel plates.

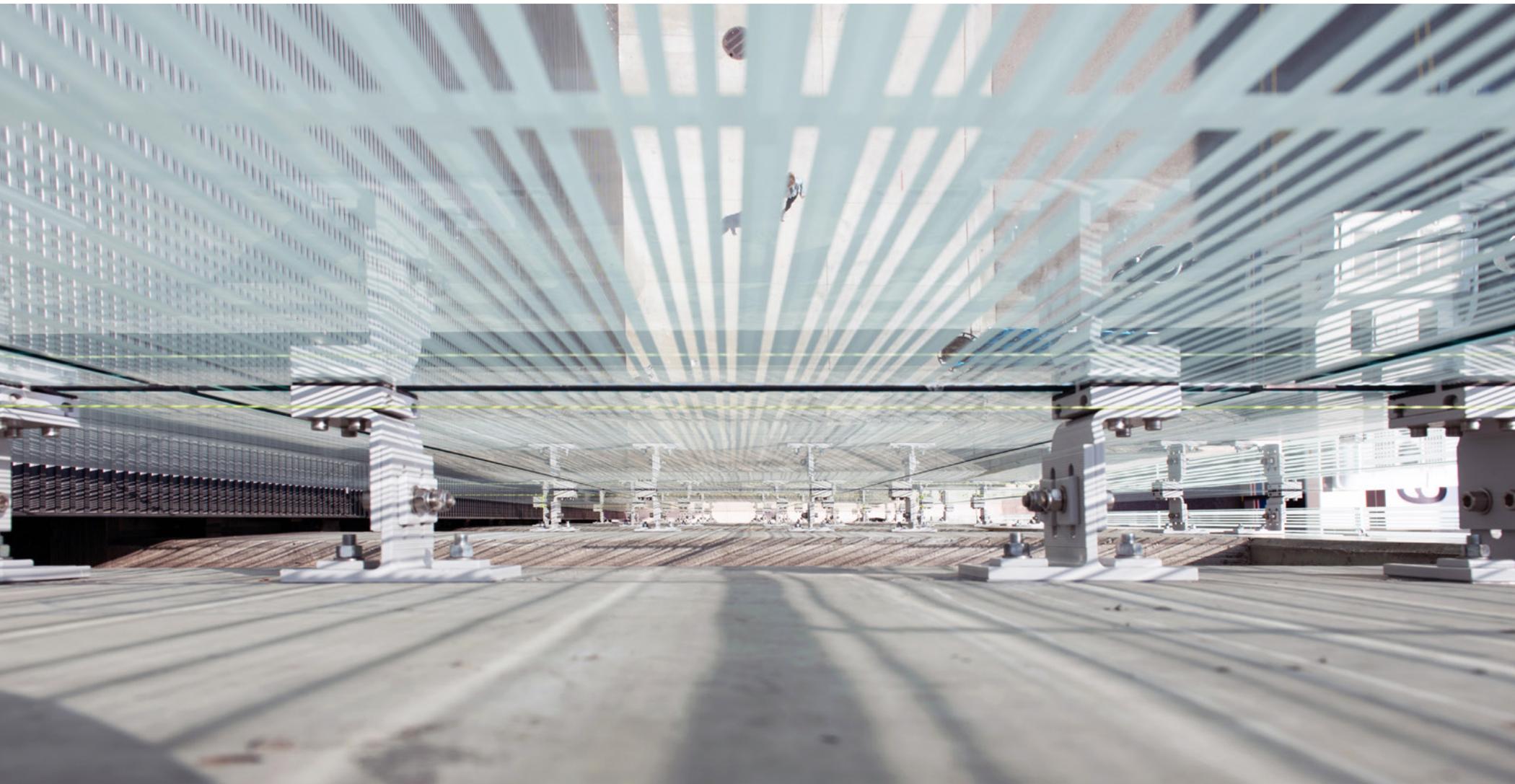
On the south side, the parking structure adjoins the high-rise. On the west, the glass facade is relatively closed, featuring ½" vertical and 2" horizontal openings (joints) between the glass panels. This created the need for increased openness on the staggered north and south sides of the parking (approx. 34%). They were originally planned with 4" open joints. However, calculations based on the overall size of the rough opening versus the size of the open areas resulted in 8" required spacing (depth) between the staggered "in-and-out" panels.

The 2" horizontal joints between the glass panels stay consistent from wall to wall and across elevations in order to maintain clean design lines. This consistency also facilitated the placement of the concrete embeds, aluminum "T" profiles, and clips throughout the facade.

The same Bendheim point-supported system in a flat (non-staggered) wall configuration shapes the west facade, facing South Halsted Street. Ease and speed of installation was a key motivator for using a single system to create the two distinct looks.

The only difference between the two seemingly contrasting wall designs are the bent steel plates that create the staggered panel placement on the north and south elevations. These plates can be infinitely modified to control the openings between the panels and provide the required natural ventilation. Thus, the system can be easily tailored to the requirements of each unique parking project.





Detail top-down view of "flat" west elevation.

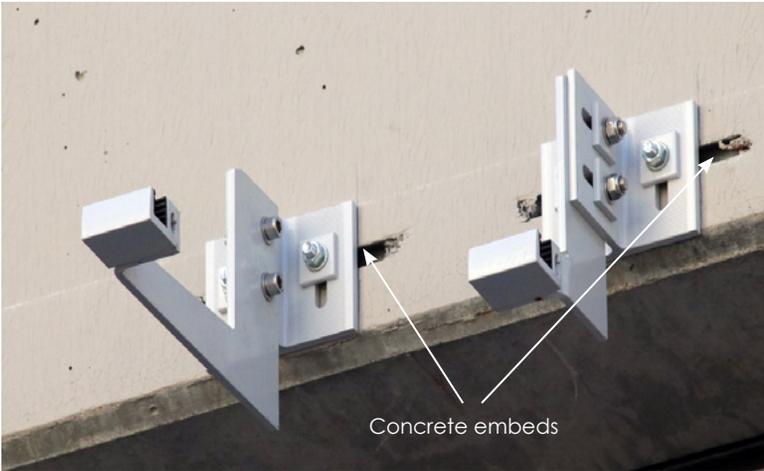


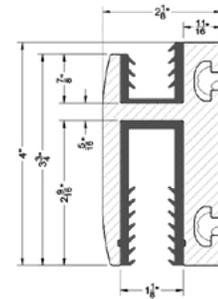
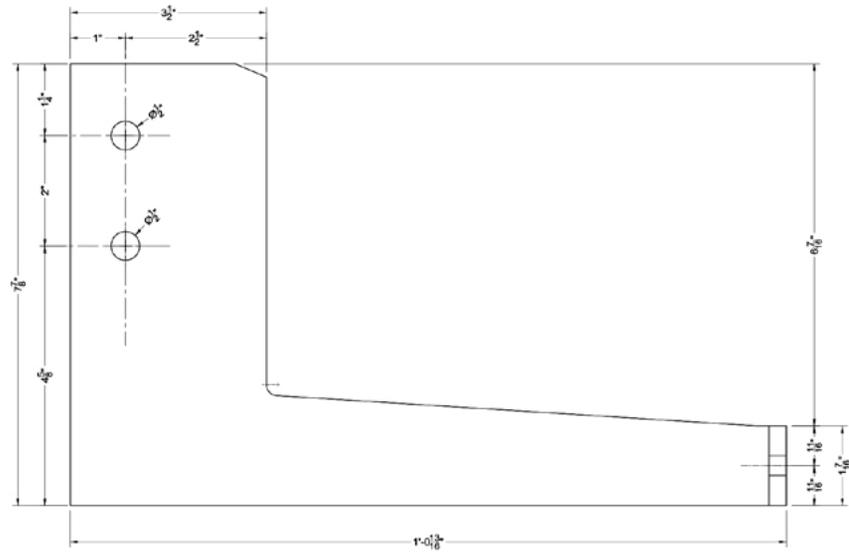
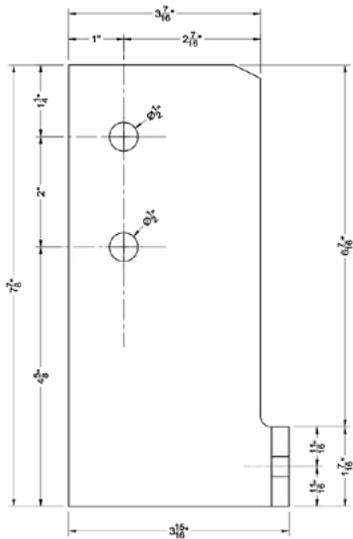
Detail top-down view of "staggered" north/south elevation.

Wherever two metal components meet to create the specified panel position or spacing, their interfacing surfaces are serrated to lock into place:

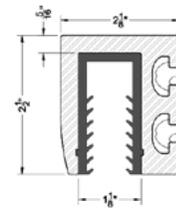
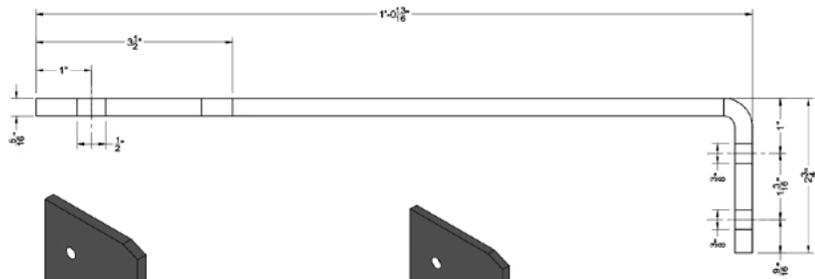
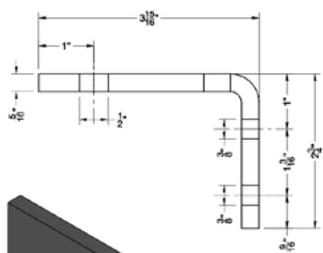


A key aspect of the design is how the ventilated glass facade attaches to the building. Bendheim's system is engineered with generous 2" tolerances in all directions, allowing the cladding to be mounted directly to the concrete walls and slabs through the embeds. The handsome and clever design eliminates the need for vertical steel supports. To ensure its success, Bendheim provided complete detail drawings for all system components, including the embeds.

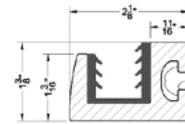
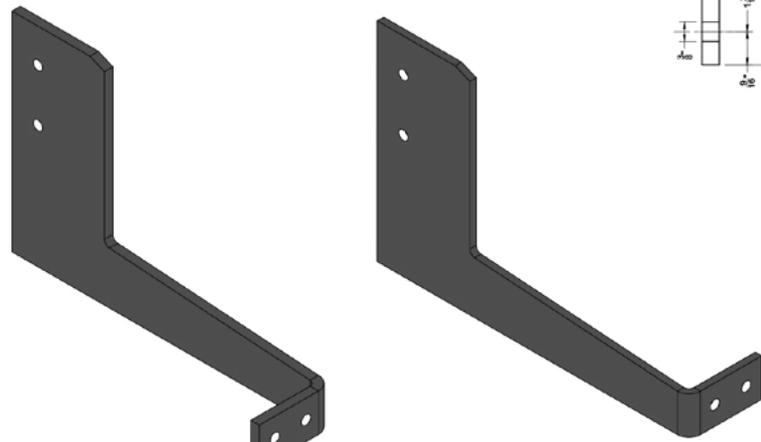
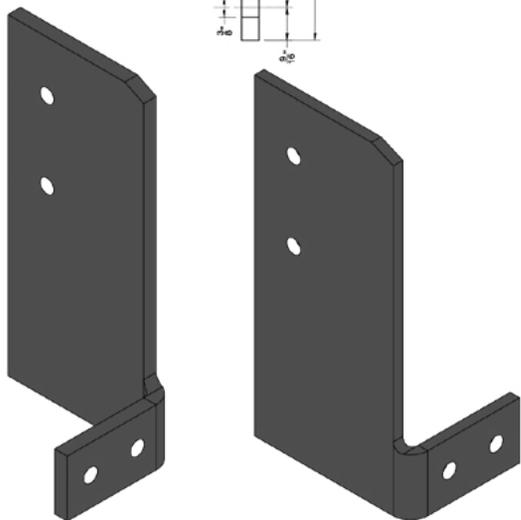




**BENDHEIM WALL FLAT
MIDDLE CLIP**
WEST ELEV.



**BENDHEIM WALL FLAT
TOP CLIP**
W,N,S ELEV.



**BENDHEIM WALL FLAT
BOTTOM CLIP**
W,N,S ELEV.



DECORATIVE GLASS

The two different wall layouts are accompanied by distinct decorative glass designs to further distinguish each facet of the parking structure. The “in-and-out” north and south walls comprise 546 translucent white laminated glass panels. The “flat” west facade consists of 406 pattern-fritted glass panels – a total of approx. 1,000 panels.

The north/south glass features two levels of opacity. The lites that punch forward are a more transparent shade, while the background ones are a denser white, visually enhancing the sense of depth. The layered shading and staggered panel placement create a visual “fade” effect that adds to the

beauty and dynamic quality of the design.

White fritted laminated glass with a custom linear pattern decorates the west facade, creating an enlivening play of shadow and light. It appears to float over the concrete structure, held in the visually minimal clips. The expression is light and crystalline – a nearly seamless jewel facade, uninterrupted by heavy structural supports.

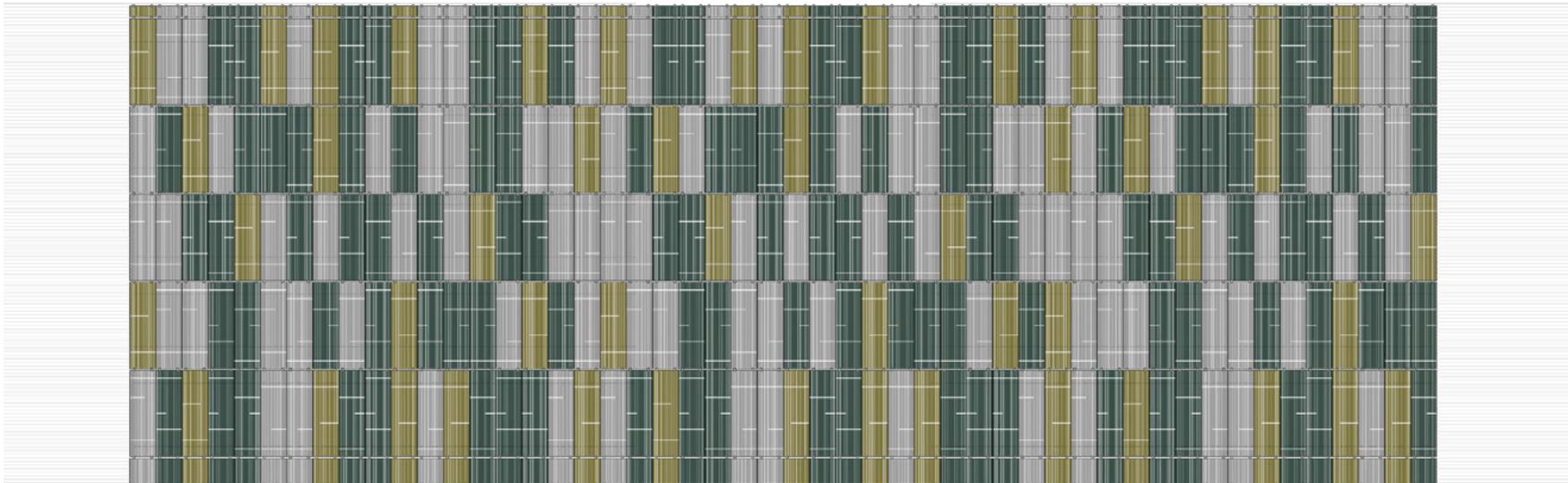
Since this side of the parking structure is the most public one, hiding outside-in views was a key design objective. Because glass patterns without easily perceivable repetition tend to



appear more obscuring, the architects collaborated closely with Bendheim to produce a budget-friendly non-repetitive pattern. Due to the consistent size and shape of the glass panels, it was determined that a silk-screened / fritted pattern was the most cost-effective solution. Three unique screens were produced to create the three primary design motifs. Rotating and mixing these achieved the desired visual variability without increasing the cost. The resulting white pattern-fritted glass effectively screens the parking decks, creating a chic monolithic appearance when viewed from the street, while simultaneously maintaining occupants' visibility to the outside.

The translucent decorative glass on all three sides of the parking structure filters a generous amount of daylight, improves the solar shading, and obscures outside-in views of the cars. As light shifts throughout the day, the entire facade changes in unison. The non-see-through glass is also inherently bird-friendly, an added benefit.

The strength and thickness of the glass were determined by the maximum allowable deflection ($L/60 = \text{length of the glass lite divided by } 60$) and the wind loads. Bendheim designed the glass to the maximum allowable deflection and highest wind load, keeping the same glass thickness throughout the facade for aesthetic consistency and ease of handling. In this case, the maximum allowable deflection was 2" and the wind load reached 50 psf at the corners. Based on these values, the glass was engineered to be $\frac{3}{4}$ " tempered-laminated. While the glass is not located in a safety condition, tempering and lamination added strength and security. Also, being located above a busy pedestrian thoroughfare with retail outlets at street level, the safety glass contributes extra peace of mind.



West elevation glass layout, achieving a non-repetitive appearance by mixing three different linear designs.



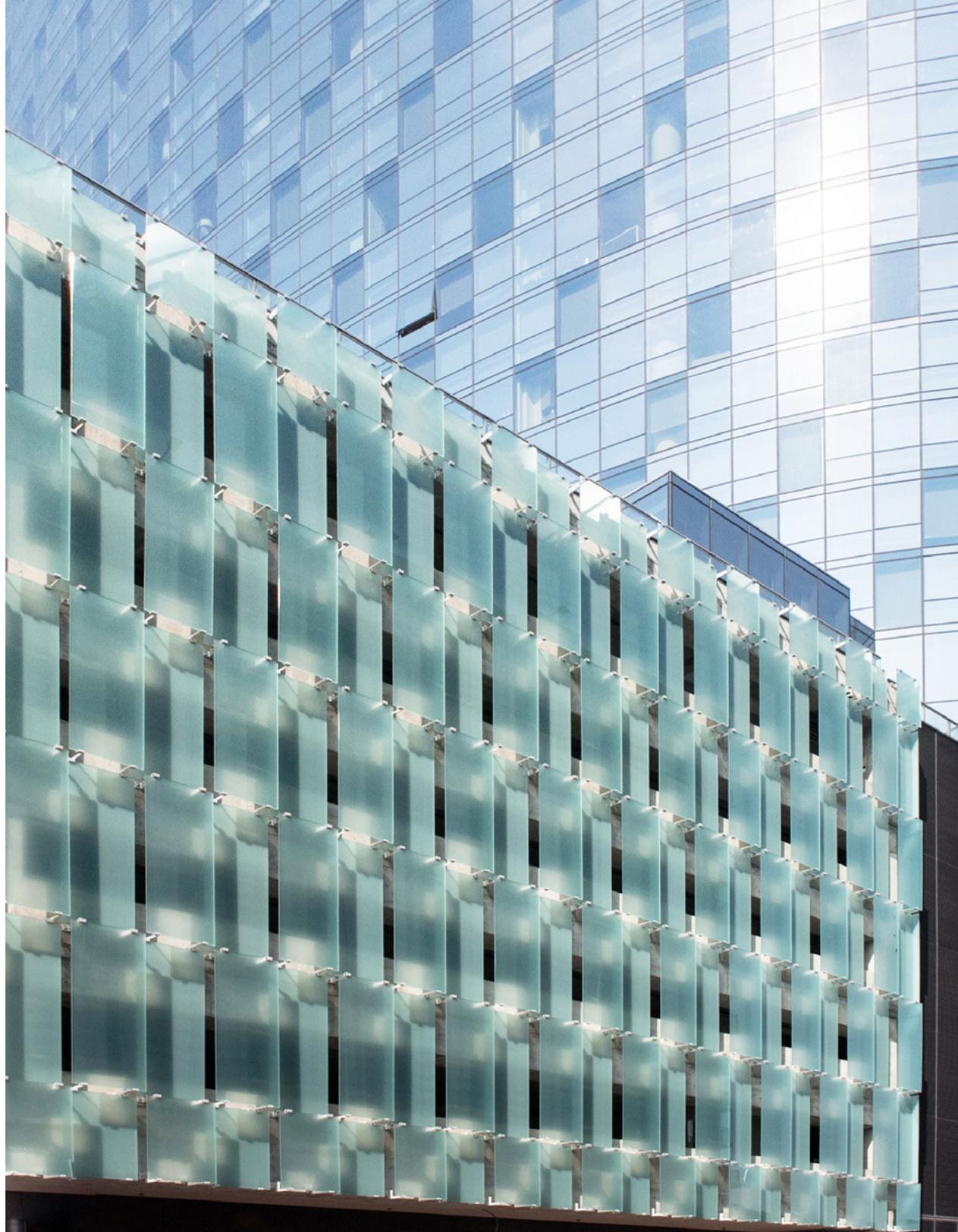
CONTEXTUAL DESIGN AESTHETIC

There are clear parallels between the parking structure's staggered glass cladding and the stepped high-rise curtain wall. The spiral access ramp of the garage also inspired the elliptical shape of the tower. Contrasts are equally evident. They visually break the building mass and add depth to the design.

On the east side, the parking facility adjoins the tower. On the north and south, the more open glass facades maximize air flow and provide the main outlet for natural ventilation. The west facade is the most public one. Its great visibility from the busy Halsted street and its proximity to the property line inspired the more decorative glass design and flat (non-staggered) wall configuration.

"We wanted a different aesthetic," explains Arjang Khorzad, FitzGerald's Senior Associate. "That side of the street gets more traffic and visibility, and we wanted to give it a special treatment. We also didn't want people to have to look at cars. The fritted pattern reduces the visibility, as intended."

The most notable aesthetic accomplishment of Bendheim's facade design is its nearly weightless appearance. The glass seems to float over the concrete parking structure – luminous and free of visible vertical supports and shadow lines.





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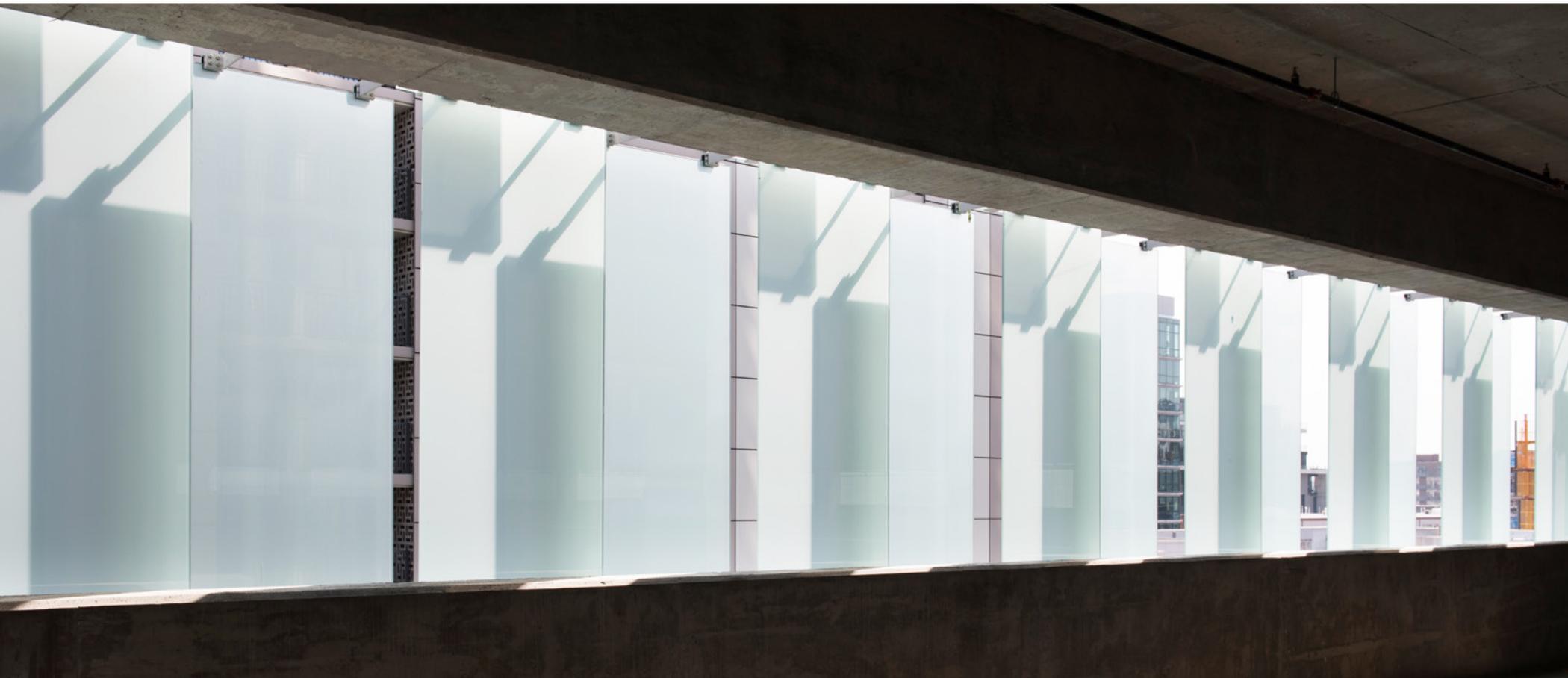
OCCUPANT COMFORT

Daylight, solar shading, protection from wind-driven rain and snow, access to fresh air and natural surveillance – all benefits afforded by the ventilated Bendheim glass system – make this Chicago parking facility a welcoming and comfortable environment.

The open joints in the cladding offer ample natural ventilation, enhancing the air quality inside the structure. Combined with the daylight-filtering glass panels, the facade's openness creates a connection to the outside and enhances visual and audio "visibility." The garage's sweeping floor plan and open-ventilated glass facade allow virtually unrestricted "natural surveillance" opportunities – to see and be seen,

hear and be heard. According to a US Department of Justice study on parking facilities, titled "[Crime Prevention Through Environmental Design](#)," "parking consultants consider natural surveillance—the ability to observe one's surroundings—to be the next most critical security design issue after lighting." The study goes on to recommend the use of glass and maximum openness to boost crime prevention and contribute to occupants' safety and comfort.

From gentle daylight to fresh air, Bendheim's ventilated glass facade helps make the 727 West Madison parking facility light-filled, welcoming, and secure.



DURABILITY & MAINTENANCE

Bendheim's parking facade system surpasses ASTM test requirements for structural performance. Engineered for strength and durability, the glass has already weathered one uncharacteristically stormy Chicago winter season.

The laminated safety glass was specially formulated for the demanding, exposed-edge exterior application, using specialized, UV-stable PVB interlayers. It blocks as much as 99% of UV radiation, and meets the requirements for ANSI Z97.1 and the Consumer Product Safety Commission CPSC 16FR, Part 1201 – Safety Standard for Architectural Glazing Materials.

The durable architectural glass stands up to the punishing effects of water, wind, and time. It is maintenance-friendly and resists permanent staining and graffiti. Water simply rolls off its smooth, non-porous surfaces. Periodically, traditional window washing techniques can be used to clean it more thoroughly from the front and/or back. In-between cleanings, the light-diffusing decorative glass conceals water stains and dirt.

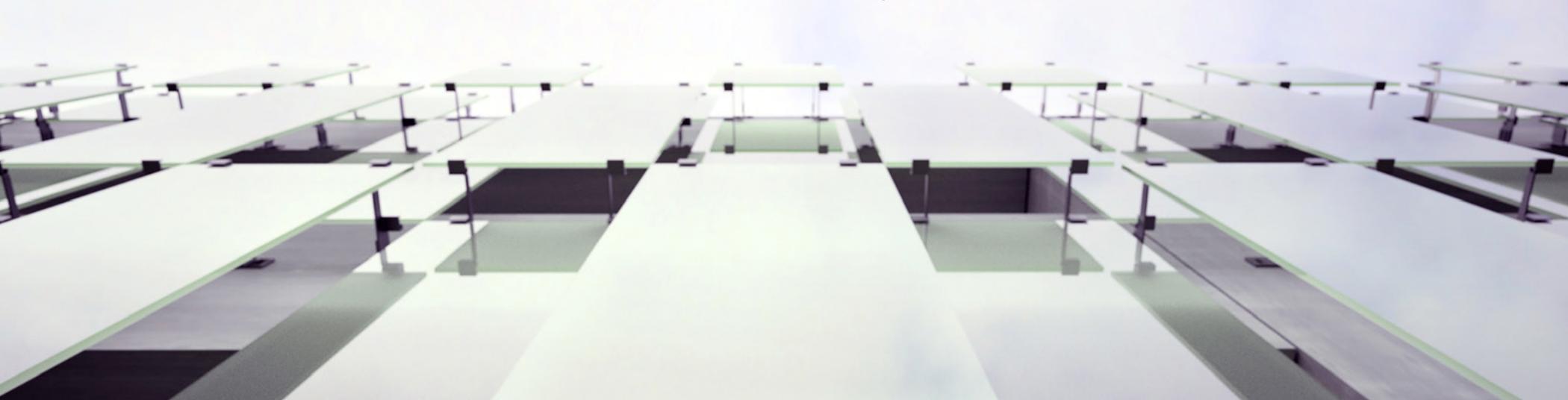
The metal system components feature a durable, weather-resistant powder-coated "silver" finish. It allows the aluminum and steel parts to interface safely. To help repair any accidental damage to the finish during installation (scratches or chips), Bendheim also provided a fixing kit for field touch-ups.

DESIGN-ASSIST BOTTOM LINE

The collaboration between FitzGerald, Reflection, and Bendheim, starting early in the design process, allowed the team take full advantage of the tremendous flexibility and customization potential of Bendheim's ventilated glass cladding system. It helped achieve a standout facade aesthetic, generous natural ventilation, and significant cost savings.

Attaching the glass cladding directly to the building saved approx. \$900,000 in steel costs. The unique 8" glass panel staggering saved another \$150,000 in mechanical ventilation. Finally, Bendheim's patented quick-assembly and the use of the same system to create two distinct wall aesthetics contributed installation efficiencies, resulting in an untold benefit to the project's construction timeline and labor costs. The substantial savings realized by the system's smart engineering cut its cost roughly in half.

Note: Editorial case studies on this project have been published in the October issue of The Construction Specifier: "[The Design-Assist Benefit | Affordable 'Jewel' Façades](#)" and Contract magazine: "[Jewel Box.](#)"





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