CASE STUDY

Ventilated Glass Facade for Fast-Track Stadium Project

Quick Fabrication & Even Quicker Installation Score a Touchdown

BENDHEIM

KINNICK STADIUM CASE STUDY

FAST-TRACK VENTILATED GLASS FACADE SCORES A TOUCHDOWN

THE CHALLENGE

Home of the University of Iowa Hawkeyes and ranked best among the Big 10 (B1G) stadiums, Kinnick entered the 2019 football season with an expanded North End Zone. The $89.9-million renovation called for a new hawk-wing-inspired glass facade to highlight the cantilevered addition to the historic 1929 structure, as well as brand the exterior with Hawkeyes' symbolism.

The main objectives for the customized ventilated glass facade included:

1. the ability to seamlessly clad non-conditioned and conditioned areas alike;
2. combine decorative glass and fiber cement panels in the same system;
3. rapidly deliver and install during the football off-season.

"IOWA FANS ARE TRULY PASSIONATE ABOUT THEIR STADIUM. EVERY DESIGN DECISION WAS MADE TO IMPROVE THE FAN EXPERIENCE."
– KIM MCDONALD, PRINCIPAL, NEUMANN MONSON

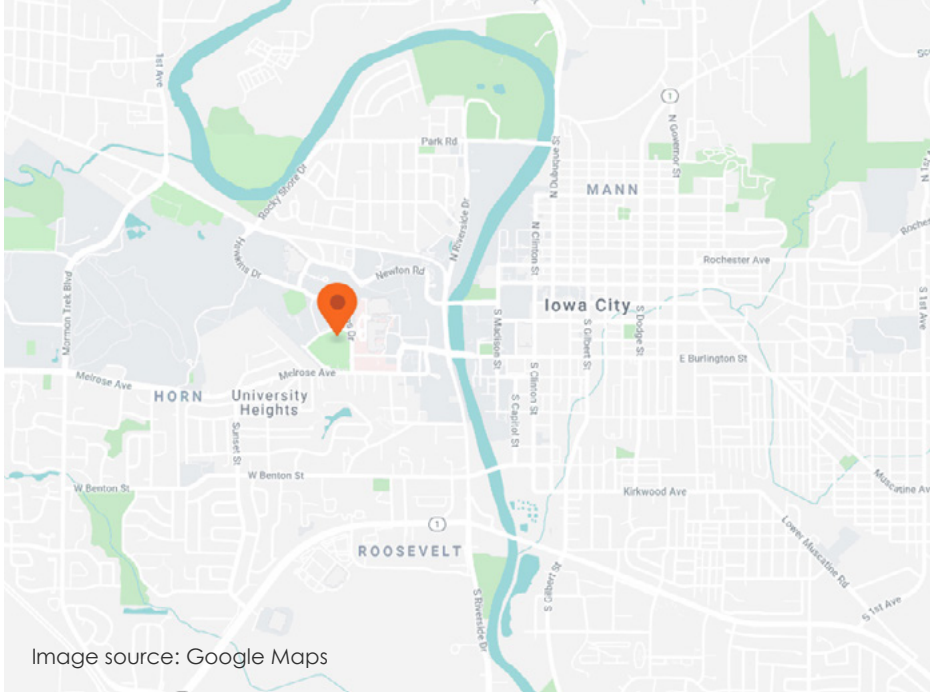
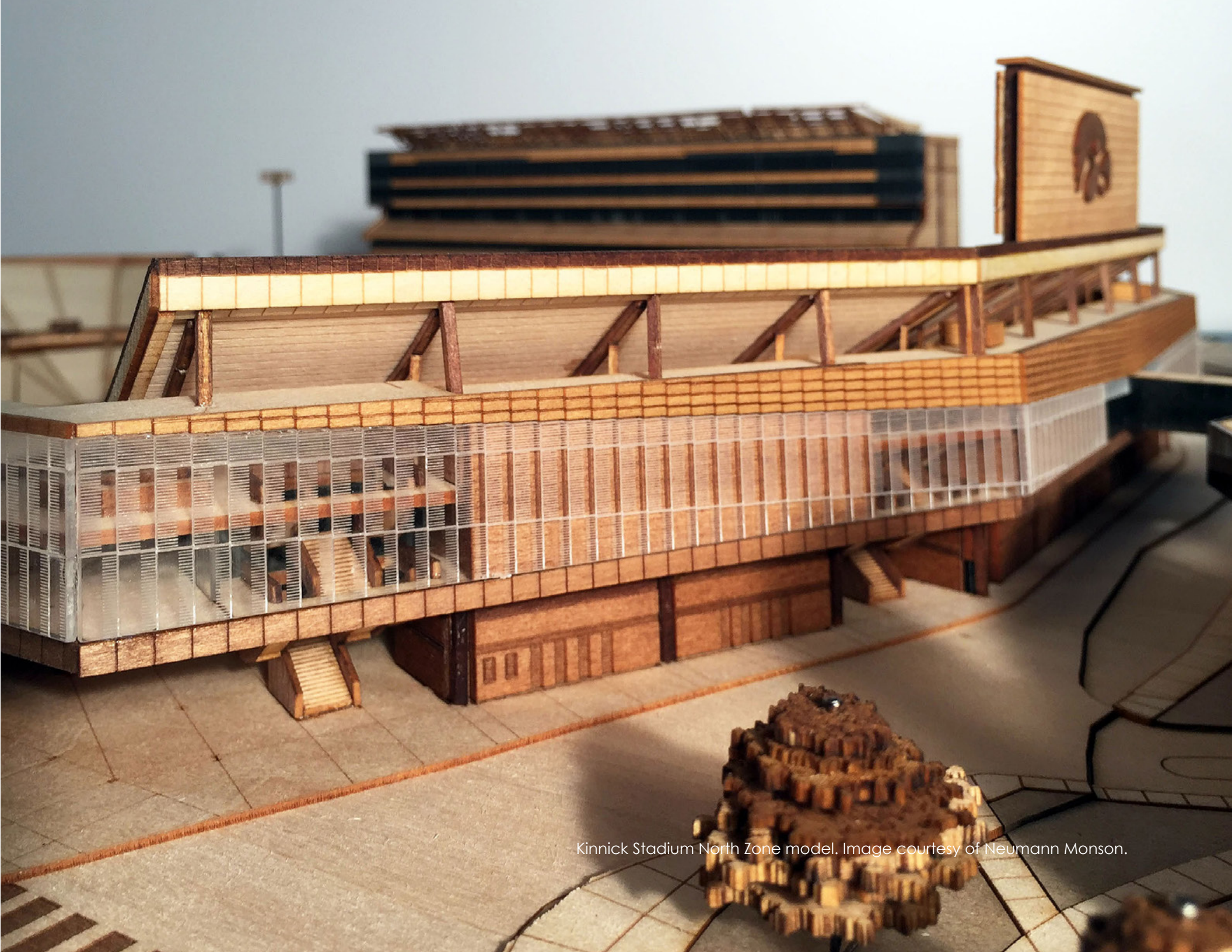


Image source: Google Maps

AT A GLANCE

- Kinnick Stadium Renovation, Iowa City, IA
- Design by Neumann Monson Architects and HNTB
- Custom Imprinted Ventilated Glass Facade by Bendheim Wall Systems Inc., New Jersey
- Installation by Architectural Wall Systems (AWS), Clive, IA
- Approx. Facade Area: 20,000 sq. ft. (14,000 sq. ft. glass + 6,000 sq. ft. fiber-cement)
- Max. Glass Panel Size: 62" W x 154" H
- Glass Type: 5/8" low-iron laminated glass with a custom grey frit linear pattern
- Photos by Neumann Monson, Bendheim, and Cameron Campbell of Integrated Studio



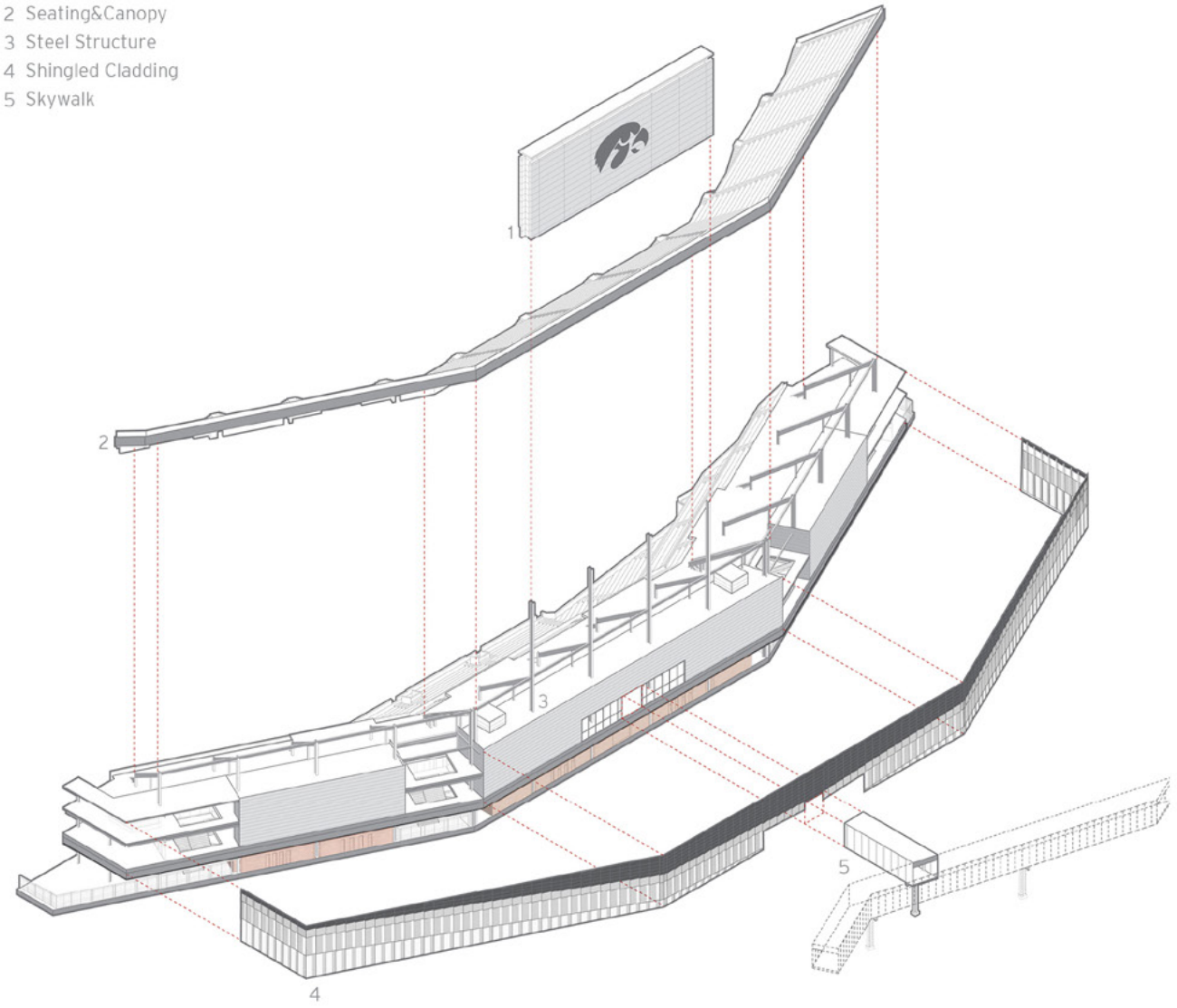
Kinnick Stadium North Zone model. Image courtesy of Neumann Monson.

SITE PLAN

400'
0' 200' 800'

NORTH END ZONE

1 Score Board
2 Seating&Canopy
3 Steel Structure
4 Shingled Cladding
5 Skywalk



Expanded North Zone & facade. Images courtesy of Neumann Monson.

THE SOLUTION

Bendheim's non-traditional ventilated facade system was the optimal solution. It uses patented compression fittings (clips) to capture the glass panels, making it exceptionally flexible, durable, and forgiving in the field. At Kinnick Stadium, this translated into very expedient fabrication and installation. In a complete reversal of "typical" specialty glass delivery expectations, the fully fabricated glass system arrived well in advance of the project start date. Then, installation of the approximately 20,000 sq. ft. of cladding was completed in only two months.

Bendheim's fully customizable glass cladding systems are available in a variety of panel configurations, including a double-shingled Wall-VH option. This elegant textural option was ideal for Neumann Monson's "hawk wing" design aesthetic.

Achieving the wing design also required the use of a custom fritted glass pattern, representing the natural color gradient in hawk feathers. To ensure the frit pattern aligned from side to side and floor to floor, Bendheim engineered the facade system with generous 1.5" tolerances in all directions. Then, according to McDonald, "each glass panel was placed precisely to achieve the overall design and required careful coordination, planning, and attention to detail."

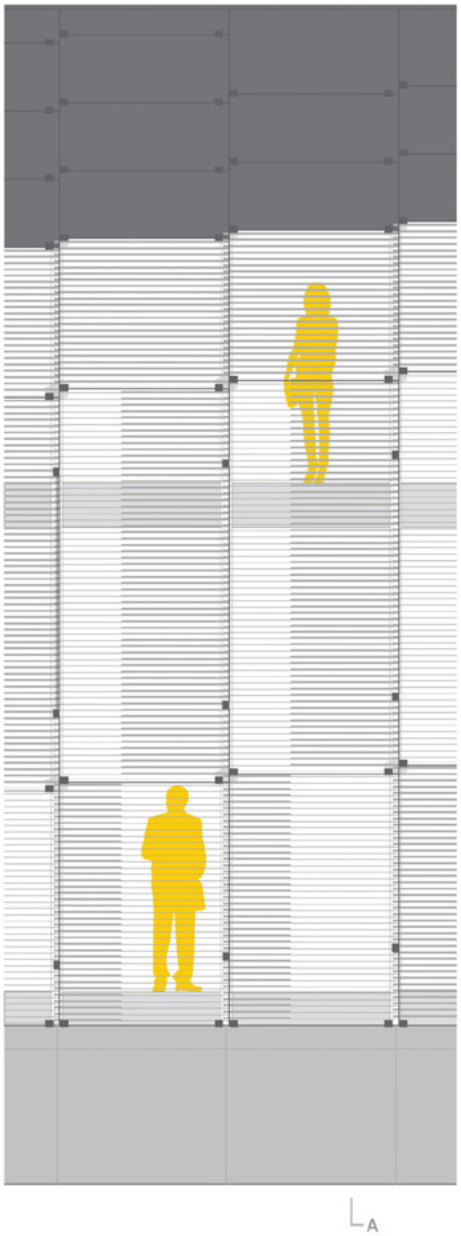
Pictured here: "Hawk wing" glass facade design, showing fiber-cement panel inserts (center top). The custom glass frit pattern is bird-friendly, designed to the bird-safe "2x4" rule. Images courtesy of Neumann Monson.

ENLARGED FEATHER

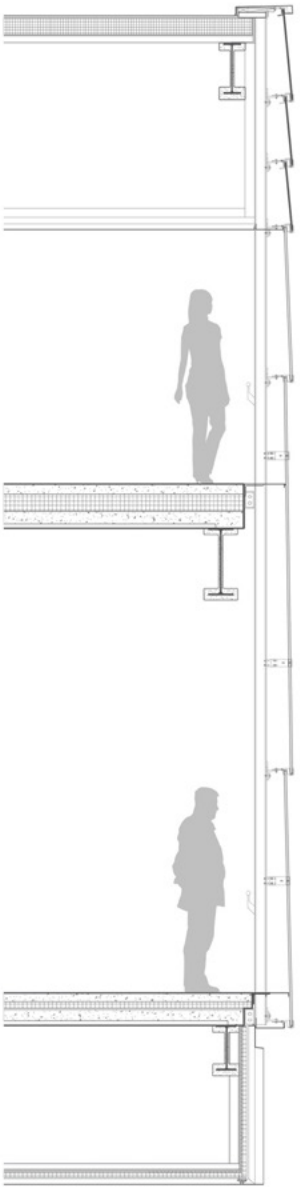
FRIT PATTERN ZOOM

HAWK FEATHER

PANEL MODULE



ELEVATION



SECTION A-A

Bendheim's compression-clip system did not require drilling holes through the cladding, and could seamlessly integrate the glass as well as the porous fiber-cement panels. The finished facade spans 655 ft. It incorporates over 14,000 sq. ft. of decorative glass and 6,000 sq. ft. of fiber-cement.

Kinnick Stadium interior view of fiber-cement panels.

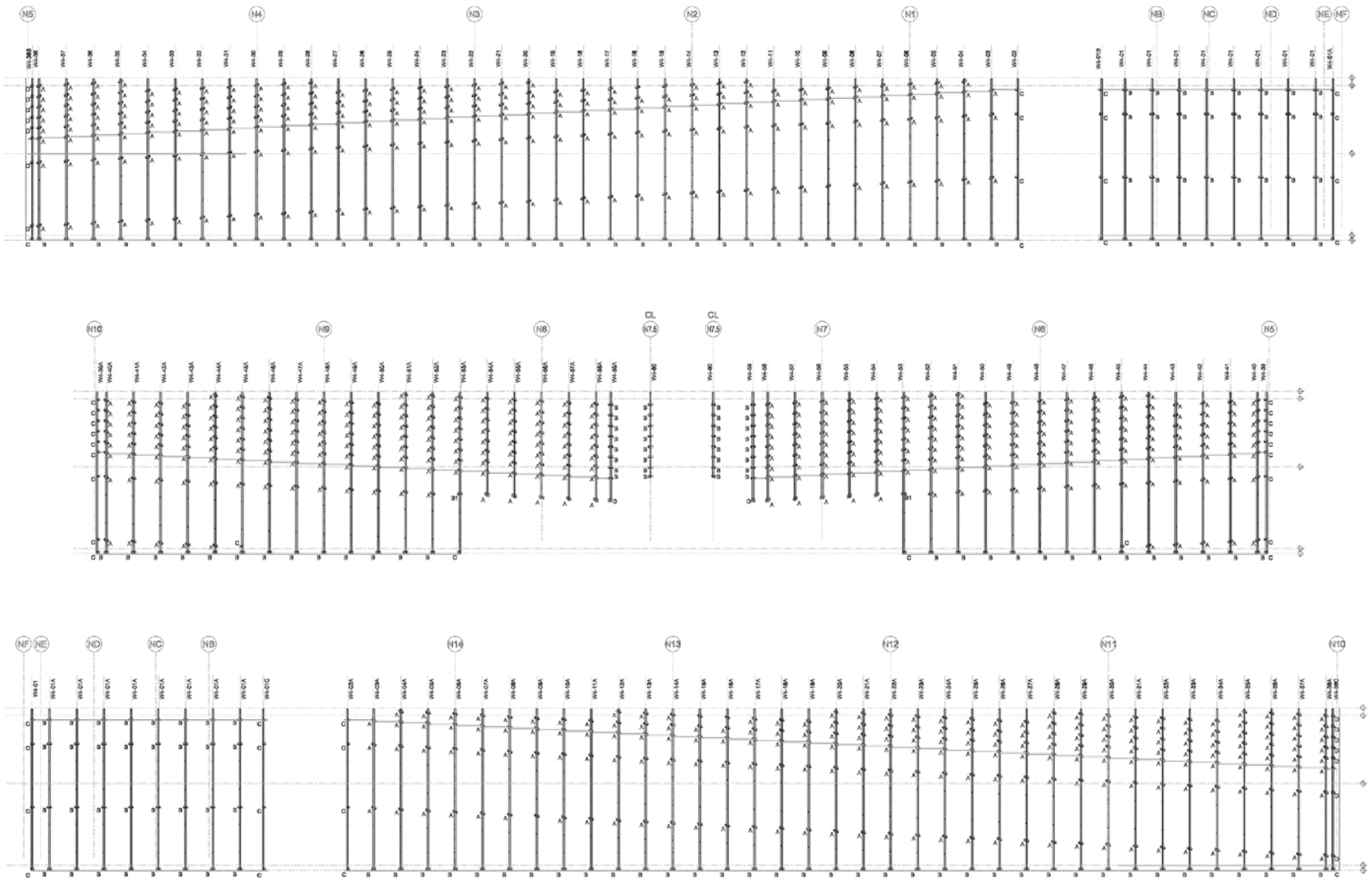

EXIT ONLY
EXIT ONLY

EXECUTION

The project was originally designed with a traditional point-supported spider cladding system. The architects switched to Bendheim's compression fitting system after learning of its numerous advantages, including speedier fabrication and installation. Bendheim presented the solution through renderings and a competitive 6 ft. by 6 ft. mockup, incorporating both glass and fiber-cement panels (pictured here).

According to McDonald, evaluating the competitive facade offerings through physical mockups "assisted in reviewing constructability and understanding tolerances. The success of the mockup directly correlated to the smooth and efficient installation of the final product."

Bendheim's facade design and development process started with 3D models for the custom system, providing the required tolerances. Once the design and engineering were approved, our team proceeded to produce exact shop drawings for the steel supports. According to Said Elieh, Bendheim's Vice President of Systems & Innovation, "the greatest technical challenge was realizing the complex panel layout and creating over 50 pages of detailed shop drawings for all 200 vertical facade supports. We had to meticulously detail the size and location of each hole in the metal, as well as the precise placement of each glass and fiber-cement panel."



Kinnick Stadium compression fitting placement.

The meticulous drawings helped the installer, Architectural Wall Systems (AWS), pre-drill the steel supports, finish them, and pre-assemble the clips, significantly speeding installation. Production of the glass was also expedited. The flexibility of our system allowed fabrication to start early, based on the approved drawings rather than precise field measurements. The speedy fabrication and installation were a win for the fast-track project.

"THE SYSTEM WAS DESIGNED AND INSTALLED SKILLFULLY WITHIN A VERY TIGHT JOBSITE, AND IN COORDINATION WITH THE MORE THAN 10 TRADES INVOLVED IN THE PROJECT." – KIM MCDONALD, PRINCIPAL, NEUMANN MONSON

Rainscreen installation. Images courtesy of AWS.

A TOUCHDOWN FOR THE CONSTRUCTION SCHEDULE

Typically, point-supported cladding systems require field measurements. The facade fabricator has to wait until all rough construction is completed to obtain the precise dimensions. Only then can manufacturing of the glass and hardware begin. From that point on, fabrication and delivery typically require at least 1-2 months.

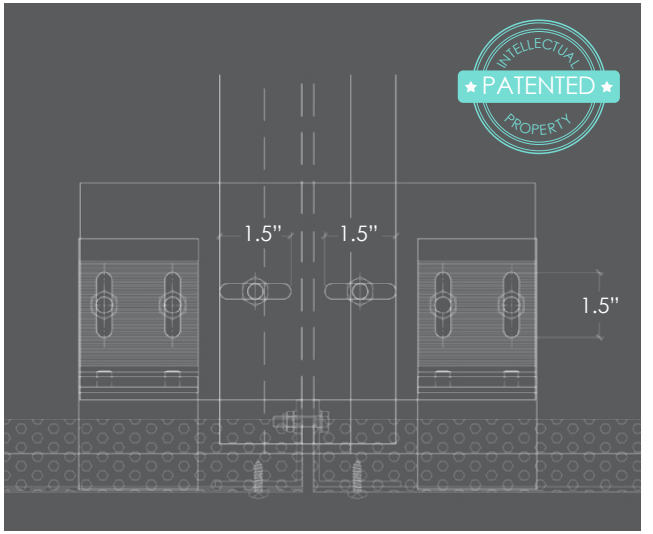
In contrast, the tremendous built-in flexibility of Bendheim's ventilated facade system meant fabrication could begin as soon as the drawings were completed. The 1.5" total tolerance in all directions was a boon for the design, fabrication, and installation. Every single component of the system was carefully engineered to provide this generous amount of play:

- in-and-out movement through the connection between the angle and the clip;
- up-and-down movement through the connection between the angle and the steel plate;
- left-and-right movement through the connection between the steel plate and the structural steel supports.

AWS was able to complete the installation of all 20,000 sq. ft. of glass and fiber-cement cladding in approximately 2 months, during the football off-season.

"BOTH COLLABORATION AT THE BEGINNING OF THE PROJECT AND THE VERSATILE COMPRESSION FITTING SYSTEM INCREASED INSTALLATION EFFICIENCY BY MINIMIZING ADJUSTMENTS IN THE FIELD THROUGH AMPLE TOLERANCES." – ADAM BOECKMANN, PRESIDENT, ARCHITECTURAL WALL SYSTEMS (AWS)

Attachments with 1.5" tolerances




UNIVERSITY OF IOWA
EXIT ONLY
EXIT ONLY

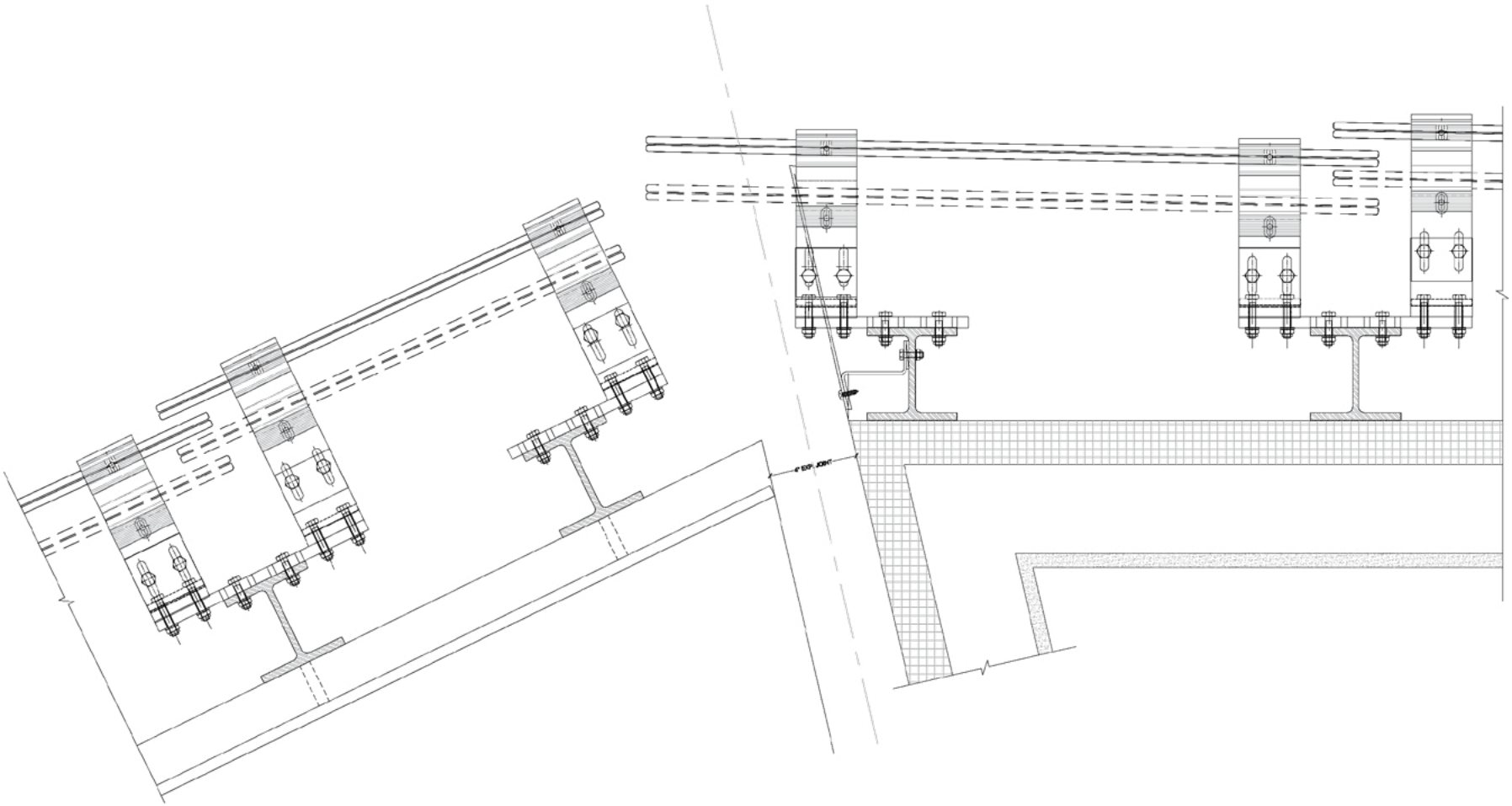
THE SYSTEM

Kinnick features Bendheim's non-traditional, point-supported glass facade system with vertical-and-horizontal panel overlap. The shingled aesthetic adds a textural quality to the facade and allows greater flexibility and adjustability in the field, contributing to its speedy installation.

Most importantly, the fully-mechanical, compression-fitting system eliminates the need for adhesives and hardware holes through the panels. Adhesives are prone to failure when improperly applied. Drilling holes can weaken the cladding panels, add cost, and slow down fabrication and installation. Bendheim's patented compression clips are fail-safe and secure.

The unique parameters of the project required a tailored Bendheim Wall-VH glass facade system. Custom mid-point wind clips and other custom components were developed to handle the large glass panels, reaching sizes up to 5 ft. by 13 ft. and weighing over 500 lbs. each. In total, Kinnick Stadium's new ventilated facade features approximately 2,500 custom-colored aluminum fittings and 1,100 steel plates.

The facade was engineered with custom ½" spacing between the double-shingled glass panels to accept reinforcing mid-point wind clips. As an added benefit, the generous spacing ensured there would be no issues associated with strong vibrations or loud sounds.



The large building runs required significant expansion joints, and the glass system was designed to accommodate them. It features joints with 4" total expansion (2" in each direction). The shingled glass aesthetic and corner placement obscure the appearance of the expansion joints, maintaining clean design lines.

The technical customization and engineering of Kinnick's facade are based on the performance of Bendheim's standard Wall-VH system, which has been rigorously tested in accordance with ASTM E330-02 and AAMA 509-09 standards for water penetration, air leakage, and structural performance. The glass cladding stops over 90% of wind-driven moisture. The remaining less than 10% dissipate quickly via the open joints, through the combined actions of gravity (drainage) and evaporation.

From an aesthetic standpoint, one of the most challenging custom elements on the project was the color of the metal components. Multiple samples were produced, until a perfect match for the fiber-cement and fritted glass was identified – a custom "flat metallic" grey.

Approved custom powder-coat color.

Fittings in custom "flat metallic" grey powder coat.

SEAMLESS MIX OF WALL TYPES

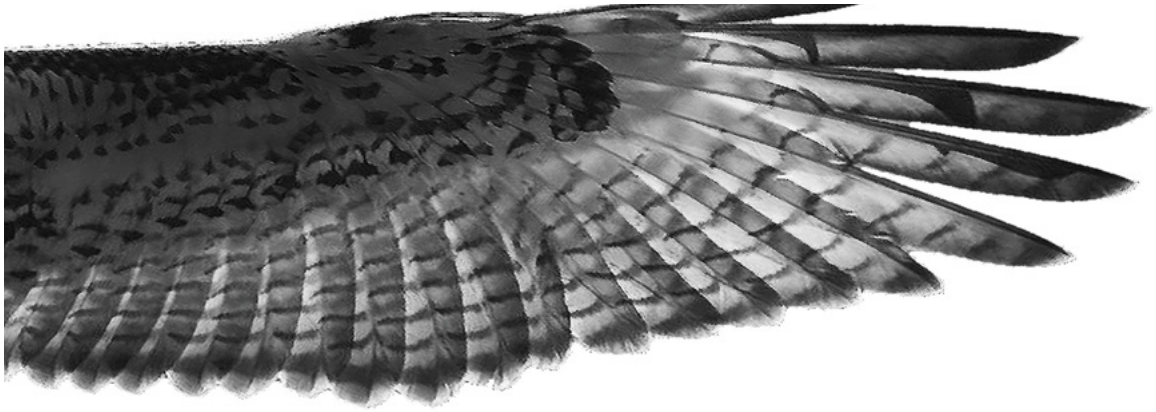
The cantilevered Kinnick Stadium facade is a mix of true rainscreen (installed in front of the insulated metal panels and curtain wall, which wrap the air-conditioned suites) and open-ventilated facade that encloses the walkways and concession areas (mounted directly on W4 vertical steel supports).

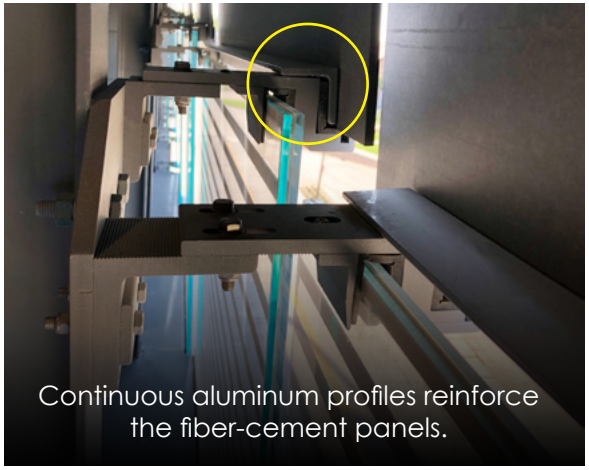
Shingled rainscreen over curtain wall. Image courtesy of Neumann Monson.

Open-ventilated glass facade around the concessions.

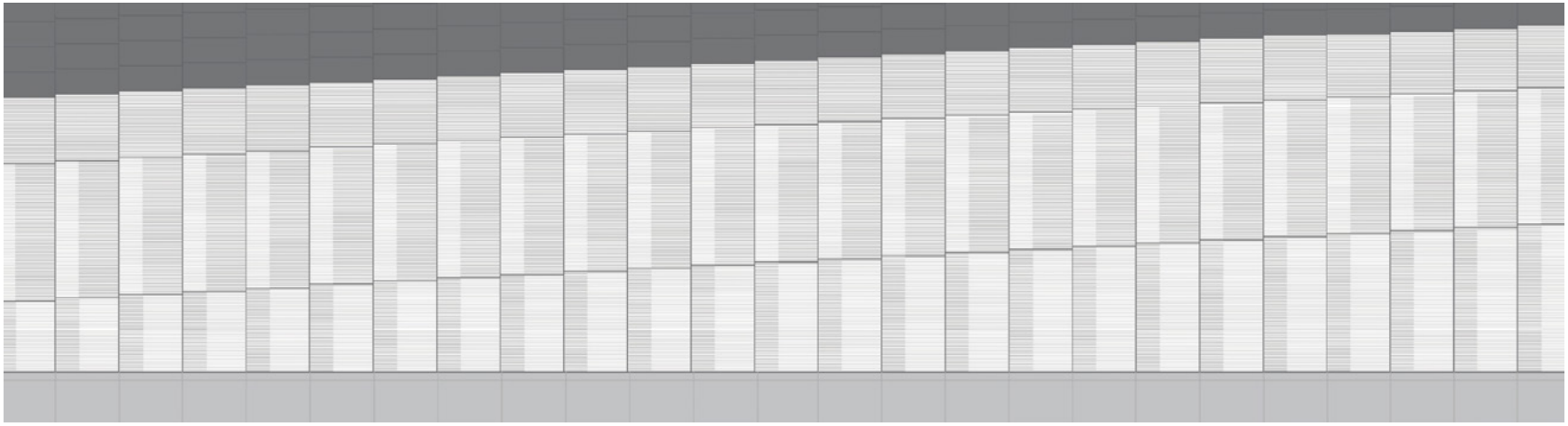
SEAMLESS MIX OF MATERIALS

Seamlessly integrating the glass and fiber-cement cladding panels in a single continuous system was integral to achieving the “hawk wing” effect. The custom glass frit color further matches the grey fiber-cement to weave the two materials into a cohesive whole. The fittings are custom colored in a harmonizing “flat metallic” grey to round out the integrated design.





Continuous aluminum profiles reinforce the fiber-cement panels.



THE GLASS

Kinnick Stadium features premium custom architectural glass that is:

- low-iron
- custom imprinted
- safety tempered & laminated w/ structural SGP interlayers

The low-iron glass is nearly colorless, free of the typical greenish-blue tint that can be easily distinguished in regular glass during the day. At night, the crystal-clear material transforms into a sheer membrane that presents inviting views of the interior.

The primary objective for the glass' varied fritted linear pattern was to convey the architect's vision of a hawk wing. To create the diversity of patterns required for the custom design, three extra-large silk screens were produced from the architect-provided artwork. Each glass panel was then carefully aligned to one of the screens to produce the mixed imprints, as detailed in the shop drawings.

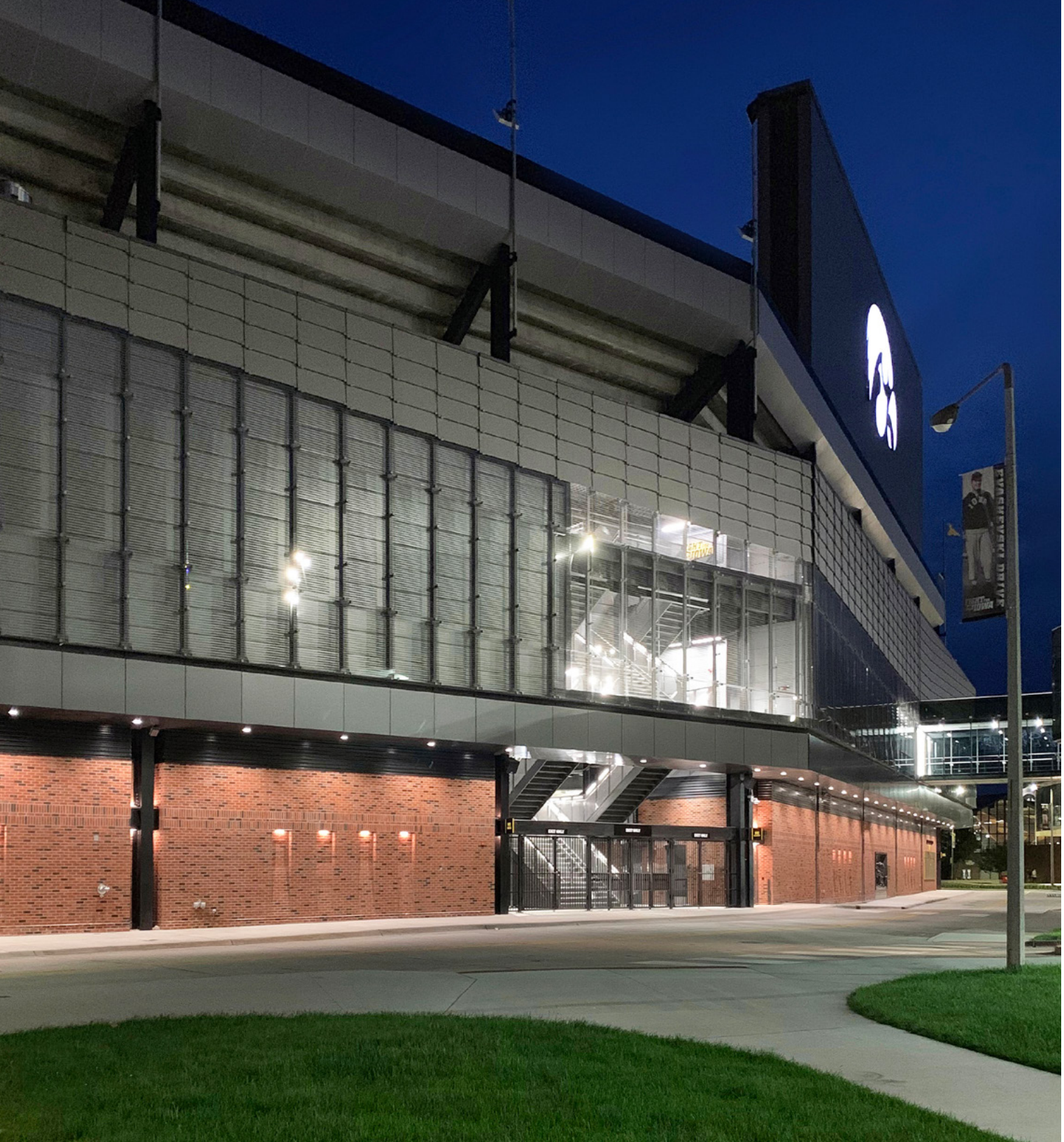
According to the architects, the custom glass pattern was "one of the smoothest things" around executing the bespoke hawk wing aesthetic. Bendheim was instrumental to this success, having meticulously detailed the fabrication and installation of the 200+ glass panels required to achieve the complex design.

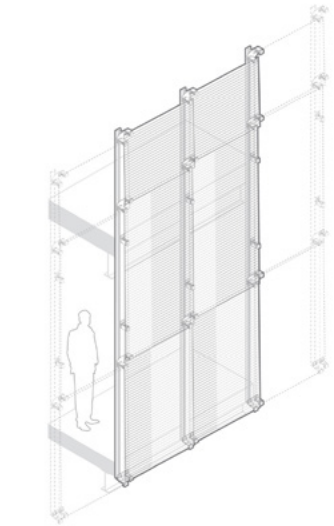
The decorative glass pattern has a practical purpose, as well. During the off-season, the stadium's upper stories can be used for temporary storage. Their denser fritted pattern, together with the opaque fiber-cement panels above, provide a higher level of privacy. They obscure outside-in views, maintaining a cleaner, more uniform exterior aesthetic.

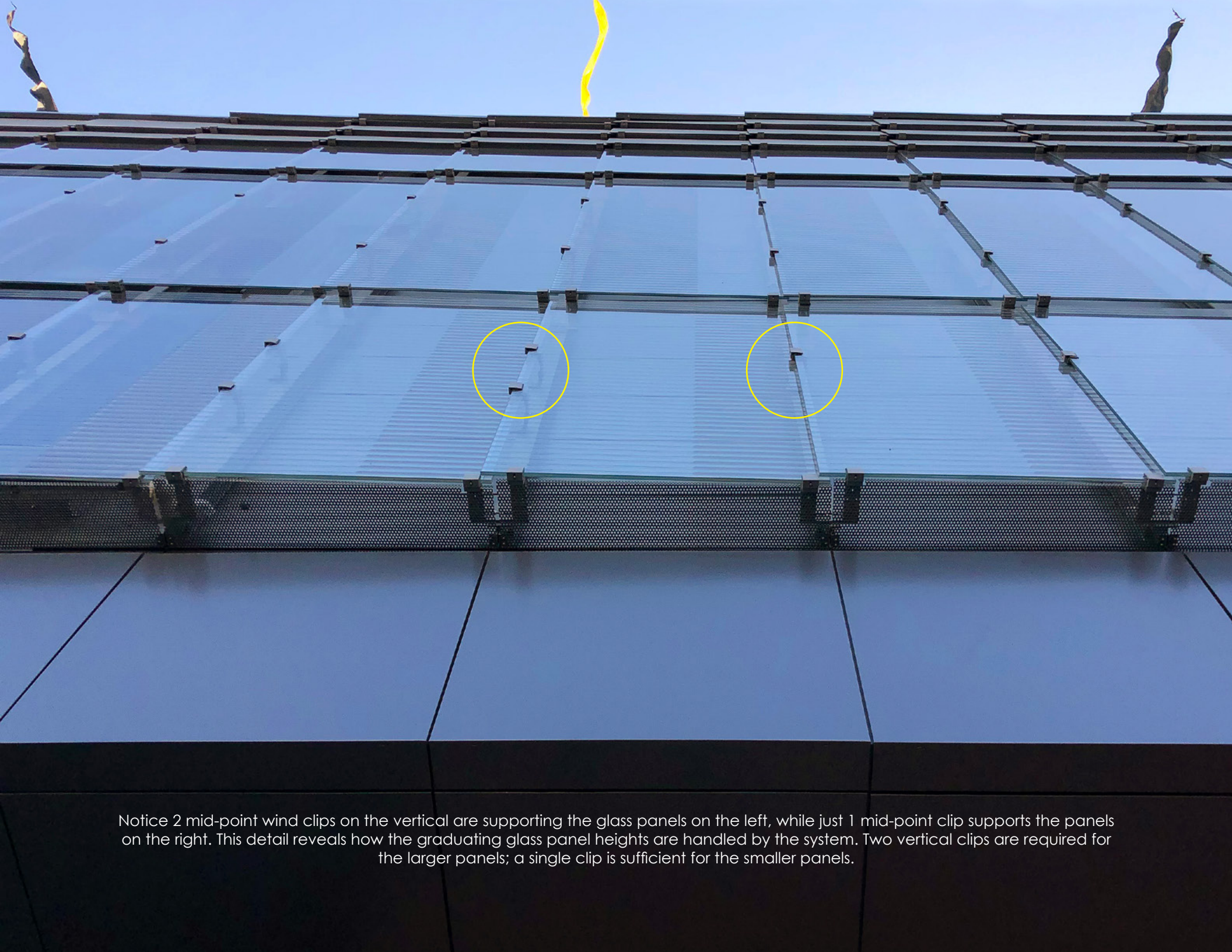
The tempered-laminated glass meets the safety requirements for ANSI Z97.1 and the Consumer Product Safety Commission CPSC 16FR. It comprises two lites of tempered (heat-strengthened) glass, permanently bonded through lamination, with a structural SGP interlayer at the center. The surface of the glass is four to six times stronger than regular annealed (non-safety) glass of the same thickness, significantly reducing the likelihood of accidental damage. In the event of breakage, the SGP interlayer provides added rigidity, holding the panel in place until it can be safely deglazed and replaced. The interlayer also adds strength to the glass, allowing the use of thinner 5/8" glass, which minimizes the overall weight and bulk of the facade.

The glass panels reach 62" W x 154" H in size, and the lites on the bottom row change sizes to create the slanted "wing" design. They slowly graduate by 3" – from longer to shorter and then longer again – in order to accommodate the gently sloping shape. The fiber-cement panels at the top also change sizes to create the "blades."

The 3" slope posed a challenge with the corner details and glass pattern alignment. Bendheim had to carefully detail each glass panel and its placement in the shop drawings, ensuring perfect execution of the design. Corner glass panels also had to be special-cut (special shapes) to create the clean design lines.

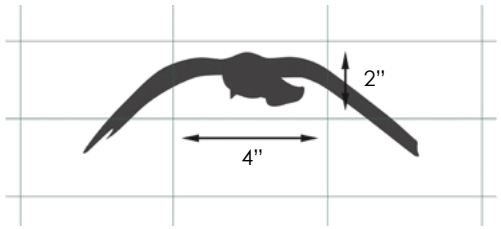






Notice 2 mid-point wind clips on the vertical are supporting the glass panels on the left, while just 1 mid-point clip supports the panels on the right. This detail reveals how the graduating glass panel heights are handled by the system. Two vertical clips are required for the larger panels; a single clip is sufficient for the smaller panels.

Bird-Friendly
Kinnick's pattern-fritted glass is bird-friendly, complying with the "2 x 4" bird-safe principle. This helps prevent accidental avian strikes and deaths. According to the principle, horizontal lines, such as the ones comprising this pattern, should be spaced no more than 2" from each other (vertical lines should be spaced no more than 4" from each other). Kinnick pattern's spacing ranges from 1.5" to 2".



GAME-DAY EXPERIENCE & OCCUPANT COMFORT

"HAWKEYE FANS ARE PASSIONATE ABOUT THEIR STADIUM... WE WERE VERY RESPECTFUL TOWARDS THEIR EXPERIENCE. WE WANTED TO DESIGN SOMETHING LIGHT AND ELEGANT, TO CREATE A MODERN INTERVENTION ON THE NORTH SIDE OF THE HISTORIC STRUCTURE." – ASA HOUSTON, ARCHITECT, NEUMANN MONSON.

According to the architects, in addition to providing moisture protection, Bendheim's open-joint glass facade maximizes natural ventilation during the hot early-season games, blocks wind during the cold fall and winter months, and facilitates smoke mitigation.

It is also part of the "more visceral visitor experience" at the club level. The center of the facade, with its winged V-shape, aligns with the centerline of the stadium – at the exact point where pedestrian traffic streams into the club from the north skywalk. "This creates a subtle culmination to the fan 'procession' that promenades through the north skywalk along the stadium centerline," said McDonald.

Kinnick Stadium on game day. Photo by Cameron Campbell.

Ventilated Glass Facade for Fast-Track Stadium Project

CASE STUDY

BENDHEIM

TRADE SHOWROOM
200 Lexington Avenue
New York, NY 10016

HEADQUARTERS
82 Totowa Road
Wayne, NJ 07470

T: 800.221.7379, x5
rainscreens@bendheim.com
www.bendheim.com/systems