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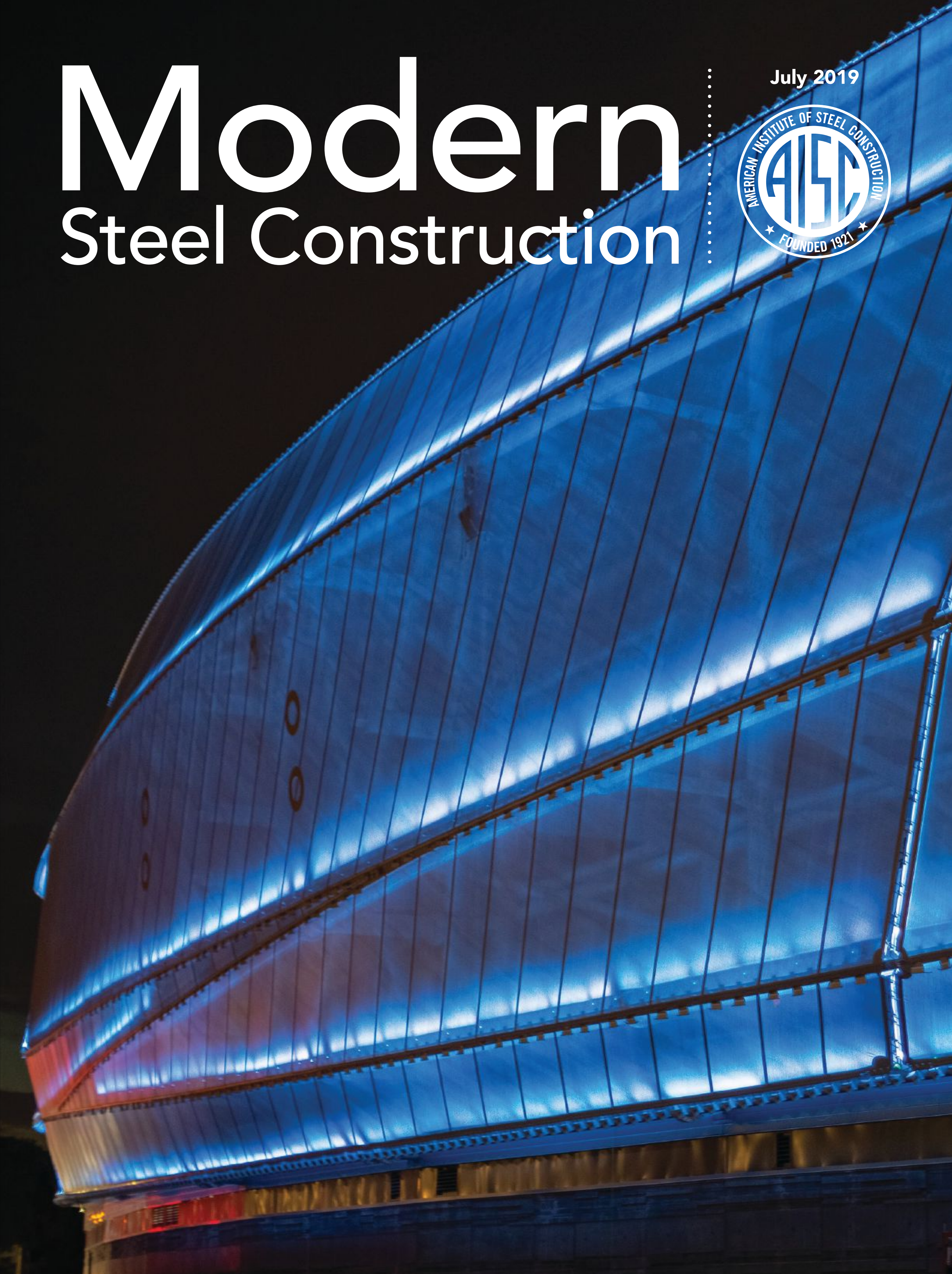

A century-old service station becomes a steel-framed TV studio thanks in part to a creative column configuration and a fresh façade.

A Studio Grows in Brooklyn

BY MARCO SHMERYKOWSKY, PE

Cuppek Photography

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BROOKLYN IS WHERE IT'S AT.

Once the target of scorn from well-heeled Manhattanites, Brooklyn has established itself as the international capital of "cool."

Whether you're looking for an organic, small-batch IPA, a cassette single from a band that's about to be moderately famous or a pop-up restaurant that serves $50 artisanal chicken nuggets, Brooklyn is where members of today's creative class ply their trades. And if you're a media company looking to stay relevant in a rapidly changing entertainment landscape, there's no better place to be. For one such company, a four-story 1920s building, originally a Studebaker service station, in the borough's Crown Heights neighborhood proved to be an ideal location. But of course, such a building needed extensive renovation to become a 21st century television studio space.

Shmerykowsky Consulting Engineers was brought in to handle the structural design as well as to solve some of the inevitable challenges that crop up when retrofitting a nearly century-old building. The plan was to divide the building into three areas: one in the north for storage, one in the south for offices and, in between, a studio. For the studio space, the client had its eyes on a sizable one-story garage area measuring approximately 88 ft by 82 ft in plan. The garage met the basic criteria for a television studio: a large, column-free space with high ceilings (the top of the roof slab is approximately 19 ft above the ground floor slab, slightly higher than the original elevation). However, the structural team soon discovered that essential supporting features like ceiling lighting grids, new air handling units and acoustical walls would require several upgrades to the building. The existing structure was analyzed with a RAM structural model, using field measurements and observations of the existing framing and conditions. The analysis showed that the original roof structure did not have the reserve capacity to support the heavier superimposed loads of the new studio equipment.

opposite page: The studio space measures approximately 88 ft by 82 ft.

right: A structural analysis showed that the original roof structure did not have the reserve capacity to support the heavier superimposed loads of the new studio equipment, so a new steel roof was constructed.

After considering a variety of approaches, the design team determined that the best plan was to completely alter the space, adding a new steel column grid and an updated ceiling system. In the end, the only portions of the structure that would be retained were the existing southern and western CMU façade walls and their respective footing systems; everything else would go. In addition, following the geotechnical engineers' subsurface investigation, it was recommended that the new columns would be supported on the undisturbed soil of the glacial till stratum, thus providing an allowable bearing pressure of 4 tons per sq. ft.

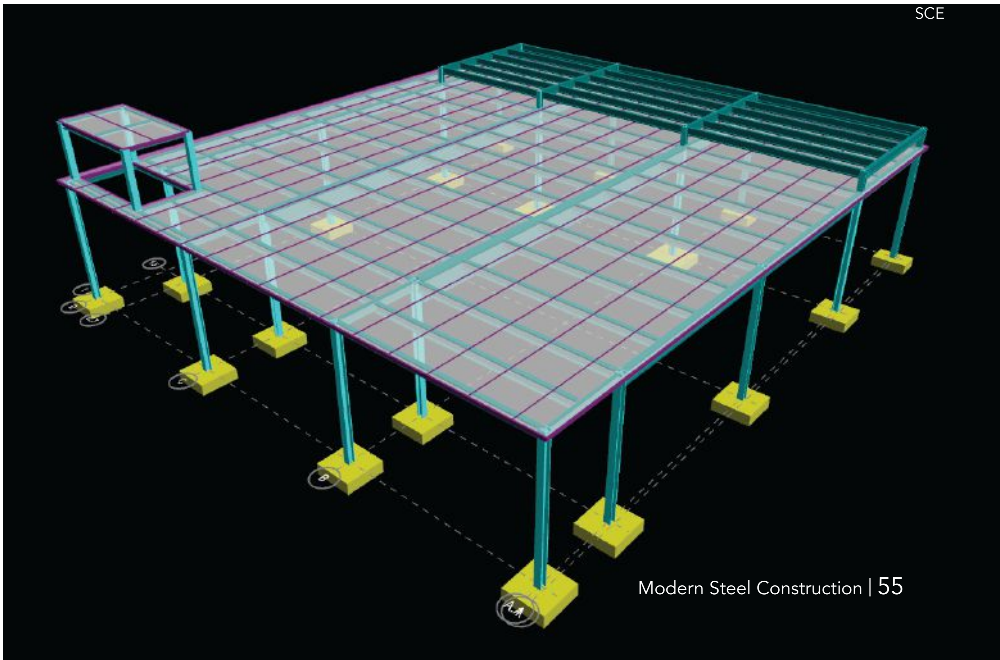
New Column Lines

The new column layout accommodates an acoustically isolated television studio with plan dimensions of approximately 54 ft by 63 ft, 3 in. In order to maximize the studio space, the westernmost column line was placed within 2 ft of the property line. However, the design team realized that supporting these columns would be tricky, as an existing building was immediately adjacent to this column line. Since this neighboring building contained a cellar level, the engineers knew that its foundations, along with the foundations of the existing western CMU wall, would be located well below grade, and subsurface investigations confirmed this. As a result, the new footings would need to be extended down to the level of the existing foundation elements nearby.

Unfortunately, the location of the new steel columns and their corresponding structural loads meant that going with square concentric footings wouldn't be feasible. Instead, the structural team decided to build new spread footings at the level of the adjacent existing foundation elements. New concrete piers were built, beginning at the footings and reaching up to within approximately 4 ft of the finished grade, then a concrete strap beam was added, cantilevering out from one of the new interior steel columns to the face of the existing exterior CMU wall. This cantilevered strap beam provided a support point on which the new columns could bear.

above: The studio resides in a one-story portion of a 1920s-era four-story building that originally served as a Studebaker service station.

below: A framing model for the one-story portion.



The east side of the garage provided its own challenges. As the garage was originally connected to the rest of the building, there wasn't much need to create a separate exterior wall. Accordingly, the original column line was located a fair distance away from the building's exterior wall. The design team employed a similar strategy to what was implemented on the west side, placing the new columns 5 ft to the west of the wall. But in this case, the column line offset facilitated concentrically loaded footings, which eliminated the need for eccentric footings or strap beams.

Another challenge was the garage space's independent lateral load-resisting system—specifically, the fact that it originally didn't have one. The team introduced a new lateral load-resisting system consisting of chevron braces (HSS6×6×5⁄16 brace elements and W24×76 girders), with one chevron brace being added to each face of the main studio area. To support these new braces, the team designed a spread footing system, above which concrete piers would connect to the columns of each chevron brace. However, since the spread footings needed to be placed at an elevation a few feet below the slab on grade, a concrete grade beam was added to connect the piers. Following standard practice, the lateral loads were evaluated for both wind loading and seismic loading as per the New York City building code.

To the Roof!

With the new ground-level structure taken care of, the team moved on to the roof. To frame the new roof structure, the engineers designed a system that would cantilever eastward from the new column line to the face of the service station's exterior wall. The roof structure was made up of new W14×34 ASTM A992 members spaced at approximately 6 ft on center, supporting a new 3¼-in. lightweight concrete slab on 2-in.-deep galvanized composite metal deck. At the south end of the structure, the building columns were extended approximately 4 ft above the roof level to allow for the creation of a large dunnage platform. The new dunnage platform itself was framed with galvanized W14×38 beams and W16×36 girders, creating a plan area of approximately 76 ft, 6 in. by 21 ft, 6 in. for the placement of the new mechanical equipment. The platform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above: The roof structure was made up of new W14×34 ASTM A992 members supporting a new 3¼-in. lightweight concrete slab on 2-in.-deep galvanized composite metal deck.

right: The new column layout accommodates an acoustically isolated television studio with plan dimensions of approximately 54 ft by 63 ft, 3 in.

below: The engineering team introduced a new lateral load-resisting system consisting of chevron braces, with one chevron brace being added to each face of the main studio area.


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"floor" was constructed of galvanized metal grating secured with mechanical fasteners.

The engineering team's final consideration for this project involved the exterior wall facing the street. The original plan called for saving and reusing the existing wall in the final design. But as the project moved forward, it became apparent that with the modifications to the building's entrances and the increase in height between grade and the roof level, it would be more cost-effective to construct a new façade. A key aspect of the new façade consisted of two large barn door-type sliding assemblies whose centerlines would be offset from the centerline of the building columns and the supporting steel. One door would be offset to the exterior and the second door would be offset to the interior. The support structure was designed to take advantage of the torsional properties of a HSS16×8 tube spanning between exterior columns. These hollow structural sections (HSS) were then moment connected to the new exterior building columns. Two additional bard door sliding assemblies were installed about 12 ft in from the façade leading into the studio space.

By devising a new column layout, lateral load-resisting system, and façade, the structural team was able to transform a nearly century-old structure into a state-of-the-art television studio, with a Manhattan-based engineering firm displaying some of the creativity and design chops for which the residents of Brooklyn have become famous. Most importantly, this new space gives its tenant a foothold in Brooklyn and will put the company in closer contact with the artists, designers, and directors who are forging the future of media.

And hey, it's adaptive reuse. What's more Brooklyn than that? ■

General Contractor
Talisen Construction Corp., New York

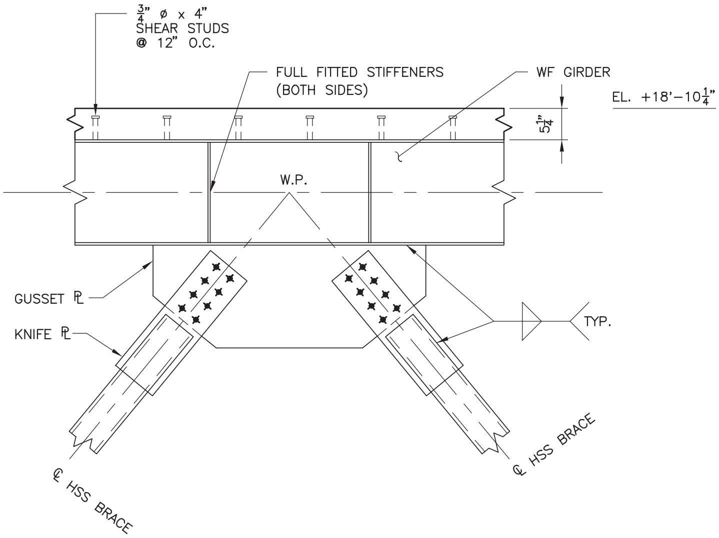
Architect
Meridian Design Associates Architects, PC, New York

Structural Engineer
Shmerykowsky Consulting Engineers, New York

Steel Fabricator and Erector
Babylon Iron Works, Inc., West Babylon, N.Y.

right: The new dunnage platform on the roof was framed with galvanized W14×38 beams and W16×36 girders, creating a plan area of approximately 76 ft, 6 in. by 21 ft, 6 in. for the placement of the new mechanical equipment.

below: A sample bracing detail.



above and left: The braces are supported by a spread footing system, above which concrete piers connect to the columns of each chevron brace.