Warehouse-to-Retail

2400 Market Street Renovation and Vertical Expansion

By Lea Cosenza

Adaptive re-use of buildings is commonplace. For this project in Philadelphia, PA, The Harman Group and the Varenhorst/Gensler architectural design team were challenged with adapting a turn of the century, occupied, five-story concrete automobile warehouse building with diagonal column grids and 40-inch-diameter columns into functional office/retail space. Additionally, while occupied, the team had to complete a five-story steel framed overbuild; cut out the existing concrete core; rebuild two lateral concrete cores supported on hundreds of micro-piles; remove a column supporting 1,700 kips of load; and, insert a 6,000-square-foot atrium and a new full building length promenade for an incredible experience on the urban waterfront.

Built around 1920, the existing automobile warehouse, encompassing a whole city block, is a two-way concrete flat plate with concrete columns (mostly circular) that have capitals and drop panels. The grid is on a diagonal pattern called the Morrow System, and the bay spacing is roughly thirty feet square. The existing columns are supported on spread footings 14 feet below the slab on grade.

After PMC purchased the building in 2014, multiple iterations of design were assessed until Aramark signed a lease in 2016 to take over the top five vertically expanded floors for their new corporate headquarters. Fastrack, PMC's owned contractor, along with architecture firms Varenhorst and Gensler, and The Harman Group, structural engineer, made up the team.

Overbuild

The vertical expansion is structural steel with a concrete-slab-on-metal-deck floor system, and steel columns and beams. The new columns are set above the existing columns, creating a diagonal pattern with large bay spacing and large cantilevers.

Two concrete cores sitting on hundreds of micropiles act as the lateral load resisting system for the existing building and the overbuild. Oversized openings to permit room for formwork and construction were cut into the existing floors, requiring careful analysis of the existing concrete structure. Shear walls were formed and placed, formwork removed, then a continuous concrete corbel was installed off the walls to re-support the existing floor slabs and tie the existing building into the new shear walls for lateral support. In some locations, existing beams, both steel and concrete, were also re-supported on the new shear walls. The existing beams were overcut to allow for formwork and construction, and extended with intricate connection details to attach to the new shear walls.

Interior Fitout Work

Throughout the design, additional tenants signed up for the floors in the existing building, including The Fitler Club, a high-end club that was set to occupy three floors. The Club's space would feature an event ballroom, a bowling alley, a fitness center, a restaurant, and hotel rooms. Further structural challenges were faced to provide a space fit for this tenant.

Significant upgrades were made to the ground floor, first floor, and second floor for The Fitler Club. Also, a new 16,000-square-foot, two-way, flat plate concrete mezzanine was required for the fitness center. This mezzanine is supported by a combination of the existing columns, new steel columns and hangers, and new concrete square columns sitting on new micropiles. At the existing columns, the floor is supported with a continuous shelf plate attached to the circular columns with collar plates affixed with adhesive anchors. A small 1,200-square-foot mezzanine was also required above the bowling alley to create a trophy room.

The event space on the ground floor required a large open area for dancing. One of the existing concrete columns, supporting 10 floors, was removed to provide the open area. Two new, six-foot-deep steel trusses spanning 50 feet were installed to support a steel transfer girder that carries the column supporting the floors above with a service load of 1680 kips. These trusses, supported on each end by new steel columns on micropile foundations, also provided support for the temporary shoring columns installed at the floors above. After the jacking process, the ground floor column was removed and the transfer girder, spanning from truss to truss, was installed beneath the column above, completing the clear space required below. This construction was done while a tenant occupied the floor above the truss and the vertical expansion was being fit out by Aramark.

The Harman Group was an Award Winner for its Aramark Headquarters project in the 2018 Annual Excellence in Structural Engineering Awards Program in the Category – Forensic/Renovation/Retrofit/Rehabilitation Structures over $20M.

Additional Challenges

Serving as a main entrance and connection of Market Street to Chestnut Street, the promenade is constructed of steel that cantilevers out from the existing building. New foundations were not possible because of a major CSX rail line adjacent to the building. Large steel plates are attached to the existing concrete columns with adhesive anchors, and cantilevered steel beams are supported with braces to the lower part of the columns below.

Connections to the existing round columns proved especially challenging. One of the connections of the steel beams to the existing round column utilized a large collar plate fastened with adhesive anchors. The connection was not possible at the top of the column because of the capital. Therefore, the collar plate was wrapped around the concrete column on the floor above, and two steel rods pass through the existing floor to hang the new steel beam below. Underneath the 5th floor/existing roof, this detail could not be used because there was no concrete column above. Thus, the concrete capital was cut out and a new steel beam was installed over the concrete column. Half of the steel structure was in place above when the capital was cut. Shoring was designed to support the steel columns above to erect the new steel transfer girder.

The design team for 2400 Market Street incorporated complex solutions to revitalize this landmark building, now forming a link between the office corridor of West Market Street and Philadelphia's University City neighborhood.▪

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