

Making Up for Lost Time

BY JASON SQUITIERE, P.E., AND JANIS VACCA, P.E.

An adaptive reuse project in Philadelphia adjusts to the current economy
with prefabricated sensibility.



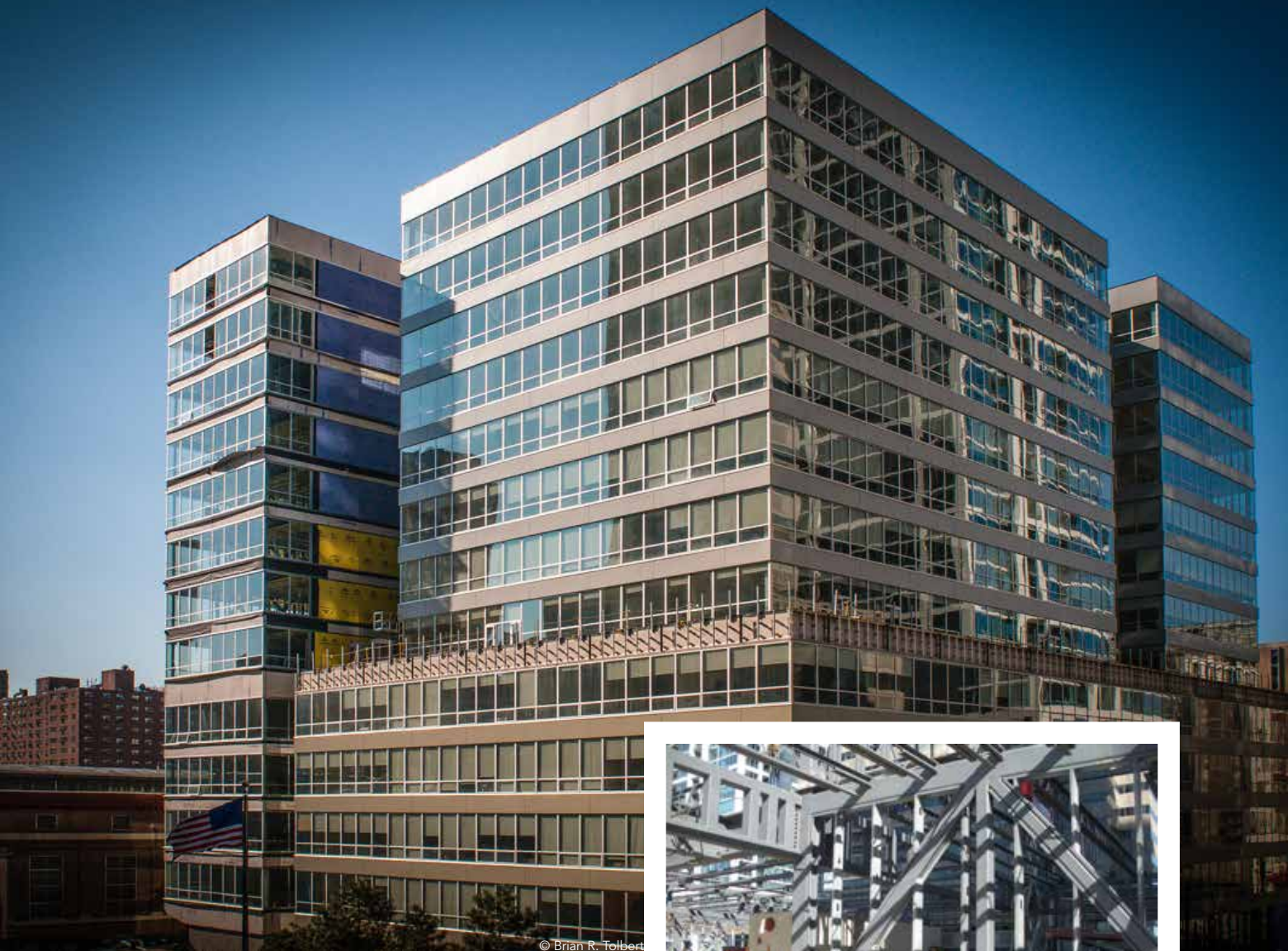
The Harman Group

THE PROVERBIAL “SIGN OF THE TIMES” can come in many forms—for example, a vacant building.

The existing building at 2040 Market Street in Philadelphia, formerly the headquarters for the American Automobile Association (AAA), sat vacant through the “Great Recession” of 2008–2009, providing a constant reminder of the dismal economy. Several developers reviewed the possibility of adapting the building for new use, and eventually PMC Property Group of Philadelphia decided to develop a vertical and horizontal expansion of the existing five-story concrete-framed building.

Structural engineering firm The Harman Group was chosen to determine how many additional floors could be added to the existing building. Using a system incorporating a load-bearing steel wall panel called Integrity Max by Integrity Wall Panel, along with the Ecospan composite joist floor system from Nucor-Vulcraft, it designed a 120,000-sq.-ft vertical overbuild that added eight residential floors to the existing building. The building was also expanded horizontally, with 68,000 sq. ft. added to the original footprint reaching the same top floor elevation as the overbuild. This vertical and horizontal expansion turned a 120,000-sq.-ft vacant office building into more than 300,000 sq. ft of vibrant residential rental units and ground-level retail space, now known simply as 2040 Market.

The Ecospan floor system helped maximize the number of floors that could be added, thanks to its shallow depth and light-weight construction—a structure depth of 15 ½ in., a span to depth ratio of 27 and a weight of 40 lbs. per sq. ft. The light-weight construction of this system allowed for three more over-build levels than a traditional steel-framed system would have allowed. In addition, the floor joists have a special flush joist seat that allows for uninterrupted bearing through the floor slab from level to level, which is critical for load transfer.



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- ▲ The 2040 Market overbuild added eight floors to an existing five-floor building as well as expanded the building's footprint.
- ◀ The building, before the expansion.
- An in-wall transfer truss.



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The Integrity Max panel also helped minimize the weight of the overbuild portion, while at the same time helped reduce erection time. The 11-ft, 2½-in.-tall panel is constructed with 4-in. cold-formed tubes supplemented with 4-in. hollow structural sections (HSS) where required. The interior tubes can carry significant loads without any horizontal bridging, creating an open vertical space between studs for mechanical and other systems.

Transfer Structure

The existing building is concrete waffle-slab construction with columns spaced 27 ft apart. To minimize cost and depth for the transfer structure between the concrete building and the new steel-framed floors, Integrity Wall prefabricated an in-wall HSS transfer truss designed to transfer the loads from above. With this combined structure providing load support and serving as an architectural wall, the transfer level structure was reduced to only 10 lbs. to 15 lbs. per square foot, 40% to 60% less than



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- ▲ An Integrity Shear panel, providing interior framing.
- Integrity spandrel panels line the building's façade at each level.

the 25 lbs. per sq. ft offered by a conventional stick-built structural steel transfer floor.

A traditional base plate with post-installed anchor rods would not resist the high net uplift forces at the interface with the overbuild. Tie-down connections to the existing roof slab would also not provide the strength necessary, so the connection had to bypass the roof slab. The solution was to install 1½-in.-diameter rods through holes drilled in the existing roof slab and weld the rods to steel plates with post-installed anchors on all faces of the existing concrete column. This anchorage would eventually be fireproofed, though when a representative of Varenhorst Architects (the project's architect) saw the installed solution on-site he exclaimed, "I would be really proud to have steel like that exposed in my apartment!"

Maximizing all space available, the team used prefabricated Vierendeel trusses for the girders. Also fabricated by Integrity Wall/South Shore Iron Works, the 50%



- A Vierendeel truss performing as a girder.



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Integrity/South Shore

- ▲ An Integrity Max door opening. Drywall is fastened to the light-gauge steel, which is attached to HSS4x4—which carries the load.
- ▲ A tie-down for the vertical expansion.
- ▼ Integrity Wall Panels, installed on the building's façade.



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open structure provided the ability to pass utilities through congested areas.

Vierendeel trusses with HSS top and bottom chords and vertical tubes, built by Integrity, were used for the exterior as well. Installed at each floor below the glazing, they were erected concurrently with the building and support Trespa façade materials. The new addition uses a total of 256 tons of structural steel in all.

Today's economics demand new ideas in construction, emphasizing prefabrication of as many elements as possible. The overbuild of 2040 Market, which opened this past September, used every imaginable way of prefabricating the steel structure to enable a lightweight overbuild structure that was constructed quickly and economically. If the original building was a sign of bad economic times, the newly adapted building will hopefully be seen as a sign of ongoing recovery. **MSC**

Owner

PMC Property Group, Philadelphia

Architect

Varenhorst Architects, Philadelphia

Structural Engineer

The Harman Group, Inc., King of Prussia, Pa.

General Contractor

Fastrack Construction, Fort Washington, Pa.

Steel Team

Fabricator and Detailer

Integrity Wall Panel/South Shore Iron Works, Chicago (AISC Member/AISC Certified Fabricator)

Erector

Quinco Contracting, Harleysville, Pa. (AISC Member)