

The second phase of a steel-framed high-rise development in the heart of Philly is on pace to open this fall.

Take Two

STORY AND PHOTOS BY CHRISTOPHER GOTTSCHALL



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PHASE II of the East Market development in Philadelphia's Center City was originally planned to sit on the shelf for five to ten years following the completion of Phase I, which opened last year.

But a funny—and fortunate—thing happened. Business got better than expected. The area is booming with tourists and residents, driving the demand for Phase II tower to be completed sooner rather than later.

Topping out this past November—one year after Phase I topped out—the 22-story, 240-unit Phase II residential tower rises 270 ft above the corner of 12th and Market Streets. The steel framing scheme allowed the tower to be erected quickly: only 100 working days from start of erection to the topping off, a pace better than one floor per week. The 240,000-sq.-ft tower uses 1,750 tons of structural steel and sits on a previously constructed steel podium consisting of two levels of retail space and one level of underground parking.

opposite: The building's steel "core" consists of six braced frames that are continuous from the foundations to the top of the tower.



The steel framing scheme facilitated the economical floor-to-floor heights required of high-rise residential buildings and maximized the number of residential units while staying below the project's height restriction.

The Philadelphia real estate market, especially where East Market is located, is in the midst of a major transformation. The area is booming with tourists and residents, and this strong market dictated that the Phase II tower would proceed ahead of schedule and as a residential building. The steel framing scheme facilitated the economical floor-to-floor heights required of high-rise residential buildings and maximized the number of residential units while staying below project's the height restriction, which was based on the capacity of the foundations and retail podium columns.

Structural engineer The Harman Group worked closely with the owner and the architect, BLT Architects, to determine the lo-

cation of columns and lateral force-resisting elements that would work with the parking and retail layouts in the podium, as well as any of the potential future uses of the tower above. The structural team designed a steel "core" for the building, consisting of six braced frames that are continuous from the foundations to the top of the tower. This steel core was configured to accommodate office, hotel or residential uses in the tower, as well as several iterations of tower footprints and tower heights based on all the potential configurations for the tower. The design also facilitated using the same column grid through the parking, retail and tower levels, thereby eliminating costly column transfers and helping the project stay on budget.

The Phase II tower at East Market currently stands as the tallest all-steel building designed by The Harman Group and the tallest all-steel building in Philadelphia since the introduction of the *International Building Code*. Using plank for this height of construction provided design challenges related to lateral force transfer in the floor diaphragm and bracing of the columns. Some of the perimeter column loads at the base of the tower are on the order of 1,600 kips (factored). Where beams did not frame into the columns in both directions, the team wasn't comfortable relying solely on the plank to brace these heavily loading columns. The solution was to bury a tension tie in the top of architectural walls. These tension ties connected the exterior columns to an interior column, which in turn would be braced by the buildings lateral system. Once grouting operations were complete, the plank prevented the exterior columns from "tipping in" and the tension tie prevented the column from "tipping out" of the building. The Harman Group worked closely with the steel fabricator, Berlin Steel, to develop details to remove any sag or slack from these tension ties so they could be immediately engaged to brace the columns.

In addition, all the perimeter beams were tied together to create a tension/compression loop at the perimeter that allowed our perimeter beams to act as the tension/compression diaphragm steel to help the diaphragm span laterally from the perimeter of the building to the lateral core. This was accomplished by designing all the perimeter beams as beam columns to resist the diaphragm chord forces and specifying that all of the perimeter beam end connections should have a tension/compression capacity of 16 kips in addition to the specified shear reaction.

When both phases are complete, East Market will connect shopping, dining, working and living in a newly revitalized hub at the heart of the City of Brotherly Love. ■

Owner

National Real Estate Development

Construction Manager

Clemens Construction Company

Architect


BLT Architects, Philadelphia

**Structural Engineer and
Connection Designer**

The Harman Group

Steel Fabricator, Erector and Detailer

The Berlin Steel Construction Company,

West Chester, Pa. 





First Phase

Phase I of the East Market development opened last year, supported by all-steel gravity and lateral framing systems and no concrete core. Located on the corner of 11th and Market Streets, the 220-ft-tall, 400,000-sq.-ft tower uses 3,500 tons of structural steel to frame one level of below-grade parking and two floors of retail topped with 15 floors of luxury apartments. A column grid of 27 ft, 6 in. by 27 ft, 6 in. was used in the below-grade parking level and continues through the retail levels, then the columns shift slightly off-grid to accommodate the architecture of the apartment tower above. For more on Phase I, see "Philadelphia Freedom" in the February 2017 issue (www.modernsteel.com).



left: The design facilitated using the same column grid through the parking, retail and tower levels.

above: The 22-story, 240-unit residential tower rises 270 ft above the corner of 12th and Market Streets.