

Sustainable Design

Michael G. Brennan, P.E.

All photos courtesy Astorino and Edward Massery Photography Inc.

Located along Pittsburgh's Monongahela River, the new operations center for PNC Bank is both employee- and Earth-friendly.

Planning for the design and construction of a new Pittsburgh-based operations center for PNC Bank began in 1997. PNC selected five architectural firms to submit schematics for the facility and ultimately chose architect Astorino's design because it was the most responsive to PNC's vision for an employee-centered work environment.

Driven by the owner's initiatives for energy awareness and efficiency, the Pittsburgh-based, full-service A/E firm partnered with PNC leadership from the beginning to ensure that the operations center met their expectations. Astorino assigned their sustainable design experts to the project and with the help of a local advocacy group, the Green Building Alliance, utilized the concepts of LEED™ to integrate the owner's needs into concrete, steel, curtain wall, terrazzo, HVAC systems, lighting, and power distribution.

SITE SELECTION

Selecting and securing the job site of the new operations center was the first strategic decision since the location alone could prove instrumental in meeting many of the environmental awareness goals. By reclaiming a former "brownfield" site, PNC brought new life into an underutilized parcel of land in Pittsburgh's historic "Firstside" section at the site of an old Baltimore and Ohio (B&O) railroad terminal.

The site already offered close proximity to public transportation, parking facilities, and the city's business district. Nonetheless, PNC made significant contributions to the construction of a subway stop to service the new building. PNC also incorporated the riverfront bike trail into the site plan so employees could make maximum use of public and alternate transportation.

Additionally, the existing city infrastructure allowed for effective connections into storm-water systems. If the project occupant-load criteria were projected into a suburban site, it has



The spectacular five-story central atrium is a dramatic intersection of the three major building sections.



Trusses being delivered to Pittsburgh on barges. These trusses were then trucked across the city to the job site.

been calculated that surface parking and storm-water management would require an additional 15 or 20 acres of real estate.

DESIGN BASICS

PNC's business support functions required a highly fluid office space. With that in mind, Astorino developed a 125,000-sq.-ft floor plate, approximately 270' by 510', stacked on five floors. While other designs would have necessitated vertical expansion as units grew to meet market demand, this model provides different business units and cost centers the flexibility to expand on the same floor for efficient adjacencies.

Since Pittsburgh sits at the confluence of the Ohio River, which is formed where the Monongahela and Allegheny Rivers meet, the city's three rivers have naturally created alluvial deposits as the base geology near the shoreline. What this means to modern-day builders is that significant buildings require deep foundations which bear on (or in) residual and competent soil masses. PNC Firstside Center is founded on auger cast piles, arranged in a pile grouping. With the understanding that deep foundations were required, Astorino utilized a parametric study to establish the optimum "typical bay." This bay was established as 30' by 30'. Based on structural criteria alone, the bay would be slightly smaller; however, a smaller module did not integrate as well into the planned office layout.

The base grid was established and the typical infill condition was set. A composite concrete floor deck with structural beams was selected as the best choice for the structural framing. Concrete was not considered as a viable material solution due to the "non-typical" special cases where columns were eliminated to create open spaces, such as the loading dock, as well as the need to increase the capacities in individual bays. It was felt that simply changing the beam spacing or bumping a size was the most effective way of modifying the load rating. Due to the variable uses and potential configurations in the structure, the design basis live-load rating is set as 100 psf. To account for specific departments or uses, it is adjusted to 250 psf and 300 psf. The largest value is to allow for file-storage rooms.

This decision was also made with an eye toward building flexibility. It is an easy task to increase the capacity of a composite beam by adding plate to the bottom flange. It would be difficult to modify the in-place strength of a concrete section.

The most cost effective steel fabrication method is usually one with a high degree of repetition. To this end, the fill beams and girders were repeated throughout the floor plate. The lateral-force resisting system is Type 2, with flexible wind connections. The girders are designed for the full pin-pin gravity loading and the end wind moments are taken through cap and seat angles.

Aside from the pure structural considerations of span and load, steel allowed the project to achieve a LEED point for recycled content and radius of material availability. Due to good structural planning, waste could be considered negligible.

ARCHITECTURAL ELEMENTS

To help meet the environmental goals for the building, a high degree of natural light is allowed to enter the building through curtain walls, window systems and a spectacular five-story atrium. Because the quality of this light varies based on the time of day and year, automated sunscreens were installed.

The atrium is set in-line with the main entrance to the building and a 60'-by-90'-by-five-story volume is carved out of the plan. It is capped by four 15'-wide-by-90'-long triangular pipe trusses. The roof is constructed with 6"-deep-by-18-gage long-span roof deck; and the bearing for the southern exposure is elevated 15' above the bearing of the northern end. This super elevation allows an elevated curtain wall that bathes the entrance in natural light from above. The trusses were completely fabricated off site and barged to Pittsburgh. Since there was no off-loading capability at the site, the trusses were trucked across town on a Saturday morning and set in place over a weekend.

The southern face of the structure has a view of both the south side of Pittsburgh and the Monongahela River. In order to maximize this view, the perimeter columns were set off the face of the building and the beams were cantilevered 11' in a post-and-beam arrangement. This particular erection sequence was tedious but the effect is dramatic.

The air-supply system runs through an under-floor plenum so return air is taken through the ceiling. To accomplish this, a pedestal-type raised floor system is set on the structural deck. This highly efficient system allowed for air distribution and created a raceway for the cabling needs.

Another dramatic element is the entrance canopy. A 60'-by-30' complex curved shape is supported on 16 bents of varying length, framing into a 20"-diameter carrying pipe. The pipe is supported approximately 12' in the air

off three wide-flange buttresses. The extreme-tip cantilever is 21'.

ACKNOWLEDGMENTS

As a result of PNC's leadership and full support, as well as the efforts of the whole design and construction team, PNC's operations center was constructed on budget and ahead of schedule. It is the largest facility to have earned Silver rating under the 2.0 version of LEED.

The success of this project has not gone unnoticed. In 2001 alone, PNC Firstside Center was named as the

AIA's Committee on the Environment Top 10 Green Projects, received commercial project of the year in the Northeast Sustainable Energy Association's Green Building awards, received an honor award and green design citation award from AIA Pittsburgh Chapter, was named building of the year by the Engineers' Society of Western Pennsylvania, and won the Three Rivers Environmental Award from the Pennsylvania Environmental Council. ♻️

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