Merit Winner

ENGINEERING

Awards of Excellence

GATEWAY VILLAGE

Charlotte, North Carolina

Clinton O. Rex, Ph.D., P.E.

Gateway Village is one of the largest commercial building projects ever undertaken in Charlotte, NC. At the start of the project, it was also the largest private, mixed-use urban project in active development in the United States. The total project will be built on a 15-acre site in the heart of uptown Charlotte. It will include over 1,350,000 sq. ft. of office space, 5,000 parking spaces, over 500 residential units, street level retail space and an extensive garden common area.

An E-builder web site (author asked about name of web site) was established for the project so that information could constantly be available on the progress of the project.

Phase I—Block 800 of Gateway Village began construction in January 1999. The first occupants moved into the building in June 2000. Building 800, the first of two office buildings in this phase, contains 650,000 sq. ft. and is composed of two buildings connected by a three-story sky-bridge. The building encompasses two major public spaces, the Gardens at Gateway

and a five-story Promenade directly below the sky-bridge. The north and the south buildings sit on a one-story basement. Each building has typical floor plates of approximately 40,000 sq. ft. allowing flexible space layout and accommodating technology infrastructure.

The design floor loading was significantly higher than standard office loading. First, all the floors have raised flooring to allow for the special wiring that would be required for the bank. Second, floor live load requirements far exceeded the typical 50 psf. Live load requirements ranged from a minimum of 100 psf to a maximum of 200 psf.

Foundations for Building 800 were a combination of spread footings at the basement floor level and pile caps on driven steel piles at the first floor level. The basement and lobby level was constructed using reinforced concrete. Composite concrete encased steel columns were used at the interior column locations that extended to the basement floor. This allowed for a smooth transition from the concrete basement and lobby level framing to the steel framing above and it reduced the size of the concrete columns in the basement space.

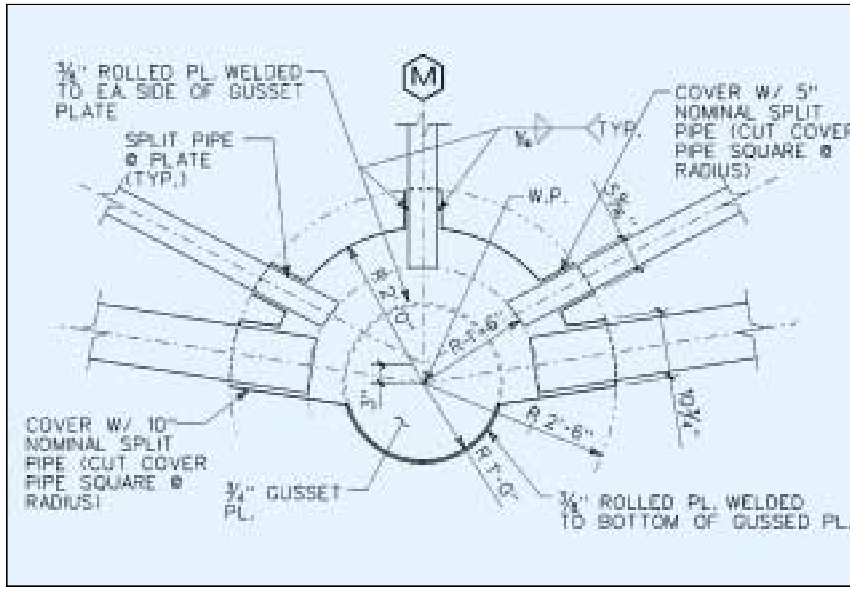
Two different lateral load-resisting systems were used in Building 800. In the north-south direction, each building has four eccentric braced frames incorporated into the building core. The east-west direction of each building features a partially restrained (PR) moment frame. Each main line of beams and columns in the building was used as part of the frame. Combinations of bare steel PR connections and composite PR connections were used. The bare steel connections were used at spandrel locations and interior columns adjacent to major floor openings. These connections used double angle web connections in combination with top and bottom clip angles to develop the connection moment resistance. The composite connections used double angle web connections in combination with a bottom clip angle and a reinforced composite slab at the beam top to develop moment resistance. Shear studs were used to transfer the forces out of the slab and into the beam at the connection.

Two additional challenges in the building included a very complicated façade and two building setbacks. First, the combined brick and curtain wall system was very complicated with five different planes of the face of brick jutting in and out from the building. Second, each end of the building and the roadside face of each building steps back at the sixth and seventh floors, resulting in all but a few of the exterior columns being transfer columns at these levels. The heavy roof required heavy steel transfer girders to accommodate setbacks.

The three-story sky-bridge connecting north and south parts of the building spans 80′ resulting in nearly 18,000 sq. ft. of column free space on the fifth and sixth floors. The south side of the sky-bridge is directly attached to the south building while the north side of the bridge is separated from the north building with an expansion joint. A combination of long-span composite beams and king-post trusses were used to frame the fifth floor of the bridge. The king-post trusses were constructed from round and rectangular HSS members in combination with traditional wide flange members and built-up steel shapes. The sixth floor of the sky-bridge is a two-story space. The floor is constructed using long-span composite joists provided by Vulcraft. Finally the roof is constructed of steel trusses made up from round and rectangular HSS sections. Both the floor and roof trusses were fabricated in the shop and shipped to the site. Special transportation permits were required, and they had to be brought to the site in the very early hours of the morning.

In summary, Building 800 met the owners' needs for large floor plates and technology infrastructure support. In addition, innovative steel technology, such as partially restrained moment frames, long-span composite joists and eccentric braced frames, were used to provide a cost effective structure which met the owners needs.

Clinton O. Rex, Ph.D., P.E., is a design engineer with Stanley D. Lindsey and Associates, Ltd. in Atlanta.



PROJECT OWNERS:
Bank of America, Charlotte, NC

STRUCTURAL ENGINEER:
Stanley D. Lindsey and Associates, Ltd., Atlanta, GA

DESIGN ARCHITECT:
Duda/Paine, Durham, NC

ARCHITECT OF RECORD:
Little & Associates Architects, Charlotte, NC

GENERAL CONTRACTORS:
Rogers Hardin, Charlotte, NC
Cousins Real Estate Corporation, Charlotte, NC

FABRICATOR:
SteelFab, Charlotte, NC (AISC member)

ERECTOR:
Buckner Steel,
Charlotte, NC (SEAA member)

DETAILER:
Steel Detail, Charlotte, NC

SOFTWARE:
RAM S-Beam and SANDE (an in-house analysis and design program)