A Walk Around The Block

By Suzanne Provanzana, S.E., P.E. and Sara Knight, P.E.

With a rich history dating back to the early 1800s, the Block 37 section of the Downtown Loop district has seen periods of activity and dormancy. Vacant since 1989, Block 37 is once again ready to become a central focus for downtown Chicago.

3-D exploded rendering of Block 37. Courtesy of Gensler.

A Brief History of Block 37

Block 37 was one of the original 58 blocks included in the 1830 survey of Chicago. Early office buildings occupied the site in the 1870s, and in the 1890s, early Chicago skyscrapers (such as the 16-story Unity Building) occupied the site after the Chicago fire. The Stop and Shop building was built along Washington Street in the 1920s as one of Chicago's first supermarkets. The decline of business in the downtown loop in the 1960s led the City of Chicago to buy Block 37 for $40 million. In 1989, the entire site except for the Commonwealth Edison (ComEd) substation was razed. Since 1989, the site has been used for numerous city activities including Skate on State, Gallery 37 art fairs and outdoor markets.

Project Overview

The current development plan has several components, both above and below grade. Above grade is the 17-story Media Tower on the southwest corner of the site, which will be the home of CBS2 in Chicago with two television studios and offices for Morningstar, an investment research firm. The existing ComEd building on the west side of the site will remain active and accessible during construction. The remainder of the site, which covers about three quarters of the city block, will be an above-grade four-story Retail Podium. Plans call for a future hotel and apartment building above the north and west sides of the Retail Podium. Four sub-basements will extend as much as 50 feet below grade. The first basement level will contain a loading dock area and retail space; the other sub-basements will have parking, and the fourth sub-basement will be bisected by the new Chicago Transit Authority (CTA) station. The new CTA line that cuts diagonally across the site will connect Midway and O'Hare airports. It will also tie into the existing Red Line train tunnel, which runs along the east side of the property under State Street, and Blue Line train tunnel, which is located on the west side of the property under Dearborn Street. Construction of the Media Tower and Retail Podium began in 2005 and 2006, respectively.

Building Structural and Deep Foundation Systems

The Media Tower is a 17-story tower with one basement level. The tower structure is comprised of a reinforced concrete core, exterior steel framing and composite metal deck slabs. The southwest corner of Block 37, where the Media Tower is located, originally had the 1920s mid-rise building, the Stop and Shop, which had three sub-basements. When the Stop and Shop building was demolished, much of the below-grade structure and demolition debris from the building was left in the deep basements. Excavating the site for the new Media Tower would have been extremely difficult, so only one basement level

Schematic of the Future 108 N. State Building. Courtesy of Gensler.

was constructed. Many components of the original Stop and Shop foundation were reused, including existing hand-dug rock caissons and portions of the existing perimeter basement wall. New caissons were sized so that the shafts of belled caissons could work as straight shaft rock caissons if obstructions from the existing building were encountered during construction. An Osterberg load cell test, a full scale caisson load test, was performed at the base of a new production top of dolomite bedrock rock caisson to increase the rock bearing pressure the Chicago code allowed from 50 tons per square foot (tsf) to 90 tsf. The former Stop and Shop structure also included large grade beams, consisting of steel beams encased in concrete, which had to be either removed or designed around. For the southernmost column line of the Media Tower site, where a deep excavation was not allowed to remove these grade beams to limit the street movements, four column foundations were redesigned during construction from one rock caisson per column to six rock-supported 390-kip-capacity micropiles per column.

The retail development occupies three quarters of Block 37, with a total of 350,000 square feet in plan, and acts as a podium for the future hotel and apartment tower. The four levels of retail space above grade are steel framing with concrete shear walls; composite metal deck is used for the slabs. Below grade are four concrete basement levels that provide space for retail, parking, and the CTA. A 36-inch reinforced concrete slurry wall was selected for the majority of the perimeter of the retail basement area. In select areas where increased structural stiffness was required, a 36-inch secant pile wall reinforced with full-length W24 steel beams was chosen. Excavation of the four-level basement was complicated by the need to keep local services active. The earth retention system was selected and designed to protect the active Randolph Street freight tunnel (which carries numerous utilities) located eight feet from the property line on the north side of the site, the CTA tunnels on the east and west sides of the site, and the Washington Street pedestrian tunnel on the south side of the site during excavation of the four sub-basements. In addition, historic landmark buildings supported on shallow foundations, which are located across the street at the northwest and southeast corners near the future CTA connections, were also factors in the selection of the earth retention system.

The sequence of construction and coordination with the future CTA train tunnels presented challenges to the design of the slurry wall. Large openings for the train tunnels were required at the fourth sub-basement level at the northwest and southeast sides of the site. Adding large openings into the slurry wall 45 feet below grade meant that the wall panels would have to withstand the high soil and water pressures due to the temporary loading before the train tunnels could be installed. Cutting through the three-foot-thick wall with steel rebar was a concern for the contractor. To accommodate the temporary forces in the wall and make the future creation of the opening easier for the contractor, glass fiber reinforcement was used in the opening zones from 28 to 45 feet below grade.

Caisson shafts, constructed with 10,000-psi concrete, act as structural columns, and the surrounding secant pile and slurry wall provide edge support for concrete slabs. At the fourth basement level, a two-foot-thick slab on grade will be poured to support the future CTA tracks that run from the northwest corner to the southeast corner of the site. The path of the CTA train requires a column-free space and creates long spans, over 40 feet, for the slabs above. The resulting column grid at the train lines is irregular and on a diagonal. Elsewhere, the concrete slabs are typically 10 to 12 inches thick with regular column spacing of about 30 feet. In some of the longer span areas, and in areas of higher loading, such as the truck loading dock, 18- and 24-inch structural slabs are used. Story-deep Vierendeel trusses with 48-inch-deep plate girder chords span the loading dock between the above-grade levels 1 and 2, transferring out the retail and future tower loads from above. The design of the trusses took into consideration strict deflection criteria to accommodate escalator supports.

Concrete core walls provide the lateral stiffness for the Media Tower and the Retail Podium. These lateral systems are tied together by the floor diaphragms at the first and third floors. Tying the lateral systems together provides increased stiffness at the base of the Media Tower and the future hotel tower.

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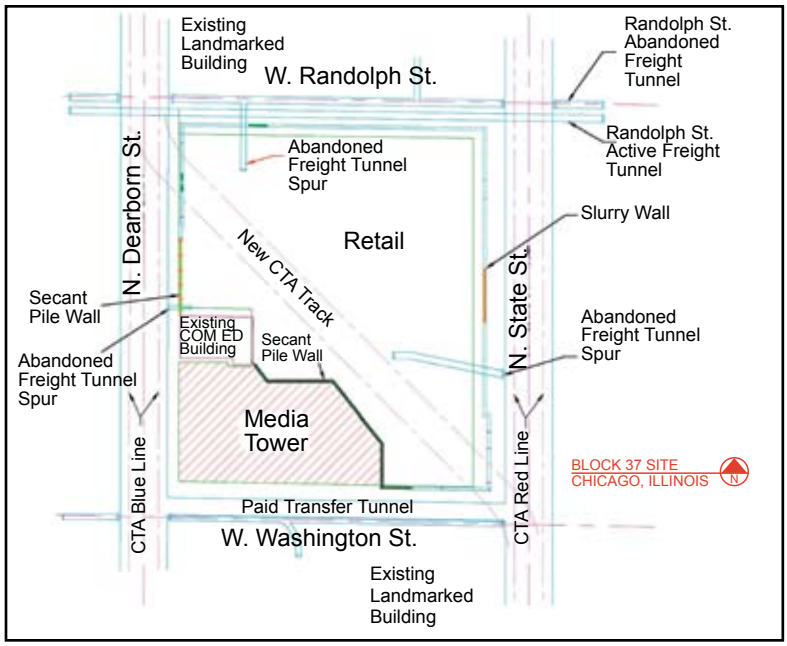
Retail steel framing is erected alongside existing operational ComEd building while the Media Tower situated in the background awaits remaining curtain wall.



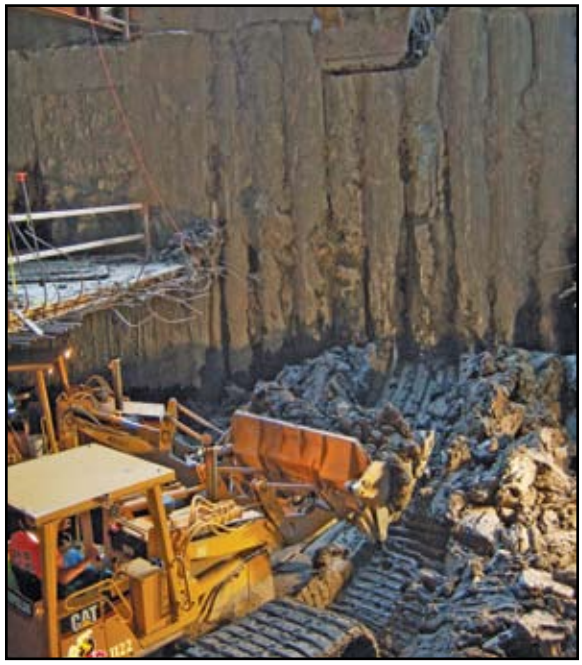
Overall site plan of Block 37. Earth retention elements, existing structures and tunnels shown.

Building Up and Down... At the Same Time

Top-down construction was chosen for the Retail Podium to accelerate the project schedule, so that the steel erection would not be delayed by below-grade construction. Top-down construction is a method in which the foundation elements and permanent perimeter earth retention systems are installed at the beginning of the project; basement levels are constructed and excavated one at a time, starting at grade level. Below-grade and above-grade construction happens concurrently. Each subsequent basement level is excavated as a mining operation after the previous slab level has been constructed.

With the deep excavation required to build the four basement levels, top-down construction using permanent earth retention systems would be more rigid than traditional temporary cross-lot bracing and open-basement construction methods. Placement of the secant pile and slurry walls was facilitated by their location; most of the perimeter walls were placed below the sidewalk, outside the footprint of the above-grade building, allowing the caissons supporting the steel structure above to be placed without interference from the perimeter walls. Two large temporary "glory hole" openings, one north and one south, were included in the slabs to allow for the excavation of the soil. Low-profile, low-pressure tracked dozers and loaders dig and push soil over to the openings, where the soil is picked up by long-boom backhoes and loaded onto a dump truck. Ventilation of the space below the slabs during the mining process is handled by large fans and exhaust shafts.

The top-down construction method presented several challenges to the design team. Flat slabs were used to avoid additional excavation for beams, which would have been difficult to form. Mud slabs over fill and clay are poured to create the bottom formwork for the slab construction. Since the caissons were installed before the slabs, the slab-to-caisson connection was designed to take the shear reactions only. No moment fixity was relied upon between the slabs and the columns, resulting in larger amounts of reinforcing than would normally be found in traditional flat-slab construction.



Small track-mounted loaders push soft clay from below the B1 slab level while a long-boom backhoe removes the soil from the glory hole on the south side of the site at the secant pile wall.

Summary

One of the primary challenges of the Block 37 project was the required coordination between two different project teams and the surrounding public entities, such as the City of Chicago and the CTA. Design and construction coordination with the CTA team for the tunnel connections was integral for the project. The protection of existing active facilities combined with a practical earth retention system for the retail portion was a major challenge of the project, as well. Strong relationships and open lines of communication between the developers, contractors, design group and city officials has allowed the project to continue successfully.

The project involved a large number of diverse and sometimes competing requirements, including the removal or protection of existing structures, the need to keep services operating both under and around the site, and the application of top-down construction methods. Critical to the project's success was open and frequent communication among the entire project team, allowing design solutions that are both effective and constructible.▪

Team Members

Owner

Joseph Freed and Associates LLC (Retail Podium)
Golub & Company, LLC (Media Tower)

Architects

Gensler
(Retail Podium and Below Grade Parking and Subway Structures)

Perkins and Will
(Media Tower)

Structural Engineer

Thornton Tomasetti, Inc.

Geotechnical Engineer

STS Consultants

Contractor

W.E. O'Neil Construction Company

General Foundation Contractor

Case Foundation Company and Hayward Baker, Inc.

Suzanne Provanzana, S.E., P.E., is a Senior Project Engineer with Thornton Tomasetti, Inc. in Chicago, IL. She can be reached at ***sprovanzana@ThorntonTomasetti.com****.*

Sara Knight, P.E., is a Geotechnical Engineer with STS Consultants in Chicago, IL. She can be reached at ***sara.knight@sts.aecom.com****.*