2015 Outstanding Infrastructure Project

The Plaza Substation and Queens Structures

By Frank E. Townsend III

The Plaza Substation and Queens Structures provide structural and architectural rehabilitation to existing facilities along the existing 63rd St Station and will tie in from Long Island to the East Side Access project as a major hub rail station. Tunnel and construction improvements to the Plaza, also known as the Harold Interlocking, connect below-grade facilities for the Mainline Traction Power Substation, Facility Power Substation, ventilation, signal, emergency power, mechanical, and communication rooms.

Superior Gunite installed concrete on structural perimeter walls, interior I-beam walls, interior steel-reinforced walls, and circular and

Fig. 1: CQ32 is a four-level ventilation facility, passenger station, and office for the MTA. Five other active projects are adjacent to and/or tie directly into the project, making logistics a challenge

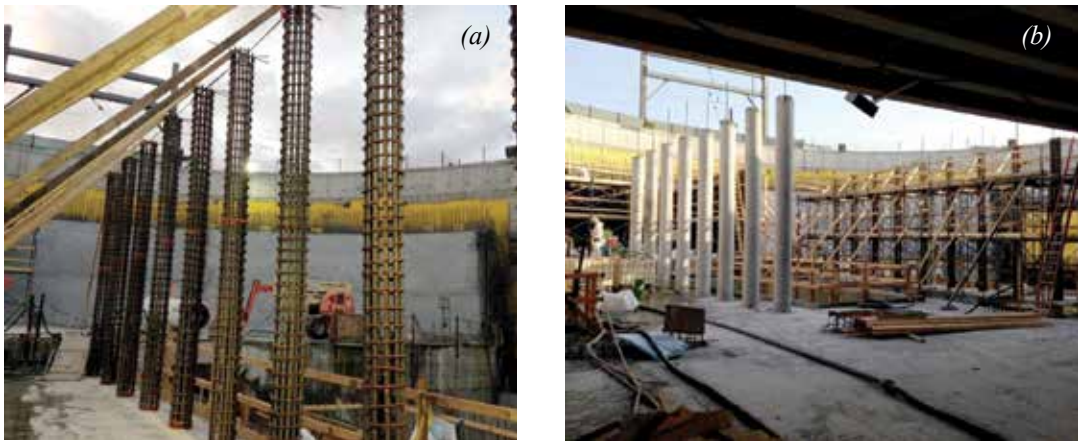

Fig. 2: Round columns. Most had: (a) a roof to wire and support; and (b) some did not

square columns. The shotcrete process was used in varied thicknesses from 12 to 72 in. (300 to 1800 mm) depending on type of wall, and 24 in. (600 mm) diameter circular columns. The base contract volume was approximately 19,232 yd^3 (14, 704 m^3) plus an additional 13,885 yd^3 (10,616 m^3) in change orders.

The base contract work consisted of 12,520 yd^3 (9572 m^3) of structural perimeter walls (one-sided finish); 3904 yd^3 (2985 m^3) of interior I-beam walls (two-sided finish); 2436 yd^3 (1863 m^3) of interior steel-reinforced walls (two-sided finish); and 372 yd^3 (284 m^3) of columns: 101 circular columns with a 24 in. (600 mm) diameter; 16 circular columns with a 12 in. (300 mm) diameter, and 16 square columns measuring 3 x 3 ft (900 x 900 mm). The change order work was an additional 13,000 yd^3 (9939 m^3) in one-sided wall smoothening and 885 yd^3 (677 m^3) of one-sided walls with a rubber float finish.

The shotcrete process was used for all vertical elements on this project. The project ran from December 2012 to August 2015. Superior Gunite used a 5000 psi (35 MPa) concrete mixture supplied by Ferrara Bros. Building Material Corp. and Tec Crete Transit-Mix Corp. to aid the general contractor in meeting Federal DBE goals. The coordination between the providers and teamwork was instrumental in making this job a success. The major challenge was shooting through the difficult East Coast winters that required tenting and heating the placements through the 0°F (–18°C) temperatures. All structural walls and columns required a steel trowel finish. This was especially difficult when it came to circular columns. To aid in the precise finish of the columns, workers used fabricated trowels and a cutting rod that were shaped to the curve of the column.

Frank E. Townsend III *is the East Coast Region Manager for Superior Gunite. He is a civil engineering graduate of Worcester Polytechnic Institute in Massachusetts and received his master's degree from the University of Missouri. Townsend comes from the U.S. Army Corps of Engineers and has been running Superior's East Coast operations (predominantly New York; New Jersey; Connecticut; and Boston, MA) for 4 years. Townsend is an active member of ACI Committee 506, Shotcreting; a member of ASA; and currently serves on the ASA Board of Directors.*

Fig. 3: One of the four levels of interior walls

Fig. 4: Each of the three bays shown is a future train corridor for Long Island Railroad. To the right you can see square columns

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Project Name
CQ32

Project Location
Queens, NY

Shotcrete Contractor
Superior Gunite

General Contractor
Tutor Perini Civil

Architect/Engineer
New York Metropolitan Transportation Authority Capital Construction (MTACC)

Material Supplier/Manufacturers
Ferrara Brothers Building Material and Teccrete

Lab
Tectonic