

The Plaza Substation and Queens Structures

By Frank E. Townsend III

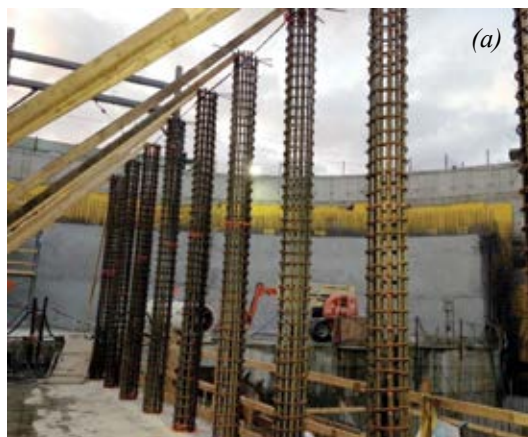
The Plaza Substation and Queens Structures provide structural and architectural rehabilitation to existing facilities along the existing 63rd St Station and will tie in from Long Island to the East Side Access project as a major hub rail station. Tunnel and construction improvements to the Plaza, also 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



(a)



(b)

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 yd³ (14,704 m³) plus an additional 13,885 yd³ (10,616 m³) in change orders.

The base contract work consisted of 12,520 yd³ (9572 m³) of structural perimeter walls (one-sided finish); 3904 yd³ (2985 m³) of interior I-beam walls (two-sided finish); 2436 yd³ (1863 m³) of interior steel-reinforced walls (two-sided finish); and 372 yd³ (284 m³) 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 yd³ (9939 m³) in one-sided wall smoothing and 885 yd³ (677 m³) 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, Worcester, MA, and received his master's degree from the University of Missouri, Columbia, MO. 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. 2015 ENR top 20 under 40.



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

The Outstanding Infrastructure Project

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/Manufacturer
Ferrara Brothers Building Material and Teccrete

Lab
Tectonic

*Corporate Member of the
American Shotcrete Association