

Project Name: The 55th St Ventilation Facility

Project Location: Manhattan, NY

Shotcrete Contractor: Superior Gunite

General Contractor: Schiavone Construction Co., LLC and John P. Picone, Inc.

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

Material Supplier/Manufacturers: Tec Crete Transit-Mix Corp.

Lab: Tectonic

The 55th St Ventilation Facility is a critical piece of the East side Access Program for the New York Mass Transit Authority. This facility provides critical ventilation for the new tunnels that carry Long Island Rail Road trains to Grand Central Terminal. Unlike most other ventilation facilities, the 55th St Ventilation Facility like the 50th and 44th Vent facility is designed to be entirely underneath the street's pavement. These do not have an above-ground component and all vertical elements shot by Superior Gunite.

Superior Gunite was assigned the task to install shotcrete on a complex capsule shaped vertical ventilation shaft and overhead arch surfaces without the need for forming, saving over \$1m in forms to the General Contractor. The concrete in the ventilation shaft varied in thicknesses from 24 to 54 in (61 to 137 cm) depending on overbreak as this was a blasted structure. The base contract volume was approximately 1,927 yd³ (1473 m³) with the arch being 48" thick and 1,277 yd³ (976 m³).



Shaft structure shot 2 ea water barrier panels per shift

There were several logistical challenges to the 55th St Ventilation Facility. There was limited access for materials and formwork so the Shotcrete process was needed. Shooting the crown of the arch, left just 5' (1.5 m) of working distance from the final arch, making it challenging for access. The elimination of formwork and the ability to access difficult-to-reach areas were a key benefit in why shotcrete was chosen as the placement method for structural shotcrete in the ventilation shaft and overhead arches. In addition, to speed production on a fast paced scheduled, the shotcrete method saved the time it

would take to construct and form the 8,613 ft² (800 m²) overhead arch. Total time savings was 32 working days to the East Side Access project.



Arch lower panel being built up, not the BA anchors and hoses running out displaying what the full depth is



Working the final panel, ventilation needed and made curing a challenge as the heat was a challenge to manage on a daily basis.

This project ran from September 2013 being initial lining in the main cavern to May 2015 the arch and shaft lining. The wet-mix process was used with timely concrete delivered via ready-mix supplier Tec Crete Transit –Mix Corp (WBE) who provided a 5,000 psi mix in the heart of NYC. The concrete was pumped from the surface level to the area of placement with a combination of 2" (5 cm) slick line and flexible rubber hoses. Forming on the ventilation shaft was almost completely eliminated except for two-side sections of the shaft in which stay-form was used. At some locations, the actual field measurements for the overhead arch were over 48 in. (121 cm) thick with 3 layers of reinforcement. To address this problem, shotcrete was applied in three 12 in. (30.5 cm) lifts with scratch finish on the first two and a rubber float on the final finish.



Final arch structure performed in layers due to thickness

Written by Frank Townsend and Dennis Rubi



Author Biography:

Frank E. Townsend III, is the East Coast Region Manager for Superior Gunitite. He is a Civil Engineer graduate of Worcester Polytechnic Institute, in MA, and Master's Degree from the University of Missouri. Frank comes from the Army Corps of Engineers and has been running Superiors East Coast operations (Predominantly New York, New Jersey, Connecticut, and Boston) for 4 years now. Frank is an active member of ACI 506 and ASA, and currently serves on the ASA Board of Directors.