

CRITICAL BLAST DESIGN OF A NEW YORK CITY SHAFT AND IT'S EFFECT ON VIBRATION CONTROL

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ABSTRACT

The New York City Department of Environmental Protection (DEP) is currently building City Water Tunnel #3 beneath the city. The purpose of this tunnel is to improve water distribution to the city and to allow the DEP to inspect the older tunnels and make the necessary repairs. These older tunnels have been in continuous operation since the early 1900's. Construction on the Third Tunnel is planned in four stages. The Nelson Street Shaft, which is the focus of this paper, is part of the second stage.

Contract 543A was awarded to Nelson Street Shaft Constructors, (NSSC), a joint venture between Grow Tunneling Corporation, MacLean-Grove and Company, Inc., Kiewit Construction Company and Morrison-Knudsen Company, Inc. The contract is for the construction of the Nelson Street Shaft of City Tunnel #3, stage 2 and for appurtenant work. In the contract the DEP specifies that the maximum pounds of explosives, per delay interval, could not be greater than 4 pounds. It also stated that vibration readings had to be less than 1 inch per second at the nearest structure. This was later revised to 0.4 inches per second by the DEP, due to the recommendations made by an independent consulting engineering firm.

Figure 1 illustrates three areas that concerned the DEP in respect to vibration. The row house apartments, which are situated on Nelson Street, are 85 feet away from the shaft opening at the closest point. The Brooklyn shaft chamber is 195 feet away, while the distance to the check valve chamber is 215 feet. The most critical area to vibration, though, is the apartment buildings because of their poor structural condition. One building is actually leaning away from the adjacent building.

The Nelson Street Shaft Constructors (NSSC) had to keep in mind the necessary requirements for an efficient drilling, blasting and mucking cycle when designing a blasting plan that would adhere to the strict contractual specifications. It was these specifications that made the blast design for the Nelson Street Shaft so unique.