

# **Blasting Techniques Used On The Cliff Avenue Reconstruction Project**

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## ABSTRACT

The scope of the Cliff Avenue Reconstruction Project in Sioux Falls, South Dakota was to widen a two lane highway to five lanes, along with removing and reconstructing both above and below ground utilities located along the project limits. The objective of this paper is to present the blasting techniques used in the rock excavation phase of the Cliff Avenue Reconstruction Project.

The majority of the 5200 cubic yards of pink Sioux Quartzite was to be excavated out of three utility trenches; storm sewer, sanitary sewer, and water main. Of the three trenches, the storm sewer was closest to existing structures at  $\pm 20'$  and the sanitary sewer and water main were located  $\pm 35'$  from the same structures. Approximately 75% of the trench blasting was done at these distances to structures.

The primary patterns used were 3' x 3' or 3' x 4' staggered, depending upon the size of the pipe. Decking was used where rock excavation depth exceeded 6' of rock. In a special case, a 3' straight line pattern with decking was used to enlarge an existing trench.

Powder used on the project was either 1 1/4", 1 1/2" or 2" x 16" products. No ANFO was used because of vibration concerns, as well as loading concerns. It was found that when the 2" x 16" was used in the deeper cuts, our vibration to surrounding structures was significantly reduced.

The blasting techniques used on the Cliff Avenue Reconstruction Project were designed for a large amount of close in construction blasting where up to 11 1/2' cuts would be encountered. Seismic concerns were monitored throughout the project for potential problem areas.

With the positive results of this drilling and blasting project, the public is slowly shedding the negative attitude associated with explosives and realizing what a delicate science the explosives field really is.