

**FULL-FACE BLAST ROUNDS IN SHAFT SINKING WITH ELECTRONIC  
DELAY DETONATORS - A CRITICAL APPRAISAL**

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**ABSTRACT**

Full-face blasting rounds have been used to excavate a 4.6-m diameter shaft at Atomic Energy of Canada Limited's Underground Research Laboratory near Pinawa, Manitoba. Both standard pyrotechnic delay detonators and the newly developed electronic delay detonators (EDD) were used on the project. The full-face blasting technique, employing 89-mm-diameter relief holes and 38-mm diameter blast holes, NG-based explosives, and the regular long period delay detonators, has been standard practice at the site, giving excellent wall control and fragmentation results. The comparison blasts using pyrotechnic detonators and EDDs were carried out to test the operational logistics, timing accuracy and blast results obtained with the latter. The long period pyrotechnic delays ranged from 0 to 18, with the nominal delay varying between 350 ms and 800 ms. The EDD blasts used the same number of periods, with the respective delay interval between successive periods set precisely at 190 ms and 210 ms for the two blasts. Based on a broad range of critically assessed parameters, the EDD blast results proved to be significantly superior to those obtained with regular pyrotechnic detonators. The results have been analyzed in detail and the relative merits of the two delay systems have been determined. Alternative designs to derive maximum benefits from EDDs in shaft and tunnel blasts have also been suggested.