

ENGINEERING CONSIDERATIONS FOR BLASTING AT THE HANGING LAKE TUNNEL PROJECT, GLENWOOD CANYON, COLORADO

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Abstract

The Hanging Lake Tunnel Project represents a major portion of the Glenwood Canyon Project, the last piece of Interstate 70 to be constructed. The project features twin bore, large span rock tunnels and six open cut portal excavations, all excavated by drilling and blasting. This paper presents descriptions of the methods used by the Owner and Engineer to control and monitor the drilling and blasting practices in the tunnels and in the portal areas.

Considerations for tunnel blasting included (1) the need for an excavation method compatible with rock reinforcement in large span openings driven through a variety of ground conditions, and (2) the desire to minimize rock damage and overbreak, thus minimizing costs of stabilization and concrete, without unduly impacting excavation progress. These considerations were addressed by requiring a multiple stage excavation sequence, smooth blasting practices, and limited ground vibrations.

Considerations for portal area blasting included (1) the requirements for maintaining uninterrupted service of an existing railroad, a dam and control house, and a public highway, all located within 90 m (300 feet) of one portal, (2) the stability of a massive rock overhang above another portal, and (3) the stability of narrow pillars between the twin bores at the project limits. Potential blasting related problems at these portals were minimized by flagging rail and highway traffic and by placing more stringent specifications on excavation methods and blast vibrations.

Methods used to monitor and control drilling and blasting during construction included (1) extensive inspection and record keeping, (2) geologic mapping, (3) extensive tunnel perimeter surveys, (4) vibration monitoring, (5) use of the submittal process, and (6) frequent and timely communication with the Contractor.

A discussion of specific tunnel blasting practices used on the project is presented, including quantitative comparisons of perimeter and cushion loads (loading density and powder factor), maximum charge per delay, ratio of number of holes to number of delays, and measured blast vibrations for various tunnel segments.