

STEMMING EJECTION AND BURDEN MOVEMENTS OF SMALL BOREHOLE BLASTS

John W. Kopp, Mining engineer,
Twin Cities Research Center,
Bureau of Mines, Minneapolis, MN.

ABSTRACT

Stemming is used in blasting operations to help contain explosive gases as long as possible. Stemming can reduce airblast, improve fragmentation, and reduce the chances of hot explosive gases igniting methane and dust explosions in underground mines.

The types and amounts of stemming material that are desirable in underground metal and nonmetal mine blasting to improve fragmentation while containing the hot gases are largely unknown. This Bureau of Mines research examined the effectiveness of differing lengths of stemming by measuring stemming ejection times as related to burden movement. With properly stemmed blasts, stemming is contained until some burden movement has occurred. Test blasts at two surface limestone quarries were evaluated using high-speed photography. For the conditions of these tests, a stemming length of at least 26 charge diameters was found to prevent premature stemming ejection. In tests with stemming lengths of 16 charge diameters, the stemming was effective but there was early venting of hot gases through fractures in the rock. Further testing with other rock types, hole diameters, explosive types, and stemming materials to determine their effect on incendivity is recommended.

INTRODUCTION

Methane emissions in underground mines can present hazards, especially when ignition sources such as hot gases from explosives are present. The problems associated with blasting in underground coal mines have been addressed by use of permissible explosives and permissible procedures for their use. However, methane also occurs in some noncoal underground mines, particularly oil shale, bauxite, salt, potash, copper, limestone, and uranium mines. At present, such mines receive a variance from the U.S. Mine Safety and Health Administration (MSHA) blasting regulations, depending on the source of methane, associated ore body, and the method of mining. Conventional explosives and blasting agents, rather than permissible explosives, are normally used for both practical and economic reasons.

A recent Bureau of Mines contract (Contract J0215031; Bauer, Calder & Workman, Inc.) examined blasting practices in gassy noncoal mines. Most of these operations use conventional explosives in standard underground blasting practices. Safety is sometimes ensured by evacuating all personnel to the surface during the blast. However, this is often