

# EXPLOSION CRATERS IN EMBANKMENTS

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## Abstract

In previous times, the attack threat of concern for embankment dams was an air strike with penetrating bombs, where a crater produced in the crest of the dam could lead to a catastrophic breach. Today, the threat of concern has changed to ground attacks by terrorists with vehicle bombs. Compared to an air attack, a ground attack normally involves larger detonations, in very different burst geometries. The mechanics of the crater formation and the influence of the material properties of the embankment are also very different.

This paper describes the blast effects of importance in such an attack, and the response of the embankment material, including compaction, ejection, flow displacements, etc. that define the size and shape of the crater. The influence of the dam geometry and the material properties of embankment dams on these processes are discussed, along with some key difficulties in modeling the crater formation, either experimentally or with advanced computer codes. A method is described that provides reasonable predictions of craters in embankments based on craters formed in flat terrain. The effectiveness of the method is demonstrated by comparison with the results of small-scale experiments.