

# **DAMAGE CRITERIA FOR NEARBY STRUCTURES DURING UNDERGROUND EXPLOSIONS AND EARTHQUAKES**

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## **ABSTRACT**

For assessing the safety of structures during underground explosions, ground particle velocity gives the best damage criteria, and 100 mm/sec of ground particle velocity has been internationally accepted as the threshold value of safety (no damage). Results of extensive controlled underground explosion experiments conducted by the author to study the effects of ground vibrations on specially prepared concrete blocks, and also on low rise buildings and dams showed that no damage normally occurred when ground particle velocities were less than 100 mm/sec. Analysis of a large number of accelerograms from a dam site in India also indicated that no damage occurred to normal structures when integrated ground particle velocities were less than 100 mm/sec. Major damage in well built structures like a dam was noticed for ground particle velocity as high as about 350 mm/sec. These results are also generally substantiated from damage data obtained for various structures during other earthquakes, including Elcentro (1940), Taft (1952), Parkfield (1965), and San Fernando (1971). These studies, therefore, suggest that the damage criteria during underground explosions and earthquakes are similar; and 100 mm/sec of ground particle velocity seems to be the general threshold value of safety (no damage) against ground vibrations.