

عنوان مقاله:

Pre-existing Crack Effect on Damage of Inner Concrete Lining under an Internal Explosion: A Numerical Study

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خلاصه مقاله:

Engineers use various methods to evaluate the performance of concrete structures under dynamic loads, including numerical simulations, laboratory experiments, and field tests. By combining the results of these methods, the engineers can develop a comprehensive understanding of the behavior of concrete structures under dynamic loads and use this information to design more resilient structures capable of withstanding these loads. In this work, four models of the concrete lining of the circular tunnel are simulated to investigate the effect of the pre-cracked in the tunnel's concrete lining under an internal explosion loading. A crack in three different locations at angles of 0° , 45° , and 90° on the horizontal axis of the tunnel is investigated and analyzed. The coupled Eulerian-Lagrangian method and the constitutive behavior, such as concrete damage plasticity for concrete and Drucker-Prager for soil, allows a more accurate simulation of the internal explosion loading scenario. The selection of Trinitrotoluene and the Jones-Wilkins-Lee equation of state for the explosive provides a realistic representation of the behavior of the explosive material. The modeling results show that in an internal explosion, by examining three different locations of a crack in the concrete, the occurrence of a crack in the crown of the tunnel is more critical than two crack locations. Hence, the existence of a crack with a length of 100 cm and a depth of 15 cm in the crown of the tunnel increases the tensile damage zone by 16.59% compared to the case where there is no crack.

کلمات کلیدی:

Concrete Damage Plasticity, Concrete, coupled Eulerian-Lagrangian, Explosion, ABAQUS

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