۹th National Congress on Civil Engineering, ۱۰-۱۱ May ۲۰۱۶
Ferdowsi University of Mashhad, Mashhad, Iran

Numerical study of the effect of explosive charge depth and mass on damage and behavior of simply supported RC slab

Seyed Ahmad Anvar[۱], Mohammad Amiri[۲], Seyed Mohammad Afzali[۲]

۱- Faculty of Shiraz University, Shiraz, Iran

۲- MS student in Department of Civil Engineering, Shiraz University, Shiraz, Iran

anvar@shirazu.ac.ir

mohammad_amiri@outlook.com

s.mohammad.afzali@outlook.com

Abstract

In this paper numerical study of behavior of simply supported RC slab subjected to blasting is presented. To accomplish this task, ABAQUS ۶-۱۲ software, capable of performing nonlinear analysis, were used. Using available experimental data, and with a reverse engineering process, appropriate behavioral model for concrete, rebar and explosives were adopted and the detail of modeling was verified. After verification, the effect of explosion depth and charge mass, keeping constant the slab size and concrete grade were investigated. It was shown that increasing the explosion depths beyond ۰٫۲ m leads to an increase in the damage on front and back surfaces and the crater in back surface while the crater diameter on the front surface decreases. It was also shown that the size of damage and crater increases almost linearly with increasing the mass of TNT, keeping the charge depth fixed

Keywords: ABAQUS, RC slab, explosion, charge

۱. INTRODUCTION

Damage due to blast loading is a general topic that is of interest to researchers in different fields. A few papers focus on the damage of the RC structures attributable to air blast loading and some on the projectile impact on metal targets at high velocity. But, few researchers have investigated explosion deep inside RC slabs.

Wang et al. [۱], investigated explosive tests of RC slabs subjected to various charge of TNT close-in explosions and compared their data with simulation results. They experimented on three slabs with ۳۰۰۰×۳۰۰۰×۳۰۰ mm dimensions and ۱, ۲ and ۳kg TNT equivalent explosive and the simulation results were compared with experimental ones. Fig. ۱ shows geometry of physical and simulated slab in Ls-Dayna [۱]. The diameters of crater, scabbing and spalling were measured in this research.

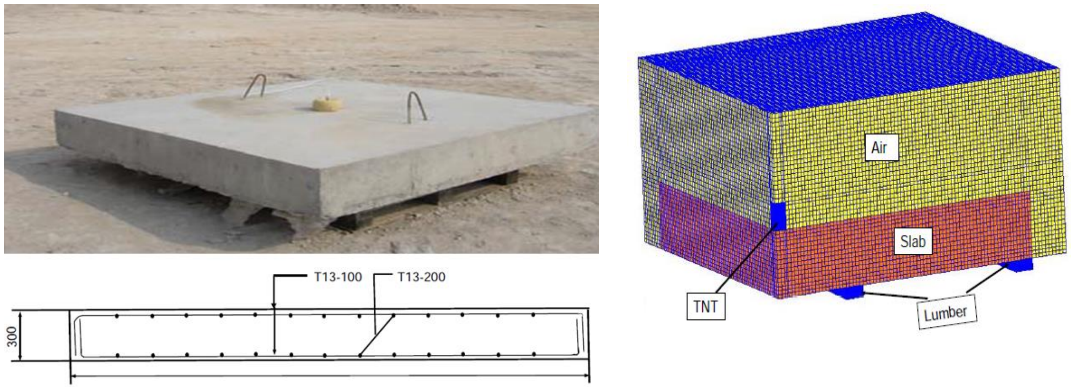

Figure ۱. Geometry of experimental and simulated slab. [۱]