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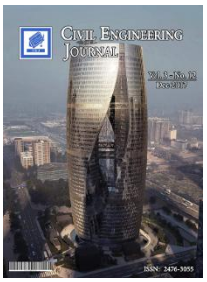

Evaluation of Nonlinear Behavior of Reinforced Concrete Frames by Explosive Dynamic Loading Using Finite Element Method

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Abstract

These days, due to the unpleasant spread of the threat imposed to human life by explosion, the analysis and designating of important structures such as military, governmental and fundamental, and utilities against explosive loading is not anymore a costly conservatism but an inevitable necessity. In this study, the nonlinear behavior of the fortified concrete walls by various carbon fiber reinforced polymers (CFRP) such as glass, carbon and Aramid against the load generated by the explosion wave is investigated by the use of ABAQUS finite element software. In this study, the explosive load, base conditions, wall dimensions, and the features of the material are considered to be the same. The state and the amount of distribution of destruction parameters, tension and displacement in the walls were calculated and the critical areas were identified. Other Two 2 and 4 story models were investigated to examine the frame height and different arrangements of composite fiber reinforcing polymer (CFRP). Similarly, in order to obtain more accuracy in the results, nonlinear behavioral models of concrete and nonlinear plastic damage to concrete have been applied. A 4-node Shell element was used for meshing. The results indicated that, in the reinforced model, about 30% of decrease in the base cutting power is observed, and the reduction of the values for maximum displacement and maximum stress outputs are 30 percent and 45 percent respectively.

Keywords: Reinforcement; CFRP Composite Fiber; Explosion; Concrete Frame; ABAQUS.

1. Introduction

Due to various accidental or intentional events related to important structures all over the world, explosive loads have received considerable attention in recent years. The aim of this study is to further investigate the response of reinforced concrete structures subjected to explosions. Since the capacity of an impulse loaded structure depends on its ability to develop internal work, a parametric study is carried out in order to investigate the important parameters for impulse loaded structures.

Regarding explosive analysis and designing, due to the nature of these charges and applications of the building and also observing economic issues, different levels of performance for the structure under the explosive load are considered. On the other hand, using modern approaches and efficient materials the structure can be reinforced [1].

One of the threats to the urban environment is the explosion. The calculation and estimation of charges caused by the explosion and the conditions under which the charges are imposed on structures is one of the important issues in the

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