University of Baghdad	
Department	Civil Engineering
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Thesis Title	Comparison between Energy Equivalent (SDOF) and Finite Element Models for Reinforced Concrete Slabs Subjected to Blast Pressure
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Abstract	In the present study, a comparison has been made between two methods of nonlinear dynamic analysis of reinforced concrete slabs subjected to blast pressure. The first is the energy equivalent method using single degree of freedom (SDOF) system and the other is the finite element method (FEM). The blast pressure was predicted using the charts of the (UFC 3-340-02, 2008). In the (SDOF) method, the slab can be simplified by evaluating transformation factors that convert the slab into a single degree of freedom system. The reliability of results obtained by using the (SDOF) system is evaluated and the results are compared with thos of the (FEM) which is deemed to be more rigorous method of analysis. To perform the nonlinear dynamic (SDOF) analysis, the resistance-deflection function should first be determined. In the present study, this has been achieved experimentally and theoretically. Nonlinear static analysis was performed on the slabs to obtain the resistance-deflection relationship. Finite element analysis was carried out using ANSYS version.11 software. The concrete was idealized by eight node isoperimetric brick elements (SOLID 65) since this element is capable of modeling cracking and crushing of concrete while steel reinforcing bars were modeled by a three dimensional spar element (LINK 8) which has two nodes with three degrees of freedom identical to those of the (SOLID 65). The parameters considered in the analysis are; the reinforcement ratio, mechanical properties of concrete and steel, scaled distance of explosion, slab thickness and types of support. Results have shown that the FEM underestimates the maximum static deflection as compared to test values in the range of (8%-21%) and the (FEM) overestimates the static failure load by about (2%-7%). The results of dynamic finite element analysis are compared with those of single degree of freedom (SDOF). The SDOF method overestimates the dynamic deflection in the range of (9%-22%) for scaled distances ranges between (0.4 m/Kg1/3 to 1.9 m/Kg1/3). The difference in the fundamental frequency between the two methods is (0.8%-3%). The results show that the effects of analysis parameters on the response of reinforced concrete slabs are similar (i.e, decreasing or increasing) in both FEM and SDOF. The results also show that the main parameter which has effect on both ductility and maximum transient displacement of RC slabs is the scaled distance. Increasing the scaled distance by 270% (0.7 m/Kg1/3 to 1.9 m/Kg1/3) results in a reduction in ductility ratio and maximum displacement by about 75% and 82% respectively, also the energy absorption is reduced by 85%. When increasing the reinforcement ratio by 100% (0.005 to 0.01), the

	ductility ratio and the displacement are reduced by 40% respectively at a scaled distance of 1.3 m/Kg1/3.