World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:8, No:12, 2014

Theoretical Modal Analysis of Freely and Simply Supported RC Slabs

Authors : M. S. Ahmed, F. A. Mohammad

Abstract : This paper focuses on the dynamic behavior of reinforced concrete (RC) slabs. Therefore, the theoretical modal analysis was performed using two different types of boundary conditions. Modal analysis method is the most important dynamic analyses. The analysis would be modal case when there is no external force on the structure. By using this method in this paper, the effects of freely and simply supported boundary conditions on the frequencies and mode shapes of RC square slabs are studied. ANSYS software was employed to derive the finite element model to determine the natural frequencies and mode shapes of the slabs. Then, the obtained results through numerical analysis (finite element analysis) would be compared with an exact solution. The main goal of the research study is to predict how the boundary conditions change the behavior of the slab structures prior to performing experimental modal analysis. Based on the results, it is concluded that simply support boundary condition has obvious influence to increase the natural frequencies and change the shape of mode when it is compared with freely supported boundary condition of slabs. This means that such support conditions have direct influence on the dynamic behavior of the slabs. Thus, it is suggested to use free-free boundary condition in experimental modal analysis to precisely reflect the properties of the structure. By using free-free boundary conditions, the influence of poorly defined supports is interrupted.

Keywords : natural frequencies, mode shapes, modal analysis, ANSYS software, RC slabs
Conference Title : ICCEAE 2014 : International Conference on Civil, Environmental and Architectural Engineering
Conference Location : Paris, France
Conference Dates : December 30-31, 2014