

SIMPLIFIED ANALYSIS TO PREDICT THE BEHAVIOR OF R.C. BEAMS UNDER COLLAPSE

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ABSTRACT

The behavior of beams under progressive collapse plays an important role in resisting the collapse. This research addresses the complicated behavior of beams under collapse. The goal of this research is to provide an easy-to-use computational program using Matlab, the technical computing software, which predicts the load-carrying capacity of beams under a column removal scenario. Therefore, the program can be a good substitute of using complicated computational finite element software, such as ANSYS, which require a full understanding of the program, consume more time for modeling, and need more time and work for the changes in material or geometric properties of the case that is being studied.

This program does both the static and dynamic analysis for beams under a column removal scenario. The static part of the program utilizes the basic concepts of equilibrium, compatibility, and material properties in developing a set of equations that forms the Matlab algorithm while the dynamic part of the program makes use of the static results and the numerical time-stepping evaluation methods. Furthermore, the program will introduce, for the first time, a full procedure that helps better understanding the behavior of beams under collapse using the basic concepts of compatibility, material relationship, and equilibrium.

Finally, the results of the program are compared to some previous collapse-related experimental tests in order to validate the proposed beam model and the methods and the assumptions that have been made in developing the computational program.