



Cairo University

# **EVALUATION OF CODE REQUIRED SEPARATION DISTANCE BETWEEN ADJACENT R.C FLAT SLAB MID-RISE BUILDINGS**

By

**Hosam Eldin Mohamed Gamal Mahmoud**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
in Partial Fulfillment of the  
Requirements for the Degree of  
**MASTER OF SCIENCE**  
in  
**Structural Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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**Title of Thesis:**

**EVALUATION OF CODE REQUIRED SEPARATION  
DISTANCE BETWEEN ADJACENT R.C FLAT SLAB  
MID-RISE BUILDINGS**

**Key Words:**

Performance evaluation; Pounding; Gap distance; Fragility curves; Code requirement

**Summary:**

Recent and past earthquake damages have proven that buildings can undergo significant structural damage under intense ground shakes. One of the possible factors that may lead to structural damage is the seismic pounding phenomenon, where adjacent buildings with insufficient gap distance may collide with each other leading to excessive shear forces and moments. As pounding may cause fatal outcomes, evaluation of code requirements for the gap distance between adjacent buildings is addressed in this thesis. A parametric study on the inelastic response of flat slab buildings under seismic action is carried out. In addition, the study evaluates the requirements of Egyptian Code of Practice regarding separation distance between adjacent mid-rise flat slab buildings. In this study, typical RC flat slab buildings, with three heights, represents residential buildings designed in accordance with the Egyptian Standards are analyzed using nonlinear time history analysis. Ten different earthquake records with 6 different peak ground accelerations varying from 0.15g to 0.7g are considered herein in order to simulate constructing the same buildings in different locations with different earthquake intensity. In this regard, fragility curves, which illustrate the relation between the peak ground acceleration and the probability of certain damage occurrence, are established for the concerned buildings considering different damage states. Then, more than 350 nonlinear pounding scenarios between adjacent buildings are studied and compared with Egyptian Code of Practice requirements, clarifying the need to adjust the Egyptian Code to prevent all pounding probabilities, especially for smaller earthquake intensities less than 0.3g.

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## **Dedication**

*To my fiancée,  
To my mother and father,  
To my grandmother,  
To my entire family.*





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