ANALYSIS AND DESIGN OF WALLS AND WALL PROTECTION SYSTEMS SUBJECT TO BLAST USING THE APPLIED ELEMENT METHOD

By

Tarek Mohamed Mohamed El-Kadry Mohamed Osman

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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Under the supervision of

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Title of Thesis: Analysis and Design of Walls and Wall Protection Systems Subject To Blast Using the Applied Element Method

Key Words: (Petrochemical Structures, Vapor Cloud Explosions, Protection Walls, Blast Loads and AEM)

Summary:

Blast loading due to vapor cloud explosions is a common case of loading in the design of petrochemical structures. Most blast design codes allow the use of simplified single degree of freedom (SDOF) analyses to design structures subjected to blast loading. However, using SDOF simplification is always accompanied with overly conservative assumptions. Thus, performing advanced three-dimensional structural analysis can lead to reduction in the straining actions and deflections resulting from the analysis. In this study, the effect of using three dimensional Applied Element analyses for walls subject to blast loading was highlighted using the software (ELS). The program was verified by comparing the results to results from experimental testing. Also an applied element model was developed for a building was designed to resist blast loading using the SDOF method. The AEM results show noticeable reduction in walls deflection and rotation, and a cost saving in wall materials was achieved.

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