Cairo University

STRUCTURAL PERFORMANCE OF CONCRETE BLAST WALL BARRIERS IN RESISTING SURFACE EXPLOSIONS

BY

Ashraf Gamal Ahmed Ahmed Nayel

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements of 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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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Structural Performance of Concrete Blast Wall Barriers in Resisting Surface Explosions

Key Words:
Blast ; Detonations; TNT; Blast Wall Barriers; ConWep; Abaqus Dynamic Explicit Analysis; Strain Rate.

Summary:
Accidental explosions have been witnessed and recorded with increasing rate around the globe. The effect of those explosions on civil structures and infrastructures is a point of interest for engineers and researchers to safeguard and protect lives and other assets. From here comes the importance of understanding different kinds of explosives that may threaten the target of interest. Blast wall barriers are one of the physical protective measures that are used as sacrificial elements to reduce the potential of risk caused by explosion on the structures behind. They also work as anti-ram element by obstructing vehicles to impact the structure. This research focuses on and deals with the behavior of concrete blast wall barriers that may be either rested on ground or anchored (fixed) to the ground by several means. Three different walls with three different geometrical surfaces exposed to the blast loading are studied under the effect of different levels of blast loading. The base of wall can be considered fully fixed in ground by forming pockets and laying the walls inside. In addition, the concave curved concrete wall is investigated under small charges in order to investigate the stability of wall in case it was rested on ground. A new method to clamp the base of the concave curved wall to ground to reduce the damaging effect of blast is proposed and evaluated in this research. All Charges are considered placed on ground surface producing surface blast wave. The three walls represent three different surfaces (i.e. vertical straight surface, concave surface and convex surface).

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Dedication

This work is dedicated to my family for their sacrifices and support without which completion of this work would have not been possible. Hot gratitude for my father and mother for their unlimited patience and support. Gratitude is extended to my brothers and sisters (Ahmed, Asma'a, Fatima El-Zahra'a and Abdul-Hai).

Table of Contents

List of Tables

List of Figures