OPTIMUM BLAST PROOF DESIGN OF PERIMETER WALLS

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By

D.K.A.A. Dikkowita

SUPERVISED BY

Professor M. T. R. Jayasinghe

STRUCTURAL ENGINEERING DIVISION

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF MORA TUWA

SRI LANKA

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Abstract

The use of vehicle bombs to attack city centers has been a feature of campaigns by terrorist organizations around the world. A bomb explosion within or immediately nearby a building can cause catastrophic damages on the building's external and internal structures frames, collapsing walls, blowing out of large expanses of windows, and shutting down of critical life-safety systems. Loss of life and injuries to occupants can result from many causes, including direct blast effects, structural collapse, debris impact, fire, and smoke. The indirect effects can combine to inhibit or prevent timely evacuation, thereby contributing to additional casualties.

As such, security against vehicle bombs is becoming a more vital area in planning and design of buildings which includes high rise buildings, embassy compounds and military buildings etc. A simple approach for providing protection against such attacks is the use of barrier walls or blast walls. Blast walls are placed around a building to provide protection to that building from the effects of an explosive attack by terrorists.

In this research, it is shown that how a reinforced concrete blast proof perimeter wall can be analyzed, designed and detailed under the effects of a bomb blast in an appropriate manner. Further, as an out come of the literature review, it is shown that the effectiveness of such wall in mitigation of blast pressures of very high magnitude is governed by factors such as stand-off distance, height of wall and shape of wall cross section.

A desperate attempt was made to investigate the effectiveness of two types of wall cross sections (Case 4 & 7 - Table 2.6) which are very common in use and a parametric study was carried out by means of blast simulation module developed in ANSYS AUTODYN interface. Due to the complexity in blast simulation techniques and lack of thorough knowledge in CFD . - (computational Fluid Dynamics) and CSM (Computational Soils Mechanics) models, a strong conclusion cannot be

obtained. But, it is recommended that the same methodology be followed to conduct future assessments of this nature, even though the research was not conclusive, mainly, due to the limitations of the software which was used. This method of assessment for optimum angle of inclination of the top portion of walls with the use of advanced simulation software will produce the required/expected results and provide an accurate conclusion.

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ABBREVIATIONS

TNT	-	Trinitrotoluene
ASTM	-	American Society for Testing Materials
ACI	-	American Concrete Institute
VBIED	-	Vehicle Borne Improvised Explosive Device
UN	-	United Nations
Psi	-	Pound per Square Inch
UNOPS	-	United Nations Office for Project Services
PIDU	-	Physical Infrastructure Design Unit
UNDP	-	United Nations Development Programme
USAID	-	United States Agency for International Development