Ain-Shams University

Faculty of Engineering

# ELASTIC STRUCTURAL BEHAVIOUR OF INFILLED PORTAL FRAMES

By

**Tarek Anwar Taha Ewida**

A thesis

Submitted in partial fulfillment for the requirements of the degree of Master of Science in Structural Engineering

Supervised by

Dr. Gamal El-Din Nassar

Prof. of Structural Engineering

Ain Shams University

Dr. Mostafa K. M. Zidan

Ass. Prof. of Structural Engineering

Ain Shams University

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بسم الله الرحمن الرحيم

بسم الله الرحمن الرحيم

**Examinars Committee**

Name, Title & Affiliation : | Signature

1- Dr.Abed El-Hady H. Hosny — H. Hosny 4/12/88

Head of Structural Engineering Department

And Prof. of Structural Engineering,

Ain Shams University.

2- Dr. Ibrahim Mahfouz M. Ibrahim — Dr. I. M. Ibrahim

Head of Civil Engineering Department

and Prof. of Structural Engineering,

Zagazig University,

Banha Branch, Shoubra.

3-Dr. Gamal El-Din Nassar

Prof. of Structural Engineering,

Ain Shams University.

4-Dr. Mostafa K. M. Zidan

Ass. Prof. Of Structural Engineering

Ain Shams University.

Date: 04 / 12 /1988

## Statement

This dissertation is submitted to Ain Shams University for the degree of **MASTER OF SCIENCE** in Structural Engineering.

The work included in this thesis was carried out by the author in the department of Structural Engineering, Ain Shams University, from November 1984 to October 1988.

No part of this thesis has been submitted for a degree or a qualification to any other University or Institution.

Date : 4/12/1988

Signature : Tarek

Name : Tarek Anwar Taha Awida

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## DEDICATION

TO MY MOTHER AND THE

SOUL OF MY FATHER.

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# INTRODUCTION

## General:-

Wall panels in buildings are used as partitions to separate the dwellings. The system consisting of the frame and the wall panel is called "Infilled Frame" in which the wall panel represents the infill material.

There are several interface conditions between the frame and the infill panel. These interface conditions may be without shear connectors, with shear connectors along the line of contact between the beam and the infill panel only and with shear connectors along the contact line between the frame and the infill panel.

The fact that the measured displacements of such frames are remarkably lesser than the relevant theoretically calculated ones, initiated research work towards the analysis of the effect of infill material on the frame displacements and consequently, on its stability and internal forces.

Taking the effect of the presence of the infill material into consideration in the structural analysis of frames results in increasing the strength of such frames to resist lateral loads of wind and seismic actions compared with the case of bare frame (i.e. without infill).

## Objectives :-

The main objectives of the present thesis are as follows :-

1-The accurate calculation of the internal forces and the deformations of portal framed structures subject to lateral loads taking into account the effect of the infill material. This will be done by adopting an improved technique of the finite element procedure. This technique represents with sufficient accuracy the interface condition between the frame and the infill by introducing a modified interface friction element.

2-Carrying out a parametric study on the different parameters affecting the structural behaviour of the infill material in portal frames. This study includes both single and double storey frames in the two cases of infilled frames with and without shear connectors.

3-The comparison between the results of the finite element method using the modified interface friction element and those of the approximate methods ( such as the equivalent strut method) proposed by other authors.

## Contents :-

The thesis is composed of six chapters as follows:-

In a first Chapter, a definition , classification and review of previous work carried out in the field of infilled