ANALYSIS OF
"SHEAR WALLS SUPPORTED ON FRAMES"

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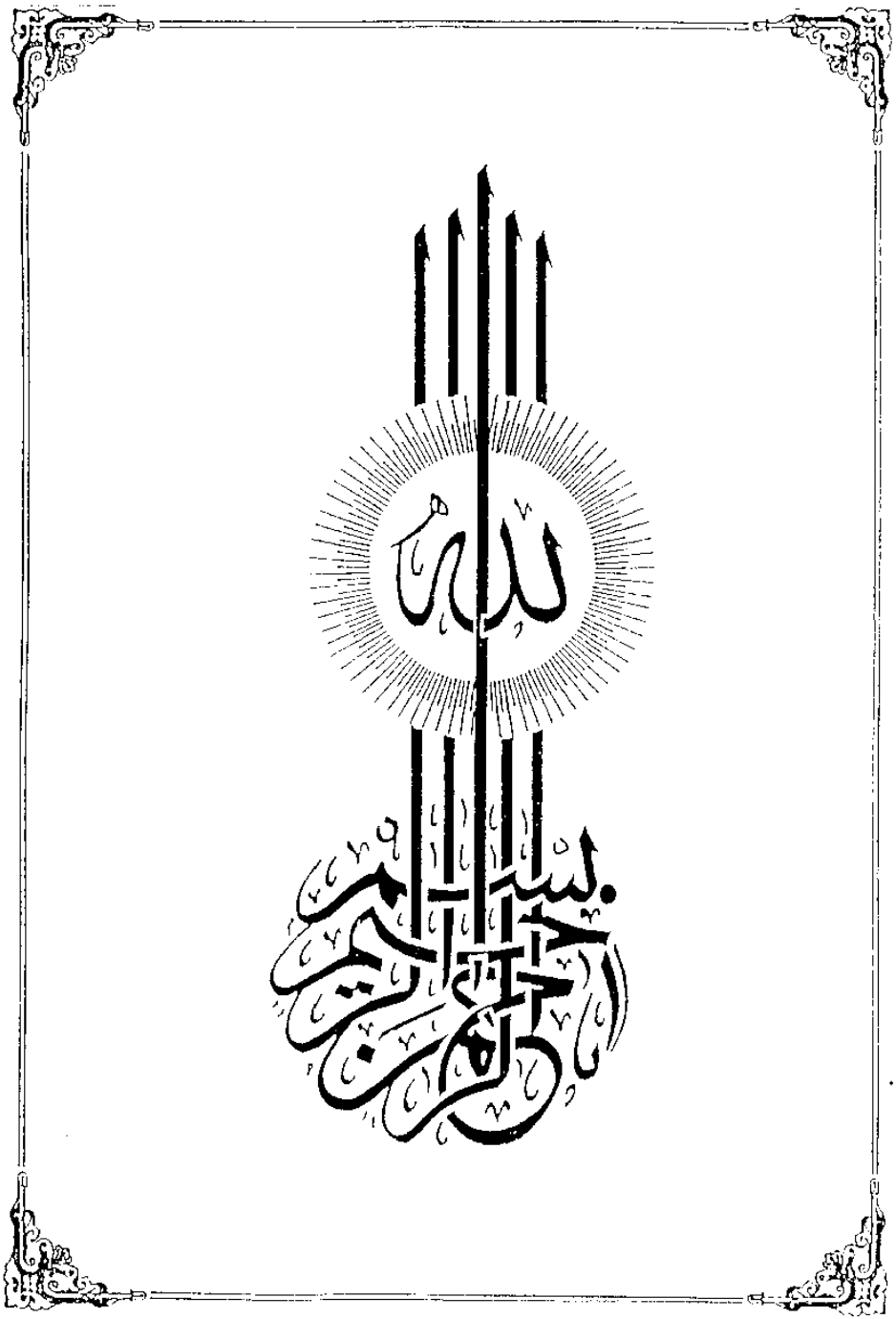

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CHAPTER (3) THE EFFECT OF CURTAILMENT ON THE STRUCTURAL BEHAVIOUR OF COUPLED SHEAR WALLS

INTRODUCTION

High rise buildings subjected to wind and / or seismic loads need certain structural elements to resist such loads. The most common used structural system in these buildings is the shear walls system. For many archtectural purposes, a curtailment process for the shear walls may be excuted in ground and lower stories to obtain large areas available for garages and office buildings. The curtailment process is the task by which the shear walls are replaced by frames.

The aim of the present thesis is to investigate the effect of the curtailment process on the structural behaviour of shear walls subjected to lateral loads. The behaviour of these curtailed shear walls when they are supported on elastic foundations is also examined. Three computer programes are written especially for the analysis of such irrational walls.

The thesis contains six chapters and four appendices.

In the first chapter, some imperical equations used in evaluating the internal forces and stresses in curtailed shear walls subjected to both vertical and horizontal loads are presented.

The second chapter presents two different methods used

previously to analyze the curtailed shear walls. The first method uses the well-known technique of finite elements while the second one is the frame idealization method. Two computer programs are prepared to fit these two approaches. A comparative study was carried out on practical curtailed walls to check the correspondance between the results of both approaches.

The third chapter comprises a comprehensive parametric study to investigate the effect of the curtailment process on the structural behaviour of the walls. The following different parameters are included in the study:

(a) the slenderness of the supporting frames's columns.
(b) the openings position.
(c) the curtailed level.
(d) the number of curtailed stories.
(e) the wall height.
(f) the number of bays.

Chapter (4) deals with the curtailed shear wall-frame interaction in sustaining lateral loads. The behaviour of braced curtailed shear walls is also investigated.

In chapter (5) an approximate simplified method for the analysis of curtailed shear walls is presented. This method has the advantage of using standard plane frame computer programs to describe the structural behaviour of

such walls. The merit of the proposed method is judged by comparing its results with those of the more comprehensive methods through a comparative study on both symmetrical and un symmetrical walls.

The behaviour of curtailed shear walls supported on elastic foundations is the subject of chapter (6). The parameters affecting this behaviour, such as the wall geometry, the factor of soil subgrade reaction and the foundation rigidity, are examined. A computer program dealing with this study was prepared.

The comprehensive study carried out in the present thesis provides a wide practical base in the field of the predication of the structural behaviour of curtailed shear walls. Design curves are presented, conclusions are given and recommendations for future expansion are specified.

CHAPTER (1)

LITERATURE SURVEY

(1-1) Shear walls subjected to horizontal loads

The usefulness of walls in the structural planning of multistory building has long been recognized. When walls are situated in advantageous position in a building, they can be very efficient in resisting lateral loads originating from wind or earthquakes.

Different methods has been presented for the analysis of the shear walls subjected to lateral horizontal loads. In 1962, BECK[1], established the continuous mediuum method for analyzing symmetrical interconnected shear wall structures (Fig. (1-1-a)). In this method, the system of interconnecting beams is assumed replaced by a continuous medium with equivalent but distributed structural properties. A differential equations is written for the analogous structure and solved to determine the actions. In 1967[2,3], the previous method was extended by COULL, to be used in case of symmetrical as well as unsymmetrical interconnected shear wall using a family of curves for evaluating both the stress and the deflection along the wall height.

The second common method used in the analysis of shear wall, is the equivalent wide column frame method.