LATERAL LOAD ANALYSIS OF TALL BUILDINGS BY APPROXIMATE METHODS

by

A.K.NAGPAL

Thesis submitted to the Indian Institute of Technology, Delhi
for the award of the degree of
DOCTOR OF PHILOSOPHY

Department of Civil Engineering
Indian Institute of Technology, Delhi

April, 1976

CERTIFICATE

This is to certify that the thesis entitled "LATERAL LOAD ANALYSIS OF TALL BUILDINGS BY APPROXIMATE METHODS" being submitted by Mr. A.K. Nagpal to the Indian Institute of Technology, Delhi for the award of the degree of Doctor of Philosophy is a record of the bonafide research work carried out by him. Mr. A.K. Nagpal has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis which to my knowledge has reached the requisite standard.

The thesis, or any part thereof, has not been submitted to any other University or Institute for the award of any degree or diploma.

(A.K. Basu)
Professor,
Department of Civil Engg.,
Indian Institute of Technology,
Hauz Khas, New Delhi - 110029.

ACKNOWLEDGEMENTS

It is indeed a pleasure to express my profound sense of gratitude to Prof. A.K. Basu for his inspiring guidance and valuable suggestions throughout the course of present work. I am indebted to him for his encouragement throughout and especially during difficult periods.

I am thankful to Mr. K.K. Gupta for his whole-hearted help and valuable suggestions during the preparation of the thesis. My thanks are due to Mr. Anil Kumar for useful discussions and his help and encouragement throughout and to Mrs. S. Kayal for her help at various stages. My thanks are also due to my other friends for their help from time to time.

I am thankful to Mr. D.R. Joshi for his expert typing and to Mr. Arora for preparing the tracings of figures.

A.K. Nagpal
(A.K. Nagpal)

ABSTRACT

The object of the present work is to develop approximate methods suitable for hand calculations and/or for use with small computers for the lateral load analysis of tall buildings. Both the continuum method and the discrete method have been used. Using the continuum method closed-form solutions for frame-wall systems, coupled walls, coupled wall-frame systems, and coupled wall-core wall systems have been obtained. These systems are assumed to be symmetric in plan-form but can be subjected to eccentric loading. Using the discrete method approximate procedures for generating the lateral stiffness matrix of frames, and of rigidly jointed frame-wall systems and the rotational stiffness matrix of core walls have been developed. Methods for the approximate analysis of these structural units have also been presented. By making use of these procedures computer programs for three-dimensional static and dynamic analysis of buildings orthogonal in plan-form have been developed. These computer programs are suitable for implementing in small core computers. The effect of lintel beams in core walls on the behaviour of buildings has been studied by using these programs for both static and dynamic loading.

CONTENTS

PART 2

DISCRETE METHOD