

**BEHAVIOUR OF R.C. AND COMPOSITE TALL
BUILDINGS DUE TO CREEP AND SHRINKAGE**

By

RAVI KUMAR SHARMA

DEPARTMENT OF CIVIL ENGINEERING

Submitted

in fulfilment of the requirements for the degree of Doctor of Philosophy

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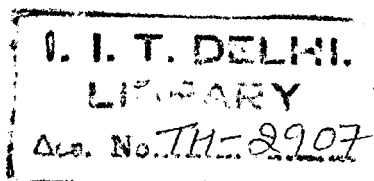
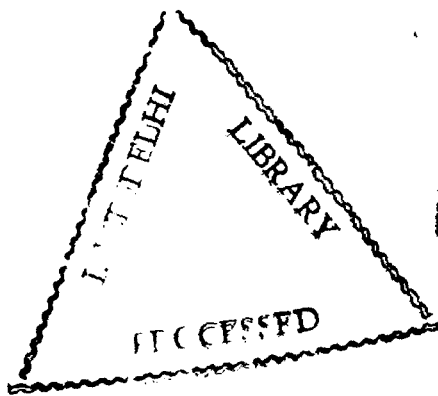
INDIAN INSTITUTE OF TECHNOLOGY, DELHI

INDIA

JULY, 2002

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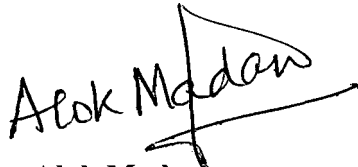
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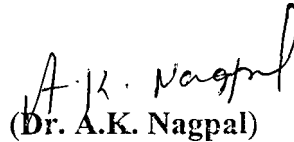
CERTIFICATE

This is to certify that the thesis entitled, “**Behaviour of R.C. and Composite Tall Buildings Due to Creep and Shrinkage**” being submitted by **Ravi Kumar Sharma** to the Indian Institute of Technology, Delhi for the award of the degree of **Doctor of Philosophy** is a bonafide record of research work carried out by him under our supervision and guidance. The thesis work, in our opinion, has reached the requisite standard fulfilling the requirement for the degree of **Doctor of Philosophy**.

The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.



(**Dr. Alok Madan**)
Assistant Professor,
Department of Civil Engineering
Indian Institute of Technology,
Delhi
Hauz Khas, New Delhi – 110016
India



(**Dr. A.K. Nagpal**)
Professor,
Department of Civil Engineering
Indian Institute of Technology,
Delhi
Hauz Khas, New Delhi – 110016
India

ACKNOWLEDGMENTS

It gives me a great pleasure in expressing my regards and profound sense of gratitude to Prof. A.K.Nagpal for his perspective supervision, invaluable guidance and constant encouragement throughout this work. With his magnificent understanding and in-depth knowledge of Structural Engineering he has motivated and cultivated in me a very deep interest and ability to understand the behaviour of tall buildings.

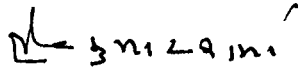
My sincere thanks are due to Dr Alok Madan for his valuable supervision.

I personally want to thank my all friends for the help; they have extended at various stages. In any work of this magnitude, a solid beginning is worth half the work done. My special thanks are due to Savita who helped me in getting started. I would also like to thankfully acknowledge Amit for his concern and timely help provided by him whenever it was required. I also want thank Javed Bhat for his help during preparation of thesis. Let me not forget my friends like Umesh Maheswari, Rajesh Diwedi, Akhil Garg, M.K.Bhardwaj, R.Senthivel, A. K. Banik and others, who may not have helped me directly, but their constant encouragement pushed me to work with a renewed vigor.

I would like to express my sincere regards to my parents, who always want to see me progressing. I would like to appreciate my brothers and their family members for their consistent encouragement and moral support.

I wish to express my gratitude to my mother in-law and all other family members for their concern and constant support throughout this work. I must admit that most of the time I took their support for granted.

I express my hear-felt indebtedness to my kids Megha and Siddharth, who were deprived of the privileges due to preoccupation of myself with the research work. Lastly, the work of this dimension could not have possible without encouragement and co-operation from my wife, Shipra who managed all my responsibilities on her shoulders magnificently.


(Ravi Kumar Sharma)

ABSTRACT

Creep and Shrinkage effects in tall buildings need special consideration as differential time dependent deformation in vertical members are critical in these buildings.

The most widely used procedure available in literature for determining creep and shrinkage effects in RC buildings henceforth designated as Approximate Procedure 1, AP1 has been recommended for buildings having low stiffness of beams. In this procedure, inelastic deformations are obtained by multiplying coefficients designated as reinforcement coefficients with inelastic deformations in plain concrete. These reinforcement coefficients are evaluated by calculating stress transfer from concrete to steel by Rate of Creep Method, RCM. There is a discrepancy in evaluation of reinforcement coefficients that these coefficients have been taken to be the same at all time and equal to the value at time, $t = \infty$. Modified formulation is presented here to overcome this discrepancy.

Inelastic deformations obtained using stress transfer method, RCM are overestimated as creep recovery of the concrete is neglected in this method To evaluate these deformations more accurately, modified formulation using AEMM, designated as AP1(AEMM) is presented in this work. Systematic studies are carried out for the comparison of results from this procedure with those from widely used procedure AP1.

Recently an accurate procedure termed as Consistent Procedure, CP has been developed for low as well as high beam stiffness. Some discrepancies e.g. evaluation of stress transfer using RCM and reinforcement coefficients as in AP1 exist in CP. In

the present work, CP is refined using the stress transfer method AEMM and results from this procedure CP(AEMM) are compared with those obtained using stress transfer method, RCM.

To increase the applicability of AP1(AEMM), a modified approximate procedure AP2(AEMM) is also presented here and detailed studies are carried to determine the range of parameters for which AP1(AEMM) and AP2(AEMM) are applicable as CP(AEMM) requires large computational effort.

Only a few studies are available for the effect of beam stiffness on inelastic deformations and load transfer among columns. Elaborate studies are reported in this work for a wide range of beam stiffness. Also inclusion of shear walls alters the load transfer among vertical members. No systematic study is available to evaluate the effect of inclusion of shear walls on load transfer among vertical members. Such studies are reported in detail in the present work.

Redistribution of vertical load among columns takes place through beam which act as the medium of transfer. No study is available on the effect of inelastic deformations on beam forces. In the present work the effect of these inelastic deformations on beam forces is studied in detail.

No studies are available for the behaviour of composite buildings using CP(AEMM). In the present work CP(AEMM) is modified for a class of composite buildings and studies are reported for the behaviour of these buildings.

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