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

By

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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.

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(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. Suc 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 inelasti deformations on beam forces. In the present work the effect of these inelast deformations on beam forces is studied in detail.

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

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