



Comparison between Eurocode 2, ACI 209R-92 and Gardner&Lockman Models in Creep Analysis of Composite Steel-Concrete Section

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Summary

The paper presents analysis of the stress-strain behaviour and deflections changes due to creep in statically determinate composite steel-concrete beam according to EUROCODE 2, ACI209R-92 and Gardner&Lockman models. The mathematical model involves the equation of equilibrium, compatibility and constitutive relationship, i.e. an elastic law for the steel part and an integral-type creep law of Boltzmann – Volterra for the concrete part considering the above mentioned models. On the basis of the theory of the viscoelastic body of Maslov-Arutyunian–Trost-Zerna-Bazant for determining the redistribution of stresses in beam section between concrete plate and steel beam with respect to time “ t ”, two independent Volterra integral equations of the second kind have been derived. Numerical method based on linear approximation of the singular kernel function in the integral equation is presented. Example with the model proposed is investigated.

Keywords: steel-concrete section, integral equations, rheology, numerical method.

1. Introduction

The time-varying behaviour of composite steel-concrete members under sustained service loads drawn the attention of engineers who were dealing with the problems of their design more than 60 years. [2,3,4,5]. Creep have a considerable impact upon the performance of composite beams, causing increased deflection as well as affecting stress distribution. Creep in concrete represents dimensional change in the material under the influence of sustained loading. Failure to include creep effects in the analysis of the composite steel-concrete beams may lead to excessive deformation and caused significant redistribution of stress between concrete plate and steel beam. In general, time-dependent deformation of concrete regarding creep phenomena may severely affect the serviceability, durability and stability of structures. In this paper we try to make the comparison in results, obtained from Eurocode 2, ACI209-R2 and G&L models[1] in creep analysis of composite steel concrete beams.