



Numeric Analysis of Creep Effects on Steel-concrete Composite Structure with Equivalent Temperature Field Method

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Abstract

The analysis of creep effect on steel-concrete composite structure is very complex. In this paper, the numeric analysis method of creep effect on steel-concrete composite structure with equivalent temperature field method is deduced, including transformation of initial creep strain to nonlinear equivalent temperature field along composite section, and also the reduced elasticity modulus of the concrete deck is taken for solution by computer. Based on this method, the programs for analysis of creep effect on steel-concrete composite structure with elements of integrated section without need of building models as divided separate layer have been developed, which has been used to analyse the creep effect on a long-span pre-stressed steel-concrete composite bridge. The conclusion has been drawn that creep effect is remarkable on pre-stressed steel-concrete bridge even if the reduced equivalent modulus of elasticity is considered.

Keywords: creep; steel-concrete composite beam; equivalent temperature field; reduced modulus of elasticity ; numeric analysis.

1 Introduction

Steel-concrete Composite Structure is a type of structure widely used in bridge and civil engineering. As its section is composed of two different kinds of material of concrete and steel, and creep caused by concrete is more evident than steel that the creep of steel can be neglected, and so the creep effect analysis of this composed structure become more complicated. The statically determinate composite structure can also cause self-stress due to the strain re-distribution of creep, which complies the plain section assumption. As the statically indeterminate composite structure, secondary super-static stress should be caused by creep,

besides the self-stress. Self-stress effect of creep from static for example simply supported composite beams can be solved by manual calculation or with equations given in textbook[1], but creep effect of super-static composite beams is far more complicated than that of static ones that it can not be analysed accurately only if by programs. There is great need for suitable and numeric analysis method and effective software. In some cases we may build models by two separate layers that represent respectively different material of steel and concrete, and connect them with additional rigid element. But this method increase the element numbers, and bring the result that is not continuous where the node points connect, and so is usually not ideal.