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# Matrix creep influence on structural performance of steel-concrete composite members subjected to long-term loads

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**Abstract**

Previous theoretical studies supported by practical experiments have shown that the use of differential equations in problem solving oriented to the field of steel-concrete composite structures and specifically to steel-concrete composite precast and prestressed trusses, columns and slabs is effective to improve the stiffness of the structural material, predicting the eventual progressive cracking characteristics of the structural members. Design formulas for stress-strain limit states of the structures have been previously proposed based on these said experiments. However, little evaluations of time effects provided by the stressing of high strength steel tendons, and by the long-term static loading of the structural members have been conducted. This present paper shows the simplification of the design procedure of these above said composite structural members, a simplification due to the use of equilibrium differential equations, series method for approximate integrations, and derivatives of linear and non-linear functions.

***Key words***: *Steel-concrete composite material, Matrix concrete, Matrix creep, Matrix shrinkage, Prestressed steel tendons, Prestressing losses, Composite slabs, Composite trusses, Composite columns, Prestressing forces*

## 1. Introduction

The actual concern for structural engineers is the failure of the structural material to meet the design safety and the safe service life of large span and wide floor space buildings including modern industrial buildings, warehouses, aircraft hangers requiring more and more free and clear spaces.

To satisfy this requirement for spans exceeding 18 m steel-concrete composite precast and prestressed trusses accommodating composite precast and prestressed roof slabs and supported by composite columns as shown in Figure 1 are more suitable and more economical comparably to our traditional timber trusses covered by steel roof sheets and supported by timber columns with regards to termites' attack and corrosion.

Many previous theoretical and experimental studies

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