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Comparisons between design models for serviceability limit state of composite steel-concrete slabs

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Abstract

Composite steel-concrete structures are widely used throughout the world for building and bridge applications. Their design is carried out ensuring a number of limit states to be satisfied. This paper is concerned with the serviceability limit state of simply-supported composite steel-concrete slabs, placing particular attention to the effects produced by concrete shrinkage on the structural response. In this preliminary study the differences obtained in calculated deflections based on design models available in international guidelines or used by practicing engineers are presented. In particular, three approaches are considered in relation to shrinkage effects, i.e. one where shrinkage is omitted in the deflection calculations, one where the shrinkage profile is taken as uniform over the slab cross-section and one where a shrinkage gradient is adopted over the slab depth, as observed in recent experimental long-term experiments.

Keywords: Composite, concrete, deflection, serviceability, shrinkage, steel.

1 Introduction

Composite steel-concrete structures are widely used throughout the world for building and bridge applications because leading to economical and efficient structural solutions. When considering building floors, composite slabs represent an attractive form of construction and consist of thin-walled profiled sheeting, reinforcement and concrete. A typical composite slab is depicted in Figure 1.

There is a wide range of steel sheeting available on the market and vary for their material and geometric properties. Common profiled sheeting layouts include re-entrant, L-shaped and trapezoidal profiles.

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