Chapter 1

Introduction

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This chapter presents the main concepts relevant to the design of composite steel-concrete structures for the serviceability limit state associated with the time-dependent effects of concrete caused by creep and shrinkage. After providing an overview of the verification of the serviceability limit state requirements, attention is given to the calculation of the service loads and their combinations. The key features associated with the limit states of deflection and concrete cracking are then introduced to provide a summary of how the service conditions can be incorporated into the design of a structure and its components. Finally, a classification of the different types of structures and their levels of sensitivity related to concrete time effects are presented. This classification is used to give insight into the available sets of recommended material models and analysis methodologies that can be used in design. The serviceability limit state requirements presented in this chapter have been outlined with reference to European, Australian and New Zealand, and American guidelines.

1.1 Background

Composite steel-concrete structures are widely used throughout the world for building and bridge applications. One of the distinguishing features of this form of construction is that the advantages of concrete and steel are combined to achieve stiffer and stronger structural solutions than those exhibited by the two materials working independently. The ability of the concrete and steel components to work together is commonly referred to as composite action and the force transfer mechanisms at the basis of this behaviour depend on the type of the structural component under consideration, such as a slab, column or beam, and the type of connectors used to tie the two materials together. For example, the composite action in composite beams is usually provided by means of mechanical devices, typically in the form of shear connectors, or in composite slabs by a mechanical interlock produced at the concrete and steel interface by embossments or indentations on the profiled steel sheeting. The peculiarities of the composite action exhibited by each structural component are briefly introduced in the corresponding chap-