https://doi.org/10.2749/sed018.ch4

Chapter 4

State-of-the-art review on the time-dependent behaviour of composite steel-concrete beams

Gianluca Ranzi[1], Graziano Leoni[2], Raymond Ian Gilbert[1], Luigino Dezi[2], Riccardo Zandonini[2]

1 Australia, 2 Italy

This chapter provides an overview of the work carried out to date on the long-term behaviour of composite steel-concrete beams. In the first part of the chapter, a description of the components forming a composite member is presented. This is followed by an outline of the main kinematic concepts, such as full and partial shear interaction, that influence the structural response of this form of construction due to the flexibility of the shear connection provided between the concrete and steel components. The review of the work performed on the time-dependent behaviour of concrete and its influence on the long-term structural response of composite beams for building and bridge applications is then presented. The modelling and experimental work considered in the review highlights the importance of considering concrete time effects, when predicting the in-service response of composite beams.

4.1 Introduction

Composite steel-concrete beams are widely used for building and bridge applications. Typical composite beams used for building applications combine steel beams with solid or composite slabs, as illustrated in Figs. 4.1a and 4.1b, respectively. In this case, the depth of the steel beam is usually of the same order or a few times larger than the thickness of the concrete slab. Typical composite beam arrangements for bridge applications are depicted in Figs. 4.2a and 4.2b for a twin-girder deck and a box girder, respectively. The depth of the steel section of composite bridges is usually about one order of magnitude larger than the concrete slab thickness.

Composite beams represent an economical structural solution. This form of construction is particularly efficient in positive (sagging) moment regions in which the concrete is mainly in compression and the steel is in tension. In such an arrangement, the coupling of