

Chapter 3

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

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This chapter presents a state-of-the-art review of work published to date on the time-dependent response of composite steel-concrete slabs. The key components of this form of construction are introduced in the first part of the chapter, followed by a review of the time-dependent behaviour of the concrete and how it affects the in-service response of composite slabs. Throughout the chapter, particular attention is given to recent experimental and modelling work related to concrete time effects, and how these affect the in-service response of composite slabs, including the development of non-uniform shrinkage gradients that have been recently shown to occur in composite floors due to the inability of the concrete to dry from its underside because of the presence of the profiled steel sheeting.

3.1 Introduction

Composite steel-concrete slabs are widely used for building applications and consist of reinforced or post-tensioned concrete slabs cast on profiled steel sheeting. A typical layout of this form of construction is illustrated in Fig 3.1. The key components consist of profiled steel sheeting, concrete slab, steel reinforcement, and, in the case of post-tensioned floors, pre-stressing ducts and strands. Composite slabs are widely used in steel framed construction, while post-tensioned composite slabs have found wide applicability in concrete structures.

It is common practice to classify profiles of steel sheeting according to their geometry. The most common geometries are depicted in Fig 3.2 and include re-entrant trough profiles, clipped-pan profiles and open trough profiles (EN 1994-1-1 [1], AS/NZS 2327 [2]). The profiled steel sheeting may have different patterns of embossments or indentations on its surface to improve the bond between the steel and the concrete.

In this form of construction, the profiled steel sheeting is used as permanent formwork and, once the concrete hardens, the slab becomes composite and the sheeting acts as