

In situ tests on steel deck concrete composite slabs at Zurich Airport

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Summary

This paper presents an experimental study on composite slabs with profiled steel sheeting (Holorib 51) performed at Zurich Airport in conjunction with the conversion of Dock B. The structure was built in 1974 with composite floor slabs, a steel frame with stub-girder beams and hot-rolled steel columns as supporting structure. The experimental investigation focused on the bond behavior of the composite slabs and the influence of the 35 years service life.

Ten large-scale tests were carried out on simple beams with different shear span length to evaluate the shear capacity. In addition, tests on two-span beams and cantilever beams were performed. The slab beams were cut from the slab and tested in situ. The data generated by these tests enabled the assessment of the slabs. The paper presents the results of the tests on simple and continuous beams and the evaluation of the results with common design methods.

Keywords: Composite Structure, composite slab, profiled steel sheeting, in-situ tests, m-k-method, partial shear connection theory

1. Introduction

Dock B at Zurich Airport was built in 1974. After 35 years in service it will be converted to implement the Schengen agreement with the European Union. As a precondition to reuse the existing structure it had to be shown that the structure still meets the safety and serviceability requirements in particular the longitudinal shear capacity of the composite slabs after 35 years in service. Hence, large scale tests were performed in situ on the composite slabs. The test results on simple beams were analysed with the m-k-method and the partial shear connection method according to Eurocode 4 [1], which were developed based on numerous tests under laboratory conditions [2]. The test results show that the longitudinal shear strength is still in the range of the specifications of the manufacturer given in design-charts for new-built composite floors.

This paper first describes the experimental program, particularly the test setup and the procedure, for the in situ tests on steel deck concrete composite slabs at Zurich airport. Next, the test results including load-deflection and load-slip history records on simple beams and two-span beams are presented. Finally, the shear bond parameters required for the m-k-method and the partial shear connection theory are determined based on the simple beam test results.