

Loading Test on Composite Slab with Profiled Steel Decking To BS5950: Part 4: 1994 and Code of Practice for the Structural Use of Steel 2005

Scope

In order to demonstrate structural adequacy against shear-bond failure between the concrete and the profiled steel decking, it is essential to perform full-scale dynamics and static tests for composite slab with profiled steel decking in accordance with the recommendations given in Section 8 of BS5950: Part 4: 1994 as well as Clause 16.4.2 of Code of Practice for the Structural Use of Steel 2005 (HKSC2005).

It is clearly stated in the paragraphs 3 and 4 of PNAP251 – Testing of Building Materials as well as clause 16.4.1 of HKSC2005 – Testing of Composite Slabs, all testing of building materials should be carried out by established testing organizations with suitable qualifications and relevant experience such as a HOKLAS accredited laboratory or equivalent.

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<p>Testing of Building Materials</p> <p>Authorized Persons (APs) and Registered Structural Engineers (RSEs) may be approached from time to time for advice on the acceptability of building materials and proprietary fire resisting products. This practice note sets out the Building Authority's position which may be of assistance to APs and RSEs in preparing advice to manufacturers, suppliers, registered general building contractors, registered specialist contractors and building owners.</p> <p>2. Under the Buildings Ordinance (BO), APs, RSEs and registered contractors (RC) have responsibilities to supervise building works including the selection and application of building materials/products and to certify compliance with relevant provisions of the BO upon completion of works. In this connection, it should be noted that the BO contains no provision whereby the Building Authority may issue a certificate, a test or assessment report with respect to these materials/products. The Building Authority takes the position, therefore, of relying on APs, RSEs and independent laboratories for testing for compliance with standards and for certification. For certification of the building materials/products used and their compliance with standards, upon completion of works, please refer to PNAP 53.</p> <p>3. The Building Authority will recognize those laboratories accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or by other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with HOKLAS. You may find such laboratory accreditation bodies at the web site of the Hong Kong Accreditation Service - http://www.info.gov.hk/its/eng/quality/hkas/hkas.shtml. You should ensure that the tests conducted by an accredited laboratory are within its scope of accreditation.</p> <p>4. The following list of materials/products, which is not exhaustive, would normally be required to be tested by accredited laboratories as mentioned in paragraph 3: -</p> <ul style="list-style-type: none"> (a) Concrete cube and core; (b) Steel reinforcement (c) Reinforcement splices/couplers; (d) Curtain wall systems; and (e) Fire resisting products. <p style="text-align: right;">/Proprietary</p>		

<p>(b) Qualifications and experience of test consultant and accreditation status such as a HOKLAS accredited laboratory;</p> <p>(c) Dimensions and arrangement of the test rig including the positions of loading points and measuring devices;</p> <p>(d) Actual dimensional measurements of the test specimen;</p> <p>(e) Details of the loading method and testing procedure;</p> <p>(f) All test results necessary for the test evaluation;</p> <p>(g) A record including data and photographs of all other observations from the test. As far as is possible tested samples should be retained. If not, then photographs of the samples after testing should be kept.</p>	<p>16.4 TESTING OF COMPOSITE SLABS</p> <p>For composite slabs with profiled steel sheets, it is essential to perform full-scale dynamics and static tests to demonstrate structural adequacy against shear-bond failure between the concrete and the profiled steel sheets.</p> <p>16.4.1 General</p> <p>The tests described in this section are of two types.</p> <p>(1) Specific tests</p> <p>These are full-scale tests of a composite slab with a particular member configuration, using actual loading or a close approximation to it. The purpose is to determine the load carrying capacity of a slab directly by testing. The results obtained should be applied only to the particular case of span, profiled steel sheets and concrete grade and thickness tested.</p> <p>(2) Parametric tests</p> <p>These are a series of full-scale tests of a proposed type of composite slab, over a range of parameters covering loading, profiled steel sheet thickness, concrete thickness and spans. The purpose of these tests is to obtain data to enable the values of the empirical parameters k_1 and m_1 to be established, which are then used to determine the shear-bond capacity V_s (see clause 10.4.5.3(2)a).</p> <p>All testing should be carried out by established testing organizations with suitable qualifications and relevant experience such as a HOKLAS accredited laboratory or equivalent.</p> <p>16.4.2 Specific tests</p> <p>(1) Test arrangement</p> <p>A minimum of three full-scale tests should be carried out on representative samples of the proposed slab construction using actual loadings or, in the case of uniformly distributed loads, a close simulation of the loading as shown in Figure 16.1. In the case of continuous spans, the tests should either be on multiple spans or be on a single span with simulated support moments.</p> <p>The width of the test slabs should not be less than the largest of the following:</p> <ul style="list-style-type: none"> • three times the overall depth, $3D_s$; • 800 mm; • the width of the profiled steel sheet. <p>Thin sheet steel crack inducers extending to the full depth of the slab and coated with a debonding agent should be placed across the full width of the test slab to ensure that the cracks form in the tensile zone of the slab. In the case of four-point loading, the crack inducers should be positioned under the two more central loads, as shown in Figure 16.1. For non-uniform or asymmetrical loading arrangements, the crack inducers should be positioned at the points of maximum bending moment.</p>
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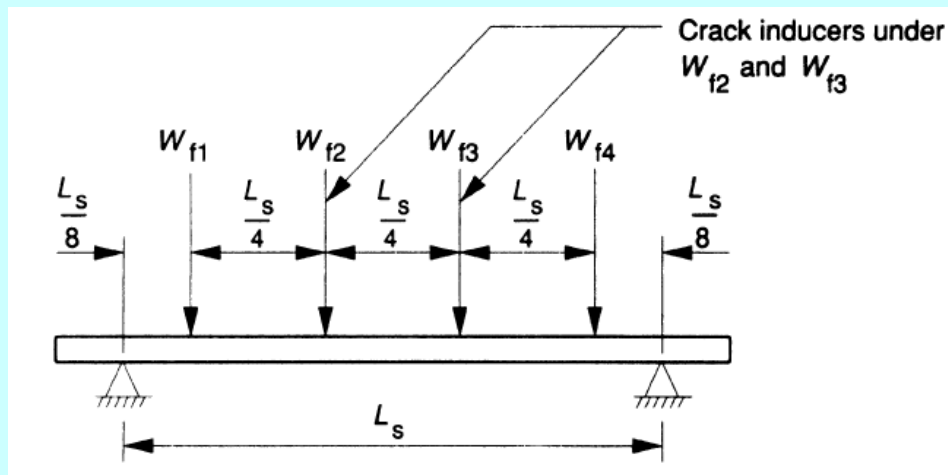
Objectives

The purpose of full-scale test of a composite slab with a particular member configuration is to determine its load carrying capacity as well as overall performance directly by testing. The results obtained should be applied only to the particular case of span, profiled steel decking, material thickness, steel grade and concrete grade tested.

The test data can be used to establish the values of the empirical parameters m_r and k_r , which are then used to determine the shear-bond capacity of the composite slab with profiled steel decking in composite stage.

Test Methods

- Section 8 of BS5950: Part 4: 1994.
- Clause 16.4.2 of Code of Practice for the Structural Use of Steel 2005.



- Annex B.3 of BS EN 1994-1-4: 2004.
- Chapter 3 of ANSI/ASCE 3-91.

