Performance of a concrete slab incorporating Vermitex “AF” sprayed insulation applied to underside

Assessment Report

Author: Keith Nicholls
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Client: L & A Fazzini Manufacturing Pty Ltd

Commercial-in-confidence
Inquiries should be address to:
Fire Testing and Assessments
NATA Registered Laboratory
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5444

Author
Infrastructure Technologies
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5449

The Client
L & A Fazzini Manufacturing Pty Ltd
23-25 Wentworth Street
Greenacre NSW 2190
Telephone +61 2 9642 4745

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<tr>
<td>Keith Nicholls</td>
<td>Brett Roddy</td>
<td>Brett Roddy</td>
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1 Introduction

This report is an assessment of the performance of LAF Vermitex “AF” when spray applied to the underside of a concrete slab.

This report is prepared for the purpose of meeting the evidence of suitability requirements of Specification A2.3 for FRL.

This report reviews and confirms the extent to which the reference fire resistance tests listed in section 2 meet the requirements of the standard fire test standards listed in section 4 of the report. The proposed variations to the tested construction presented in section 3 are subject to an analysis in Appendix B and the conclusions are presented in Section 5 of this report.

The field of applicability of the results of this assessment report are presented in Section 6.

2 Supporting Data

This assessment report refers to various test reports to support the analysis and conclusions of this report. They are listed below;

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<th>Report Reference</th>
<th>Test Standard</th>
<th>Outline of Test Specimen</th>
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<td>FSH 0236</td>
<td>AS1530.4-1990</td>
<td>Vermitex “AF” sprayed insulation up to 25mm thick applied to the underside of a concrete slab</td>
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The test report FSH 0236 was undertaken by CSIRO and sponsored by L & A Fazzini Manufacturing Pty Ltd.

3 Proposed Variations

The proposed construction is for concrete slabs designed in accordance with AS3600-2009 with Vermitex “AF” sprayed insulation up to 25mm thick applied to the underside of a concrete slab.

4 Referenced Standards

This assessment makes reference to the following standard

Standards:

AS 1530.4-2014 Methods for fire tests on building materials, components and structures Part 4: Fire resistance tests of elements of building construction.
5 Conclusion

On the basis of the analysis presented in this report, it is the opinion of this Testing Authority that the tested prototypes described in Section 2 when varied as described in Section 3 are suitable for meeting the requirements of AS 3600-2009 clause 5.8.1.2 for a period of up to 188 minutes and a thickness of 25mm when submitted to a standard fire test in accordance with the test methods referenced in Section 4 and subject to the requirements of Section 7.

6 Direct Field of Application of Results

The results of this report are applicable to floors exposed to fire from the underside.

7 Requirements

Any variations with respect to size, constructional details, loads, stresses, edge or end conditions that are other than those identified in this report, may invalidate the conclusions drawn in this report.

8 Term of Validity

This assessment report will lapse on 30 March 2022. Should you wish us to re-examine this report with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this assessment in the light of new knowledge.

9 Limitations

The conclusions of this assessment report may be used to directly assess the fire resistance performance under such conditions, but it should be recognised that a single test method will not provide a full assessment of the fire hazard under all fire conditions.

Because of the nature of fire resistance testing, and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment report does not provide an endorsement by CSIRO of the actual products supplied to industry. The referenced assessment can therefore only relate only to the actual prototype test specimens, testing conditions and methodology described in the supporting data, and does not imply any performance abilities of constructions of subsequent manufacture.
This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are the subject of constant review and improvement and it is recommended that this report be reviewed on or, before, the stated expiry date.

The information contained in this assessment report shall not be used for the assessment of variations other than those stated in the conclusions above. The assessment is valid provided no modifications are made to the systems detailed in this report. All details of construction should be consistent with the requirements stated in the relevant test reports and all referenced documents.
**Appendix A  Supporting Test Data**

**A.1. Test Report FSH 0236**

On 18 December 1992 this Division conducted a full-scale fire-resistance test on ductwork protected by Vermitex "AF" sprayed insulation. In order to save constructional costs associated with the testing, the concrete slab, which formed the top of the furnace chamber and provide the penetrated element for the vertical duct systems, was one which had previously been subjected to a standard fire.

A nominal thickness of 25 mm Vermitex "AF" was sprayed on the underside of the slab to provide additional insulation to the reinforcement steel and protect the heat affected concrete. The slab exhibited only marginal deflection during the test under which conditions the applied Vermitex "AF" remained attached to the slab for the duration of the test (188 minutes). The applied spray material did exhibit acceptable stickability around the duct sections which were the subject of significant expansions and buckling.

**A.2. Relevance of Test Data from AS1530.4-1990 to AS1530.4-2014**

*General*

The referenced test report FSH 0236 describe a test conducted in accordance with AS 1530.4-1990, which differs from the current standard AS 1530.4-2014.

The potential effect of these differences on specimen performance is discussed below.

*Furnace Temperature Measurement*

The specifications for furnace thermocouples in AS 1530.4-2014 are similar to the specification of fully enclosed thermocouples specified in AS 1530.4-1990. AS 1530.4-1990 however also allows the use of “exposed thermocouples”, or “substantially enclosed thermocouples”. The latter thermocouple type allow the thermocouple to be placed within a closed end tube. This type of thermocouple is substantially less responsive as the thermocouple is shielded from temperature changes by the enclosing steel tube.

Thermocouples that are less responsive to heating will require the furnace to run hotter in period of significant temperature rise so as to follow the required heating curve.

Based on the above it is confirmed the furnace control thermocouples required by AS 1530.4-1990 will result in heating conditions that are similar to or will be more onerous than that required by AS 1530.4-2014.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2014 and AS 1530.4-1990 are not appreciably different.

*Furnace Pressure Regime*

For a walls AS 1530.4-1990 requires the furnace pressure differential not less than 20 Pa above the laboratory atmosphere to the top two-thirds (2m) of the test specimen.

Although the pressure requirement for floors and ceilings is not explicitly stated, the above requirement for a wall implies for floor above a wall the requirement would be nominally 20Pa 100mm below the soffit of the floor.

For floor and ceilings AS 1530.4-2014 specifies that the pressure of 20Pa is established at a position 100mm below the soffit of the floor or ceiling.
The referenced test report FSH 0236 state the pressure was in accordance with the AS 1530.4-1990 and note the pressure was recorded. It is considered reasonable to accept this test was undertaken with furnace pressure of 20Pa is established at a position 100mm below the soffit of the floor or ceiling.

The pressure conditions in the furnace has little effect on tests that do not allow gaps to form like the specimen tested in FSH0236 therefore it is considered any differences would not impact on the performance if tested to AS 1530.4-2014 Section 4 for floors.

Application of Test Data in FSH 0236 to AS 1530.4-2014

The minor variations in furnace heating regimes are not considered to significantly affect the behaviour of the specimens relevant to this assessment.

In light of the above, it is considered that the results test FSH 0236 can be used for the purpose of assessment of stickability in accordance with AS 1530.4-2014.
Appendix B  Analysis of Variations

B.1 Assessment of Variation 2

The intended purpose of this assessment is to verify the construction tested in FSH 0236 is suitable for demonstrating compliance with AS3600-2009 clause 5.8.1.2 (c) which states the following:

5.8.1.2 Acceptable forms of insulation

Acceptable forms of insulation include the following:

(a) Slabs of 1 part cement to 4 parts vermiculite (by volume) concrete or of 1 part cement to 4 parts perlite (by volume) concrete, appropriately bonded to the concrete.

(b) Gypsum-vermiculite plaster or gypsum-perlite plaster, both mixed in the proportion of 0.16 m$^3$ of aggregate to 100 kg of gypsum, in the form of either slabs appropriately bonded to the concrete, or as a sprayed or trowelled application applied in situ.

(c) Any other fire-protective building board or material, which has been demonstrated to be suitable for the purpose in a standard fire-resistance test.

With reference to the construction tested in FSV 0236, the specimen comprised a concrete slab with a nominal thickness of 25 mm Vermitex "AF" which was sprayed on the underside of the slab. When tested the slab exhibited only marginal deflection during the test under which conditions the applied Vermitex "AF" remained attached to the slab for the duration of the test (188 minutes). The applied spray material did exhibit acceptable stickability around the duct sections which were the subject of significant expansions and buckling.
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FOR FURTHER INFORMATION

Infrastructure Technologies
Keith Nicholls
Senior Consultant Assessments Engineer
t  +61 2 94905450
e  Keith.Nicholls@csiro.au
w  https://research.csiro.au/infratech/fire-safety/fire-testing/

Infrastructure Technologies
Brett Roddy
Manager, Fire Testing and Assessments
t  +61 2 94905449
e  brett.roddy@csiro.au
w  https://research.csiro.au/infratech/fire-safety/fire-testing/