

The fire resistance performance of Dincel-Form concrete filled wall system in accordance with AS 1530.4-2014

Assessment Report

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Commercial-in-confidence

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1 Introduction

This report presents an assessment of the fire resistance performance of Dintel-Form concrete filled wall system in accordance with AS 1530.4-2014.

This report is prepared for meeting the evidence of suitability requirements of NCC Schedule 5 clause 2 b) as appropriate for FRL.

This report reviews and confirms the extent to which the referenced fire-resistance tests listed in Section 2 meet the requirements of the 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 is presented in Section 6 and subject to the requirements, validity and limitations of Section 7, 8 and 9.

2 Supporting Data

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

Report Reference	Test Standard	Outline of Test Specimen
FSV 1346	AS 1530.4-2005	A full-scale fire-resistance test on a 200mm thick Dintel wall system.

The test reported in FSV 1346 was undertaken CSIRO North Ryde and sponsored by Dintel.

3 Proposed Variations

The proposed wall systems shall be as tested in FSV 1346 and subjected to the following variation:

- Confirmation of performance when tested in accordance with AS 1530.4-2014

4 Referenced Standards

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 Accredited Testing Laboratory that the tested prototypes described in Section 2 will achieve the performance below when submitted to a test in accordance with the test methods referenced in Section 4, and subject to the requirements of section 7, validity of section 8 and limitation of section 9.

240/240/240

6 Direct Field of Application of Results

The results of this report are applicable to walls exposed to fire from either side.

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 31st December 2024. 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 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 is 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 FSV 1346

On 26 February 2009, CSIRO conducted a full-scale fire-resistance test in accordance with AS 1530.4 - 2005 on a wall system comprising a reinforced concrete wall system 3000-mm high x 3000-mm wide x 200-mm thick made up of nine pre-fabricated Dincel-permanent polymer formwork panels filled with in-situ concrete after assembly.

The 2mm thick webbed polymer formwork panels measured 333-mm in width x 200-mm in thickness, each module connected to the other via a patented snap engagement mechanism at each joint. The prefabricated panels incorporated 25-mm high x 65-mm base triangular service voids, as well as 115-mm diameter holes spaced at 150-mm centres located in the webbing of the panel.

The panels were put up vertically and appropriately braced before 20 Mpa concrete mix (slump estimated by the client to be in excess of 150-mm) was pumped in through the top in one continuous pour without the use of concrete vibrators, and trowelled off when completely filled. There were no reinforcement bars used in the test wall.

A total load of 800 kN was applied to the specimen for the duration of the test.

The Structural adequacy and integrity of the wall system were maintained for the full 240 minutes duration of the test. Insulation failed at 230 minutes.

A.2. Applicability of AS 1530.4-2005 test data to AS 1530.4-2014

General

The fire resistance tests FSV 1346 was tested in accordance with AS 1530.4-2005. This standard differs from AS 1530.4-2014, and the significance of these differences relevant to Section 3 for walls is discussed below.

Specimen mounting

The differences in the AS 1530.4-2005 and AS 1530.4-2014 requirements specimen are editorial and not significant to the test specimens tested in this case.

Specimen thermocouple arrangements

The specimen thermocouple arrangements for the referenced tests are not appreciably different between AS 1530.4-2005 and AS 1530.4-2014.

Application of cotton pad

The differences in the AS 1530.4-2005 and AS 1530.4-2014 in regard to the application of the cotton pad have been considered and is further discussed below.

Criteria for failure

AS 1530.4-2014 requires thermocouples only be applied to surfaces and not to cracks and fissures for the determination of insulation while AS 1530.4-2005 allows rovers to be placed on cracks and fissures for the determination of insulation.

Otherwise, the criteria of failure are not appreciably different between AS 1530.4-2005 and AS 1530.4-2014.

Conclusion

The variations in the application of cotton pad are not expected to have an overall significant effect on the outcome of the referenced fire resistance test.

In the referenced test FSV 1346, an observation of the exposed side of the specimen after the test showed that the location of insulation failure corresponds with a circular concrete blow out in the middle-lower section of the wall.

As a result of the spalling in this area, the insulation performance of the wall at this location was reduced locally, which resulted in the thermal degradation of a circular section of the plastic Dintel form wall on the unexposed side exposing the concrete core.

This combined with the shrinkage of the concrete core of the Dintel wall system when exposed to furnace heating regime resulted in the formation of a gap between one the joints in the middle of the panel wall system. This gap did not allow sufficient furnace flue gas to pass through so as to ignite the cotton pad when it was applied at 219 minutes and 238 minutes into the test, nor was the surrounding plastic ignited.

However, the conduction of heat through the gaps in the wall at the location of the gap was sufficient to fail the insulation criteria by the application of a roaming thermocouple at 229 minutes.

AS1530.4 more clearly specifies that roving thermocouple is applied to specimen surface not over gaps and fissures in the specimen. This means the insulation failure recorded at 230 minutes in the referenced test FSV 1346 would not have occurred should the test be undertaken in accordance with AS 1530.4-2014, as this standard would require the cotton pad be applied to the surface beside the crack, not over the crack. The remaining thermocouples on the unexposed face of the specimen did not exceed 100°C by 242 minutes.

The difference in the application of the cotton pad criteria between AS 1530.4-2005 and AS 1530.4-2014 is only relevant when the specimen temperature is above 180°K rise and below 300°C, which is the case with this test. However, as the cotton pads applied at 219 and 238 minutes did not ignite the relevance of the difference in the standard would not change the integrity performance of the specimen tested.

Since the furnace condition, specimen setup and criteria of failure are not appreciably different between AS 1530.4-2005 and AS 1530.4-2014, it is considered that the observed mode of degradation in the tested wall would be the same when tested in accordance with AS 1530.4-2014.

Based on the above it is confirmed the referenced test data FSV 1346 will achieve the structural adequacy, integrity and insulation of 240/240/240 tested in accordance with AS 1530.4-2014.

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