



Bushfire performance of Dincel-Form concrete filled wall system in accordance with AS 1530.8.2-2018

Assessment Report

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Commercial-in-confidence

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Contents

1	Introduction	4
2	Supporting Data	4
3	Referenced Standards	4
4	Conclusion	4
5	Direct Field of Application of Results	5
6	Requirements	5
7	Term of Validity	5
8	Limitations	5
Appendix A	Supporting Test Data	6

1 Introduction

This report presents an assessment of the bushfire performance of Dintel-Form concrete filled wall system in accordance with AS 1530.8.2-2018.

This report is prepared for meeting the requirements of AS 3959-2018 clause 3.4 and 3.8 and NCC 2022 Volume 2 Clause A5G3 clause 1 (d) as appropriate for the required Bushfire Attack Level (BAL) performance.

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.

The test identified above is analysed in this report and confirmed by this Accredited Testing Laboratory to be equivalent or more severe than a Standard Fire Test in accordance with the test standard specified in Section 4 of this report when applied to the specimen as identified above.

3 Referenced Standards

Standards:

AS 1530.8.2-2018 Methods for tests on building materials, components and structures: Part 8.2: Tests on elements of construction for buildings exposed to simulated bushfire attack - Large flaming sources

4 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 BAL 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.

BAL - FZ

5 Direct Field of Application of Results

The results of this report are applicable to external walls exposed to fire from the outside.

6 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.

7 Term of Validity

This assessment report will lapse on 31st March 2029. 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.

8 Limitations

The conclusions of this assessment report may be used to directly assess the BAL 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 BAL 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 240 minute duration of the test. Insulation failed at 230 minutes.

A.2. Applicability of AS 1530.4-2005 test data to AS 1530.8.2-2018

Australian Standard 3959 describes the requirements for buildings constructed in bushfire-prone areas in Australia. In that document, it defines a series of Bushfire Attack Levels (BAL) ranging from Low through 12.5, 19, 29, 40 to FZ (Fire Zone) in ascending severity of attack. Levels up to BAL-40 are covered in Australian Standard 1530.8.1-2018 and BAL-FZ is covered in Australian Standard 1530.8.2-2018.

AS 1530.8.2-2018 specifies that the test shall be performed in accordance with the requirements of AS 1530.4-2005, except that the test duration is 90 min comprising a 30 min heating phase and a subsequent 60 minutes period during which the performance of the element is monitored.

The specimen shall be exposed to the standard heating regime specified in AS 1530.4-2005. Control of the furnace shall be in accordance with the requirements of AS 1530.4-2005. Within 2 min of termination of heating, the specimen shall be removed from the furnace to enable observation of the fire-exposed face.

With respect to AS 1530.8.2-2018 test criteria, the test specimen reported in FSV 1346 was subjected to the heating conditions of AS 1530.4-2005 for the 240 minutes rather than 30 minutes and there was no 60 minutes observation period after heating.

This on the face of it is a significant departure from the testing requirements of AS 1530.8.2-2018. In practice, however, the continued heating of the fireside of the element in FSV 1346 produced a significantly higher fire exposure on the specimen making flaming on the non-fireside more likely.

The performance criteria of AS 1530.8.2-2018 are specified in Clause 13.6 and states:

When exposed to the design bushfire conditions, the building exterior shall not permit the following:

- (a) Formation of an opening from the fire-exposed face to the non-fire-exposed face of the element through which a 3 mm diameter probe can penetrate for the duration of the 90 min test period.
- (b) Sustained flaming for more than 10 s on the non-fire side for the duration of the 90 min test period.
- (c) Flaming on the fire exposed side at any time between 60 min and 90 min of the 90 min test period.
- (d) Where the specimen includes a protected opening, radiant heat flux exceeding 15kW/m², 365mm from the unexposed face of the specimen at any time in the 90 min test period.
- (e) The mean and maximum temperature rises greater than 140 K and 180 K on the non-fire side at any time during the 90 min test period, except for protected openings which the radiant heat flux limits are applicable.
- (f) Radiant heat flux 250 mm from the fire-exposed face of the specimen, greater than 3 kW/m² at any time during the 60 min and 90 min of the 90min test period.
- (g) Mean and maximum temperatures of the internal faces of construction including cavities exceed 250°C and 300°C, at any time during the 60 min and 90 min of the 90min test period.

Evaluating the performance of the wall reported in FSV 1346 against these criteria shows:

- (a) No holes of any size were formed in the wall during the first 90 minutes of the test period;
- (b) No sustained flaming on the unexposed face for the first 90 minutes of the test period
- (c) No flaming on the fireside was evaluated after 30 minutes exposure, however when tested the exposed face consisted of plain concrete at the 30 minute duration significantly reducing the materials available on the non-fireside for burning.
- (d) The wall did not include protected openings so this clause is not applicable.
- (e) The maximum temperature rise and average temperature rise were approximately 65K and 22K, respectively, at 90 minutes;
- (f) See (c) above; and
- (g) The wall was solid and did not incorporate internal faces.

Based on the above, it is expected that if the wall tested in FSV 1346 was subjected to the heating conditions of AS 1530.8.2 – 2018, it would not have failed any of the performance criteria clause 13.6 and as such is it considered the tested wall would achieve the BAL level FZ when tested accordance with AS 1530.8.2 – 2018.

Based on the above discussion, the test identified above is confirmed by this Accredited Testing Laboratory to be equivalent or more severe than a Standard Fire Test in accordance with the test standard specified in Section 4 of this report when applied to the specimen as identified above.

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