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Australian Standard 5113 Fire Propagation Testing and classification of external walls of buildings

QT Panel with 10mm Cement Render

PRODUCT EVALUATION AND TESTING

IGNL-3282-08 I01 R01

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CONDITIONS AND LIMITATIONS

This assessment report does not provide an endorsement by Ignis Labs Pty Ltd of the actual product evaluated.

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

Because of the nature of fire 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.

The assessment can therefore only relate only to the actual prototype test specimens, testing conditions and methodology described in the referenced documents, 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.

This report is prepared in good faith and with due care for information purposes only, and should not be relied upon as providing any warranty or guarantee. In particular, attention is drawn to the nature of the inspection and investigations undertaken and the limitations these impose in determining with accuracy the state of the building, its services or equipment and life safety.

Ignis Labs' involvement in the Project is limited to the role outlined in section 2 'Scope of Service' of the Letter. This report reflects that role. Any reliance on, or use of, this report for purposes outside the scope of service is at the user's own risk.

Ignis Labs shall not be held liable for any loss or damage resulting from any defect of the building or its services or equipment or for any non compliance of the building or its services or equipment with any legislative or operational requirement, whether or not such defect or non-compliance is referred to or reported upon in this report, unless such defect or non-compliance should have been apparent to a competent engineer undertaking the evaluation of the type undertaken for the purpose of preparation of this report.

Ignis Labs has carefully reviewed and applied to the best of our ability the requirements of local Legislation, the NCC and the International Fire Engineering Guidelines.

Ignis Labs follows the requirements of ISO 17025 in its testing procedures. Clause A5.2 of the Building Code of Australia establishes the evidence of suitability for buildings and details that the evidence to support that the use of a material or product meets a Deemed-to-Satisfy Provision may be in the form of any one, or any combination of the following.

- A report issued by an Accredited Testing Laboratory; or
- A certificate or report from a professional engineer.

Either of the documents listed above are to demonstrate or certify that a material or product fulfils specific requirements of the NCC; and sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate its suitability for use in the building.

Benjamin Hughes-Brown is a Chartered Professional Engineer and Fellow of Engineers Australia with over 15 years experience in fire safety engineering. Benjamin, satisfy the criteria established by BCA Clause A5.2 being a professional engineer. This is a report from a professional engineer.

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1 INTRODUCTION

1.1 General

BS 8414-2:2005 describes a method of assessing the behaviour of non-load bearing external cladding systems, rainscreen over cladding systems and external wall insulation systems when applied to a structural steel frame and exposed to an external fire under controlled conditions. The fire exposure is representative of an external fire source or a fully developed (post-flashover) fire in a room, venting through an opening such as a window aperture that exposes the cladding to the effects of external flames.

The specification and interpretation of fire test methods is the subject of on-going development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test repot.

All measurements given in this report are normal unless stated otherwise.

Ignis Labs was engaged by QT Systems to conduct an external wall test in accordance with BS 8414.2-2015 as modified by AS 5113-2016 and Amendment 1:2018.

1.2 Sponsor

QT Systems

PO Box 451 Acacia Ridge

LPO QLD 4110

1.3 Manufacturer

The primary material being 50mm conpolcrete panel and 10mm cement render has been acquired by QT Systems and have provided permission for Ignis Labs to undertake a test including the products.

1.4 Test Number

The Ignis Labs reference test number is IGNL-3282-08.

1.5 Test date

The test was conducted on 4 December 2019.

1.6 Details of tests carried out

Installation	The test was undertaken at Ignis Labs by QT Systems where they arranged construction of the wall system by Tilton Interiors in accordance with the installation instructions provided by QT Systems.
Method	The test was carried out in accordance with BS 8414.2-2015 as modified by AS 5113-2016 and Amendment 1:2018 as appropriate for a non-loadbearing external cladding being an external lightweight wall system with the QT Conpolcrete wall panels and 10mm concrete render.
Deviations:	The test was undertaken in accordance with BS 8414 Amendment 1 subject to the variations listed in AS 5113-2016 (amdt 1).
Duration	The test duration was 60 minutes.

2 DESCRIPTION OF SPECIMEN

2.1 General

The test included 50mm QT Systems Conpolcrete panels fixed to steel studs with 10mm cement render. The QT System was fixed to two layers of 13mm fire grade plasterboard in accordance with Clause 5.4.4 of AS 5113-2016 Amendment 1:2018 which has been used to represent the non-combustible inner leaf.

The wall system consists of the following wall elements from the non-fire affected side. The construction of the wall is detailed in the figures provided in section 3.3.

- 2 x 13mm Fire rated plasterboard | CSR Fyrecheck (fixed to test wall sub-frame)
- Steel Top hats 20x25x50x25x20 1.15BMT fixed to stud frame through the fire grade plasterboard at 450mm spacings.
- 50mm QT panel horizontally installed with QT Buttons and fixed with 12-14 x 50mm Metal hex screws.
- The vertical joint as well as the horizontal joint located at 2.4m above the combustion chamber were installed as control joints with a 10mm gap. Polyurethane backing rod was installed and the gap sealed with Bostic FireBan One to a depth of 10mm.
- 10mm concrete render was installed over the completed QT Conpolcrete wall system

FIGURE 1:

QT SYSTEM FIXING SYSTEM

2.2 Selection, construction and installation of the specimen

The construction of the specimen was organised and undertaken by Tilton Interiors. Ignis Labs was not involved in the selection of the materials. The wall system was constructed between the 14-16 November 2019. The render was installed on 20 November 2019 and left to cure until testing. Testing of the wall occurred on 4 December 2019.

3 TEST PROCEDURE

3.1 Statement of Compliance

The test was performance in accordance with the requirements of BS 8414-2 2015 (amdt 1) as appropriate for a non-loadbearing external cladding system fixed to and supported by a structural steel frame. The test was undertaken for the purpose of classification of the external wall in accordance with AS 5113-2016 (amdt 1) Classification of external walls of buildings based on reaction-to-fire performance.

An overview of the test procedure is as follows; the timber crib was measured for size and moisture content then constructed by Ignis Labs, the thermocouples were installed and verified for operation, the wind speed was measured, the strips of low density fibreboard were soaked for 5 minutes prior to insertion, the datalogger and video recording was started, the strips of low density fibreboard were inserted into the base of the crib and ignited to start the test. The timber crib was allowed to burn for at least 30 minutes and observations of the wall was undertaken for at least 60 minutes from the start of the test.

3.2 Specimen Configuration

The test specimen is representative of a wall system comprising a single form wall system with a joint located at 2400mm above the lintel as well as within 100mm of the centre of the combustion chamber opening to the top of the wall.

3.3 Wall Design

The following figures detail the wall installation.

FIGURE 2:

TOP HAT INSTALLATION

FIGURE 3:

QT SYSTEM INSTALLATION

FIGURE 4:

QT SYSTEM INSTALLATION

FIGURE 5:

QT SYSTEM INSTALLATION

FIGURE 6:

CEMENT RENDER INSTALLATION

FIGURE 7:

CEMENT RENDER INSTALLATION

3.4 Environmental Conditions

The environmental conditions for the test were clear sunny skies with a temperature of 17°C and humidity of 49% The test recording time started at 10:16 am.

3.5 Timber Crib

The timber crib included 1500-mm wide, 1000-mm deep and 1000-mm high of pinus radiata being in the order of 50 mm square section. The crib was located centrally within 250mm of each side and within 100mm to the front and rear of the crib platform. Each crib timber element was measured with a J-2000 Delmhorst moisture meter where the moisture content was 10.1% The following image details the timber crib installation.

FIGURE 8:

TIMBER CRIB INSTALALTION

The crib platform was located on a plinth comprising a single layer of 16mm CSR Fyrecheck and a steel sub-frame to a height of 410mm for the test.

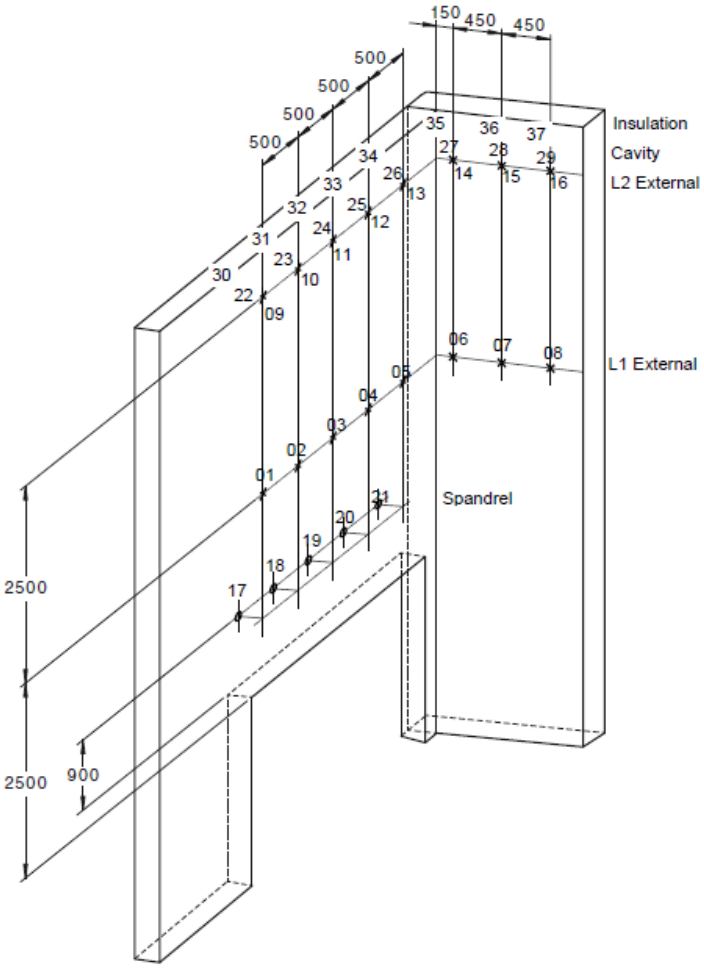
3.6 Instrumentation and Equipment

The instrumentation was provided in accordance with AS5113-2016 and BS8414.2-2015 and is detailed below:

- All exposed and internal temperatures were measured by Type K thermocouples with overall diameter of 1.5mm with the measuring junction insulated from the sheath. The thermocouple positions are detailed below.
- The thermocouple temperatures were recorded by a Graphtec Corporation GL840 Multichannel data logger.
- The wind velocity was measured to 0m/s prior to the test.
- The data from all sensors were collected for at least 20 minutes prior to the ignition of the timber crib.
- A continuous audio-visual record of the condition of the full height of the test faces was recorded during the burning of the test.

FIGURE 9:

THERMOCOUPLE LOCATION



3.7 Variations to the Method

The test was undertaken in accordance with BS 8414-2 2015 (amdt 1) subject to the departures listed in AS 5113-2016 (amdt 1).

4 TEST MEASUREMENTS

4.1 Specimen temperatures

The specimen temperatures were recorded during the test and documented below.

FIGURE 10:

EXTERNAL LEVEL 1 THERMOCOUPLE MEASUREMENTS

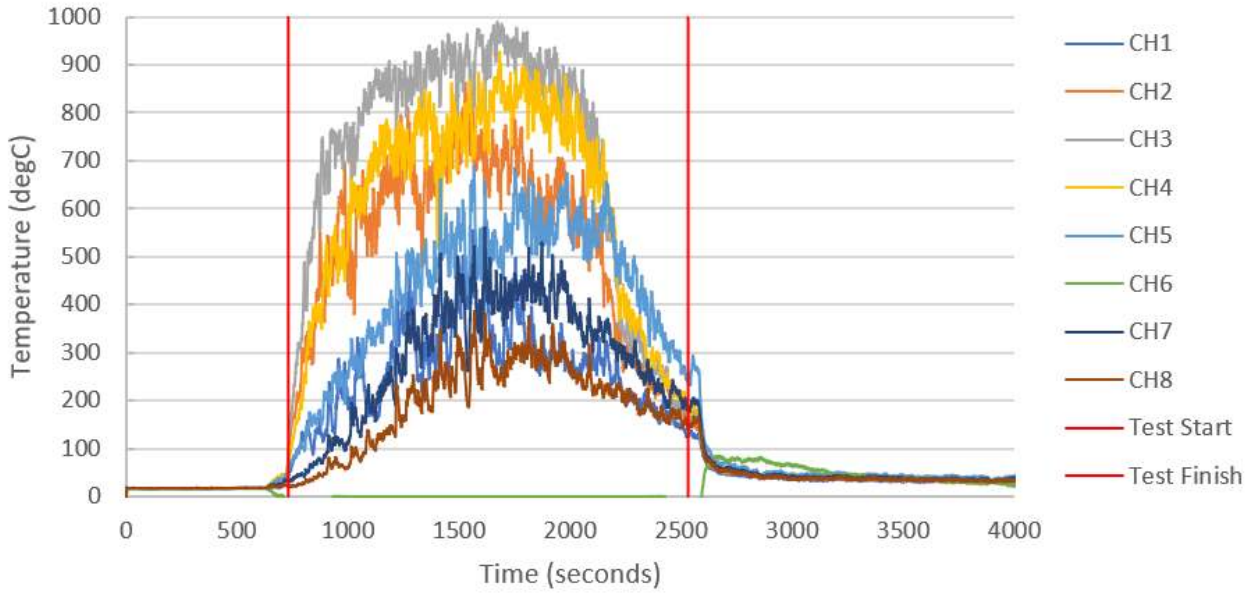
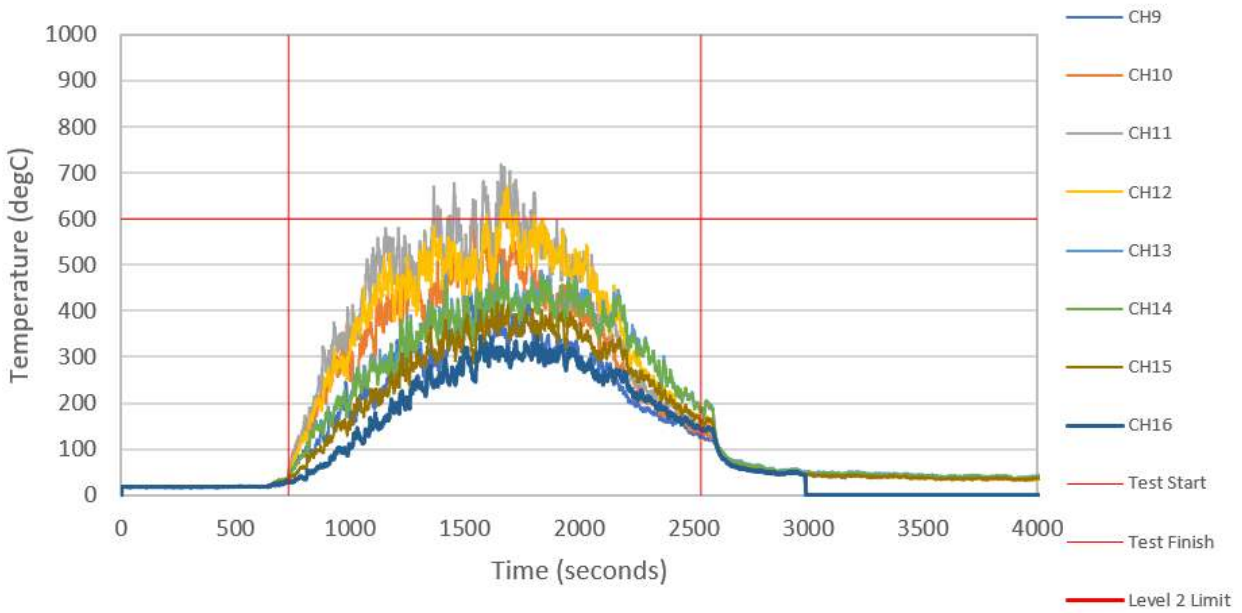


FIGURE 11:

EXTERNAL LEVEL 2 THERMOCOUPLE MEASUREMENTS



Spikes in the temperature for thermocouple 11 and 12 increased over 600°C for an average of approximately 10 second intervals with a maximum time of 30 seconds in one instance. In accordance with Clause 5.4.5(a) of AS 5113-2016 Amendment 1 2018 the temperature shall not exceed 600°C for a continuous period greater than 30 seconds. Within the test the temperature did not exceed 600°C for greater than a 30 second continuous period.

FIGURE 12:

CAVITY LEVEL 2 THERMOCOUPLE MEASUREMENTS

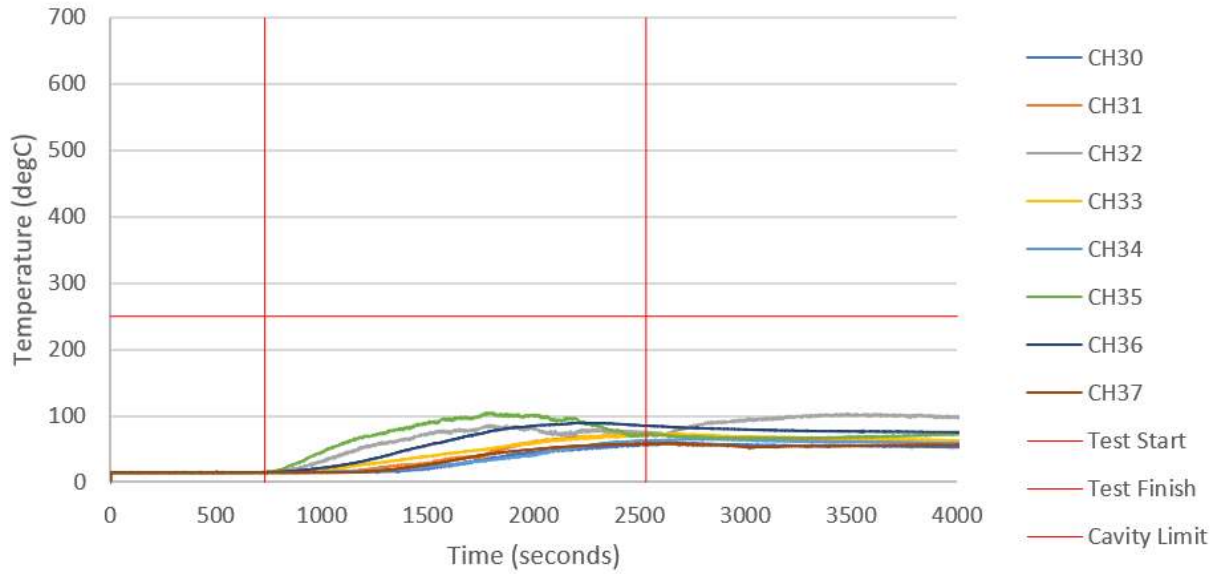


FIGURE 13:

INSULATION LEVEL 2 THERMOCOUPLE MEASUREMENTS

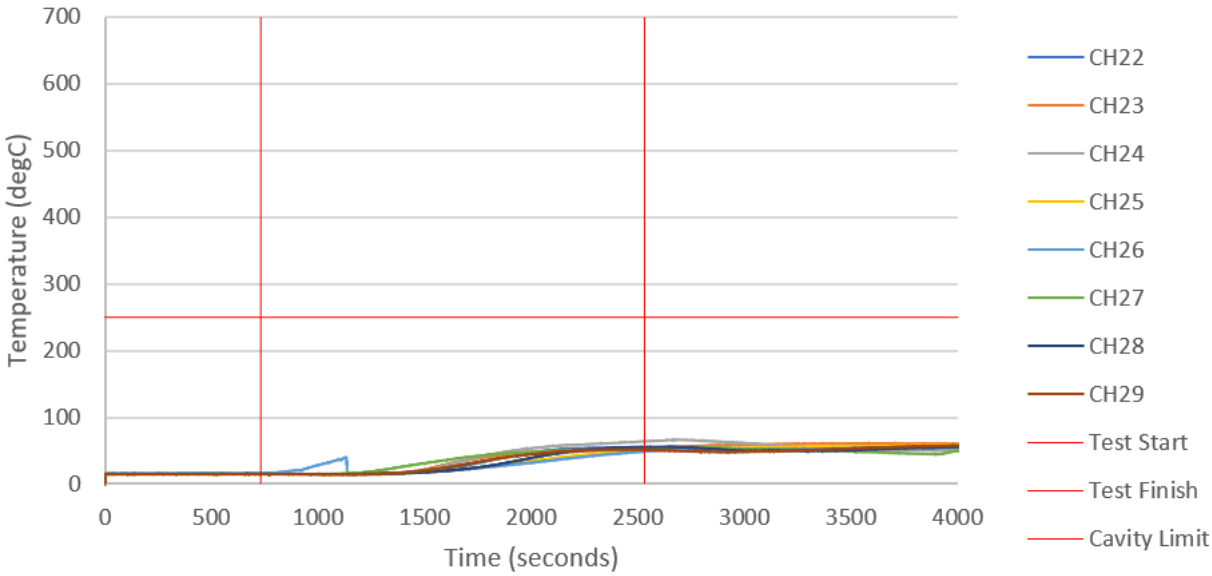
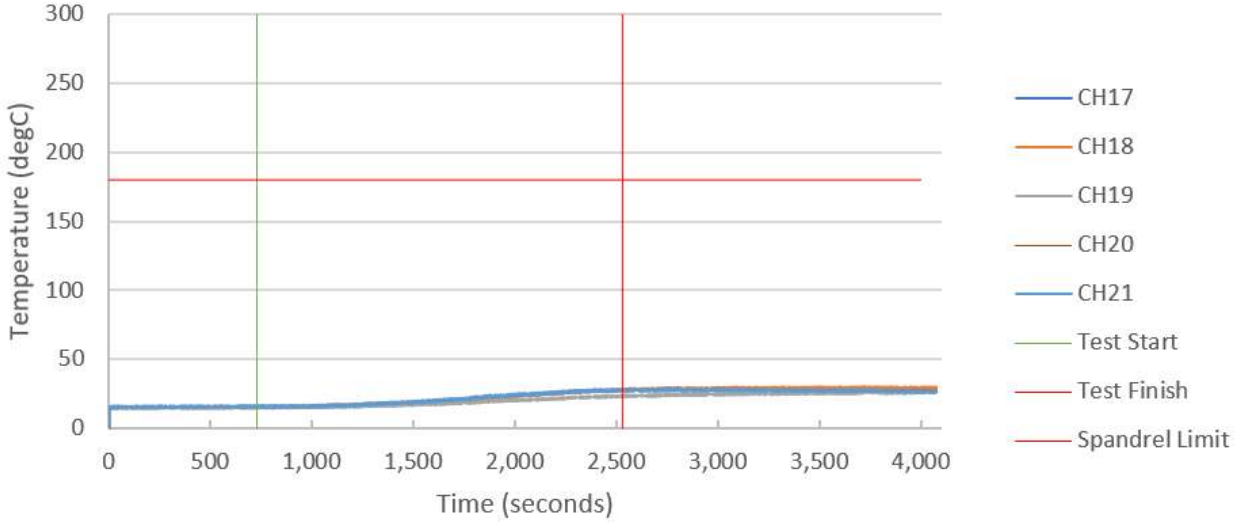


FIGURE 14:

SPANDREL THERMOCOUPLE MEASUREMENTS



4.2 Observations

The following include observations of the significant behaviour of the specimen. Times are all in relation to crib ignition.

TABLE 1:

TEST OBSERVATIONS

Time	Observation
10:16	Ignition
10:18 0 minutes	Test start (Level 1 reaches 200°C) The test was started
03:58	Soot impact from crib reached Level 1 thermocouples
08:40	Fire impacts on Level 2. Impact on render is observed
11:34	Horizontal cracks on centreline joint appear up to 3m
14:36	Centreline control joint increases its opening
15:00	Wing wall up to Level 1 has soot impact
16:00	Centreline control joint crack extends to Level 2
18:18	Timber crib collapses
20:10	Centreline control joint has flaming up to 4m above combustion chamber
25:10	Cracks through render associated with the location of each QT Conpolcrete panel occur over main wall.
25:52	Small flames observed within centreline joint
26:25	Small continuous flaming in centreline crack above combustion chamber
32:45	Timber crib extinguished
30:16 to 60:00	Wall is observed to smoke over centreline joint for remainder of observation time. No observation of flaming during this time occurred.

At the conclusion of the test, the top panels of the main wall were removed and the rear of the panels observed. Whilst heat damage was noticed on the edge of the panel, there was no evidence that continuous burning on the back of the panel occurred. The following figure shows the back of the two panels located at the top of the main wall.

FIGURE 15:

BACK OF QT PANEL AT TOP OF SPECIMEN

4.3 Mass of debris fallen from specimen

The test had no observation of falling debris from the wall.

5 TEST RESULTS

The following section details the results of the test in accordance with the set criteria established by AS 5113:2016 Amendment 1:2018.

5.1 Specimen Results

The AS 5113:2016 Amendment 1:2018 classification indices are detailed below:

TABLE 1:

SPECIMEN RESULTS AND CLASSIFICATIONS

Classification Criteria	Related Classification Measure	Pass/Fail
5.4.5(a)T_{w5m}	≤600°C	Max 717˚C spike @ 15 min <10s | PASS
5.4.5(b)$T_{Insulation5m}$	≤250°C	Max 55˚C | PASS
5.4.5(b)$T_{Cavity5m}$	≤250°C	Max 101˚C | PASS
5.4.5(c)$T_{unexposedside0.9m}$	≤180°C	Max 27˚C | PASS
5.4.5(d)flaming	No flaming	No flaming | PASS
5.4.5(d)openings	No openings	No openings | PASS
5.4.5(e)spread	No spread beyond specimen	No spread occurred | PASS
5.4.5(f)debris flaming	≤20s	No Flaming debris | PASS
5.4.5(g)debris mass	≤2kg	No debris | PASS
Classification		**EW**

Based on the above results no failure of the criteria occurred resulting in an EW classification been allocated.

5.2 Fire Images

FIGURE 16:

START AND 10 MINUTES

FIGURE 17:

CRIB COLLAPSE AND 30 MINUTES

5.3 Post Fire Analysis

The following images detail the results of the wall as well as the backing plasterboard following the fire test.

FIGURE 18:

EXTERNAL WALL

FIGURE 19:

PLASTERBOARD FIRE IMPACT

From the above image, the QT Conpolcrete panel detailed minor impact along the vertical centreline of the specimen. No observations of fire impact on the plasterboard wall occurred.

6 APPLCIATION OF TEST RESULTS

6.1 Field of direct application

The results of this test are applicable to the construction tested when exposed to fire from the external side as tested.

The results of fire tests may be used to directly assess fire hazards, but it should be recognised that a single test method will not provide a full assessment of fire hazards under all fire conditions.

This report details methods of construction, the test conditions and the results obtained when the specific element of the construction described herein was tested following the procedures outlined in BS 8414.2 and AS 5113:2016 Amendment 1:2018.

Any significant variation with respect to the size, construction details, edge or end connections, other than those allowed under the field of direct application in the relevant test method, is not covered by this report.

6.2 Variations from the tested specimen

This report details the methods of construction, test conditions and the results obtained when the specific element of construction described herein was tested following the procedure. Variations in joint detail and wall applications within buildings are to be consistent with that evaluated.

Two concrete renders have been evaluated for use on the wall. The first is the U-Stucco render being applied to the wall. The second is the Rockcote Quick Render wall system which has been subject to large scale external wall testing in accordance with AS 5113:2016 Amendment 1:2018.

6.3 Uncertainty of Measurement

Because of the nature of fire hazard property testing and the consequent difficulty in quantifying the uncertainty of measurement of fire hazard properties, it is not possible to provide a stated degree of accuracy of the result.

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