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Fire Assessment Report

The fire resistance performance of Speedpanel Partywall Systems if tested in accordance with AS1530.4:2014

Client: Speedpanel (VIC) Pty Ltd 89-91, Canterbury Road KILSYTH, VIC 3137 Australia

Job number: 28031 Revision: R3.0

Issue date: 27/06/2019 Expiry date: 30/06/2024

DOCUMENT REVISION STATUS

Version	Date	Information relating to report			
R0.0	Issue: 20/02/2013	Reason for issue	Initial Issue		
			Prepared by	Reviewed by	
	Expiry: 28/02/2018	Name	S. Hu	K. Nicholls	
R1.0	Issue: 21/02/2013	Reason for issue	Revised the air cavity and ground floor height		
			Prepared by	Reviewed by	
	Expiry: 28/02/2018	Name	S. Hu	K. Nicholls	
		Signature			
R2.0	Issue: 23/05/2014	Reason for issue	Revised to include structural steel framing		
			Prepared by	Reviewed by	
	Expiry: 28/02/2018	Name	S. Hu	K. Nicholls	
R3.0	Issue: 27/06/2019	Reason for issue	Revised for re-validation and update to AS1530.4:2014		
			Prepared by	Reviewed by	Approved by
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GENERAL CONDITIONS OF USE

CONTENTS

1 INTRODUCTION

This report presents an assessment of the fire resistance performance of Speedpanel Partywall Systems if tested in accordance with AS1530.4:2014.

The tested systems are described in Section 2 and are subject to the proposed variations described in Section 3 if tested in accordance with the referenced test method described in Section 4. The conclusions of the report are summarised in Section 5.

The validity of this assessment is conditional on compliance with Sections 7, 8 and 9 of this report.

Summaries of the test data on which this assessment is based are provided in the Appendices together with a summary of the critical issues leading to the assessment conclusions including the main points of argument.

2 TESTED PROTOTYPES

This assessment makes reference to test reports EWFA 2736002, BWA 2286900, EWFA 2741700 and FSV 0562 were sponsored by Speedpanel (VIC) Pty Ltd and Speedwall Building Product.

Refer to Appendix A for a detailed summary of the reference test data.

3 VARIATION TO TESTED PROTOTYPES

The proposed Speedpanel Partywall system shall be construction as tested in EWFA 2736002 and BWA 2286900 subjecting to the following variations:

- Speedpanel Partywall system shall be up to 14m high.
- Timber framing sizes can be varied provided they are designed and constructed in accordance with AS1720.1 and/or AS1684 and a minimum 90mm deep.
- The steel structural framing is to be designed in accordance with AS/NZS 4600 or AS3623. A nogging is to be provided at the bracket positions to facilitate fixing to the frame if a track is not at the required position.
- Air cavity between timber framing and Speedpanel panel barrier shall be 20mm one side and 5mm the other side.
- Framing shall be fixed to the Speedpanel panel barrier with 70mm × 50mm × 1.5mm BMT aluminium angles (back to back) at 500mm centres and staggered at 250mm from both side simultaneously of the internal cavity.
- Framing may be optionally arranged such that floor joists are parallel or perpendicular to panels and do not require solid locking at the ends for fire resistance.
- Framing and linings will not extend into ceiling space.
- The proposed construction is summarised in table 1 and figures 1 to 4.

Table 1 – Schedule of Components

Item	Description	
1	**Name**	**Central Barrier**
	Material	225mm wide × 51mm thick Speedpanel panels comprised an aerated concrete barrier encased in a 0.4mm BMT galvanised steel skin. *Or* 285mm wide × 78mm thick Speedpanel panels comprised an aerated concrete barrier encased in a 0.4mm BMT galvanised steel skin.
	Installation	Fitted together (tongue and groove) vertically.
2	**Name**	**Steel Track**
	Material	Galvanised Mild Steel
	Size	1.15mm BMT × 50×54×50mm C track for 51mm Speedpanel panel Or 1.15mm BMT × 50×83×50mm C track for 78mm Speedpanel panel
	Installation	Fitted to top and bottom Speedpanel wall barrier (Item #1)
3	**Name**	**Central Barrier Bracket**
	Material	Aluminium angle
	Size	1.5mm BMT × 70mmL × 40mmH × 50mmW
	Installation	Back to back fixed between wall framing and central barrier at 500mm centres and staggered at 250mm from both side of the internal cavity. Brackets are fixed to the Speedpanel panel with two 35mm long self-tapping screws and fixed to the timber floor joist with two timber screws at least 35mm long.
4	**Name**	**Wall Framing**
	Material	Timber or Steel
	Size	A minimum of 90mm timber framing designed in accordance with AS1720.1 or AS1684. *Or* Steel framing designed in accordance with AS/NZS4600 or AS3623.
	Installation	Installed at a maximum of 600mm centres.
5	**Name**	**Wall Linings**
	Material	10mm Standard Grade Plasterboard *Or* 13mm CSR Gyprock Soundchek
	Installation	*10mm Standard Grade Plasterboard* Installed in accordance with plasterboard manufacturers installation recommendations *13mm CSR Gyprock Soundchek* Installed in accordance with plasterboard manufacturers installation recommendations.
6	**Name**	**Floor Framing**
	Material	Solid timber, floor truss or composite joists
	Size	Size shall be in accordance with AS1720.1 or AS1684.

Item	Description	
	Installation	Flooring shall be parallel or perpendicular to wall and may be installed so that it is rests on top of the lower wall framing. The gaps between the joists do not need to be specially treated.
7	**Name**	**Ceiling Lining**
	Material	10mm thick plasterboard
	Installation	30mm long bugle head plasterboard screws are used to fix the plasterboard to the floor timber framing at nominal 300mm centres.
8	**Name**	**Sealant**
	Material	Hilti CP 606 Fire Resistance Acoustic Mastic *Or* Any fire rated sealant that has been tested or assessed by others in accordance with section 10 of AS1530.4:2014 for at least 120 minutes
	Installation	Used to seal all gaps between tracks and panels.
9	**Name**	**Rockwool Cavity Seal**
	Material	Bradford Rockwool
	Installation	Filled voids within the roof capping.
10	**Name**	**Metal Flashing (Head Track Protection)**
	Material	0.7mm thick galvanised mild steel
	Installation	130mm wide galvanised steel flashing screw fixed into head track and panel at head track at 250mm centres on one side of the head track. Fixing details as per test EWFA 2741700.1.
11	**Name**	**Metal Flashing (Junction Protection)**
	Material	0.7mm BMT galvanised mild steel Or 13mm × 120mm strip of FR plasterboard
	Installation	Fixed to one side of the back to back C-tracks (Item #2) Or Fixed to one side of the joint with 2× rows of 6×40mm bugle head screws at 250mm ctrs

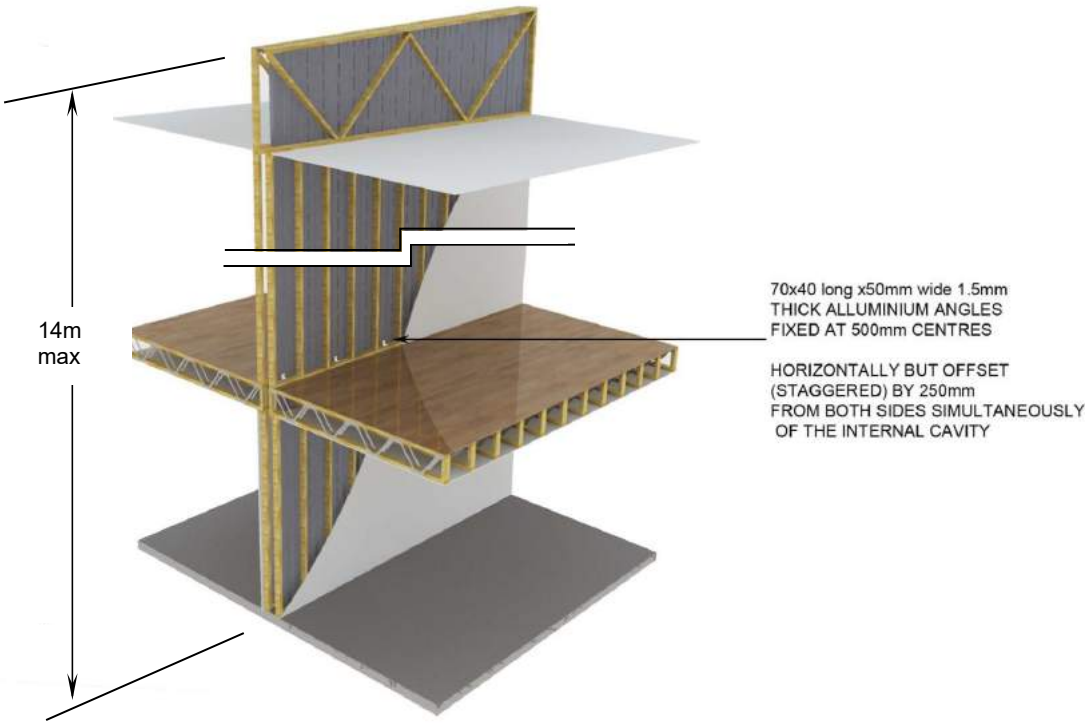

Figure 1 – Typical Elevation of Speedpanel Partywall System

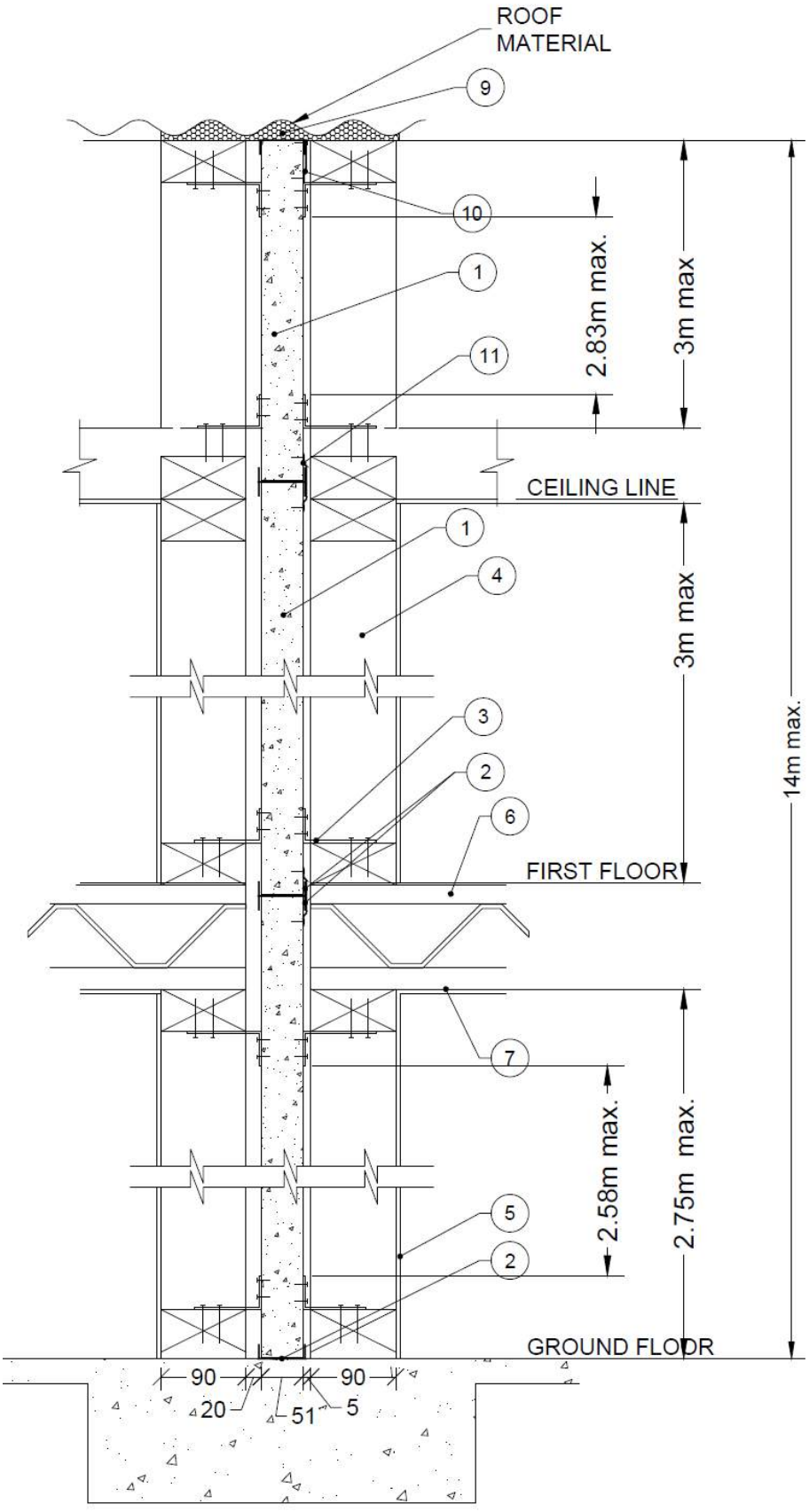

Figure 2 – Section Elevation of Speedpanel Partywall System for 60/60/60

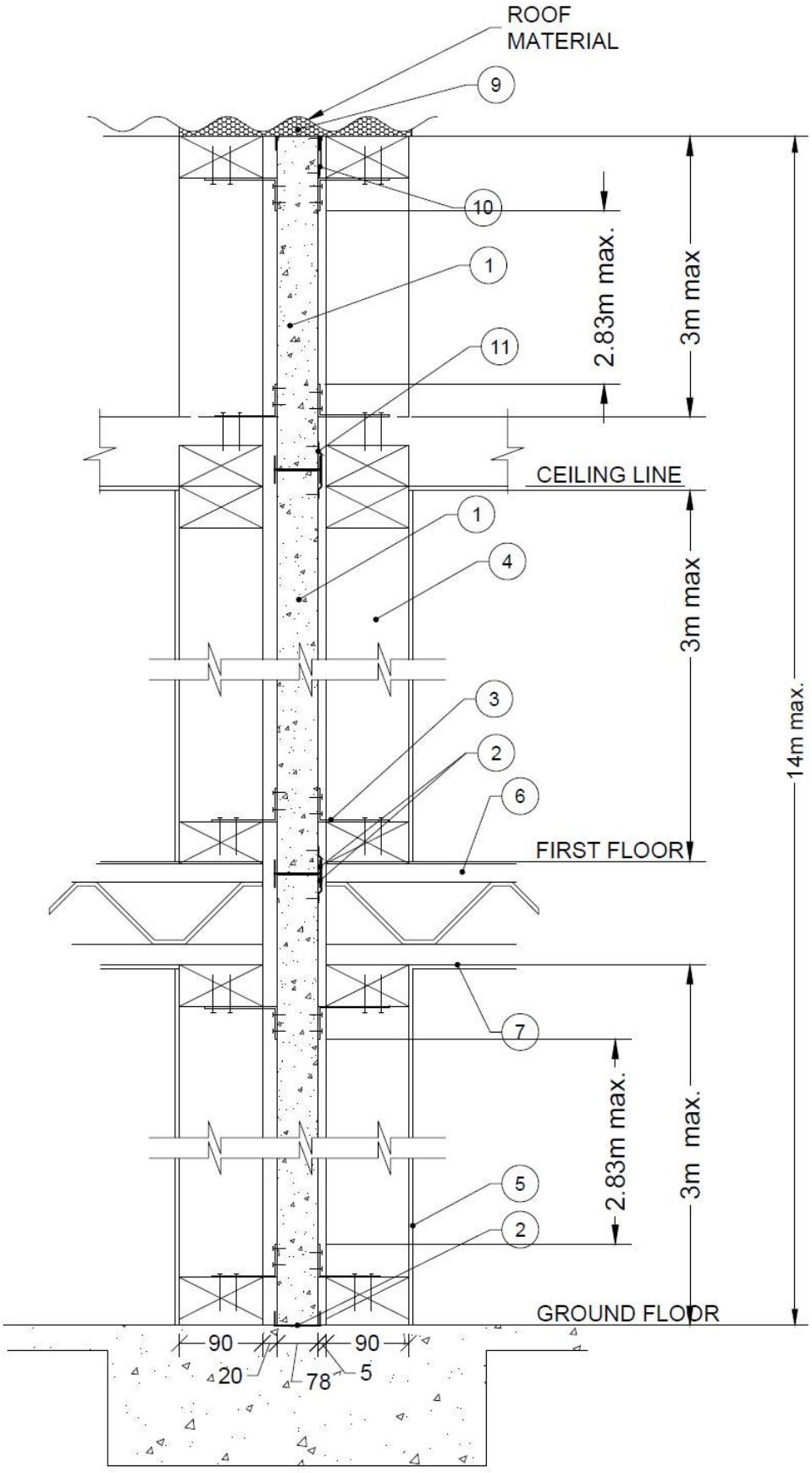

Figure 3 – Section Elevation of Speedpanel Partywall System for 120/120/120

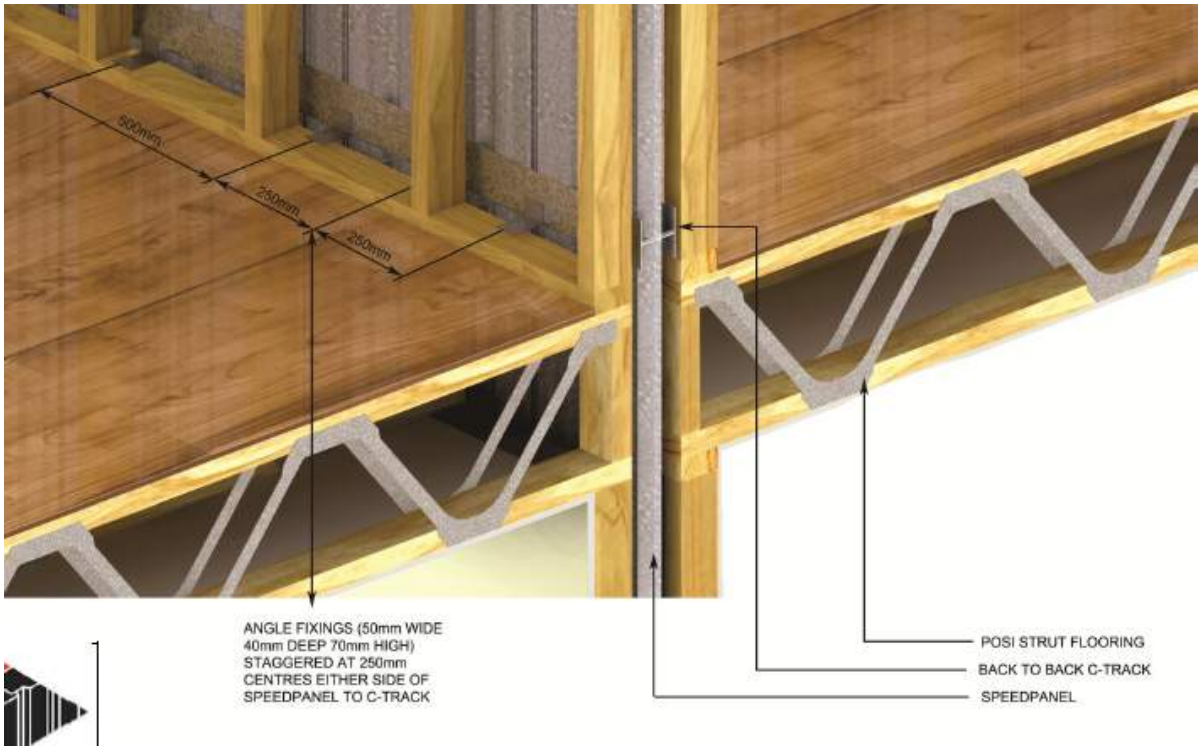

Figure 3 – Junction of Partywall and External Wall (Joists are example only)

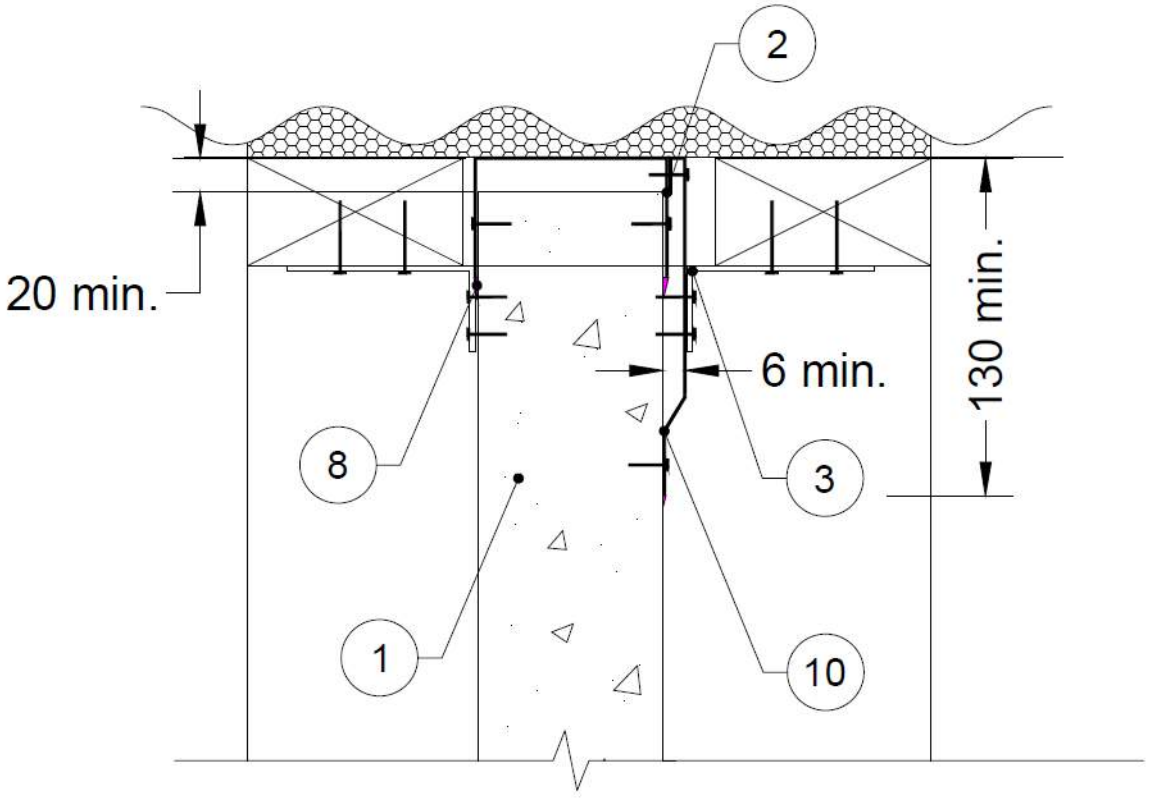

Figure 4 – Metal Flashing Protection of Barrier above Ceiling for 51mm and 78mm Panel

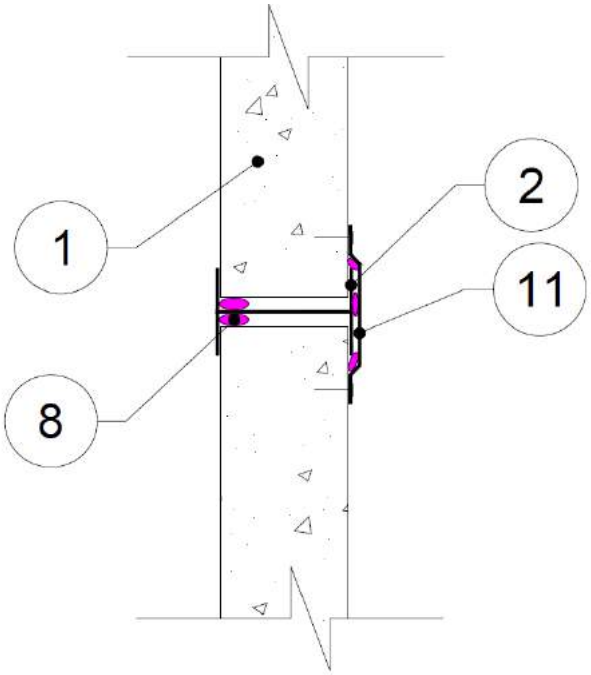

Figure 5 – Metal Flashing Protection of Junction for 51mm and 78mm Panel

4 REFERENCED TEST PROCEDURES

This report is prepared with reference to the requirements of AS 1530.4–2014

5 FORMAL ASSESSMENT SUMMARY

On the basis of the discussion presented in this report, it is the opinion of this testing authority that if the tested prototypes described in Section 2 had been varied as in Section 3, they will achieve the fire resistance performances below if tested in accordance with the test method referenced in Section 4 and subject to the requirements of Section 7.

Central Barrier (Item)	Wall linings (Item 5)	Max. Ground Floor Level Height (mm)	Max. The Rest Floor Level Height (mm)	Effective vertical spacing between clips (mm)	Max. System Height	Refer Figure	FRL
51mm	10mm Standard Grade Plasterboard *or* 13mm Fire Rated Plasterboard	2750	3000	2580	14m	Figure 2, 4 and 5	**60/60/60**
78mm		3000	3000	2830	14m	Figure 3, 4 and 5	**120/120/120**

6 DIRECT FIELD OF APPLICATION

The application of the results of this assessment is to walls exposed to fire from each side.

This report's outcome is necessarily limited to the performance requirement described in section 5 and the system construction in section 3 together with referenced test reports and discussion in the Appendices.

7 REQUIREMENTS

This report details the methods of construction, test conditions and assessed results that would have been expected had the specific elements of construction described herein been tested in accordance with AS 1530.4–2014.

All services shall be supported in a similar the manner in which they are assessed as described in Section 3.

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

8 VALIDITY

This assessment report does not provide an endorsement by Warringtonfire Aus Pty Ltd of the actual products supplied.

The conclusions of this assessment 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.

The 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 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.

9 AUTHORITY

9.1 APPLICANT UNDERTAKINGS AND CONDITIONS OF USE

By using this report as evidence of compliance or performance, the applicant(s) confirms that:

- to their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the Standard against which this assessment is being made, and
- they agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test by a test authority in accordance with the Standard against which this assessment is being made and the results are not in agreement with this assessment, and
- they are not aware of any information that could adversely affect the conclusions of this assessment and if they subsequently become aware of any such information, agree to ask the assessing authority to withdraw the assessment.

9.2 GENERAL CONDITIONS OF USE

9.3 AUTHORISATION ON BEHALF OF WARRINGTONFIRE AUS PTY LTD

10 FRAMEWORK FOR THE ASSESSMENT

An assessment is an opinion about the likely performance of a component or element of structure if it were subject to a standard fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. Therefore, we have followed the Guide to Undertaking Assessments In Lieu of Fire Tests prepared by the Passive Fire Protection Federation (PFPF) in the UK.

This guide provides a framework to undertake assessments in the absence of specific fire test results. ‘Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- Interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.’

Assessments will vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

APPENDIX A - SUMMARY OF SUPPORTING DATA

A.1 TEST REPORT – FSV 0562

A.1.1 Report Sponsor

A.1.1.1 Speedwall Building Product, Lot 4, Liverpool Road, KILSYTH VIC.

A.1.2 Test Laboratory

A.1.2.1 CSIRO, Division of Building, Construction and Engineering, 14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113.

A.1.3 Test Date

A.1.3.1 The test was conducted on 26th March 1998.

A.1.4 Test standards prescribed

A.1.4.1 AS1530.4:1997

A.1.5 General description of tested specimens

A.1.5.1 The test assembly comprised a nominal 3000mm high × 3000mm wide × 77mm thick non-loadbearing Speedpanel wall system. The Speedpanel panel was nominally 3000mm long × 250mm wide × 77mm thick. The Speedpanel panels were fitted together (tongue and groove) vertically, and clad on each side with one layer of plasterboard. The tested Speedpanel wall clad on both sides with two different kinds of plasterboard linings.

A.1.5.2 The panel wall on SIDE A, was clad on both sides with 10mm thick standard grade plasterboard which was attached vertically to the wall using daubs of stud adhesive and TEC screws. Lining sheets were butt joined and all exposed joints were taped and set on each face with bedding compound and finished with jointing cement.

A.1.5.3 The panel wall on SIDE B, was clad on both sides with 13mm thick fire rated plasterboard which was attached vertically to the wall using daubs of stud adhesive and TEC screws. Lining sheets were butt joined and all exposed joints were taped and set on each face with bedding compound and finished with jointing cement.

A.1.6 Performance

A.1.6.1 The temperature of the test was 27°C at the commencement of the test.

A.1.6.2 The test terminated at 240 minutes.

A.1.6.3 Observations of SIDE A wall partitions are summarised below:

- The exposed side plasterboard started to fall off at 20 minutes and completely fell off at 26 minutes.
- Screw heads in the field of the plasterboard on the unexposed face of Side A had been pulled in through the face of plasterboard creating holes at 80 minutes.
- Plasterboard on the unexposed side of Side A had fallen off at 161 minutes.

A.1.6.4 Observations of SIDE B wall partitions are summarised below:

- The exposed side plasterboard started to fall off at 122 minutes
- Flaming behind the plasterboard of Side B at 165 minutes.

Criteria	SIDE A	SIDE B
Integrity	Failed at 150 minutes – sustained flaming in the top corner of plasterboard	Failed at 221 minutes – sustained flaming in the top corner of the plasterboard
Insulation	Failure at 134 minutes – maximum temperature limit exceeded on the butt joints on unexposed face of plasterboard	Failed at 184 minutes – maximum temperature limit exceeded on the butt joint on unexposed face of the plasterboard.

A.2 TEST REPORT – EWFA 2736002.1

A.2.1 Test Sponsor

A.2.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.2.2 Test Laboratory

A.2.2.1 Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.2.3 Test Date

A.2.3.1 The test was conducted on 13th July 2012.

A.2.4 Test standard prescribed

A.2.4.1 The test was conducted in accordance with AS 1530.4-2005.

A.2.5 Variations to Test Standard

A.2.5.1 Average furnace temperature was outside the limits prescribed in AS1530.4:2005 Clause 2.10.2.2(a) between 21 minutes and 22 minutes 25 seconds.

A.2.6 Description of Tested Assembly

A.2.6.1 The test specimen comprised a nominal 3010mm wide x 2970mm high x 51mm thick loadbearing wall made of vertically orientated 255mm wide ×51mm thick Speedpanel panels that incorporated a “tongue and groove” detail on their vertical edges. The panels were made from 0.2mm BMT (0.27mm measured thickness) galvanised mild steel. Steel skin was joined on male and female sides with pop-rivets at nominal 50mm centres.

A.2.6.2 The test assembly was asymmetric with the West edge fixed and the East edge free from lateral restraint from the formal segment of the test. The fixed edge was then released for the second stage of the test.

A.2.6.3 The perimeter framing comprised two kinds of head tracks. The west side head track was 885mm long × 53mm deep × 50mm high × 1.01mm thick (measured) galvanised steel C-track with intumescent strip in channels in web. 2-off 2mm thick × 9mm wide strips, 2-off 4mm thick × 10mm wide strips and 1-off 4mm thick ×7mm wide strips were fixed on the top face of the track web and 2-off 4mm thick × 10mm wide and 1-off 4mm thick × 7mm wide strips on the bottom face of the track web. Strips were held in place using Firetherm Intumastic acrylic sealant mastic.

A.2.6.4 The east side head track was 2135mm long × 55mm deep ×50mm high × 0.75mm (measured) galvanised steel C-track with intumescent strips installed in a similar manner to the west side head track.

A.2.6.5 The head track fixed to the lintel with 6.5mm × 50mm galvanised steel spikes, mushroom head at 400mm centres.

A.2.6.6 The perimeter framing also comprised side tracks were made of 56mm deep × 55mm wide × 0.6mm thick (measured) galvanised steel C-track and bottom track was made of 55mm deep × 52mm wide × 1.21mm thick (measured) galvanised steel C-track.

A.2.6.7 The panels were fixed to the top and bottom C-tracks at nominal 500mm centres and fixed to each other along the horizontal centreline on both exposed and unexposed side with 16mm long self tapping screws.

A.2.6.8 Hilti CP 606 Fire Resistance Acoustic Mastic was used to seal any gaps in the construction prior to testing.

A.2.6.9 A load of 2.876kN was applied at three points 1450mm apart at the base of the wall. The applied load at each hydraulic jack was 0.959kN and was applied for the duration of the formal part of the test. The load was later increased and post-test observations were collected.

A.2.7 Instrumentation

A.2.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.2.8 Results

A.2.8.1 The ambient temperature at the start of the test was 15°C and varied between 15°C and 18°C during the test.

A.2.8.2 The test was terminated at 94 minutes.

A.2.8.3 Formal part of the test was terminated at 66 minutes and specimen prepared for load increased section of test and furnace operation continued. Fixed edge screws were removed.

A.2.8.4 A load of 2.876kN was applied via 3-off points at the bottom of the wall. The load was applied for the duration of the formal part of the test. The load was later gradually increased up to 15.15kN.

A.2.8.5 The deflection measured at the centre of wall at 60 minutes was 162mm. The centre deflection increased to 235mm when the applied load increased to 11.825kN.

A.2.8.6 The concrete lintel spalled heavily during the test affecting the validity of some of the thermocouple readings along the head of the specimen. Thermocouples 031 to 033, 034 to 035, and 047-049 were not affected.

A.2.8.7 The specimen achieved the following performance:

Criteria	Performance
Structural adequacy	No failure at 66 minutes
Integrity	No failure at 66 minutes
Insulation (Head Track)	Failed at 23 minutes, Maximum temperature on head C-track (T/C 017) exceeded 180K rise above the initial temperature. Maximum temperature on top C-track (T/C B6) exceeded 180 K above the initial temperature.
Insulation (Panels only)	Failed at 61 minutes Maximum temperature on top west quarter of panel (T/C 011) exceeded 180K rise above the initial temperature.

A.3 TEST REPORT – BWA 2286900.5

A.3.1 Test Sponsor

A.3.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.3.2 Test Laboratory

A.3.2.1 Bodycote Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.3.3 Test Date

A.3.3.1 The test was conducted on 18th August 2008.

A.3.4 Test standard prescribed

A.3.4.1 The test was conducted in accordance with AS 1530.4-2005 Sections 2 & 3.

A.3.5 Variations to Test Standard

A.3.5.1 None

A.3.6 Description of Tested Assembly

A.3.6.1 The test specimen comprised a nominal 2790mm wide x 3000mm high x 78mm thick loadbearing wall made of vertically oriented 78mm thick Speedpanel panels that incorporated a “tongue and groove” detail on their vertical edges. The panels were made form 0.42mm galvanized mild steel.

A.3.6.2 The perimeter framing comprised 83mm wide x 58mm high x 1.2mm thick steel C-tracks on the top and bottom of the wall system. End cap on the west side was 50mm wide x 59mm high x 0.6mm thick C-track and on the east side was 17mm wide x 60mm high x 0.6mm thick C-track.

A.3.6.3 The panels were fixed to the top and bottom C-tracks at nominal 250mm centres and fixed to each other along the horizontal centreline on both exposed and unexposed sides with 15mm long self tapping screws.

A.3.6.4 Fire rated acrylic sealant was used to seal any gaps in the construction prior to testing.

A.3.6.5 The wall was loaded from the base of the wall at six points at 500mm centres. The average load that was applied at each point for the duration of the test was approximately 2.0kN per load point (4.3kN/m).

A.3.7 Instrumentation

A.3.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.3.8 Conditioning

A.3.8.1 The test load was applied to the wall for 15 minutes prior to the commencement of the fire resistance test.

A.3.9 Results

A.3.9.1 The test was terminated at 144 minutes.

A.3.9.2 The ambient temperature at the start of the test was 29°C and varied between 29°C and 30°C during the test.

A.3.9.3 The specimen achieved the following performance :

Criteria	Performance
Structural adequacy	144 minutes
Integrity	120 minutes Ignition of sealant at interface of top C-track and panel initiated failure of specimen by sustained flaming for longer than 10 seconds.
Insulation (Wall System)	64 minutes Maximum temperature on top C-track (T/C B6) exceeded 180 K above the initial temperature.
Insulation (Panel only)	80 minutes Maximum temperature 15 mm from the edge of a vertical joint (T/C B8) exceeded 180 K above the initial temperature.

A.4 TEST REPORT – EWFA 2741700.1

A.4.1 Test Sponsor

A.4.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.4.2 Test Laboratory

A.4.2.1 Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC 3175.

A.4.3 Test Date

A.4.3.1 The test was conducted on 20th July 2012.

A.4.4 Test standard prescribed

A.4.4.1 The test was stated to be conducted in accordance with AS 1530.4-2005

A.4.5 Variations to Test Standard

A.4.5.1 None

A.4.6 Description of Tested Assembly

A.4.6.1 The test assembly comprised a nominal 2950mm wide × 3000mm high × 78mm thick non-loadbearing wall system made of vertically orientated 285mm × 78mm thick Speedpanel panels incorporated a " tongue and groove" detail on their vertical edges. The specimen was tested unloaded and with free vertical edges. The wall incorporated two Pyropanel FR Maxi doors, both opening inwards towards the furnace. The panels were made from an aerated concrete barrier encased in a 0.4mm BMT galvanised steel skin.

A.4.6.2 The test assembly was asymmetric that the head details varied from the East side to the West side. Fire rated sealant was applied in the 20mm gap between top C-track and wall panels. The five tested head track protecting options are summarised below:

- Option 1: Flashing installed on the exposed side only. (Temperatures recorded by T/C 121 and 122 on the unexposed side.)
- Option 2: One layer of 13mm thick × 120mm deep CSR Fyrchek plasterboard on the unexposed side only. (Temperatures recorded by T/C 123 and 124 on the unexposed side.)
- Option 3: One layer of 13mm thick × 120mm deep CSR Fyrchek plasterboard on each side of the head tracks. (Temperatures recorded by T/C 125 and 126 on the unexposed side.)
- Option 4: Flashing installed on the unexposed side only. (Temperature recorded by T/C 127 and 128 on the unexposed side.)
- Option 5: One layer of 13mm thick × 120mm deep CSR Fyrchek plasterboard on the exposed side only. (Temperatures recorded by T/C 129 and 130 on the unexposed side.)

A.4.6.3 The perimeter framing comprised head and bottom tracks made of 82mm deep × 50mm high × 1.2mm thick galvanised steel C-tracks and side tracks made of 82mm deep × 50mm high × 0.5mm thick galvanised steel C-tracks.

A.4.6.4 The panels were fixed to the top and bottom C-tracks at nominal 400mm centres and fixed to each other at 500mm centres on both exposed and unexposed side with 16mm long flat top self-drilling, zinc coated steel screws.

A.4.6.5 Fire rated acrylic sealant was used to seal any gaps in the construction prior to testing.

A.4.6.6 Details of the doors are not relevant to this assessment report.

A.4.7 Instrumentation

A.4.7.1 The test instrumentation was stated to be in accordance with AS 1530.4-2005.

A.4.8 Results

A.4.8.1 The test was terminated at 132 minutes.

A.4.8.2 The ambient temperature at the start of the test was 17°C and varied between 17°C and 19°C during the test.

A.4.8.3 The maximum temperature recorded on the unexposed side of head C-track protected by the flashing cap fixed on the exposed side at 60 minutes was 112°C.

A.4.8.4 The maximum temperature recorded on the unexposed side of head C-track protected by one layer of 13mm thick CSR Fyrchek plasterboard fixed on the fire side at 60 minutes was 101°C

A.4.8.5 The maximum temperature recorded on the unexposed side of head C-track protected by one layer of 13mm thick CSR Fyrchek plasterboard fixed on both sides at 60 minutes was 106°C.

A.4.8.6 The maximum temperature recorded on the unexposed side of head C-track protected by one layer of 13mm thick CSR Fyrchek plasterboard fixed on the non-fire side at 60 minutes was 95°C.

A.4.8.7 The maximum temperature recorded on the unexposed side of head C-track protected by flashing cap fixed on the non-fire side at 60 minutes was 105°C.

A.5 RELEVANCE OF AS1530.4:1997 TEST DATA TO AS1530.4:2005

A.5.1 General

A.5.1.1 The fire resistance test FSV 0562 was conducted in accordance with AS1530.4:1997, which is differs from AS1530.4:2005. The effect these differences have on fire resistance performance of the referenced test specimens is discussed below.

Temperature Regime

A.5.1.2 The furnace heating regime in fire resistance tests conducted in accordance with AS 1530.4-2005 follows a similar trend to that in AS 1530.4-1997.

A.5.1.3 The specified specimen heating rate in AS 1530.4-1997 is given by

$$T_t - T_0 = 345_{log}(8t+1)$$

Where;

T_t	=	furnace temperature at time t, in degrees Celsius
T_o	=	initial furnace temperature, in degrees Celsius, such that
t	=	the time into the test, measured in minutes from the ignition of the furnace

A.5.1.4 The heating regimes in AS 1530.4-1997 and AS 1530.4-2005 vary in that the former is an expression of the temperature rise in the furnace above an initial ambient temperature, and the latter although similar, assumes ambient furnace temperature of 20°C irrespective of the actual temperature. A test conducted in accordance with AS 1530.4-1997 on a warm day (ambient temperature above 20°C) could therefore be slightly more onerous than that in accordance with AS 1530.4-2005.

A.5.1.5 The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2005 and AS 1530.4-1997 are not appreciably different.

Furnace Pressure

A.5.1.6 The furnace pressure regimes for walls of 3m in height in AS1530.4:1997 and AS1530.4:2005 are not appreciably different.

A.5.1.7 The parameters outlining the accuracy of control of the furnace pressure in AS1530.4:2005 and AS1530.4:1997 are not appreciably different.

Performance Criteria

A.5.1.8 AS 1530.4-2005 specifies the following performance criteria for building materials and structures:

- Integrity
- Insulation

Structural Adequacy

A.5.1.9 The structural adequacy criteria are not relevant to this test.

Integrity

A.5.1.10 The specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4-2005 if it collapses or sustains flaming or other conditions on the unexposed face, which ignite the cotton pad when applied for up to 30 seconds.

A.5.1.11 The other integrity criterion varies slightly between AS1530.4:1997 and AS1530.4:2005. The cotton pad test is not employed in AS 1530.4:1997 and the criterion is deemed to have failed if there is development of cracks, fissures or other openings through which flames or hot gases can pass to the unexposed side of the penetrated element. This shall be judged to have occurred when:

a) a gap forms which permits a line of sight from the unexposed face of the specimen through to the furnace interior; or

b) flaming takes place at the unexposed face of the specimen for a period exceeding 10s duration.

A.5.1.12 The integrity criterion in accordance with AS 1530.4:1997 is generally more stringent and would normally occur prior to integrity failure in accordance with AS 1530.4-2005 because under normal circumstances, a through gap permitting an uninterrupted view into the furnace interior would occur before the passage of hot gases sufficient to ignite a cotton wool pad.

A.5.1.13 However, under some circumstances, it is possible for a gap or opening to form that does not allow a straight line of sight into the furnace but allows sufficient passage of hot gases to ignite a cotton wool pad.

A.5.1.14 The integrity criteria of AS1530.4:2005 differ from both AS1530.4:1997and the affect these differences have on integrity performance is discussed on a case by case basis within the appropriate appendix of this report.

Insulation

A.5.1.15 The thermocouple locations for measuring insulation performance of penetrating pipe services in AS 1530.4-2005 are slightly different from those specified in AS 1530.4-1997 and AS4072.1-1992. AS 1530.4-2005 does not require thermocouples on the pipe 400mm from the face of separating element, whereas this is required by AS1530.4:1997 and AS4072.1 1992.

A.5.1.16 AS 1530.4-2005 also generally requires a roving thermocouple to applied anywhere on the non-fire side of the specimen, though this is specifically not required for penetrations.

A.5.1.17 The failure criteria for insulation in AS 1530.4-2005 and AS 1530.4-1997 are not appreciably different except for the positioning of thermocouples stated above.

A.5.2 APPLICATION OF FSV 0562 TO AS1530.4:2005.

A.5.2.1 The variations in furnace heating regimes are not expected to have an overall significant effect on the outcome of the referenced fire resistance test.

A.5.2.2 Based on the above discussion and it is considered that the results relating to the integrity and insulation performance of the wall tested in FSV 0562 can be used to assess the integrity and insulation performance if tested in accordance with AS1530.4:2005.

A.6 RELEVANCE OF AS1530.4:2005 TEST DATA WITH RESPECT TO AS1530.4:2014

A.6.1 GENERAL

A.6.1.1 The fire resistance tests EWFA 2736002.1, BWA 2286900.5, and EWFA 2741700.1 were conducted in accordance with AS1530.4:2005, which is differs from AS1530.4:2014. The effect these differences have on fire resistance performance of the referenced test specimens is discussed below.

A.6.2 DISCUSSION

Temperature

A.6.2.1 The furnace heating regime in fire resistance tests conducted in accordance with AS 1530.4-2014 follows a similar trend to that in AS 1530.4-2005.

A.6.2.2 The specified specimen heating rate in AS 1530.4-2005 is given by

$$T_t - T_0 = 345\log(8t+1) + 20$$

Where;

T_t = furnace temperature at time t, in degrees Celsius

T_o = initial furnace temperature, in degrees Celsius, such that

t = the time into the test, measured in minutes from the ignition of the furnace

A.6.2.3 The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2014 and AS 1530.4-2005 are not appreciably different.

Furnace Pressure

A.6.2.4 The furnace pressure conditions for single and multiple penetration sealing systems in AS1530.4:2005 and AS1530.4:2014m are not appreciably different,

A.6.2.5 The parameters outlining the accuracy of control of the furnace pressure in AS1530.4:2014 and AS1530.4:2005 are not appreciably different.

Performance Criteria

A.6.2.6 AS1530.4:2014 specifies the following performance criteria for building materials and structures:

- Structural Adequacy (not relevant)
- Integrity
- Insulation.

Structural Adequacy

A.6.2.7 The specimen shall be deemed to have failed the structural adequacy criterion in accordance with AS1530.4:2005 upon collapse, or when the following occurs:

(a) When the following criteria for axially loaded elements has been exceeded:
Limiting axial contraction C = h/100
Limiting rate of axial contraction, dC/dt = 3h/1000 mm/min
where h = the initial height

(b) When the following criteria for laterally loaded elements has been exceeded:
Deflection of $L^2/400d$ mm
Where the rate of deflection is (in millimetres per minute), calculated over 1 min intervals, starting at 1 min from the commencement of the heating period, exceeds the limit set by—
Rate of deflection = $L^2/9000d$ mm/min
where
L = clear span of the specimen, in millimetres
d = distance from the top of the structural section to the bottom of the design tension zone, in millimetres

A.6.2.8 Structural adequacy requirements between AS1530.4:2005 and AS1530.4:2014 are not appreciably different.

Integrity

A.6.2.9 AS1530.4:2014 stipulates in addition to the 20mm thick x 100mm x 100mm cotton pads additional cotton pads shall be provided with a reduced 30mm x 30mm x 20mm with additional wire frame holder shall be used to determine integrity failure.

A.6.2.10 Apart from the above variation, the failure criteria for integrity in AS1530.4:2014 and AS1530.4:2005 are not appreciably different.

Insulation

A.6.2.11 The positions of thermocouples and failure criteria for insulation in AS 1530.4:2014 and AS 1530.4:2005 are not appreciably different.

A.6.3 APPLICATION OF TEST DATA TO AS1530.4-2014

A.6.3.1 There is a difference in cotton pad size between standards, however it is confirmed that the variation does not affect the integrity performance of the tested penetrations in the referenced tests for at least 120 minutes.

A.6.3.2 Based on the above, discussion and in absence of any foreseeable integrity and insulation risk, it is considered that the results relating to the integrity and insulation performance of the specimens tested EWFA 2736002.1, BWA 2286900.5, and EWFA 2741700.1 can be used to assess the integrity and insulation performance in accordance with AS1530.4:2014.

APPENDIX B - ASSESSMENT OF SPECIFIC VARIATIONS

B.1 RELEVANCE OF AS1530.4-2014 TESTING TO PARTYWALL

B.1.1 General

B.1.1.1 AS 1530.4:2014 does not specifically address the testing of wall systems where loads are applied independently to frames either side of a central barrier such that the frame on the fire exposed face can collapse without compromising the performance of the fire barrier system. This report provides an interpretation of AS 1530.4:2014 and the relevant fire safety requirements of the Building Code of Australia on which this field of application assessment is based.

B.1.1.2 Applications where such a system is considered appropriate include common walls between dwellings where fire separation is required between dwellings but not within a dwelling (i.e. all structural elements such as floors and roofs that are supported by the structural frame and internal loadbearing walls and columns are not required to be of fire resistant construction).

B.1.1.3 Applications where such a system is not considered appropriate are where the timber frames provide support for other elements that are required to have a fire resistance such as two or more storey class 2 or 3 buildings.

B.1.1.4 Based on the above it is considered that the following criteria need to be applied to the Speedpanel partywall system in order to comply with the intent of AS 1530.4:2014.

- Insulation criteria as applied to fire resistant walls and service penetrations in AS 1530.4 in habitable areas and sub/floor and ceiling spaces.
- Integrity criteria as applied to fire resistant walls and service penetrations in AS 1530.4 in habitable areas and sub/floor and ceiling spaces.
- Structural Adequacy criteria – the structural frame on the non-fire exposed face should be capable of supporting the design load.
- Collapse of the structural frame on the fire exposed face shall not cause the central cladding or joins to be breached or significantly degraded.
- Fixings between the non-fire side frame and the central cladding barrier should provide sufficient restraint to prevent collapse of the central membrane for the required fire resistance period for Structural Adequacy and Integrity.
- In order to assess partitions greater than 3m high the Central Speedpanel membrane shall be capable of supporting its self-weight plus the imposed weight of panels above for the period required for Structural Adequacy and Integrity.

B.1.2 Proposal

B.1.2.1 It is proposed the wall construction is to be as tested in EWFA 2736002, subjecting to the following variations:

- The timber framing sizes shall be varied provided they are sized in accordance with AS1720.1 and/or AS1684 and a minimum 90mm deep and no more than 600mm apart.
- The steel framing sizes shall be varies provided they are sized in accordance with AS/NZS4600 or AS3623 and no more than 600mm apart.
- Framing shall be fixed with aluminium clips on each side of the central 51mm Speedpanel barrier.
- Air cavity between timber framing and Speedpanel panel barrier shall be 20mm one side and 5mm the other side.
- Wall linings as per test FSV 0562 shall be installed to the timber framing.

B.1.3 Discussion

Impact of collapse of fire exposed side structural frame on central Speedpanel panel barrier

B.1.3.1 The philosophy of the design is that during a fire test, prior failure of the fire side timber frame, the connections attaching the aluminium clips to the timber frame will have reduced in strength due to the elevated temperature of the timber such that the frame can break away without transmitting sufficient force to damage the central 51mm thick Speedpanel panel barrier

B.1.3.2 The specimen tested in EWFA 2736002 comprised a nominally 3010mm wide × 2970mm high wall system consisted of 51mm thick Speedpanel wall fitted together (tongue and groove) vertically. The wall system was tested with a load of 0.959kN/m at the bottom edge of the wall for 66 minutes the duration of the formal part of the test, and the load was later gradually increased up to 5.05kN/m at 93 minutes.

B.1.3.3 When tested, the Speedpanel wall did not show any sign of impending the structural adequacy and integrity failure under a load of 0.959kN/m for 66 minutes, the formal part of the test. The applied load was then gradually increased, and the tested specimen continued to maintain the structural adequacy until the termination of the test.

B.1.3.4 The specimen tested in FSV 0562 comprised a nominally 3000mm wide × 3000mm high wall system consisted of 78mm thick Speedpanel wall fitted together (tongue and groove) vertically and clad on both side of the Speedpanel wall with either 10mm thick standard grade plasterboard or 13mm thick fire rated plasterboard.

B.1.3.5 When tested, the fire side 10mm thick standard grade plasterboard started to fall off at 20 minutes and had completely fallen off at 26 minutes. It was observed the tested wall system failed the insulation performance at 134 minutes when the maximum temperature rise on the unexposed side of the wall exceeded 180K.

B.1.3.6 Based on the above observations, it is considered the 78mm thick Speedpanel barrier wall clad with one layer of 10mm thick standard grade plasterboard on the non-fire side would maintain insulation for 114 minutes.

B.1.3.7 Reference test report BWA 2286900 comprised a test on a 78mm thick Speedpanel wall fitted together vertically. When tested, the average temperature measured on the unexposed side of the Speedpanel wall began to rise rapidly around 105 minutes, indicating that the 78mm thick Speedpanel panel has ceasing steaming.

B.1.3.8 When tested, the temperature measurements taken on the non-fire side of the 51mm thick Speedpanel wall show that the average panel temperature began to rise rapidly around 60 minutes, indicating that the 51mm thick Speedpanel panel has ceased steaming.

B.1.3.9 Based on the above observations, it is considered the proposed 51mm Speedpanel wall barrier clad on the non-fire side with one layer of 10mm standard grade plasterboard would maintain the insulation performance for at least 60 minutes.

B.1.3.10 It is proposed that the structural timber framing be designed in accordance with AS1684 and/or AS1720; therefore the size of the framing accommodated in the design of the structural frames under ambient conditions. Failure of the fire exposed side structural frame in the referenced test has been shown to be non-critical to the performance of the wall system but non-fire side structural frame will need to be capable of supporting its design load throughout a 60 minute fire resistance test whilst also being able to provide adequate lateral support to the central Speedpanel barrier.

B.1.3.11 The ability of the non-fire side timber frame to support its design loads can be assessed by considering the extent of charring that may occur prior to 60 minutes. The maximum temperature on the unexposed side of 51mm Speedpanel wall at 60 minutes was 295°C and a proposed 20mm air cavity is between timber framing and 51mm Speedpanel wall barrier. It is therefore expected the maximum surface temperature of the timber framing in the proposed wall system will not exceed the critical charring temperature of 300°C at 60 minutes. Therefore no charring of the framing had occurred and the non-fire side framing of proposed system.

B.1.3.12 For steel framing it is also proposed that it be designed in accordance with AS/NZS 4600 or AS3623, therefore the size of the framing accommodated in the design of the structural frames under ambient condition.

B.1.3.13 It is considered that if steel framing were used on the fire side it would also collapse in a similar manner and it is reasonable to accept that collapse of a fire side steel frame would also not cause any apparent damage or degradation of the performance of the Speedpanel barrier of the specimen described above.

B.1.3.14 The ability of the non-fire side steel frame to support its design loads can be assessed by considering the maximum temperature of the steel framing prior to 60 minutes. With reference to BS 8202 and AS1170.1: 1989, it can be calculated that the limiting steel temperature for light gauge steel (between 0.5mm and 1.6mm) is 475°C.

B.1.3.15 As discussed previously, the maximum temperature on the unexposed side of 51mm Speedpanel wall at 60 minutes was 295°C and a proposed min. 5mm air cavity is between timber framing and 51mm Speedpanel wall barrier. It is therefore the maximum temperature of the structural steel framing will reach for the proposed system with 60 minutes adequacy is 295°C.

B.1.3.16 In light of above discussion, it is considered the proposed timber and steel framing construction will remain structurally viable at 60 minutes.

B.1.3.17 Based on the above observations and discussion, it can be considered the proposed construction would maintain structural adequacy, integrity and insulation performance for 60 minutes if tested in accordance with AS1530.4-2014.

B.2 51MM PARTYWALL SYSTEM 14M HIGH FOR 60 MINUTES

B.2.1 Proposal

B.2.1.1 It is proposed the wall construction is to be as tested in EWFA 2763002, subjecting to the following variations:

- The height of the central barrier may be up to 14m.
- Floor Framing may be optionally arranged such that joists are parallel or perpendicular to wall and do not require solid blocking at the ends of fire resistance.
- The wall lining shall be 10mm standard grade plasterboard or 13mm thick fire grade plasterboard.

B.2.1.2 The critical aspects of the increase in the height of the wall are the increased weight applied the central barrier, the influence of discontinuities in the wall linings at the joist locations and influence of removal of the wall linings in the ceiling space.

B.2.2 Discussion

Stability of Central Barrier

B.2.2.1 The specimen tested in EWFA 2736002 comprised a nominally 3010mm wide × 2970mm high wall system consisted of 51mm thick Speedpanel wall fitted together (tongue and groove) vertically. The wall system was tested with a load of 0.959kN/m at the bottom edge of the wall for 66 minutes the duration of the formal part of the test, and the load was later gradually increased up to 5.05kN/m at 93 minutes.

B.2.2.2 It was observed the tested specimen failed the integrity performance at 87 minutes when the ignition of cotton pad occurred at the opening formed at the first join from east edge.

B.2.2.3 By inspection of the deflection behaviour of tested specimen during 94 minutes, it was noticed when the applied load was increased to 7kN at 77 minutes, the deflection of wall still increased in a steady rate. In addition, no sign of impending integrity failure was observed in this period. It is therefore considered if a total load of 7kN was applied to the 51mm thick Speedpanel wall from the beginning of the test, the 51mm Speedpanel would maintain the structural adequacy and integrity performance for 60 minutes. The deflection at 77 minutes was 200mm and the deflection measured at 60 minutes was 162mm.

B.2.2.4 The proposed construction for 60 minutes comprised central Speedpanel wall barrier of 51mm thick. The proposed construction includes 2750mm high ground floor level and 3000mm for the rest of the floor levels. It is considered the clips have 40mm long legs fixed to the Speedpanel barrier and timber framing which is 90mm × 45mm wide. It is thus considered the effective spacing between the two aluminium clips shall be at maximum 2580 mm centres. Following is a structural calculation of the loads for the proposed 60 minute construction.

the 51mm thick Speedpanel was capable of distorting laterally while able to support its own self weight and the additional load of 7 Kn for 3m width when tested in EWFA 2736002	
Weight of the panel	30.3 kg/m^3
Height of the wall	3 m
Width of the wall	3 m
Wall thickness	51 mm
Applied load	2.33 kN/m
Total mass of the wall	272.7 kg
Self-weight at mid height (1.5m from the base)	0.45 kN/m
Vertical unsupported span of the wall	3 m
Load at wall mid height in the test	2.78 kN/m
Measured deflection at integrity failure (77 minutes)	200 mm
Measured deflection at 60 minutes (center of the wall)	162 mm
Radius of curvature at 60 minutes	7025 mm
Maximum bending moment capacity	0.555 kNm/m
Maximum compressive stress	5.18 N/mm2

51mm thick wall	
Proposed height	14 m
Unsupported wall height	2.58 m
Self-weight of the wall at mid height	3.78 kN/m
Total self-weight	4.16 kN/m
Deflection at 60 minutes	119 mm
Maximum bending moment capacity	0.451 kNm/m
Ratio of safety with respect to bending moment	0.813 (**SAFE)**
Maximum compression stress at mid height	4.161 N/mm2
Ratio of safety with respect to compression stress at mid height	4.238 (**SAFE)**
Maximum compressive stress at bottom	0.08 (**SAFE)**

B.2.2.5 The above calculation indicates the bending moment capacity of the central Speedpanel barrier will be safe provided the spacing of the aluminium clips for the ground floor is at 2580mm centres for walls exposed for up to 60 minutes and with density of 435 kg/m^3

B.2.2.6 It is expected that increasing the level of restraint to the central barrier, the barrier will remain flatter for the whole test period rather it is expected the central barrier will remain largely in place for at least 60 minutes with improved restraint.

B.2.2.7 The above performance is based on the barrier directly exposed to fire without reliance on the additional contribution of the fire side wall linings. Therefore the results are applicable to the construction where there are unprotected gaps between the joists.

B.2.2.8 Based on the above discussion it is considered the insulation and integrity performance of the proposed Speedpanel barrier wall construction will be at least 60 minutes if tested in accordance with AS1530.4-2014.

Speedpanel Barrier above Ceiling

B.2.2.9 It is proposed that the head track of 51mm Speedpanel barrier above ceiling shall be protected on one side with a steel flashing as tested in EWFA 2741700.

B.2.2.10 The tested assembly in test EWFA 2741700 comprised 78mm thick vertically orientated Speedpanel panel wall incorporating two doorsets. The standard 82mm deep × 1.2mm BMT head C-track of Speedpanel wall was protected by five different ways which are flashing cap protected on either fire exposed side or unexposed side, one layer of 13mm thick CSR Fyrchek fixed on either fire exposed side or unexposed side and one layer of 13mm thick CSR Fyrchek fixed on both sides of head C-track. Fire rated sealant was applied in the 20mm gap between top C-track and wall panels.

B.2.2.11 With reference to the test results of EWFA 2741700, it was observed the maximum temperature recorded on the unexposed side at 60 minutes for flashing fixed on the fire side of head C-track was 112°C. The temperature recorded on the unexposed side at 60 minutes for flashing fixed on the non-fire side of head track was less hot (105°C).

B.2.2.12 With reference to the test results of EWFA 2741700, it was observed the maximum temperature recorded on the unexposed side at 60 minutes for 13mm fire grade plasterboard fixed on the fire side of head track was 101°C. The temperature recorded on the unexposed side at 60 minutes for plasterboard fixed on the non-fire side of head track was less hot (95°C).

B.2.2.13 The proposed head C –track is similar to that tested in EWFA 2741700 except the size is 53mm deep in lieu of tested 82mm deep and no fire rated sealant is filled in the gap between head track and wall panels.

B.2.2.14 With reference to test EWFA 2736002, the test results indicated the concrete barrier of Speedpanel wall panel was still releasing steam at 60 minutes, and the steam significantly affected the heat transfer, namely caused the temperature rise to dwell around 100°C. It is therefore expected in this particular case, the heat transfer in the direction of the surrounding construction via conduction (contact) and convection (in this case the 20mm gap between panels and head track) was much weaker.

B.2.2.15 In light of the above, it is considered the C-track made of same material and thickness but in a smaller size will not significantly rise the temperature on the unexposed side at 60 minutes.

B.2.2.16 In addition, with reference to test EWFA 2741700, it was observed fire rated sealant was applied in the 20mm gap between the top C-track and panels. The applied sealant was considered to reduce the gap size and hence resisted heat to transfer to the unexposed side.

B.2.2.17 With reference to EWFA 2736200, the proposed 20mm gap between head track and panels is expected to be filled with steam from the panels interrupting radiant heat transfer across this cavity and dominating the surface temperatures in the vicinity of the head. It is therefore considered the temperature recorded on the unexposed side will not significantly different the partially filled gap at the top is removed.

B.2.2.18 Based on the above, it is considered the proposed construction is capable of maintaining insulation performance for a period of 60 minutes.

Junction Protection between two vertical Speedpanel Wall Spans

B.2.2.19 The proposed junction protection is also galvanised steel flashing fixed to one side of the junction between two vertical Speedpanel wall spans. It has the similar material and 0.3mm thicker than the head track protection discussed previously.

B.2.2.20 It is considered that the discussion presented for head track protection above remains valid for the proposed junction protection.

Alternate Lining Materials

B.2.2.21 13mm fire rated plasterboard is proposed to be optional wall lining.

B.2.2.22 The specimen tested in FSV 0562 comprised a nominally 3000mm wide × 3000mm high wall system consisted of 78mm thick Speedpanel wall fitted together (tongue and groove) vertically and clad on both side of the Speedpanel wall with either 10mm thick standard grade plasterboard or 13mm thick fire rated plasterboard.

B.2.2.23 When tested, the one layer 13mm thick fire rated plasterboard remained in place longer than the tested 10mm thick standard grade plasterboard and the wall clad with one layer of 13mm thick fire rated plasterboard on each side maintained 184 minutes insulation performance.

B.2.2.24 Based on the above, it is considered the 13mm thick fire rated plasterboard will tend to absorb more heat from the fire side and made the unexposed side wall lining cooler.

B.2.2.25 Based on the above, it is considered there will be no detrimental effect on the insulation performance if the wall is clad with 13mm thick fire rated plasterboard.

B.3 78MM PARTYWALL SYSTEM 3M HIGH FOR UP TO 120 MINUTES

B.3.1 Proposal

B.3.1.1 It is proposed the wall construction is to be as tested in BWA 2286900, subjecting to the following variations:

- The timber framing sizes shall be varied provided they are sized in accordance with AS1720.1 and/or AS1684 and a minimum 90mm deep and no more than 600mm apart.
- The steel framing sizes shall be varies provided they are sized in accordance with AS/NZS4600 or AS3623 and no more than 600mm apart.
- Timber framing shall be fixed to the framing with aluminium clips on each side of the 78mm thick Speedpanel wall barrier.
- Air cavity between timber framing and Speedpanel panel barrier shall be 20mm one side and 5mm the other side.
- Wall linings as per test FSV 0562 shall be installed to the timber framing.

B.3.2 Discussion

Impact of collapse of fire exposed side structural frame on central Speedpanel panel barrier

B.3.2.1 The philosophy of the design is that during a fire test, prior failure of the fire side timber frame, the connections attaching the aluminium clips to the timber frame will have reduced in strength due to the elevated temperature of the timber such that the frame can break away without transmitting sufficient force to damage the central 78mm thick Speedpanel panel barrier

B.3.2.2 Reference test report BWA 2286900 comprised a load-bearing test on a 78mm thick Speedpanel wall fitted together (tongue and groove) vertically. A total load of 4.3kN/m was applied at the bottom of the wall during the test duration.

B.3.2.3 When tested, the tested wall specimen achieved the structural adequacy for 144 minutes and maintained the integrity performance for 120 minutes.

B.3.2.4 The specimen tested in FSV 0562 comprised a nominally 3000mm wide × 3000mm high wall system consisted of 78mm thick Speedpanel wall fitted together (tongue and groove) vertically and clad on both side of the Speedpanel wall with either 10mm thick standard grade plasterboard or 13mm thick fire rated plasterboard.

B.3.2.5 When tested, the fire side 10mm thick standard grade plasterboard started to fall off at 20 minutes and had completely fallen off at 26 minutes. It was observed the tested wall system failed the insulation performance at 134 minutes when the maximum temperature rise on the unexposed side of the wall exceeded 180K. The tested specimen maintained 120 minutes integrity performance.

B.3.2.6 Based on the above observations, it is considered the 78mm thick Speedpanel barrier wall clad with one layer of 10mm thick standard grade plasterboard on the non-fire side would maintain insulation for 114 minutes.

B.3.2.7 Although the lining on the fire side may be discontinuous at joist locations they will provide shielding of the significant effects of the fire exposure until they collapse, which, for the purpose of this assessment is considered to be at least 6 minutes.

B.3.2.8 It is proposed timber structural framing be designed in accordance with AS1684; therefore the size of the framing accommodated in the design of the structural frames under ambient conditions. Failure of the fire exposed side structural frame has been shown to be non-critical to the performance of the wall system but non-fire side structural frame will need to be capable

of supporting its design load throughout a 120 minute fire resistance test whilst also being able to provide adequate lateral support to the central Speedpanel barrier.

B.3.2.9 The ability of the non-fire side timber frame to support its design loads can be assessed by considering the extent of charring that may occur prior to 120 minutes. With reference to the test BWA 2286900, the maximum temperature on the non-fire side of 78mm thick Speedpanel wall at 120 minutes was 317°C. It is therefore expected the maximum surface temperature of the non-fire side timber framing in the proposed partition just exceed the critical charring temperature of 300°C at 120 minutes. The framing at the non-fire side is considered to start charring at 120 minutes and the char depth is expected to be small.

B.3.2.10 It is also proposed that structural steel framing be designed in accordance with AS/NZS 4600 or AS3623, therefore the size of the framing accommodated in the design of the structural frames under ambient condition.

B.3.2.11 It is considered that if steel framing were used on the fire side it would also collapse in a similar manner and it is reasonable to accept that collapse of a fire side steel frame would also not cause any apparent damage or degradation of the performance of the Speedpanel barrier of the specimen described above.

B.3.2.12 The ability of the non-fire side steel frame to support its design loads can be assessed by considering the maximum temperature of the steel framing prior to 60 minutes. With reference to BS 8202 and AS1170.1: 1989, it can be calculated that the limiting steel temperature for light gauge steel (between 0.5mm and 1.6mm) is 475°C.

B.3.2.13 As discussed previously, the maximum temperature on the unexposed side of 78mm Speedpanel wall at 120 minutes was 317°C and a proposed min. 5mm air cavity is between structural framing and 78mm Speedpanel wall barrier. It is therefore expected the maximum temperature of the structural steel framing will reach for the proposed system with 120 minutes adequacy is 317°C.

B.3.2.14 In light of above discussion, it is considered the proposed timber and steel framing construction will remain structurally viable at 120 minutes.

B.3.2.15 Based on the above observations and discussion, It can is considered the proposed construction would maintain structural adequacy, integrity and insulation performance for 120 minutes.

B.4 78MM PARTYWALL SYSTEM 14M HIGH FOR 120 MINUTES

B.4.1 Proposal

B.4.1.1 It is proposed the wall construction is to be as tested in BWA 2286900, subjecting to the following variations:

- The height of the Speedpanel barrier shall be up to 14m.
- Floor Framing may be optionally arranged such that joists are parallel or perpendicular to wall and do not require solid blocking at the ends of fire resistance.
- The wall lining shall be 10mm standard grade plasterboard or 13mm thick fire grade plasterboard.

B.4.2 Discussion

Stability of Central Barrier

B.4.2.1 The load-bearing properties of the 78mm thick Speedpanel barrier to support its self-weight was evaluated in BWA 2286900. The 78mm thick Speedpanel wall barrier was loaded with six loading jacks at the bottom of the wall with a total load of 12kN for a 2.79m with or 4.3kN/m.

B.4.2.2 When tested in BWA 2286900, loaded barrier leaf deflected towards the fire and the barrier leaf maintained the applied load and did not collapse during the test duration of 144 minutes. The wall construction maintained integrity for 120 minutes and insulation for 68 minutes.

B.4.2.3 The proposed construction for 120 minutes comprised central Speedpanel wall barrier of 78mm thick. The proposed construction includes 3000mm high floor levels. It is considered the clips has 40mm long legs fixed to the Speedpanel barrier and timber framing which is 90mm deep × 45mm wide, it is thus considered the effective spacing between two aluminium

clips shall be at maximum (3000-45×2-40×2) = 2830mm centres. Following is a structural calculation of the loads for the proposed 120 minute construction.

the 78mm thick Speedpanel was capable of distorting laterally while able to support its own self weight and the additional load of 13 Kn for 3m width when tested in EWFA 2286900	
Weight of the panel	42.05 kg/m^3
Height of the wall	3 m
Width of the wall	3 m
Wall thickness	78 mm
Applied load	4.3 kN/m
Total mass of the wall	378.45 kg
Self-weight at mid height (1.5m from the base)	0.62 kN/m
Vertical unsupported span of the wall	3 m
Load at wall mid height in the test	4.92 kN/m
Measured deflection at integrity failure (77 minutes)	184 mm
Measured deflection at 60 minutes (center of the wall)	180 mm
Radius of curvature at 60 minutes	6340 mm
Maximum bending moment capacity	0.905 kNm/m
Maximum compressive stress	3.63 N/mm2

51mm thick wall	
Proposed height	14 m
Unsupported wall height	2.83 m
Self-weight of the wall at mid height	5.19 kN/m
Total self-weight	5.78 kN/m
Deflection at 60 minutes	160 mm
Maximum bending moment capacity	0.830 kNm/m
Ratio of safety with respect to bending moment	0.917 (**SAFE)**
Maximum compression stress at mid height	5.775 N/mm2
Ratio of safety with respect to compression stress at mid height	3.342 (**SAFE)**
Maximum compressive stress at bottom	0.07 (**SAFE)**

B.4.2.4 The significance of the output of the above calculation is that the self-weight of the proposed wall construction though exceeds the applied load in test BWA 2286900, smaller than the tested self-weight at mid-height of the wall tested. In addition, the tested wall specimen maintained the structural adequacy for 144 minutes and the bending moment capacity is about 81% of the ultimate bending moment capacity of the wall tested.

B.4.2.5 The above calculation therefore indicate the bending moment capacity of the central 78mm thick Speedpanel wall barrier will be safe provided the spacing of the aluminium clips are at 2830mm centres for walls exposed for up to 120minutes and with density of 435 kg/m^3

B.4.2.6 The above performance is based on the barrier directly exposed to fire without reliance on the additional contribution of the fire side wall linings. Therefore the result is applicable to the construction where there are unprotected gaps between the joists.

B.4.2.7 Based on the above discussion it is considered the insulation and integrity performance of the proposed Speedpanel wall barrier construction will be at least 120 minutes if tested in accordance with AS1530.4:2014.

Central Barrier above Ceiling

B.4.2.8 It is proposed that the head track of 51mm Speedpanel barrier above ceiling shall be protected on one side with a steel flashing as tested in EWFA 2741700.

B.4.2.9 The wall system tested in BWA2286900.5 comprised 78mm thick panels that were tested in a loadbearing configuration 3110mm high and supporting 4.3KN/m reasonably evenly distributed along the lower edge of the wall at 6 locations.

B.4.2.10 At 120 minutes, two of the unexposed face temperatures in the vicinity of joins had risen above 195^{o}C (rise of 180^{o}K) while others remained around 100^{o}C to 130°C at the panel moisture was being driven off. The average and maximum unexposed temperature was 124^{o}C and 317^{o}C at 120 minutes. The temperature recorded on the unexposed side of top C-track at 120 minutes was around 317°C.

B.4.2.11 With reference to EWFA 2741700, which comprised a 78mm Speedpanel system that incorporated two doorsets, the insulation performance of the panel joints, remote from the doors was such that there was below 177^{o}C rise at 120 minutes at the joint above and between the doorsets.

B.4.2.12 With reference to EWFA 2286900.5, there was no sign of impending insulation failure to be observed at the bottom track of tested Speedpanel wall during the test duration.

B.4.2.13 Based on the above, it is considered that the Speedpanel panel itself will not introduce any insulation weakness for at least 120 minutes.

B.4.2.14 The tested assembly in test EWFA 2741700 comprised 78mm thick vertically orientated Speedpanel panel wall incorporating two doorsets. The standard 82mm deep × 1.2mm BMT head C-track of Speedpanel wall was protected by five different ways which are flashing cap protected on either fire exposed side or unexposed side, one layer of 13mm thick CSR Fyrchek fixed on either fire exposed side or unexposed side and one layer of 13mm thick CSR Fyrchek fixed on both sides of head C-track. Fire rated sealant was applied in the 20mm gap between top C-track and wall panels.

B.4.2.15 With reference to the test results of EWFA 2741700, it was observed the maximum temperature recorded on the unexposed side at 120 minutes for flashing fixed on the fire side of head C-track was 163°C. The temperature recorded on the unexposed side at 120 minutes for flashing fixed on the non-fire side of head track was less hot (159°C).

B.4.2.16 In addition, with reference to test EWFA 2741700, it was observed fire rated sealant was applied in the 20mm gap between the top C-track and panels. The applied sealant was considered to reduce the gap size and hence resisted heat to transfer to the unexposed side.

B.4.2.17 With reference to BWA 2286900, the proposed 20mm gap between head track and panels is expected to be filled with steam from the panels interrupting radiant heat transfer across this cavity and dominating the surface temperatures in the vicinity of the head. It is therefore considered the temperature recorded on the unexposed side will not significantly different the partially filled gap at the top is removed.

B.4.2.18 Based on the above discussion it is considered the insulation and integrity performance of the 78mm thick Speedpanel wall barrier will be at least 120 minutes if tested in accordance with AS1530.4:2014.

Junction Protection between two vertical Speedpanel Wall Spans

B.4.2.19 The proposed junction protection is also galvanised steel flashing fixed to one side of the junction between two vertical Speedpanel wall spans. It is of the same material and is of the same thickness as that of the head track protection discussed previously or a 13mm × 120mm strip of FR plasterboard.

B.4.2.20 It is considered that the discussion presented for head track protection above remains valid for the proposed junction protection.

Alternate Lining Materials

B.4.2.21 It is proposed 13mm fire rated plasterboard be optional wall lining.

B.4.2.22 The specimen tested in FSV 0562 comprised a nominally 3000mm wide × 3000mm high wall system consisted of 78mm thick Speedpanel wall fitted together (tongue and groove) vertically and clad on both side of the Speedpanel wall with either 10mm thick standard grade plasterboard or 13mm thick fire rated plasterboard.

B.4.2.23 When tested, the one layer 13mm thick fire rated plasterboard remained in place longer than the tested 10mm thick standard grade plasterboard and the wall clad with one layer of 13mm thick fire rated plasterboard on each side maintained 184 minutes insulation performance.

B.4.2.24 Based on the above, it is considered the 13mm thick fire rated plasterboard will tend to absorb more heat from the fire side and made the unexposed side wall lining cooler.

B.4.2.25 Based on the above, it is considered there will be no detrimental effect on the insulation performance if the wall is clad with 13mm thick fire rated plasterboard.

B.5 HEAD AND EDGE DETAILS

B.5.1 Proposal

B.5.1.1 The proposed head details are shown in Figure 2 and 3.

B.5.2 Discussion

B.5.2.1 These proposed details show methods of treatment of the ends and tops of the Speedpanel partywall system. AS 1530.4 does not specifically address interfaces between adjacent walls and roofs.

B.5.2.2 The method shown in figure 2 and 3 are consistent with typical details included in the Building Code of Australia and are therefore considered appropriate.