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ASSESSMENT REPORT

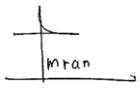
Assessment of fire resistance performance of Speedpanel 4-hour double skin wall system

Client: Speedpanel Holdings Pty Ltd

Job number: 40534400 Issuing consultant: Imran Ahamed

Date: 26 March 2019 Revision: R2.0

Amendment schedule

Version	Date	Information relating to report			
R1.0	Issue: 24/03/2016	Reason for issue	Report issued to Speedpanel Holdings Pty Ltd for review and comment.		
		Initial Issue	Prepared by	Reviewed by	Approved by
	Expiry: 31/03/2021	Name	S. Hu	K. G. Nicholls	-
		Signature			
R2.0	Issue: 26/03/2019	Reason for issue	Revised with variations to fixings and supports		
			Prepared by	Reviewed by	Approved by
	Expiry: 31/03/2021	Name	Imran Ahamed	Hon Wong	Kjetil Pedersen
		Signature			
	Issue:	Reason for issue			
			Prepared by	Reviewed by	Approved by
	Expiry:	Name			
		Signature			

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Exova Warringtonfire rebranded to Warringtonfire on 1 December 2018. Apart from the change to our brand name, no other changes have occurred. The introduction of our new brand name does not affect the validity of existing documents previously issued by us.

Contents

1. Introduction

Exova Warringtonfire, formerly known as Bodycote Warringtonfire, rebranded to Warringtonfire on 1 December 2018. Apart from the change to our brand name, no other changes have occurred. The introduction of our new brand name does not affect the validity of existing documents previously issued by us.

This report presents an assessment of the fire resistance performance of Speedpanel 4-hour double skin wall system if tested in accordance with AS 1530.4-2014.

The tested prototypes described in section 2 of this report, when subjected to the proposed variations described in section 3 and tested in accordance with the relevant standards described in section 4, are assessed to achieve performance as summarised in section 5.

The validity of this assessment is conditional on compliance with sections 6, 7, 8 and 9 of this report.

Summaries of the test data on which this assessment is based are provided in Appendix A. A summary of the critical issues leading to the assessment conclusions including the main points of argument is discussed in Appendix B.

2. Tested prototypes

This assessment is based on reference test reports EWFA 2257600.4, BWA 2286900.5 and F91794A which were sponsored by Speedpanel (Vic) Pty Ltd and conducted by Bodycote Warringtonfire (Aus) Pty Ltd.

The assessment also makes reference to test reports F91794B, EWFA 2741700.1, EWFA 2798800.1, EWFA 2848300.2, EWFA 2736001 and EWFA 2798800.1 which were sponsored by Speedpanel (Vic) Pty Ltd and conducted by Exova Warringtonfire Aus Pty Ltd., and to a supplementary test FS 3212/1924 which was sponsored by Speedpanel (Vic) Pty Ltd and conducted by CSIRO.

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

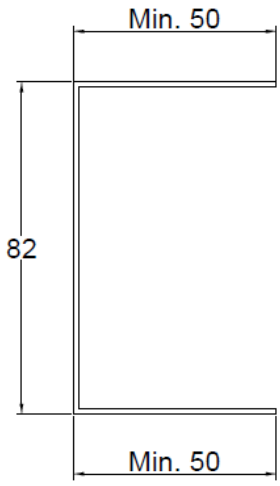
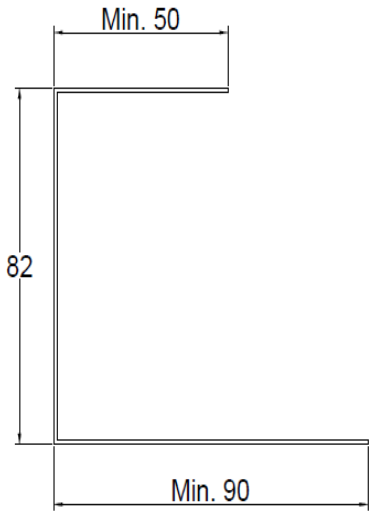
3. Variation to tested prototypes

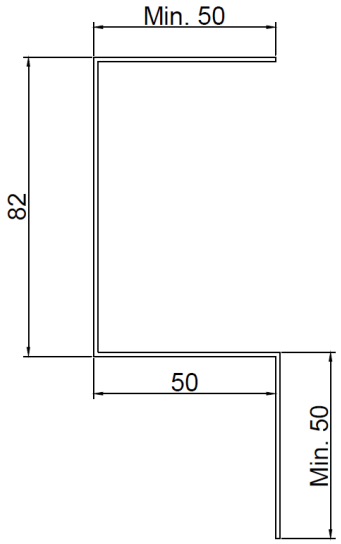
The proposed construction shall be horizontally orientated 78mm thick Speedpanel wall panel as tested in BWA 2257600.4 and EWFA 2736001 with consideration given to the following variations:

- The wall system comprised two layers of 78mm thick horizontally orientated Speedpanel wall with a minimum 50mm thick air gap in between. The plan view of the arrangement of Speedpanel wall systems is shown in figure 1.
- The panel span shall be maximum 3m wide with a maximum height of 30m and shall be supported by Square Hollow Section (SHS) or Rectangular Hollow Section (RHS) structural columns at each panel end as per details B, D or G.
- Each panel end shall be alternatively supported by structural steel I or H section instead of SHS or RHS in details B and G (Figures 12-15).
- The panel span shall incorporate an intermediate support detail C if the span exceeds 3m wide and up to 5.6m and use the same panel end fixing details as per the 3m wide span.
- The wall system shall incorporate an obtuse angle end support detail as per detail A.
- The wall system shall incorporate a 90 degree end support as per detail E or F.
- Each Speedpanel wall head shall be protected with either steel flashing or single layer of 13mm thick fire grade plasterboard strip at one side as shown in figure 2 and 3.
- Each post is required to be laterally supported at top and bottom to remain as tested.
- The sealant product can optionally be Sika Firerate – PU sealant as tested in EWFA 29942200 at side and bottom tracks.

Refer to Table 1 and Figures 1 to 16 for a summary of the proposed construction.

Table 1 Variation to tested prototypes

ID	Description	
1	**Name**	**78mm Speedpanel Panel**
	Material	285mm wide × 78mm thick Speedpanel panels are made from 0.40mm BMT roll-formed galvanised steel shells seamed together and filled with lightweight aerated concrete.
	Installation	Fitted together (tongue and groove) horizontally. The maximum gap between panel and head C-track is 20mm wide and the maximum gap between panel and side C-track is 10mm wide.
2	**Name**	**C Track**
	Material	1.15mm BMT galvanised mild steel
	Specification	 Fixed to steel structure with 10 gauge × 30mm long self-drilling screws at 500mm centres and fixed to the Speedpanel panel with 10 gauge × 30mm long self-drilling screws at 250mm centres.
3	**Name**	**J Track**
	Material	1.15mm BMT galvanised mild steel
	Specification	 Fixed to steel structure with 10 gauge × 30mm long self-drilling screws at 500mm centres and fixed to the Speedpanel panel with 10 gauge × 30mm long self-drilling screws at 250mm centres.
4	**Name**	**P Track**
	Material	1.15mm BMT galvanised mild steel

ID	Description	
	Size	 Fixed to steel structure with 10 gauge × 30mm long self-drilling screws at 500mm centres and fixed to the Speedpanel panel with 10 gauge × 30mm long self-drilling screws at 250mm centres.
5	**Name**	**Track fixing to Concrete Construction**
	Material	Minimum 5mm mushroom head spikes or metal pin anchors
	Installation	Mechanical fixing of track to surround at maximum 500mm centres and shall be in accordance with project engineer's specification and at least 40mm embedment.
6	**Name**	**Panel to Panel connecting screws**
	Material	10G x 16mm self-drilling screws
	Spacing	Fixed into every joint on one face of both Speedpanel layers at 1000mm centres
7	**Name**	**Protection – Fire Grade Plasterboard**
	Material	One of 13mm thick fire grade plasterboard strip × 120mm wide for head track One of 13mm thick fire grade plasterboard strip × 160mm wide for side track
	Installation	Fixed on one side of the C-track and the plasterboard strip is fixed to Speedpanel by 6g × 40mm Bugle head, Fine thread, Self-drilling screws in two lines and staggered at 200mm centres.
8	**Name**	**Protection - Metal Flashing**
	Size	150mm wide × 80mm × 0.7mm thick
	Installation	Screw fixed into C-track and panel at 250mm centres.
9	**Name**	**Fire Tested Sealant**
	Material	Hilti CP 606 Flexible firestop sealant
	Installation	Used to seal all gaps between top tracks and panels, between flashing and panels, between plasterboard strip and panels and between angle and panels at wall head.
10	**Name**	**Fire Tested Sealant**
	Material	Any fire rated sealant that has been tested to achieve an FRL of -/120/- when protecting an at least 20 mm wide control joint in a floor system
	Installation	Used to seal all gaps between tracks and panels, and to protect between structural angles and panels.
11	**Name**	**Corner Flashing**
	Material	0.7mm BMT × 160mm × 160mm galvanised mild steel flashing
	Installation	Capped on the outside of wall corner incorporated by two Speedpanel walls and fixed to Speedpanel panels by using 10 gauge × 30mm SDS fixings crews at 500mm centres.
12	**Name**	**Steel Angle**
	Size	50mm × 50mm × 1.15mm BMT galvanised steel angle

ID	Description	
	Installation	Fixed to Speedpanel panels by using 10 gauge x 30mm SDS screw at 250mm centres and fixed to steel structure by using 10 gauge x 30mm SDS screw at 500mm centres
13	**Name**	**Steel Angle**
	Size	3mm BMT galvanised steel angle
	Installation	Installed at inside and outside of obtuse angle corner of two Speedpanel walls and fixed to Speedpanel panels by using 10 gauge × 30mm SDS screws at 500mm centres.
14	**Name**	**SHS or RHS column – non-loadbearing**
	Size	minimum 50mm deep × minimum 5mm thick
	Material	Galvanised mild steel
	Installation	To be fabricated and supported laterally.
15	**Name**	**Cavity Infill**
	Material	Rockwool insulation
	Installation	Fully filled the cavity formed by two Speedpanel wall.
16	**Name**	**Junction Protection – Metal Flashing**
	Material	0.7mm thick galvanised steel flashing
	Installation	Fixed to one side of the back to back tracks and fixed to Speedpanel panels by using 10 gauge × 30mm SDS fixing screws at 500mm centres.
17	**Name**	**Fixing**
	Size	14 gauge SDS
	Installation	Fixing passes completely through tracks and panels at every panel joint
18	**Name**	**SHS or RHS column – loadbearing for wind load**
	Size	minimum 50mm deep × minimum 5mm thick
	Material	Galvanised mild steel
	Installation	To be fabricated and supported laterally.
19	**Name**	**Fixing to structural steel**
	Size	12 gauge SDS
	Installation	fixed at 250mm centres (into Speedpanel joints), and thread embedded min. 20mm into panel joints or structural steel
20	**Name**	**Flashing**
	Size	min. 0.7mm thick
	Installation	Fixed at 250mm centres on either edge, and min. 5mm clearance from tracks and fixings in all directions.
21	**Name**	Structural Steel Protection
	Material	**Promatect-L**
	Installation	Layered as per Promat's specifications and fixed to the Speedpanel through the joints (at 250mm centres) The required insulation thickness shall be determined according to the Hp/A ratio of the structural column using Promat's specification.
22	**Name**	**Fire Rated Sealant**
	Material	Promat Promaseal AN
	Installation	Used to seal all gaps between Promatect and panels
23	**Name**	Protection – Promatect 100
	Material	One of 20mm thick × min 100mm strip
	Installation	Installed to completely cover the track and 50mm of the face of the panels. Fixed on one side of the tracks with min. 10g × 30mm SDS screws at 500mm centres, staggered at 250mm on alternate edge. All edges sealed with Promaseal AN fire rated sealant.

3.1 Tested system/s

3.2 System A

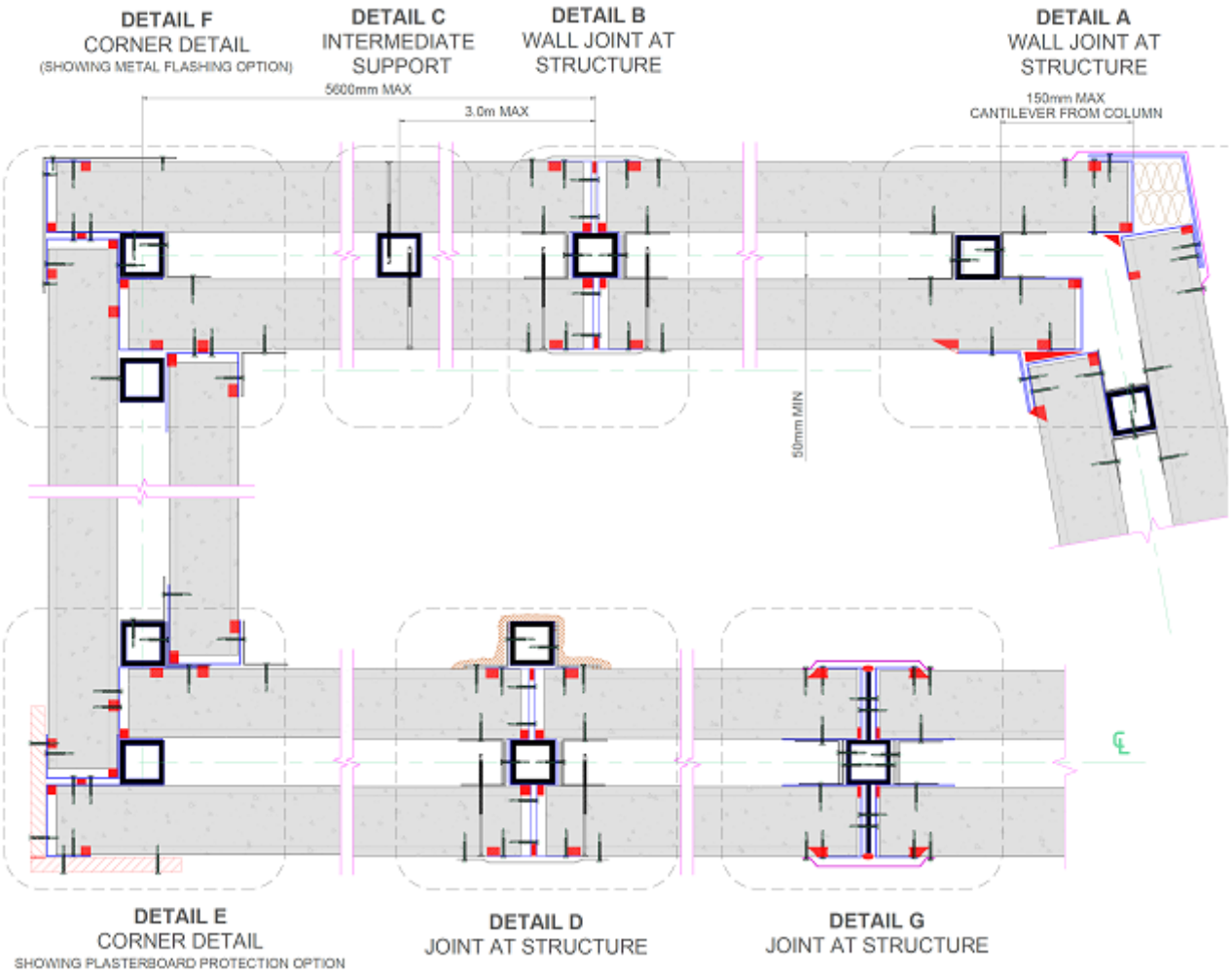


Figure 1 Plan View of Speedpanel Double Skin Wall System

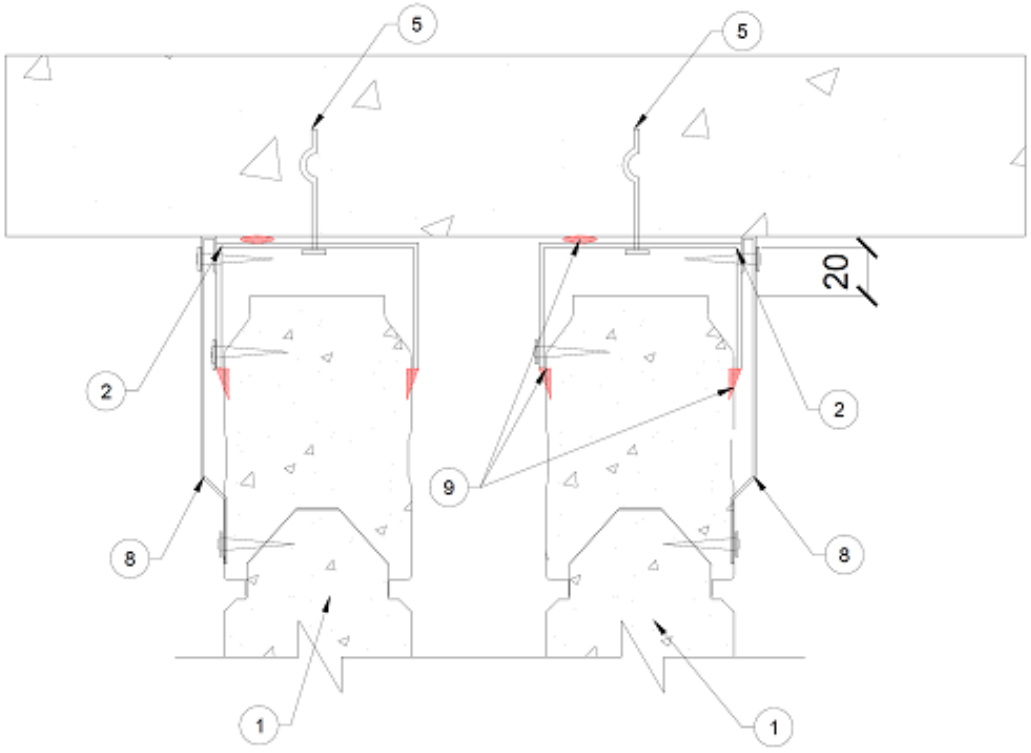


Figure 2 Head Detail with Flashing Protection

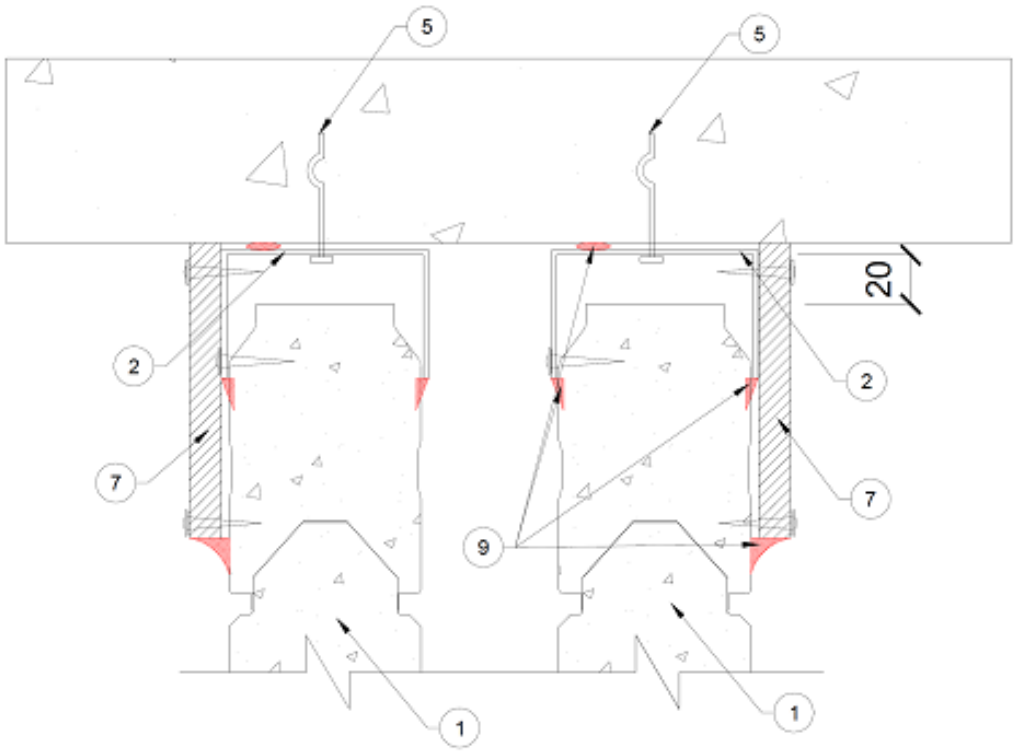


Figure 3 Head Detail with Plasterboard Protection

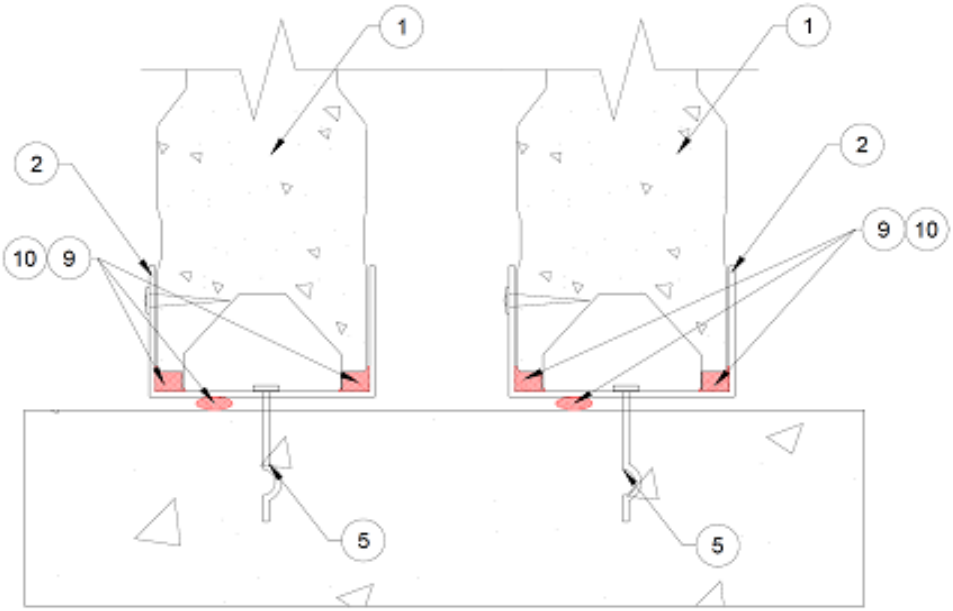


Figure 4 Bottom Detail

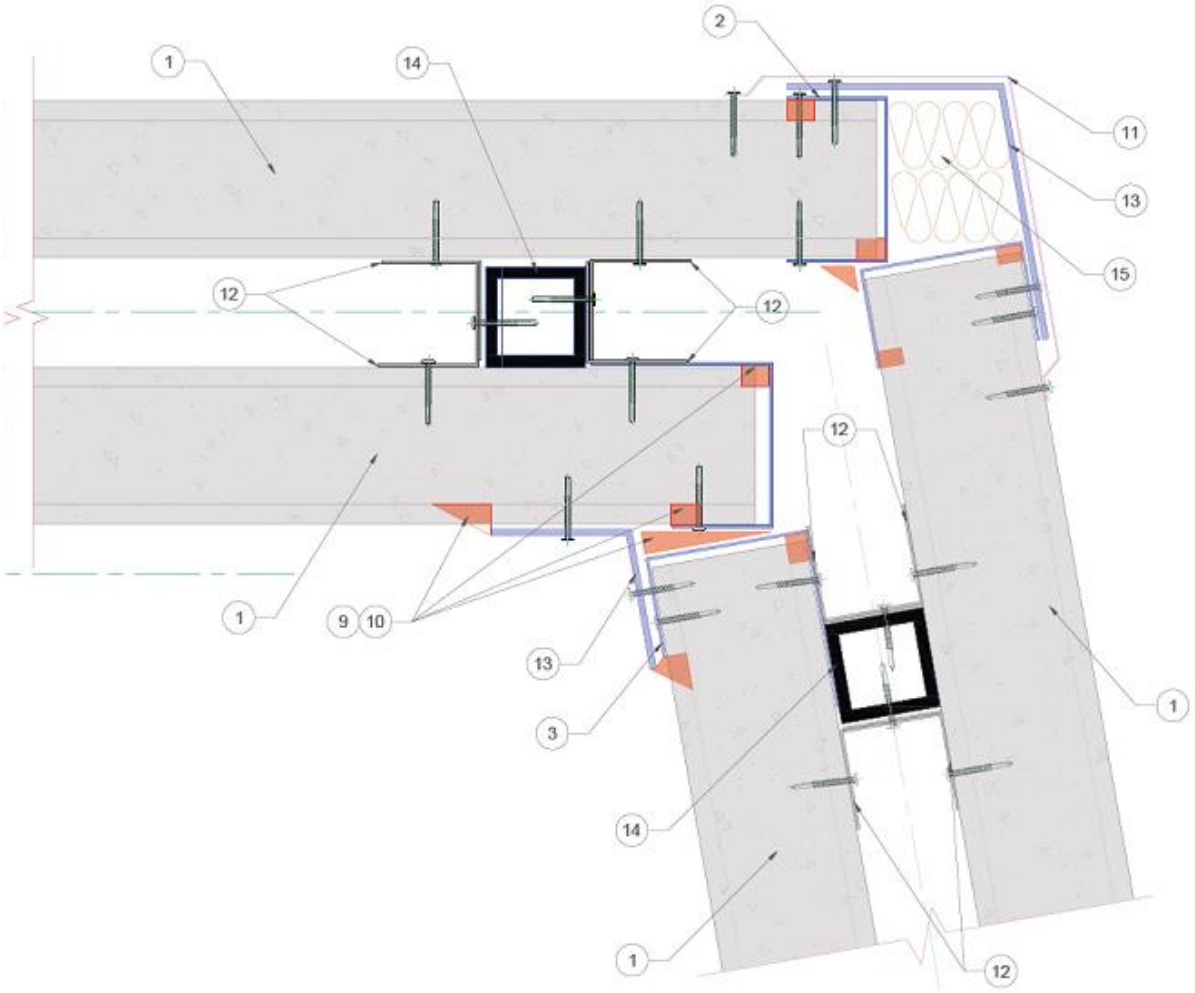


Figure 5 Detail A

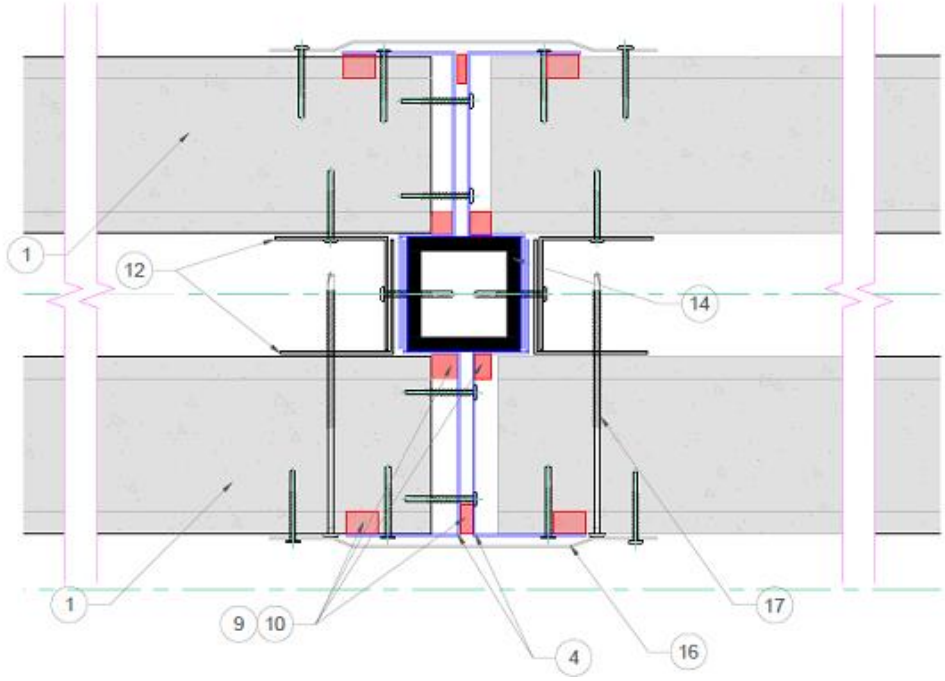


Figure 6 Detail B

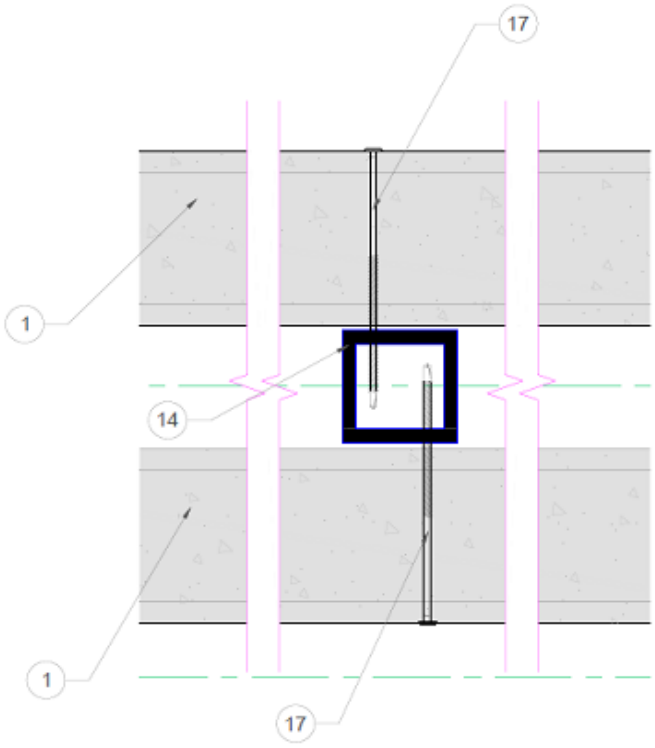


Figure 7 Detail C

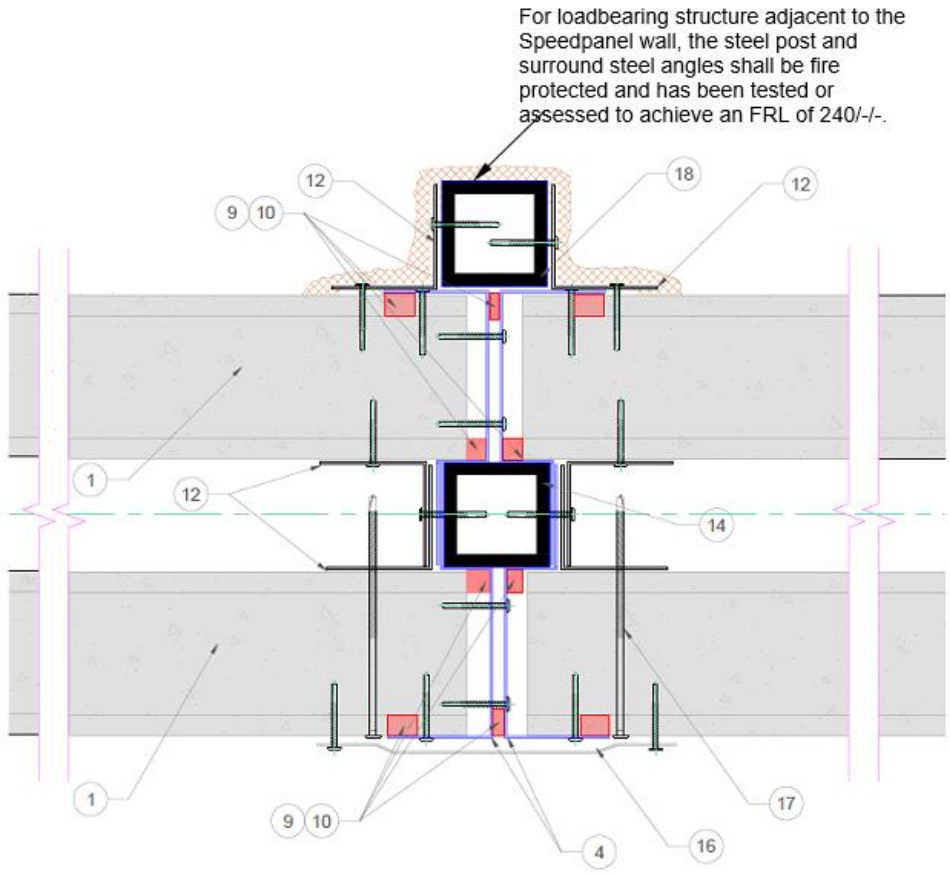


Figure 8 Detail D

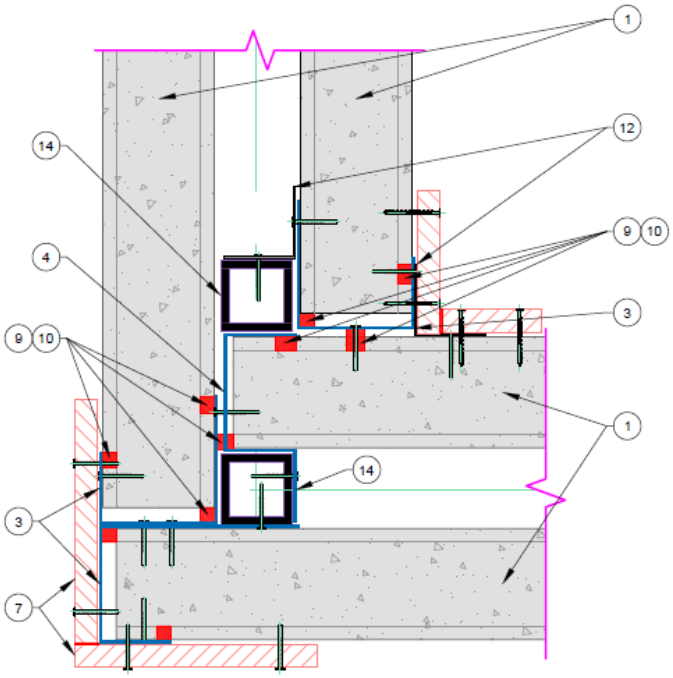


Figure 9 Detail E

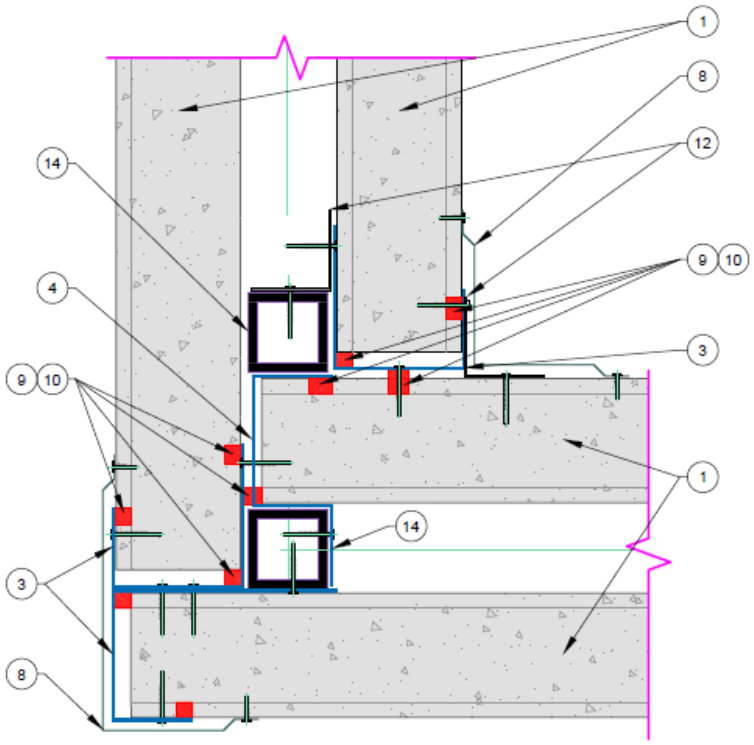


Figure 10 Detail F- Option 1

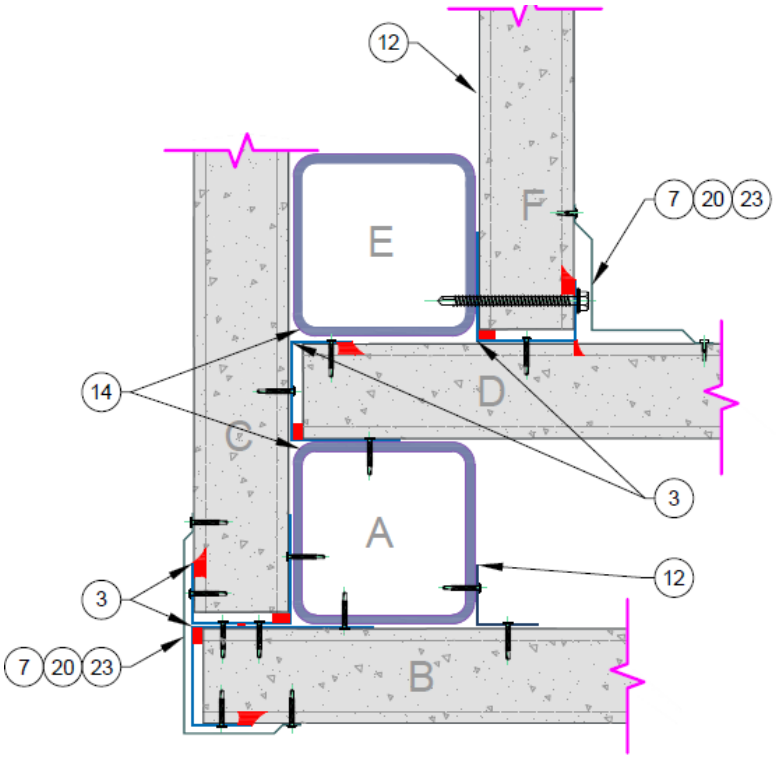


Figure 11 Detail F- Option 2

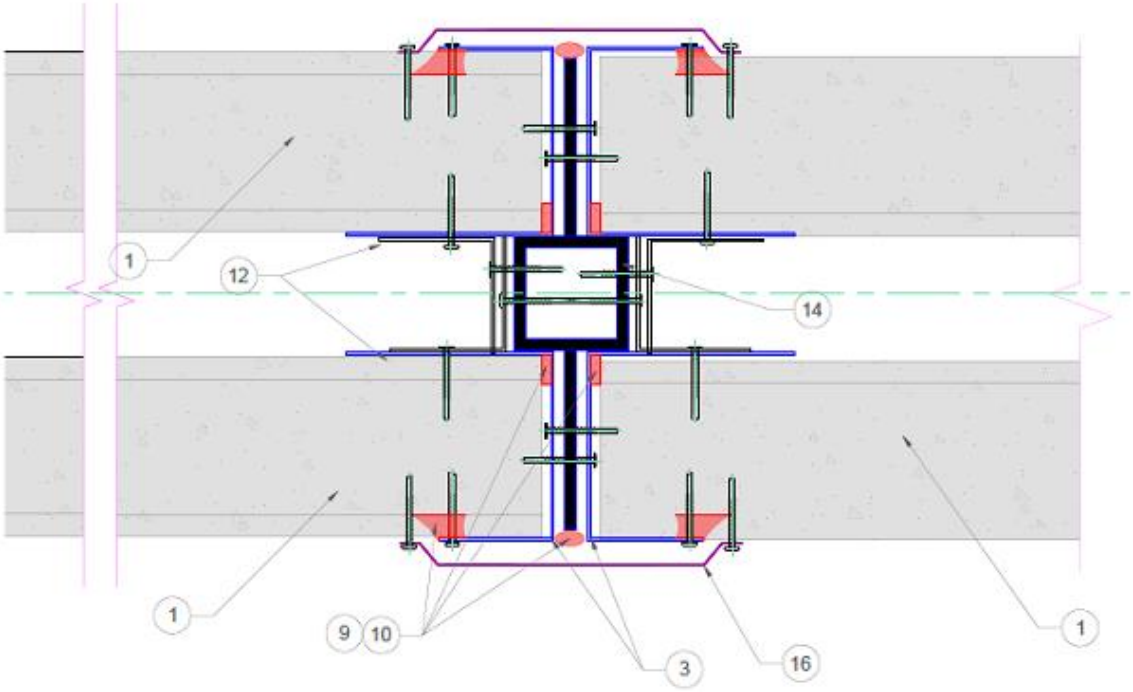


Figure 12 Detail G

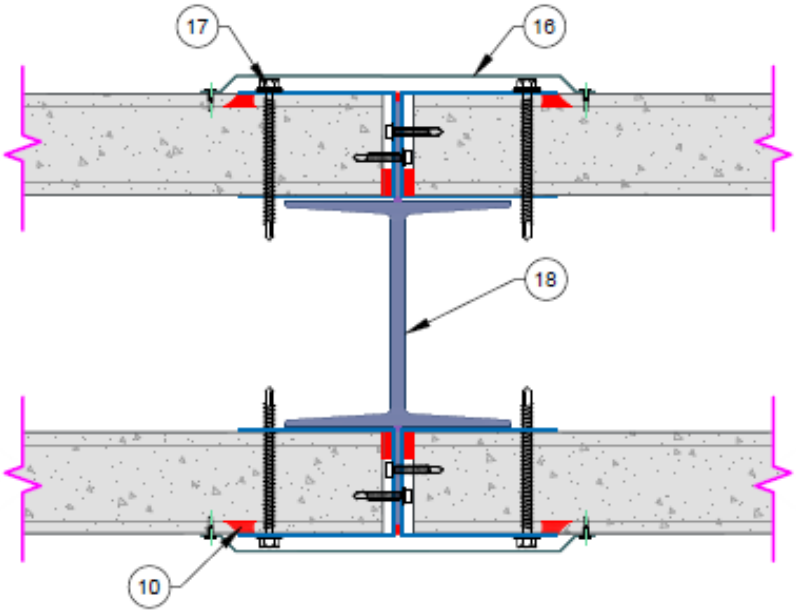


Figure 13 Optional detail 1 for Detail B or G

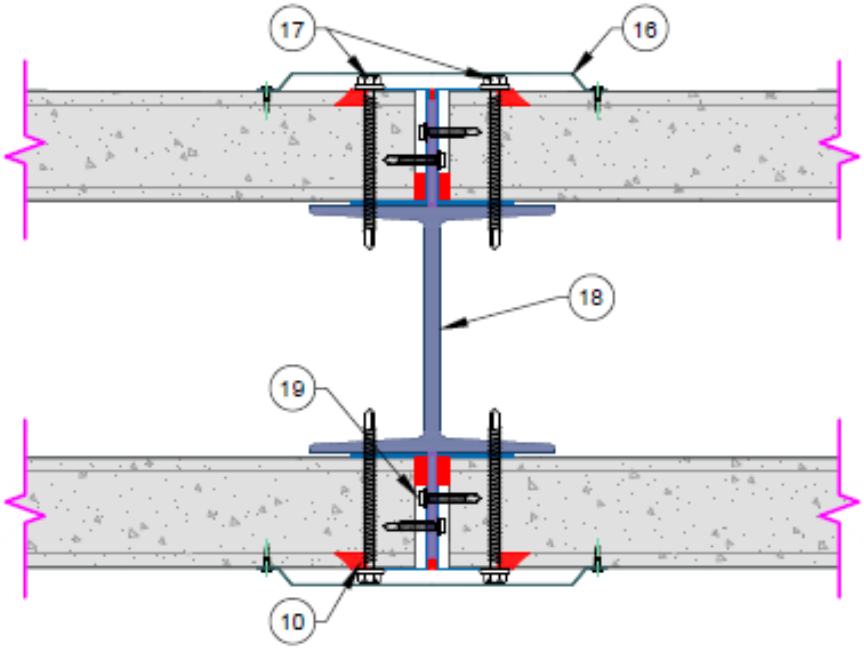


Figure 14 Optional detail 2 for detail B or G

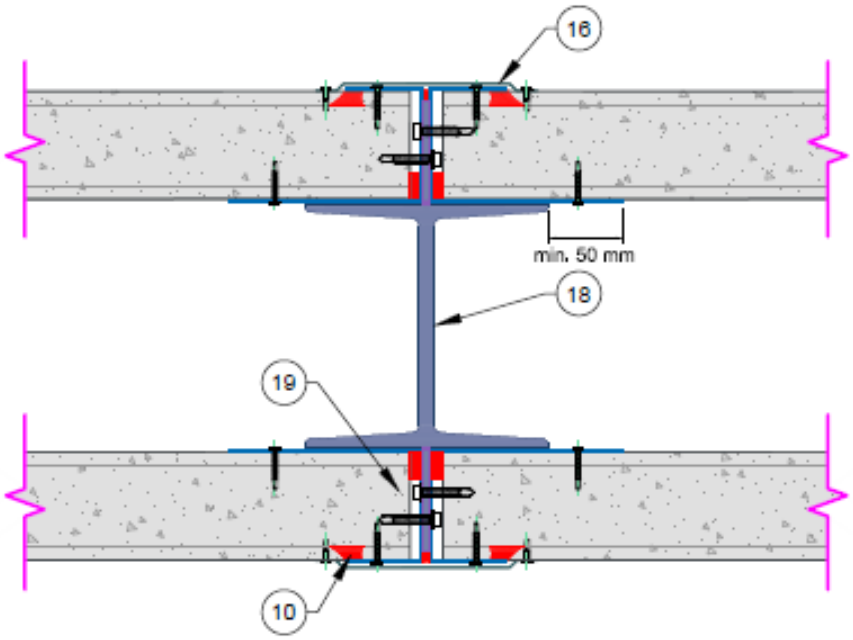


Figure 15 Optional detail 3 for detail B or G

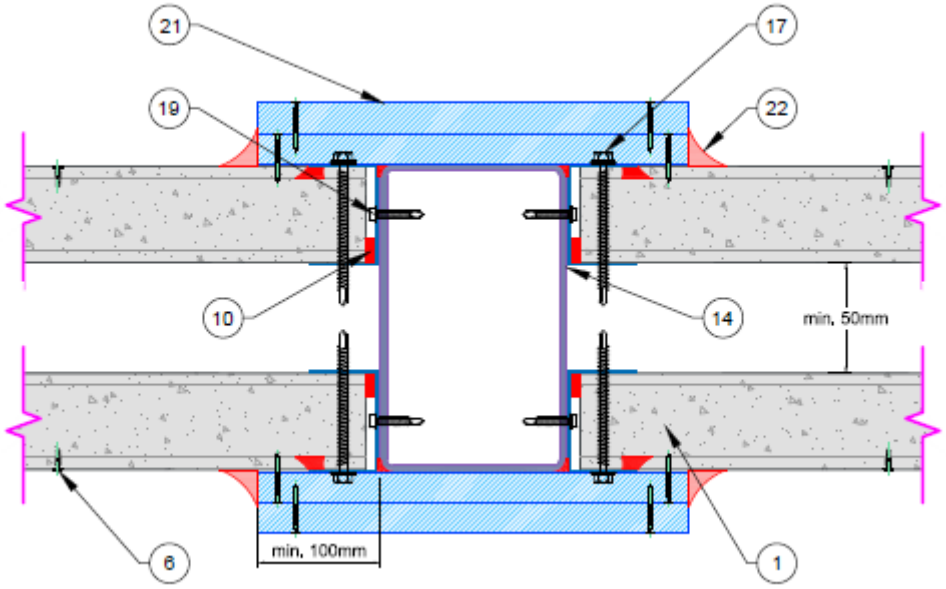


Figure 16 Optional detail 4 for detail B or G

4. Referenced test standard

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

5. Formal assessment summary

Based on the discussion presented in this report, it is the opinion of this registered testing authority that if the tested prototype described in Section 2 had been modified as described in Section 3, it will achieve the FRL as stated below if tested in accordance with the method referenced in Section 4 and subject to the requirements of Section 7.

Performance of Speedpanel Wall Systems

Table 2 Assessment summary

Wall	Max. Wall Height	Max. Wall Span Width	Head & Bottom Detail	End Support Detail	Inter-mediate Support Detail	FRL
Two layers of 78mm thick – horizontally orientated	30m	3m	Figure 2, 3 and 4	Figures 5-6 and Figures 8-16	-	-/240/240
	30m	5.6m	Figure 2, 3 and 4	Figures 5-6 and Figures 8-16	Figure 7, max. 3m from end support	-/240/240

6. Direct field of application

The application of the results of this assessment is to walls exposed to the effects of fire from either direction, but not simultaneously.

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.

It is required that each steel post is designed to carry the weight of Speedpanel wall spans, and the steel posts are laterally supported at top and below for the FRL period.

It is required that the lateral load capacity of the head track and base track be verified by the design engineer for the lateral load capacity under ambient loading conditions. The panel to panel joints detailed in the attached drawings are not to be used as control joints unless separately tested and verified.

It is required the support construction above and below the wall be capable of providing adequate vertical and lateral support for the FRL period.

All structural elements are required to be engineered by others to support the Speedpanel and any other imposed loads.

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 fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard 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 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

Appendix A Summary of supporting data

A.1 Test report - BWA 2257600.5

A.1.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.1.2 Test laboratory

Bodycote Warringtonfire (Aus) Pty. Ltd., 409-411 Hammond Rd, Dandenong, VIC- 3175, Australia.

A.1.3 Test date

The test was conducted in 6th March 2008.

A.1.4 Test standards

The test was conducted in accordance with AS 1530.4-1997.

A.1.5 General description of tested specimen

The test assembly comprised a nominal 3000mm wide × 3000mm high × 78mm thick non-load bearing panel wall comprised horizontally orientated Speedpanel panels to form a vertical wall. The panels incorporate a “tongue and groove” detail on their horizontal edges. The panels were supported at their ends on vertical edges. The top and bottom edges are unrestrained. At the top there was nominal 25mm clearance to the concrete block surround, with a nominal 80mm clearance to the steel restraint frame at the bottom.

The panels were fixed by 83mm wide × 54mm high × 1.19mm thick steel C-tracks on the vertical edges at every second panel join (500mm centres) on both exposed and unexposed sides with 35mm long self-tapping screws. The wall consisted of a number of different installation details.

Top and bottom C-track was not fixed to concrete block surround. Both the top and bottom panels were fixed to the top and bottom C-track at 450mm centres with 35mm long self-tapping screws.

The first horizontal panel joint from the bottom was fixed at 250mm centres with 35mm long self-tapping screws. The second horizontal panel joint from the bottom was fixed at 500mm centres with 35mm long self-tapping screws. No other fixings were applied to any other joints on either face of the panels

A.1.6 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-1997.

A.1.7 Test results

The ambient temperature at the start of the test was 29°C and varied between 29°C and 30°C during the test. The test was terminated after 242 minutes.

The specimen achieved the following performance when tested in general accordance with AS 1530.4-1997 Section 2 & 3

Results of Panel	
Criteria	**Performance**
Integrity	128 minutes, flaming of cotton pad in the upper half of the wall
Insulation on Panel	117 minutes, temperature measured at 15mm below a horizontal join in the upper half of the wall exceeded initial temperature of 180K rise.
Results of Perimeter	
Criteria	**Performance**

Integrity	No failure at 242 minutes
Insulation	23 minutes, temperature measured on the east edge at the section where there was only sealant on the unexposed side.

The mid-span deflection at 120 minutes was 140mm and at 240 minutes was 180mm.

The key observations of the panel behaviours during the 240 minutes are listed below:

- At 100 minutes, it had become evident that the first join from the top had begun to separate at the centre. (Note that no screws were applied at this join, as per the first joint from the bottom that was screwed along the panel join at nominal 250mm centres. Also note that no openings had become evident in any other area of the wall with or without screw in it).
- At 110 minutes, it had become evident that the forth join from the bottom had begun to separate, resulting in the upper panel remaining in position, with the lower panel deflecting towards the furnace and pulling the exposed face of the upper panel back towards the furnace. No through gap had become evident.
- At 128 minutes, cotton pad applied at the first join from the top that had begun to laterally separate, near the mid-width of the wall. No gaps greater than 6mm thick x 150mm long were evident at this location.
- At 176 minutes, it had become evident that the lateral opening formed in the fourth gap from the bottom had closed.
- At 240 minutes, it has become evident that all gaps that had previously opened up during the test had closed. There were no visible gaps evident into the furnace.
- The wall maintained integrity performance for at least 240 minutes.
- The exposed side steel skin stayed in place for 240 minutes though cracks formed along the skin.

A.2 Test report - EWFA 2741700.1

A.2.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.2.2 Test laboratory

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

A.2.3 Test date

The test was conducted on 20th July 2012.

A.2.4 Test standards

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

A.2.5 Variations of tested assembly

None

A.2.6 General description of tested specimen

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 core encased in a 0.4mm BMT galvanised steel skin.

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.)

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.

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.

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

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

A.2.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-2005.

A.2.8 Test results

The test was terminated at 132 minutes.

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

The maximum temperature recorded on the unexposed side of head C-track protected by the flashing cap fixed on the exposed side at 120 minutes was 177°C.

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 120 minutes was 154°C

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 120 minutes was 163°C.

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 120 minutes was 145°C.

The maximum temperature recorded on the unexposed side of head C-track protected by flashing cap fixed on the non-fire side at 120 minutes was 177°C.

A.3 Test report - EWFA 29942200.1

A.3.1 Report sponsor

Sika Australia Pty Ltd, 55 Elizabeth Street, Wetherill Park, NSW 2164.

A.3.2 Test laboratory

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

A.3.3 Test date

The test was conducted on 31st July 2014.

A.3.4 Test standards

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

A.3.5 Variations of tested assembly

The damper was not tested in full accordance with AS 1530.4-2005 as an air leakage test had not been conducted . The junction of the damper and the wall was tested in accordance with AS 1530.4-2005.

A.3.6 General description of tested specimen

The tested assembly comprised a nominal 3000mm wide × 3000mm high × 78mm thick Speedpanel wall system penetrated by eight different service penetration which were protected with various protection systems with Sika Firerate – PU sealant. The top edge of the Speedpanel wall system was protected with flashing and bottom edge of the wall was protected by Sika Firerate – PU sealant on the unexposed side.

For the purpose of the assessment, only the perimeter details of the 78mm thick Speedpanel wall is relevant.

The tested wall configuration incorporated 78mm thick Speedpanel panels vertically orientated to form a vertical wall system with 1.26mm BMT perimeter track. The panels incorporate a ‘tongue and groove’ detail on their vertical edges.

The panels were installed vertically starting from north edge with groove end in the north vertical track with 20mm gap between the top edge of the Speedpanel and the top track. Panels were screw fixed to each other at 1000mm centres on the unexposed side only at every panel join. Panels were screw fixed to vertical tracks at 500mm centres on the unexposed side only and fixed to head and bottom track at every 2nd panel join on the unexposed side only.

The perimeter tracks were made of 85mm × 55mm × 1.26mm BMT galvanised steel C-track.

The top head of Speedpanel wall was protected with 144mm wide × 1610mm long × 0.7mm BMT Galvabond® steel flashing. The South half of wall head was protected with flashing on the unexposed side and the North half of wall head was protected with flashing on the exposed side. The overlap of flashing was nominally 200mm.

The Sika Firerate – PU sealant was applied in the following areas:

- Applied to the interface between the perimeter tracks and the surrounding blockwork along the head, base and fixed edge.
- Applied to the spacing between the unexposed side flange of bottom track and the Speedpanel contours. The sealant was applied to the specimen from the unexposed side only.
- 20mm high × 100mm wide sealant fillet was applied to the spacing between the top track and the Speedpanel at the mid width of the specimen wall to create a fire seal in the head track to separate north and south flashing.

A.3.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-2005.

A.3.8 Test results

The test was terminated at 123 minutes.

The ambient temperature at the start of the test was 20˚C and did not vary significantly throughout the duration of the test.

The head detail of wall specimen maintained integrity performance of 123 minutes and insulation performance of 16 minutes.

The side and bottom details of wall specimen maintained integrity performance of 123 minutes and cracking had become evident on the sealant at the sill at 28 and 45 minutes.

The maximum temperature recorded on the unexposed side of head C-track protected by flashing cap fixed on the non-fire side at 120 minutes was 177°C.

A.4 Test report - F91794A

A.4.1 Report sponsor

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

A.4.2 Test laboratory

Bodycote Warringtonfire (Aus) Pty. Ltd., 409-411 Hammond Rd, Dandenong, VIC 3175.

A.4.3 Test date

The test was conducted in 2nd December 1999.

A.4.4 Test standards

The test was conducted in accordance with AS 1530.4-1997.

A.4.5 General description of tested specimen

The test assembly comprised a wall section below an enclosure that protruded horizontally from the face of the furnace above. The wall included an “I” section steel column protected with a 78mm thick horizontally orientated Speedpanel wall system. The enclosure comprised walls made from vertically aligned 78mm thick Speedpanel wall system. The floor and roof comprised horizontally aligned 78mm thick Speedpanel system. The wall was nominally 2.1m high and 1.8m wide. The enclosure opening to the furnace was 1.8m x 1.045m and protruded from the furnace.

The test specimen described in this report is the wall assembly, the enclosure assembly is reported elsewhere in report F91794B. The wall assembly comprised a 150UC 23 steel column 1800mm long and the horizontal Speedpanel wall panels.

The test assembly comprised the enclosure assembly described in report F91794A. The test specimen comprised a horizontal panel floor and panel roof. The side and end panel were made from 78mm thick vertical Speedpanel. The end wall incorporated a damper assembly to control heat distribution in the furnace and was not part of the specimen.

The 150UC23 mild steel column flange was stitch welded to C tracks of Speedpanel panels and positioned on the non-fire side wall.

A.4.6 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-1997.

A.4.7 Test results

The ambient temperature at the start of the test was 35°C.

The test was terminated after 242 minutes.

The furnace pressure was maintained at 20 ± 3Pa relative to laboratory atmosphere at 2100mm above the furnace floor.

No integrity failure at 242 minutes for the duration of the test.

At 240 minutes, the maximum temperature on the unexposed side of 78mm Speedpanel panel was 364°C.

At 240 minutes, the maximum temperature measured on the I mild steel section was 294°C.

A.5 Test report - EWFA 2736001

A.5.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.5.2 Test laboratory

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

A.5.3 Test date

The test was conducted on 26th July 2012.

A.5.4 Test standards

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

A.5.5 Variations of tested assembly

None

A.5.6 General description of tested specimen

The tested configuration incorporated 78mm thick Speedpanel panels arranged to form a vertical orientated 1920mm high × 2970mm wide wall system positioned above a horizontally orientated 1040mm high × 3000mm wide wall system.

The head detail of the specimen was not typical of regular installation as there was a 15mm air gap inside the head track at the top of the panels and no mastic on the exposed and unexposed sides at the top of the panels around the head track. The panels incorporate a “tongue and groove” detail on their edges. The specimen was tested with bottom horizontal panels section fixed and top vertical panel section with free vertical edges.

The test assembly was asymmetric as the screws in the panel joint in the field of vertical orientated wall system and those connecting the tracks and the panels were not present on the exposed side.

The 82mm wide × 50mm high × 1.15mm thick galvanised steel side C-tracks of the bottom horizontal section of the wall were fixed to perimeter block work using 6.5mm diameter × 50mm long, mushroom head, galvanised steel spikes at nominal 400mm centres. Horizontal panels were fixed to the side track at every second joint, 255mm and 755mm from the bottom of the specimen respectively.

Firetherm Intumastic acrylic sealant was applied to the joints between the panels and the C-track, and to fill the voids between the contours of the panels. Sealant was not applied at panel-panel joints.

A.5.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-2005.

A.5.8 Test results

The test was terminated at 151 minutes.

The ambient temperature at the start of the test was 14°C and varied between 14°C and 16°C during the test.

The wall system failed integrity at 98 minutes when flaming had become evident at head, gap between track and panels at head at mid-width.

The wall system failed insulation at 19 minutes 50 seconds when the temperature measured at the head of specimen, at mid-width exceeded the initial temperature of 180K rise.

A.6 Test report - EWFA 2848300.2

A.6.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.6.2 Test laboratory

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

A.6.3 Test date

The test was conducted on 29th May 2013.

A.6.4 Test standards

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

A.6.5 Variations of tested assembly

None

A.6.6 General description of tested specimen

The test assembly comprised a nominal 3000mm wide × 3000mm high × 64mm thick Speedpanel wall system.

The tested configuration incorporated 64mm thick Speedpanel panels vertically orientated to form a vertical wall system with 0.75mm BMT perimeter track. The panels incorporate a ‘tongue and groove’ detail on their vertical edges.

The side and bottom tracks were made of 67mm wide × 51mm deep × 0.8mm galvanised steel track.

Flat top self-drilling, zinc coated steel screws, 10g × 16mm fixed the side tracks to the panels at 500mm centres on exposed and unexposed side.

Flat top self-drilling, zinc coated steel screws, 10g × 30mm, fixed the head and bottom tracks to the panels at every second panel join on both exposed and unexposed sides. Head fixings were staggered.

Flat top self-drilling, zinc coated steel screws, 10g × 16mm used to fix panels to each other at every second panel join at 1500mm height from bottom on both exposed and unexposed sides.

These fixings were staggered such that one join had one screw fixing at 1500mm height.

Hilti CP 606 Fire resistant joint filler (now marked as Hilti CP 606 Flexible firestop sealant) applied to the joints between the panel and the C-track at head, base and vertical edges on both exposed and unexposed sides and also applied to joints between tracks and surround blockwork along head, base and fixed edges.

A.6.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-2005.

A.6.8 Test results

The test was terminated at 181 minutes.

The ambient temperature at the start of the test was 18°C and did not vary significantly throughout the duration of the test.

Head and Side Tracks Performance

Criteria	Result	Location
Structural Adequacy	Not applicable	Not applicable
Integrity	133 minutes	Sustained flaming at base track
Insulation	14 minutes	The maximum temperature measured at the head track of the specimen in line with join exceeded the maximum temperature rise of 180K.

Wall Panels Performance

Criteria	Result	Location
Structural Adequacy	Not applicable	Not applicable
Integrity	No failure	Not applicable
Insulation	93 minutes	The maximum temperature measured at 15mm from a vertical join exceeded the maximum temperature rise of 180K.

A.7 Test report - EWFA 2798800.1

A.7.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.7.2 Test laboratory

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

A.7.3 Test date

The test was conducted on 29th January 2013.

A.7.4 Test standards

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

A.7.5 Variations of tested assembly

None

A.7.6 General description of tested specimen

The test assembly comprised a nominal 1200mm wide × 1200mm high × 51mm thick Speedpanel wall system penetrated by various services.

A 600mm long × 55mm wide × 52mm deep × 1.2mm galvanised steel head track was installed on the west side and fixed to the lintel with 6.5g × 38mm Mushroom Head Nails. A 600mm long × 60mm wide × 52mm deep × 1.2 BMT galvanised steel head track with intumescent strips in the recessed part of the flange, on either side was installed on the east side and fixed to the lintel with 6.5g × 38mm Mushroom Head Nails.

The side and bottom tracks were made of 55mm wide × 52mm deep × 1.2mm galvanised steel track.

One layer of 13mm thick × 100mm wide × 750mm high Fyrchek plasterboard was installed along the west edge of the specimen wall and fixed to the Speedpanel through west vertical track with 6g × 40mm Bugle Head, Fine Thread, Self-drilling screws.

One layer of 20mm thick × 100mm wide × 750mm high PROMATECT® 100 was installed along the east edge of the specimen wall and fixed to Speedpanel through east vertical track with 6g × 40mm Bugle Head, Fine Thread, Self-drilling screws.

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

Details of the service penetrations are not relevant to this assessment report

A.7.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-2005.

A.7.8 Test results

The test was terminated at 132 minutes.

The ambient temperature at the start of the test was 23˚C and did not vary significantly throughout the duration of the test.

The maximum temperature recorded on the unexposed side of west head C-track at 120 minutes was 351°C.

The maximum temperature recorded on the unexposed side of 13mm thick Fyrchek plasterboard at 120 minutes was 192°C.

The maximum temperature recorded on the unexposed side of 20mm thick PROMATECT® 100 at 120 minutes was 104°C.

The maximum temperature recorded on the unexposed side of wall panel at 120 minutes was 367°C.

A.8 Supplementary test reference - FS 3212/1924

A.8.1 Report sponsor

Speedpanel VIC Pty Ltd, 89-91 Canterbury Road, Kilsyth VIC 3137

A.8.2 Test laboratory

CSIRO, 14 Julius Avenue, North Ryde, NSW 2113.

A.8.3 Test date

The test was conducted on 17th September 2009.

A.8.4 Test standards

The test was conducted in accordance with AS 1530.4-1997.

A.8.5 Variations of tested assembly

None

A.8.6 General description of tested specimen

The tested specimen comprised a 1200mm x 1200mm vertical panel (exposed area of 1000mm x 1000mm) with the specimen comprising two leaves of 78mm thick Speedpanel panels separated by a 65mm wide air gap.

A.8.7 Instrumentation

The test report states that the instrumentation was in accordance with AS 1530.4-1997.

A.8.8 Test results

The test was terminated at 240 minutes.

At 240 minutes the maximum temperature measured on the unexposed face of exposed side leave was 589°C.

At 240 minutes the maximum temperature measured at the centre of the 65mm air gap was 492°C.

At 240 minutes the maximum temperature measured on the unexposed face of unexposed side leave was 6.8°C

A.9 Relevance of AS 1530.4-1997 test data with respect to AS 1530.4-2014

A.9.1 General

1. The referenced fire resistance test BWA 2257600.5, F91794A and FS 3212/1924 were conducted in accordance with AS 1530.4–1997, which differs slightly from AS 1530.4–2014. The differences in test method considered capable of significantly altering specimen performance are discussed below.

A.9.2 Discussion

Furnace Temperature Measurement

2. The specification for furnace thermocouples in AS 1530.4-2014 and AS 1530.4-1997 are not appreciably different.

Furnace Temperature Regime

3. AS 1530.4-2014 specifies furnace temperature to follow the following trend:

$$T_{AS\ 1530.4-2014} = 345log_{10}(8t + 1) + 20$$

4. AS 1530.4-1997 specifies furnace temperature to follow the following trend:

$$T_{AS1530.4-1997} = 345log_{10}(8t + 1) + T_0, 10°C \leq T_0 \geq 40°C$$

5. The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2014 and AS 1530.4-1997 are not appreciably different.

Specimen Temperature Measurement

6. AS 1530.4-2014 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless-steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12mm diameter x 0.2mm thick copper disc. The disc shall be covered by 30 ± 0.5mm x 30 ± 0.5mm x 2.0 ± 0.5mm thick inorganic insulating pad having a density of 900 ± 100kg/m3.

7. AS 1530.4-1997 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless-steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12mm diameter x 0.2mm thick copper disc. The disc shall be covered by an oven-dry pad, not less than 30mm square, made from material having a value $\sqrt{(k\rho c)}$ not greater than 600 at 150°C, and of such thickness as will give a thermal resistance (R = t/K) of 0.015 K/W – 0.025 K/W at 150°C.

Furnace pressure

8. AS 1530.4-1997 stipulates an average 8.5 Pa gradient per meter height over the test specimen. On the other hand, AS 1530.4-2014 stipulates a pressure gradient of 8.0 Pa per meter. Therefore, it is evident that AS 1530.4-1997 is more onerous and if the specimens were to be tested in accordance with AS 1530.4-2014, they would likely behave similarly or better.

Integrity Performance Criteria

9. AS 1530.4-2014 deems integrity failure to have occurred upon collapse, sustained (10 seconds) flaming, ignition of an applied cotton pad or if a 6mm gap gauge can protrude into the furnace and can be moved 150mm along the gap (not applicable at the sill), or if a 25mm gap gauge can protrude into the furnace.
10. AS 1530.4-1997 deems integrity failure to occur upon collapse, the development of cracks, fissures, or other openings through which flames or hot gases can pass.
11. By inspection of test results, there were no integrity failure recorded in the test reports up to 240 minutes. Therefore, application of a cotton pad is expected not to change the results significantly.

Insulation Performance Criteria

12. The insulation criteria specified in AS 1530.4-2014 and the same as those specified in AS 1530.4-1997.

A.9.3 Application of Test Data to AS 1530.4-2014

13. The minor variations in furnace heating regimes, pressure gradients and integrity criteria are not considered likely to significantly affect the behaviour of the specimens relevant to this assessment.
14. In light of the above, it is considered that the integrity and insulation behaviour of systems tested in BWA 2257600.5, F91794A and FS 3212/1924 teste reports can be used to assess the likely performance in accordance with AS 1530.4-2014.

A.10 Relevance of AS 1530.4-2005 test data with respect to AS 1530.4-2014

A.10.1 General

The fire resistance tests EWFA 2741700.1, EWFA 29942200.1, EWFA 2736001 and EWFA 2848300.2 were conducted in accordance with AS 1530.4-2005, which differs from AS 1530.4-2014. The effect these differences have on fire resistance performance of the referenced test specimens is discussed below.

A.10.2 Discussion

Temperature

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.

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

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

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

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

The furnace pressure conditions for single and multiple penetration sealing systems in AS 1530.4-2005 and AS 1530.4-2014 are not appreciably different,

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

Performance Criteria

AS 1530.4-2014 specifies the following performance criteria for building materials and structures:

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

Integrity

AS 1530.4-2014 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.

Apart from the above variation, the failure criteria for integrity in AS 1530.4-2014 and AS 1530.4-2005 are not appreciably different.

Insulation

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

A.10.3 Application of Test Data to AS 1530.4-2014

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 systems in the referenced tests to a greater extend.

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 in EWFA 2741700.1, EWFA 29942200.1, EWFA 2736001 and EWFA 2848300.2 can be used to assess the integrity and insulation performance in accordance with AS 1530.4-2014.

Appendix B Assessment of specific variations

B.1 Double Skin 78mm Horizontally Orientated Wall System

B.1.1 Proposed constructions

1. The proposed construction shall be horizontally orientated 78mm thick Speedpanel wall panel as tested in EWFA 2257600.4 with consideration given to the following variations:

- The wall system comprised two layers of 78mm thick horizontally orientated Speedpanel wall with a minimum 50mm thick air gap in between. The plan view of the arrangement of Speedpanel wall systems is shown in Figure 1 of this report.
- The panel span shall be maximum 3m wide with a maximum height of 30m and shall be supported by SHS or RHS structural columns at each panel end as per details B, D or G.
- Each panel end shall be alternatively supported by structural steel I or H section instead of SHS or RHS in details B and G.
- The panel span shall incorporate an intermediate support detail C if the span exceeds 3m wide and up to 5.6m and use the same panel end fixing details as per the 3m wide span.
- The wall system shall incorporate an obtuse angle end support detail as per detail A (Figure 5 of this report).
- The wall system shall incorporate a 90 degree end support as per detail E or F.
- Each Speedpanel wall head shall be protected with either steel flashing or single layer of 13mm thick fire grade plasterboard strip at one side as shown in Figures 2 and 3.
- Each post is required to be laterally supported at top and bottom to remain as tested.

B.1.2 Discussion

Performance of Support Connection Details

Tested Specimen

2. The tested specimen in test EWFA 2736001.1 incorporated 78mm thick Speedpanel panels arranged to form a vertically orientated 1920mm high × 2970mm wide wall system positioned above a horizontal orientated 1040mm high × 3000mm wide wall system.

3. The 82mm wide × 50mm high × 1.15mm thick galvanised steel side C-tracks of the bottom horizontal section of the wall was fixed to perimeter block work using 6.5mm diameter × 50mm long, mushroom head, galvanised steel spikes at nominal 400mm centres. Horizontal panels were fixed to the side track at both exposed and unexposed sides and at every second join (500mm centre) by using 10g × 16mm flat top self-drilling, zinc coated steel screws at 255mm and 755mm from the bottom of the specimen respectively. The weight of top vertically orientated Speedpanel wall was supported by the bottom horizontally orientated Speedpanel wall.

4. When tested, the bottom horizontally orientated Speedpanel wall maintained structural adequacy for 151 minutes. The maximum temperature measured on the unexposed side of side C track at the end of the test was around 453°C.

5. By inspection of the load path of the tested configuration, the key components govern the structural adequacy performance of tested support connection are summarised below:

Components	Tested Product	Fixing spacing
Fixing to horizontal panel on both exposed and unexposed side	10g × 16mm self-drilling screws	At 500mm centres
C-track capping	82mm × 50mm × 1.15BMT galvanized steel C-track	-
Fixing to surrounding concrete block	M6.5 × 50mm mushroom head, galvanized steel spikes	At 400mm centres

6. Based on the above, the capacity of each single fixing screw fixed to horizontal panel to support the tested wall weight at 453°C has been calculated to be 88kg without introducing any foreseeable weakness to the structural adequacy of wall system. With reference to AS4100-1998 clause 12.4.1, the residual yield stress at 453°C is 65.5%.

End Support Details of Speedpanel Wall Span

7. The proposed end support details in Figures 6, 8 and 12-16 support maximum four 78mm thick Speedpanel wall spans and the maximum span length is 5.6m.

8. The proposed corner support details in Figures 5, 9, 10 and 11 support maximum three 78mm thick Speedpanel wall spans and the maximum each span length is 5.6m.

9. It is required that each steel post is designed to carry the weight of Speedpanel wall spans, and the steel posts are laterally supported at top and below. It is to be noted that all structural elements are required to be engineered, together with calculations verified, by others to support the Speedpanel and any other imposed loads.

10. In 40534400.1, SHS and RHS sections were assessed to be as the structural member to carry the weight of Speedpanel wall system at its ends. It is further proposed to have structural steel I or H section columns as an alternative to SHS and RHS in this report. It is the opinion of this test laboratory that having I or H section columns will not detrimentally affect the structural performance of the wall panels given that these sections are designed adequately by a certified structural engineer.

11. In the proposed construction, Speedpanel walls are connected to I or H section columns via a steel plate, T section or two equal angles welded to the flange. The panels are proposed to fix with 12-gauge screws with 250 mm centres and thus the proposed construction will likely add more rigidity and stability to the system.

12. By inspection of the load path of the proposed end support and corner support details, the key components governing the structural adequacy performance of each 78mm thick Speedpanel wall span at each end are summarised below:

Components	Proposed Product	Fixing Spacing
Fixing to horizontal panel on the unexposed side	10g × 30mm self-drilling screws	At 250mm centres
Side track capping	80mm × 50mm × 1.15BMT galvanised steel track	-
Steel angle connecting to structure column	50mm × 50mm × 1.15BMT galvanised steel track	-
Fixing to structure column	10g × 30mm self-drilling screws	At 500mm centres

13. The proposed construction includes a Speedpanel wall layer on each side of the structural column. It is expected that the cavity within the wall could tend to accumulate heat.

14. The specimen tested in FS 3212/1924 comprised a 1200mm x 1200mm wall specimen incorporating two layers of 78mm thick Speedpanel panel separated by a 65mm wide air gap.

15. When tested, the maximum unexposed side temperature measured on the non-fire side layer of Speedpanel wall at 240 minutes was below 100°C and the maximum unexposed side temperature measured on the fire side layer of Speedpanel wall at 240 minutes was 589°C.

16. Referenced test report F91794A incorporated the construction of a Speedpanel wall with a hot rolled 150UC23 fixed behind a joint in the panels. When tested the maximum temperature of the Speedpanel surface at 240 minutes was 364°C and the maximum temperature of hot flange at 240 minutes was 294°C.

17. The significance of the above measurements indicates that the steel section temperatures lag the Speedpanel surface temperature by some margin and the thermal gradient in the steel column was not large.

18. It is considered the temperature of the proposed fixing screws fixed to the unexposed side of the Speedpanel panel at 240 minutes would likely be similar to that on the unexposed side of

the fire side Speedpanel wall tested in FS 3212/1924. Therefore, with reference to AS4100:1998 clause 12.4.1, the yield stress at 589°C is 46%.

19. It is then conservatively considered the temperature of proposed steel angle and fixing screws to the structure column at 240 minutes is cooler than the unexposed side of fire side Speedpanel wall. Hence, it is expected to be lower than 500°C. With reference to AS4100 clause 12.4.1, the yield stress at 500°C is 59%.

20. It is calculated the force introduced by the weight of proposed Speedpanel wall span on each single fixing screw is 29.12kg, which is 33% of tested weight in EWFA 2736001.1.

Total load on each fixing = (density × length)/ (No of fixing on a panel)

= (10.4 kg/m × 5.6 m) / 2

= 29.12 kg

21. It is calculated the yield strength of the key components in comparison with that tested in EWFA 2736001.1 is reduced by maximum 30%.

Yield strength reduction = (65.5 – 46) × 100/ 65.5 = 30% (refer clause 6 and 18)

22. Based on the above combined effect of load and reduced yield stress, the maximum force that can be introduced on a single fixing screw at 240 minutes is 88*46/65.5 = 61.8kg > 29.12kg (safe).

23. The proposed end support and corner support details in Figures 9 to 11 in this report are protected by steel flashing, 1 x 13mm thick fire grade plasterboard or 20mm thick Promatect 100 strip on each side.

24. The presence of the steel flashing, or fire grade plasterboard would likely prevent the end support details from directly expose to fire for a notional margin and would reduce the tendency of gap formations at the supports.

25. With reference to EWFA 2798800.1, 20mm thick Promatect 100 and 13mm thick Fyrchek plasterboard were installed on the unexposed side of a Speedpanel wall. Upon testing, Promatect 100 recorded a maximum temperature rise of 81°C after 120 minutes and 13mm thick Fyrchek plasterboard recorded a maximum temperature rise of 169°C. From this it is proven that Promatect 100 has the ability to maintain the temperature at lower levels by acting as a thermal barrier.

26. Therefore, similar to steel flashing and fire grade plasterboard, Promatect 100 has the ability to prevent the end support construction from direct fire exposure.

27. Figure 11 in this report is an alternative construction option which consists of through screw fixing connecting the structural steel section and the Speedpanel instead of an equal angle connecting both. Screw fixing is expected to maintain the fixity throughout the fire exposure and thus the proposed corner construction is likely to maintain the stability and rigidity.

28. Based on the above, it is considered the proposed end support and corner support details will not have significantly detrimental effect on collapse performance and integrity performance up to 240 minutes if tested in accordance with AS 1530.4-2014.

Performance of Intermediate Support Detail

29. It is proposed that the wall span shall incorporate an intermediate support detail in Figure 7 if the span width exceeds 3m wide. The maximum width even with an intermediate support shall be limited to 5.6m and the same 3m wide span end fixing details shall be used.

30. The key aspects of the intermediate support detail are the viability of the panel connection to the adjoining wall element and the risk of the formation of gaps that could allow the transmission of hot gases to ignite a cotton pad.

31. With reference to test EWFA 2736001.1, the tested loadbearing horizontally orientated panels remained together at the horizontal joints and deflected together.

32. With reference to test EWFA 2257600, the tested non-loadbearing horizontal orientated panels also remained together at the horizontal joints and deflected in unison at 240 minutes. The panel deflection was 180mm at the centre of the wall and was 60mm at the top and base of the wall at 240 minutes.

33. The significance of the above result is that when the panels are free to deflect without structural connection like an angle, track or bracket, gaps may form.

34. With reference to the intermediate support detail in Figure 7, 14-gauge x 150mm hex head fine thread screws are fixed at 250mm centres at each panel joins.

35. The presence of screw fixings will tend to maintain the joins to be essentially connected without any significant tendency for the gap to form to cause integrity and insulation weakness at this particular location.

36. The deflection of the wall panels is driven by thermal expansion up to 240 minutes. With reference to test EWFA 2257600, the maximum temperature on the unexposed side of the Speedpanel at 240 minutes was 365°C.

37. The proposed construction includes Speedpanel on each side of the structural column. It is expected that the cavity within the wall could tend to accumulate heat. The enclosed space will however also be exposed to the cooler non-fire side panel and some cooling effects will be provided to the cavity, in particular when there is steaming of the Speedpanel panels.

38. It is then conservatively considered the core of fire side Speedpanel layer at 240 minutes is 500°C.

39. It is therefore expected the temperature of proposed fixing screws embedded into the Speedpanel panel at 240 minutes would likely to be similar to the core of the Speedpanel panel and with reference to AS4100 clause 12.4.1, the yield stress at 500°C is 59%,

40. The proposed wall span is maximum 5.6m long and with reference to the thermal curvature tested in EWFA 2257600, the expected deflection at the centre of the 5.6m wall span at 240 minutes is 651mm.

41. It is calculated the force on each fixing is at most, 22.4 kg, which is 26% of the strength capacity of the proposed fixing screws.

42. Based on the above the combined effect of load, thermal deflection and reduced yield stress, the stress ratio at 240 minutes for the proposed fixing screws is 88*59/65.5 = 84.0kg > 22.4kg (safe).

43. The proposed construction comprises fixing screws at each panel joins hence it is expected there shall be no detrimental weakness to the insulation performance of wall system as no increased tendency of gap formation at panel joins.

44. Following the above discussions, it is considered the proposed intermediate support detail will not have significantly detrimental effect on the integrity and insulation performance up to 240 minutes if tested in accordance with AS 1530.4-2014.

Performance of Two layers of Speedpanel Panels

Integrity Performance

45. The tested specimen in BWA 2257600 incorporated 78mm thick Speedpanel panels horizontally orientated to form a vertical barrier. The panels were supported at their ends on the vertical edge of the assembly and the top and bottom of the specimen were unrestrained.

46. The panels were fixed by 83mm wide × 54mm high × 1.19mm thick steel C-tracks on the vertical edges at every second panel join (500mm centres) on both exposed and unexposed sides with 35mm long self-tapping screws. Both the top and bottom panels were fixed to the top and bottom C-track at 450mm centres with 35mm long self-tapping screws.

47. The first horizontal panel joint from the bottom was fixed at 250mm centres with 35mm long self-tapping screws. The second horizontal panel joint from the bottom was fixed at 500mm centres with 35mm long self-tapping screws. No other fixings were applied to any other joints on either face of the panels.

48. When tested, the wall specimen stayed in place for the test duration of 242 minutes. It was observed the first panel join from the top that had begun to laterally separate near the mid-width of the wall and ignited the cotton pad at 128 minutes. No gaps greater than 6mm thick × 150mm long were evident at this location. Number of opening formations were spotted on the unexposed side at panel joins during 140 minutes to 160 minutes though all gaps that had

previously opened up during the test had closed and there were no visible gaps evident into the furnace at 240 minutes.

49. The significance of the above observations indicates for single layer of 78mm thick Speedpanel panel wall, joins would open during the test duration though the wall did not collapse for up to 240 minutes.

50. The proposed construction comprises two layers of 78mm thick horizontally orientated Speedpanel panels with a minimum 50mm wide air gap. Panels are supported by steel RHS, SHS, I or H section columns at maximum 3m centres located within the air gap.

51. It is therefore expected the deflection of proposed construction would be similar to that tested in EWFA 2257600.

52. In light of the above, it is considered during the 240 minutes fire exposure, the fire side layer of 78mm thick Speedpanel wall will stay in place and provide some form of barrier to radiation and thermal resistance for the non-fire side Speedpanel layer.

53. The non-fire side layer Speedpanel wall which is thermally separated from the fire side layer is therefore not directly exposed to the fire and accordingly will be much cooler and the integrity of the non-fire side layer will be maintained for a longer period. It is also expected that if exposure is decreased the deflection will also be reduced.

54. Based on the above, it is considered the proposed double layer 78mm thick Speedpanel wall system will maintain integrity for 240 minutes if tested in accordance with AS 1530.4-2014.

Insulation Performance

55. The test specimen tested in test FS 3212/1924 comprised a 1200mm x 1200mm wall specimen incorporating two layers of 78mm thick Speedpanel panel separated by a 65mm wide air gap.

56. When tested, the maximum unexposed side temperature measured on the non-fire side layer of Speedpanel wall at 240 minutes was below 100°C.

57. By inspection of above test results and with reference to test BWA 2257600 which indicates the fire side 78mm thick Speedpanel wall would stay in place for 240 minutes, it is expected without impending integrity failure before 240 minutes for the proposed construction, that the insulation performance of wall system tested in pilot scale test FS 3212/1924 can be applied to a fully scaled test if tested in accordance with AS 1530.4-2014.

58. In addition, the proposed construction in Figure 16 uses a Promatect-L to protect the SHS or RHS steel section. Promatect-L is expected to provide up to 240 minutes of protection for structural steel columns and therefore is capable of maintaining structural adequacy of columns up to 240 minutes. However, the required Promatect-L thickness shall be determined according to Hp/A value using Promat's specifications. In addition, these boards will be fixed to Speedpanel at 250mm centres and is expected to maintain adequate integrity and insulation performance of up to 240 minutes.

59. Based on the above, it is considered the proposed wall system will maintain insulation performance of 240 minutes if tested in accordance with AS 1530.4-2014.

Performance of Head and Bottom Details

Head Details in Figure 2 and 3

60. The proposed head details are shown in figure 2 and 3.

61. With reference to BWA 2257600.5, it was recorded the maximum temperature measured on the unexposed side of topside c-track of single layer of 78mm thick Speedpanel wall at 240 minutes was 373°C.

62. As discussed previously, it is expected that the cavity within the wall layers could tend to accumulate heat, hence it is expected the unexposed side temperature on the topside C-track would be similar to that on the unexposed side of fire side Speedpanel wall tested in FS 3212/1924, which was 590°C at 240 minutes.

63. It is considered the fire side Speedpanel layer would stay in place for 240 minutes and the non-fire 78mm Speedpanel layer would experience a much lower heat exposure for the duration of 240 minutes.

64. The tested assembly in test EWFA 2741700 comprised a 78mm thick vertically orientated Speedpanel panel wall incorporating two doorset. The standard 82mm deep × 1.2mm BMT head C-track of Speedpanel wall was protected by a flashing cap or 13mm thick × 120mm deep fire grade plasterboard strip protected at either fire exposed side or unexposed side.

65. When tested both head details achieved an integrity performance of 132 minutes.

66. With reference to the test results of EWFA 2741700, it was observed that the maximum temperature recorded on the unexposed side at 120 minutes for flashing cap fixed on either the fire side or non-fire side of head C-track was 177°C with a 20°C margin from the maximum temperature rise criteria.

67. With reference to the test results of EWFA 2741700, it was observed that the maximum temperature recorded on the unexposed side at 120 minutes for 13mm fire grade plasterboard strip fixed on either the fire side or non-fire side of head C-track was 165°C.

68. The proposed head detail in figure 2 and 3 is similar to the head detail options tested in EWFA 2741700.

69. It is considered that the head detail tested in EWFA 2741700 is exposed to a more severe heat exposure condition up to 120 minutes in comparison with the head detail of non-fire side Speedpanel layer of proposed construction for 240 minutes.

70. It is therefore considered that the proposed head detail will perform similarly to that tested EWFA 2741700.

71. Based on the above, it is considered the proposed head details in Figure 2 and 3 are capable of maintaining integrity and insulation performance for a period of 240 minutes.

Bottom Detail in Figure 4

72. The proposed base detail is shown in figure 4.

73. For the proposed detail, the presence of the sealant between C-track flange and wall panel is expected prevent hot gases from the exposed side from freely passing through to the C-track, at least until the sealants fall away.

74. The wall base detail is similar to the wall side detail tested in EWFA 2848300.2, which comprised 64mm thick Speedpanel panels, when tested the side detail achieved an integrity performance of 181 minutes and insulation performance of 137 minutes.

75. It is considered the fire side Speedpanel layer would stay in place for 240 minutes, the non-fire 78mm Speedpanel layer therefore exposes to a much lower heat exposure for the duration of 240 minutes.

76. It is considered that the bottom detail tested in EWFA 2848300.2 is exposed to a more severe heat exposure condition during 120 minutes in comparison with the bottom detail of non-fire side Speedpanel layer of proposed construction for 240 minutes.

77. It is therefore reasonable considered the proposed bottom detail will perform similarly to that tested side detail in EWFA 2848300.2

78. Based on the above, it is considered the proposed bottom detail in Figure 4 is capable of maintaining integrity and insulation performance for a period of 240 minutes.

B.2 Alternate sealant product at side and base of walls

B.2.1 Proposed constructions

1. The sealant product at side and bottom tracks can be optionally Hilti CP 606 Flexible firestop sealant or Sika Firerate – PU sealant as tested in EWFA 29942200.

B.2.2 Discussion

2. The test specimen in test EWFA 29942200 comprised a 78mm Speedpanel wall system incorporating panel joints fixed at 1000mm centres. The tested wall specimen comprised perimeter tracks fixed to Speedpanel panels at non-fire side only at 500mm centres and Sika

Firerate – PU sealant was applied at the interface of side, bottom tracks and panel on the non-fire side only.

3. When tested, the side and bottom details maintained integrity performance of 123 minutes with no sign of impending integrity failure during the test duration. It was observed smoke emission had become evident from bottom track at early stage of the test and cracking of sealant at sill was observed at 28 minutes and 45 minutes.

4. Upon inspection test observations and post-test photos of test EWFA 29942200, it was observed the Sika Firerate – PU sealant stayed in place during the test duration and there were no dark spots observed along the side and bottom tracks of the tested wall specimen.

5. The significance of above test results and observations indicates the proposed Sika Firerate – PU sealant has good compatibility with steel tracks and Speedpanel panels.

6. With reference to test BWA 2286900.5, EWFA 2848300 and EWFA 2736002.1, the wall edge and base details of 78mm, 64mm and 51mm thick Speedpanel walls were sealed with Hilti CP 606 Flexible firestop sealant. When tested, it was observed smoke emission had become evident at side and bottom tracks at early stage of the test and the Hilti CP 606 Flexible firestop sealant sheared during the test though did not introduce any foreseeable detrimental effect on the fire resistance performance of the wall systems for up to 120 minutes.

7. Based on the above, it is considered the proposed Sika Firerate – PU sealant behaves similarly to the tested Hilti CP 606 Flexible firestop sealant in BWA 2286900.5, EWFA 2848300 and EWFA 2736002.1.

8. As discussed previously, it is confirmed the side and bottom details in figure 14 to 20 would not introduce any integrity and insulation weakness of the performance of 78mm, 64mm and 51mm Speedpanel wall for up to 120 minutes if they are sealed with Hilti CP 606 Flexible firestop sealant.

9. It is considered that if the fire side Speedpanel layer were to remain integral for 240 minutes, the non-fire 78mm Speedpanel layer would therefore be exposed to a much lower heat exposure for the duration of 240 minutes and remain integral as well.

10. It is considered the perimeter details tested in the above fire resistance tests are exposed to a more server heat exposure condition during 120 minutes in comparison with the head detail of non-fire side Speedpanel layer of proposed construction for 240 minutes.

11. It is therefore reasonably considered the proposed perimeter detail will perform similarly to that tested.

12. Based on the above, it is expected that in substituting the Hilti CP 606 Flexible firestop sealant with Sika Firerate – PU sealant, the integrity and insulation performance of the proposed Speedpanel wall systems would not be compromised and be effective for up to 240 minutes.

13. Based on the above, it is considered the proposed construction is positively assessed if tested in accordance with AS 1530.4-2014.