ASSESSMENT REPORT

The fire resistance performance of 78mm thick Speedpanel wall systems installed in a scissor stair configuration when tested in accordance with AS1530.4-2005

Report No:

35875300.5

Report Sponsor:

Speedpanel Victoria Pty Ltd
421 Dorset Road,
Bayswater, VIC 3153

Testing. Advising. Assuring.

DOCUMENT REVISION STATUS

Date issued	Issue No.	Description	Prepared by	Reviewed by
24/07/2015	35875300	Initial issue	S. Hu	K. Nichols
16/11/2015	35875300.1	Revised discussion in appendix B	S. Hu	K. Nichols
29/01/2016	35875300.2	Revised to include 85mm wide gap between Speedpanel barrier and stair stringer	S. Hu	K. Nichols
29/02/2016	35875300.3	Revised to include an additional seal option for 85mm wide gap between Speedpanel barrier and stair stringer.	S. Hu	K. Nichols
27/07/2016	35875300.4	Revised to include vertically orientated Speedpanel wall option	S. Hu	D. Nicholson
19/07/2018	35875300.5	Revised to include box riser, off stair riser and dual-stack riser installations and new installation details.	H. Wong	C. McLean

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CONTENTS

1 INTRODUCTION

This report presents an assessment of the fire resistance performance of 78mm thick Speedpanel wall systems installed in a scissor stair configuration when tested in accordance with AS1530.4-2005.

The basis of the approach in this report is to confirm that when Speedpanel wall section that acts to provide horizontal separation between the stairways there will be the same number of fixings per panel on the unexposed side to support the wall section as there were in the tested construction.

The tested systems are described in Section 2 and are to be subject to the proposed variations described in Section 3 and 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 is based on fire resistance tests EWFA 2736001.1, WFRA 41162.1, BWA 2286900.5, WARRES No. 69754/C and EWFA 2736000.1 together with reference from assessment reports FAR 3580, FAR 3583, and EWFA 22551-11.

The test specimen reported in EWFA 2736001.1 comprised 78mm thick Speedpanel panels arranged to form a vertically orientated wall system positioned above a horizontal orientated wall system tested in accordance with AS1530.4-2005. The test was sponsored by Speedpanel Vic. Pty Ltd.

The test specimen reported in EWFA 2736000.1 comprised 78mm thick Speedpanel wall system incorporated various apertures were filled with TBA Intubatt. The test was sponsored by Speedpanel Vic. Pty Ltd.

The test specimen reported in WFRA 41162.1 comprised a 48mm thick Speedpanel wall tested in accordance with AS1530.4-1997. This test was sponsored by Speedpanel Victoria Pty Ltd.

BWA 2286900.5 comprised a test of a vertical 78mm thick Speedpanel wall system 3m × 3m in size. The wall was loaded to simulate a wall of increased height. The specimen was tested in accordance with AS 1530.4-2005 and sponsored by Speedpanel Vic Pty. Ltd

WARRES No. 69754/C comprised a test of linear gap sealing systems protected with Hilti sealant CP606 in concrete floor construction when tested in accordance with BS 476: Part 20: 1987. The test was conducted by Warrington Fire Research and was sponsored by Hilti Ag who has granted permission to reference the test data.

FAR 3580 comprised an assessment of horizontal and vertical orientated non-loadbearing Speedpanel walls with increase in height up to 6 metres and increase in width to 4,500mm. FAR 3683 comprised an assessment of a non-loadbearing continuous height horizontal orientated Speedpanel wall interfaced with a vertical Speedpanel wall. Both assessment reports were based on data from fire resistance tests. The reports were prepared by Branz and sponsored by Speedpanel Vic. Pty Ltd. EWFA 22551-11 comprised an assessment of the fire resistance performance of vertical Speedpanel wall systems based on fire tests. The report was prepared by Exova Warringtonfire Aus Pty Ltd and sponsored by Speedpanel Vic. Pty Ltd.

Supplementary reference is made to test Chilt/RF01120D conducted by Chiltern International Fire and sponsored by Firestopit.com Limited who has granted permission to reference the test data.

3 VARIATION TO TESTED PROTOTYPES

3.1 Proposed scissor stair with 78mm thick Horizontally Orientated Speedpanel Wall

The proposed construction comprises horizontally orientated Speedpanel panels as tested in EWFA 2736001.1 and installed in the configuration shown in figures 1, 2 and 3.

- The wall shall be fixed to the stair tread stringer on both sides of the wall with a steel angle with options for 0-10mm, 0-20mm, 0-35mm and 0-95mm gaps.
- The total length of Speedpanel wall is maximum 5.0m.
- The height of Speedpanel wall is unlimited.
- Box riser in the stair
- Dual-Stack scissor stair
- External cladding of Speedpanel wall panels (for both horizontally and vertically orientated) with fibre cement sheets

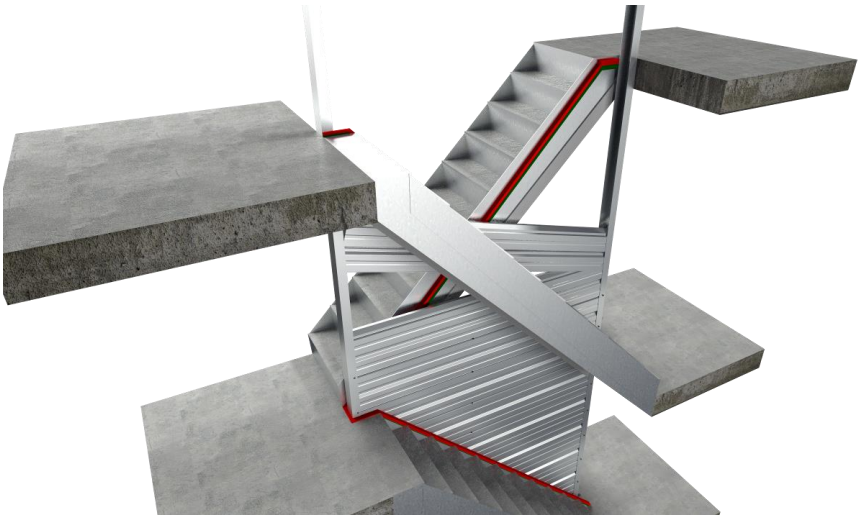


Figure 1: Scissor stair configuration during assembly – Hilti Sealant CP 606 at top

Figure 2: Scissor stair configuration during assembly, steel angle at bottom

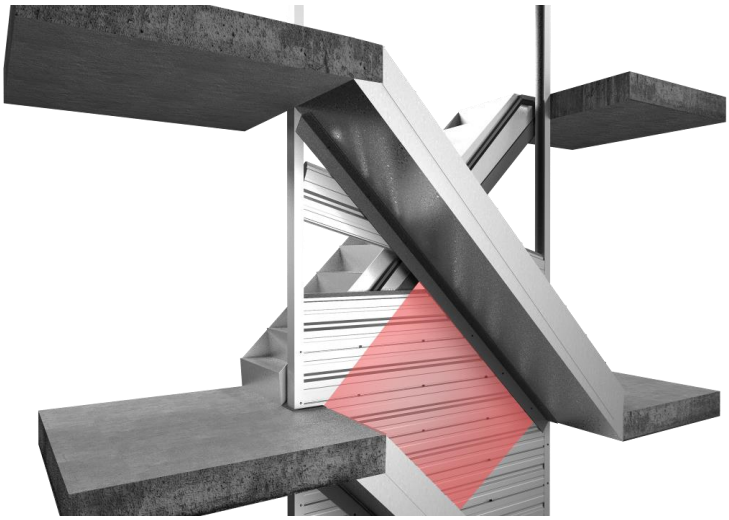


Figure 3: Scissor stair configuration during assembly. The part of wall providing fire separation highlighted.

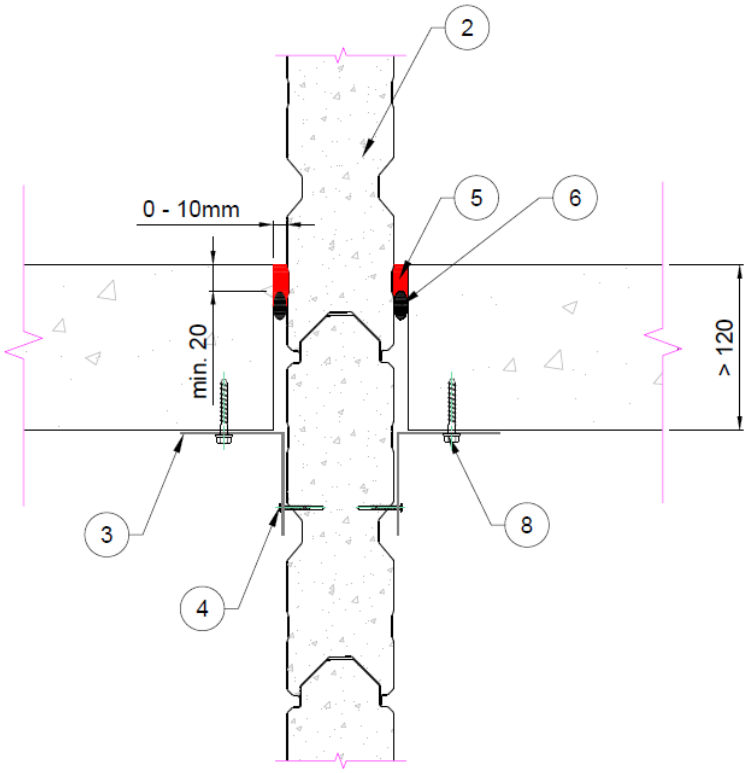


Figure 4: Wall-to-stair Joint (0-10 mm gap)

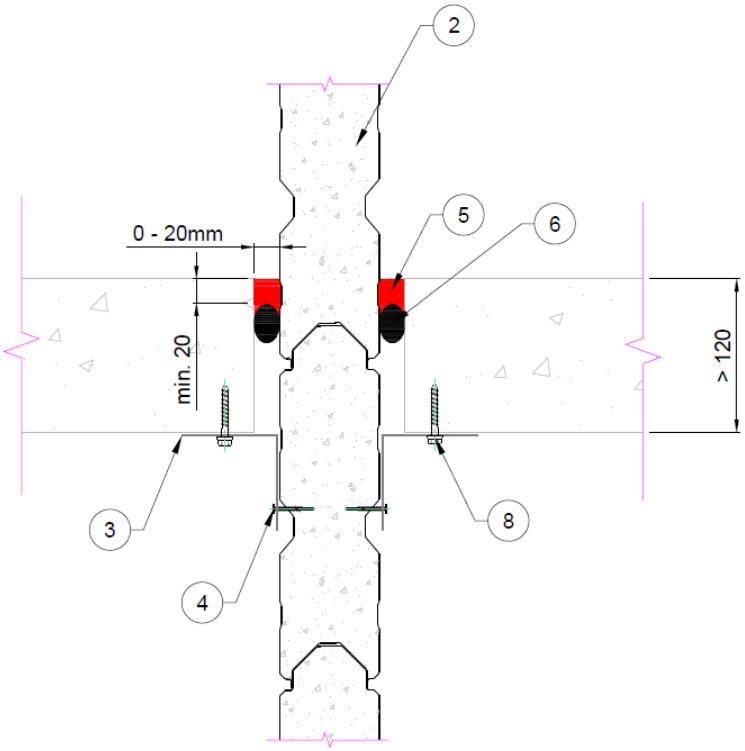


Figure 5: Wall-to-stair Joint (0-20 mm gap)

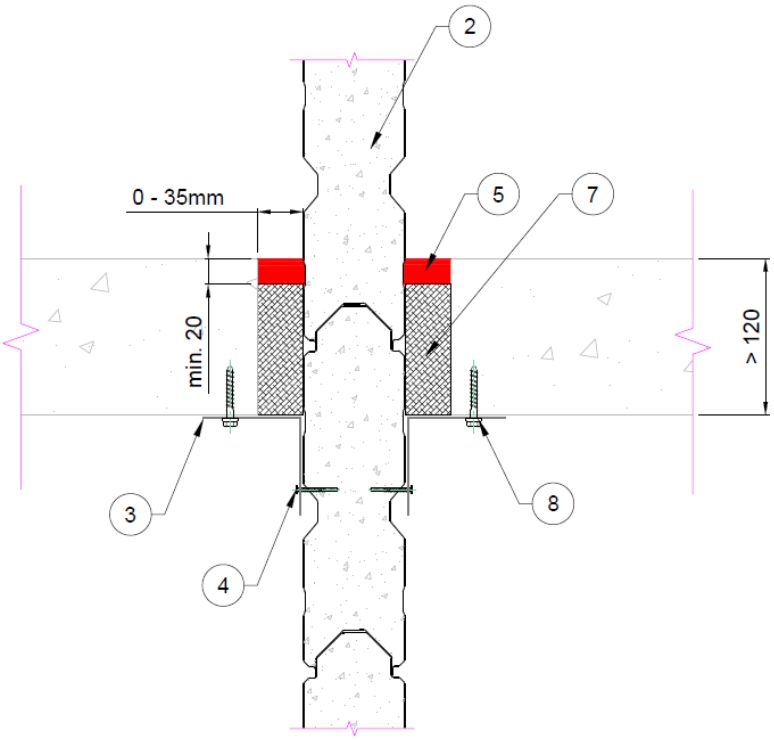


Figure 6: Wall-to-stair Joint (0-35 mm gap)

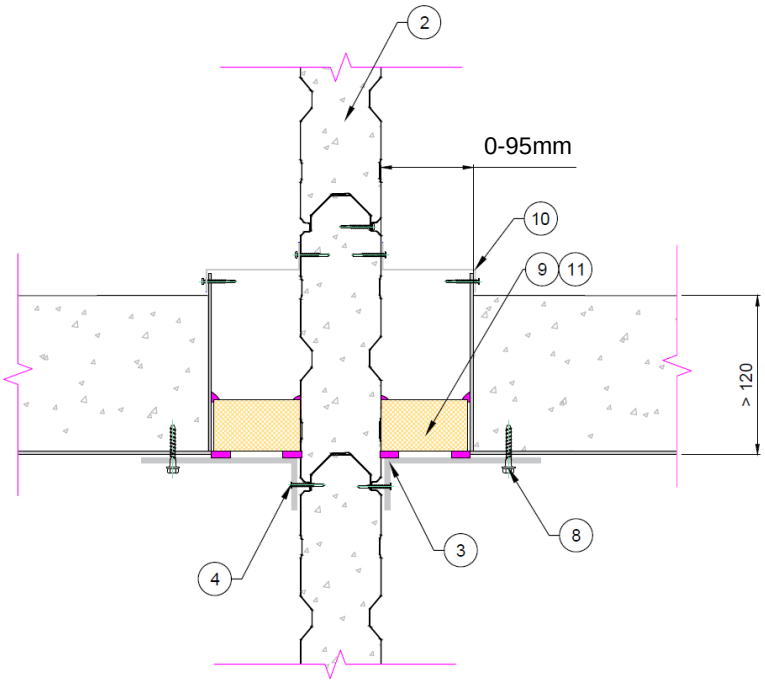


Figure 7: Wall-to-stair Joint (0-95 mm gap)

3.2 Proposed scissor stair with 78mm thick Vertically Orientated Speedpanel Wall

The proposed construction comprises vertically orientated Speedpanel panels as tested in BWA 2286900.5 and installed in the configuration shown in figures 8 and 9.

- The wall shall be fixed to the stair tread stringer on both sides of the wall with a steel angle with options for 0-10mm, 0-20mm, 0-35mm and 0-95mm gaps.
- The height of Speedpanel wall is unlimited. The maximum Speedpanel panel vertical span between concrete landings (floor to floor) is 3m high.
- The width of Speedpanel wall is unlimited.
- The back to back C-tracks shall be protected with a 0.7mm thick steel flashing on one side only.

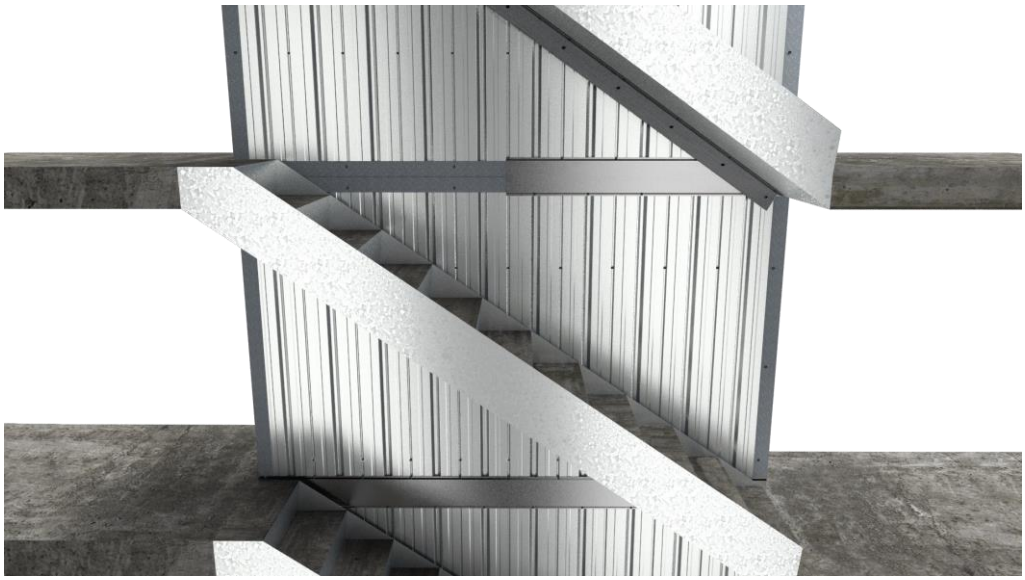


Figure 8: Scissor stair configuration, steel angle at bottom

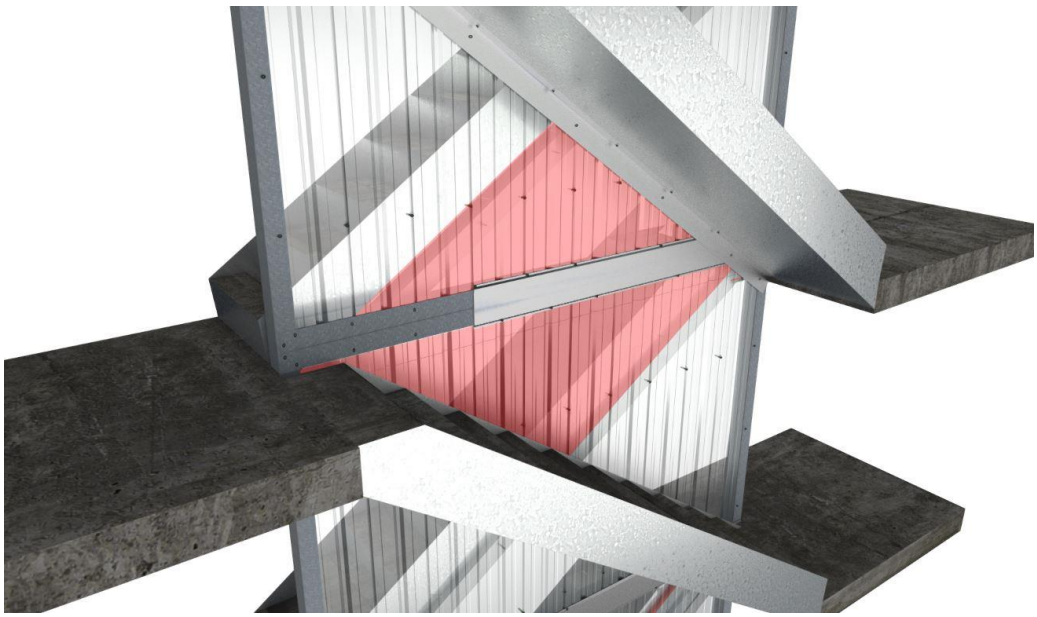


Figure 9: Scissor stair configuration. The part of wall providing fire separation highlighted.

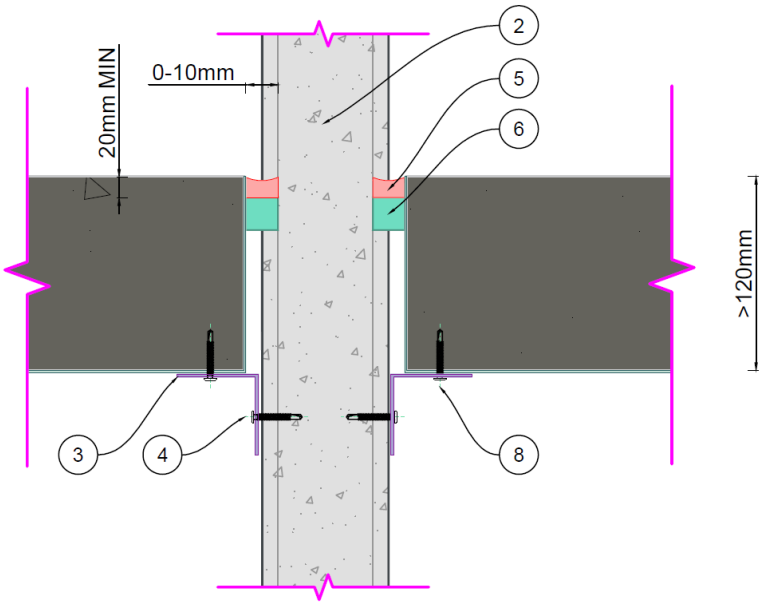


Figure 10: Wall-to-stair Joint (0-10 mm gap)

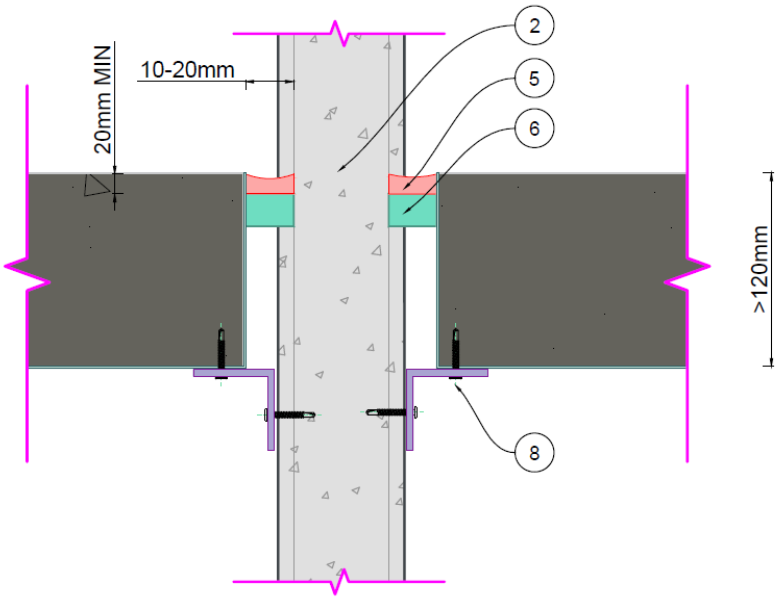


Figure 11: Wall-to-stair Joint (10-20 mm gap)

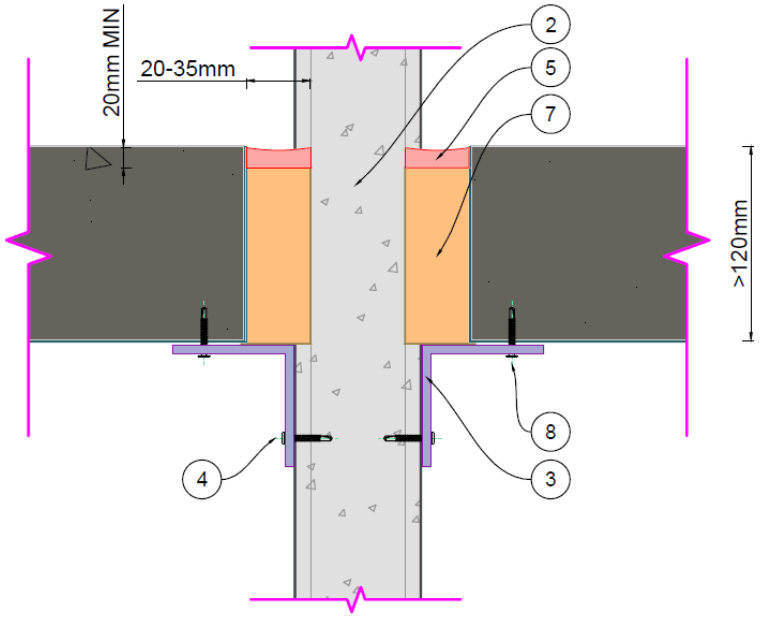


Figure 12: Wall-to-stair Joint (20-35 mm gap)

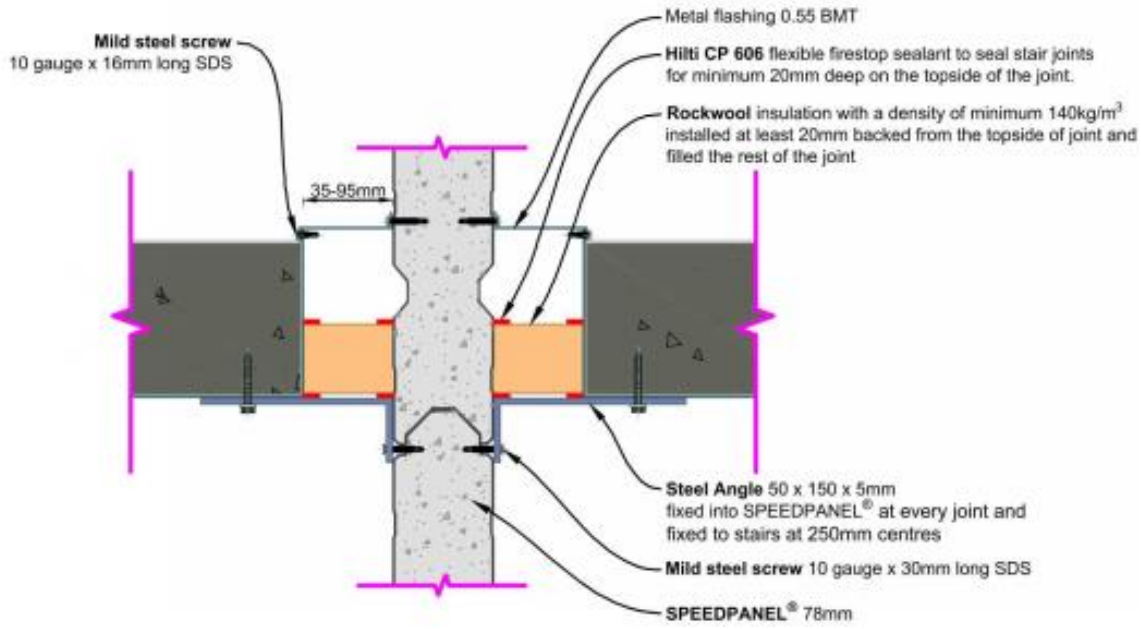


Figure 13: Wall-to-stair Joint (35-95 mm gap)

35-95mm

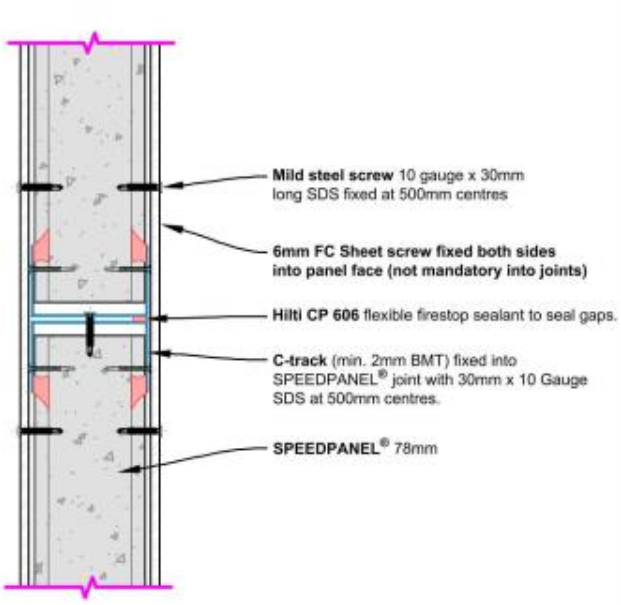


Figure 14-A: Back to Back C-tracks- Connections at Landing - Alternative-1

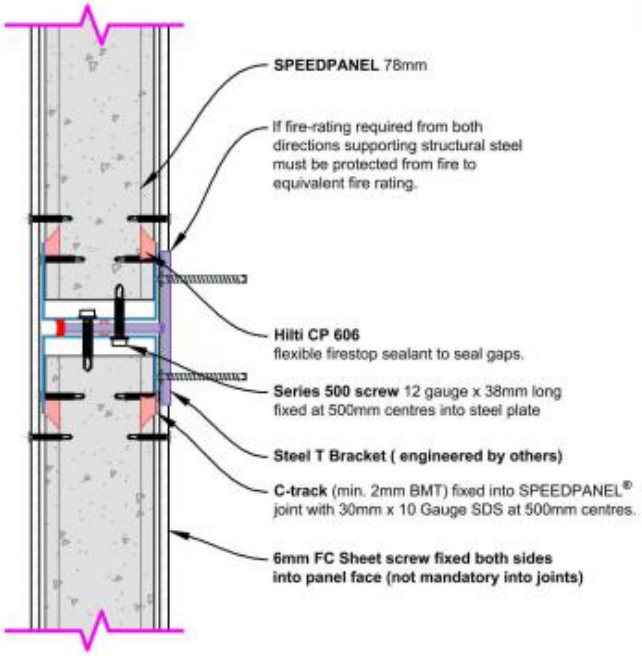


Figure 14-B: Back to Back C-tracks- Connection Details - Alternative-2

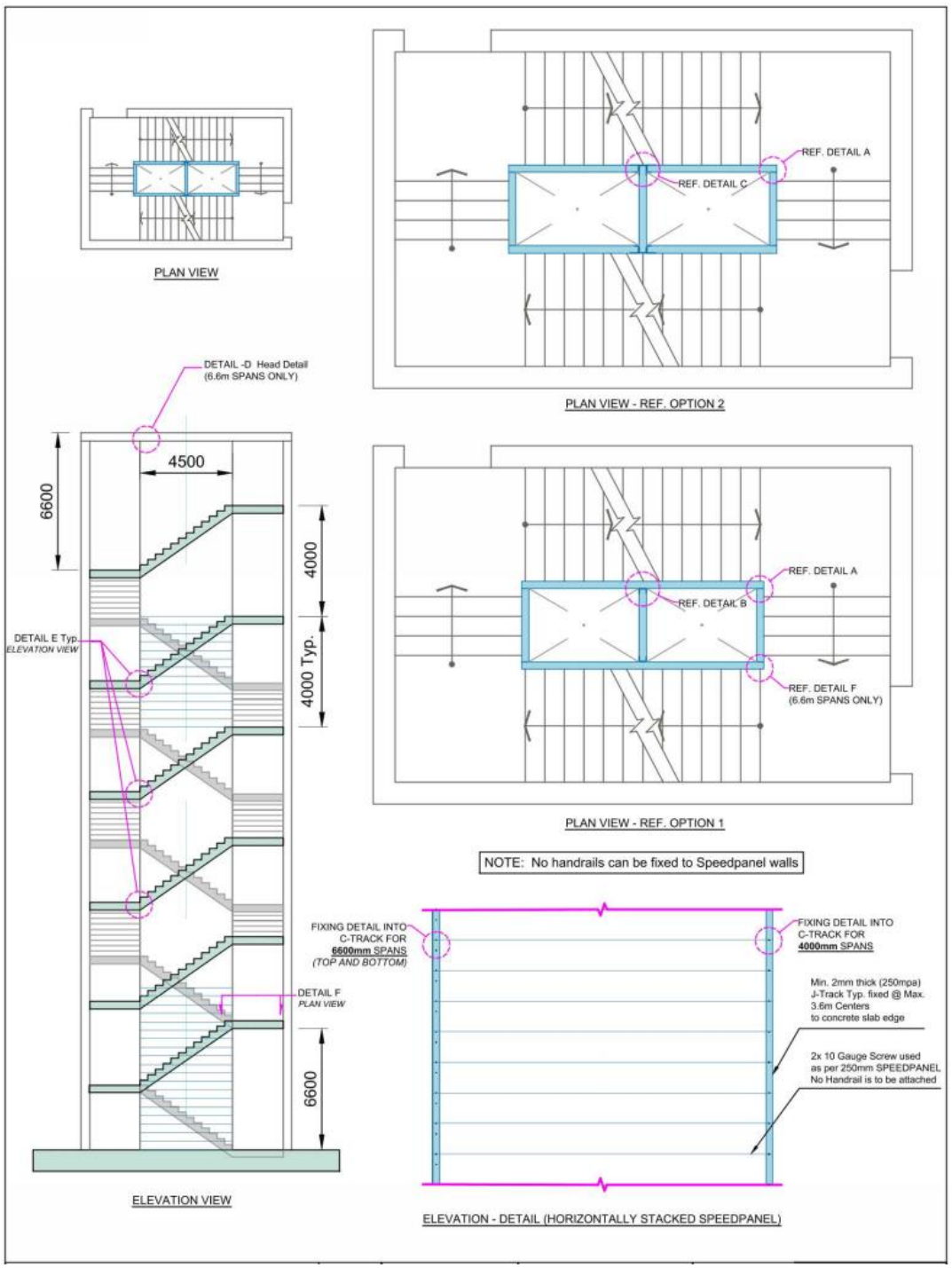


Figure 15: Details of Box Riser in Stair (1 of 10)

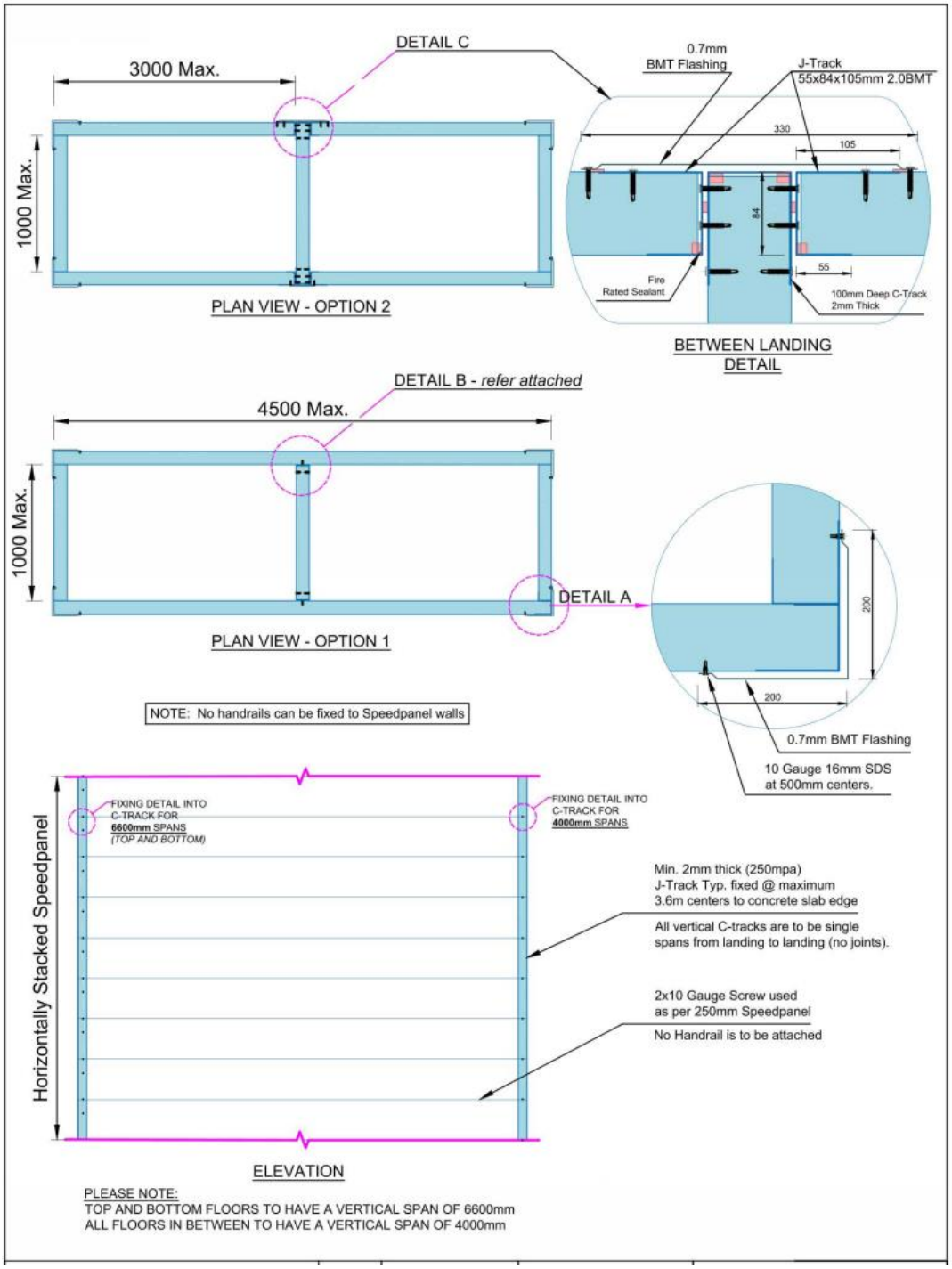


Figure 16: Details of Box Riser in Stair (2 of 10)

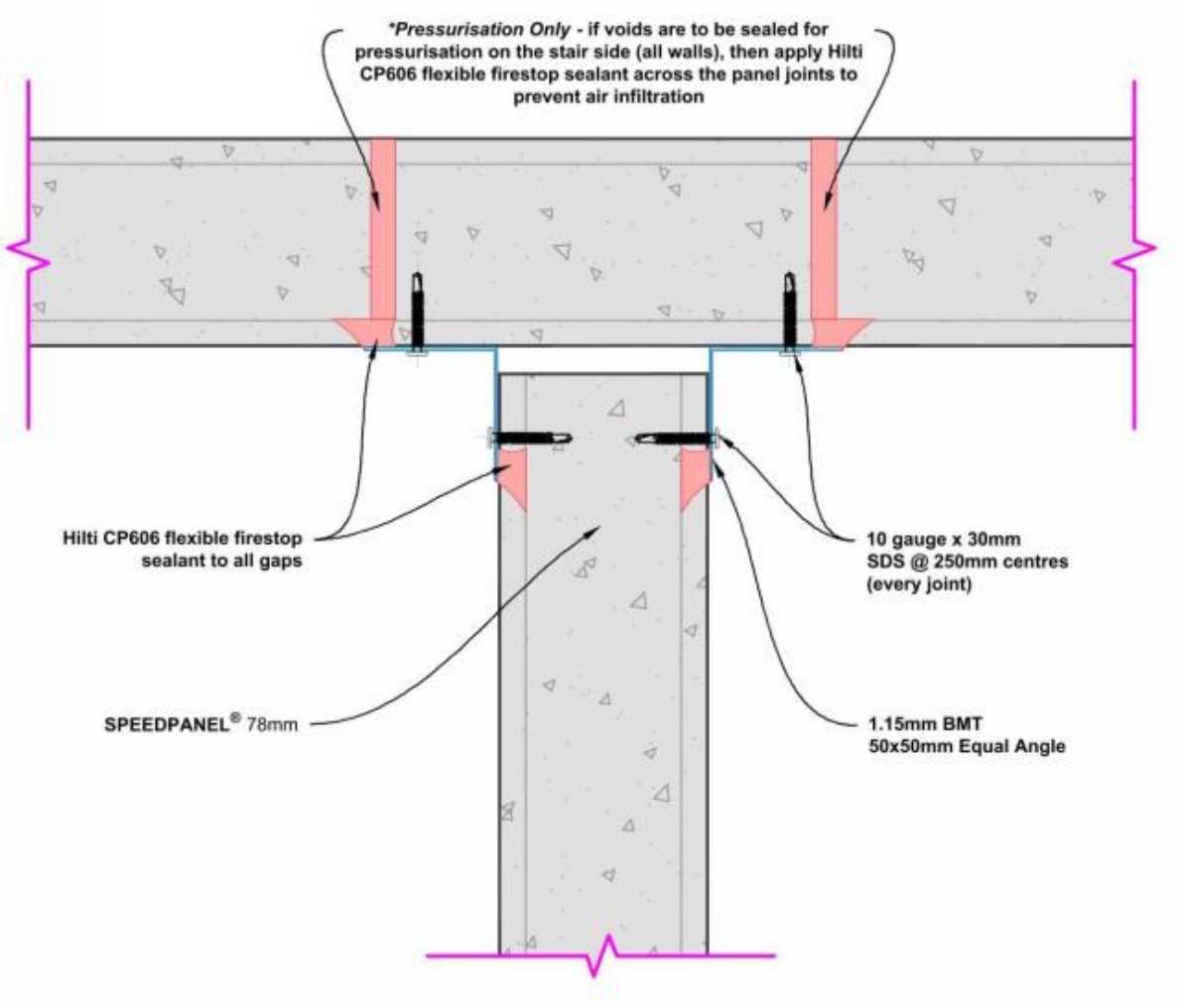
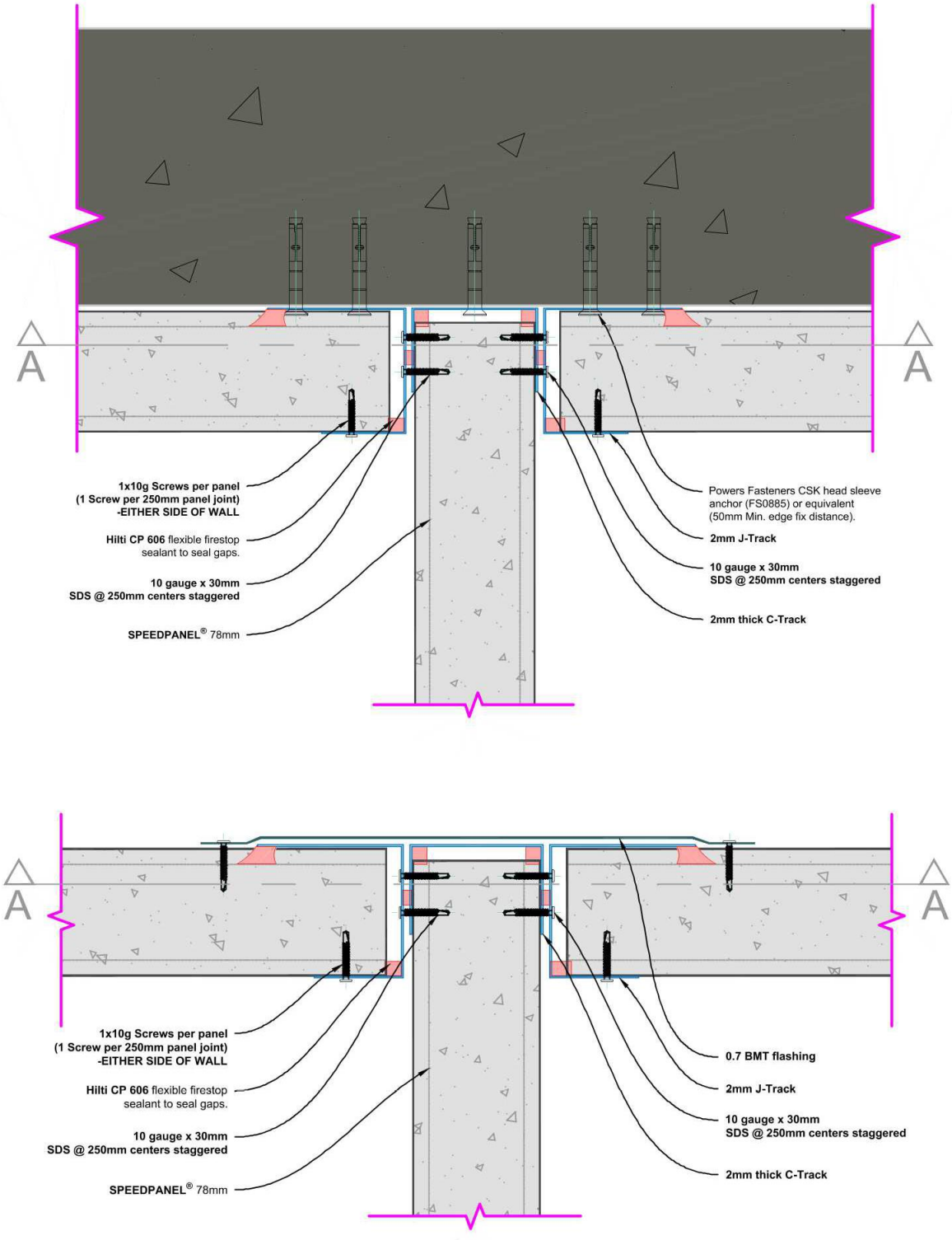


Figure 17: Details of Box Riser in Stair (3 of 10)



(Dual Void- Connection at Mid-Wall)

Figure 18: Details of Box Riser in Stair (4 of 10)

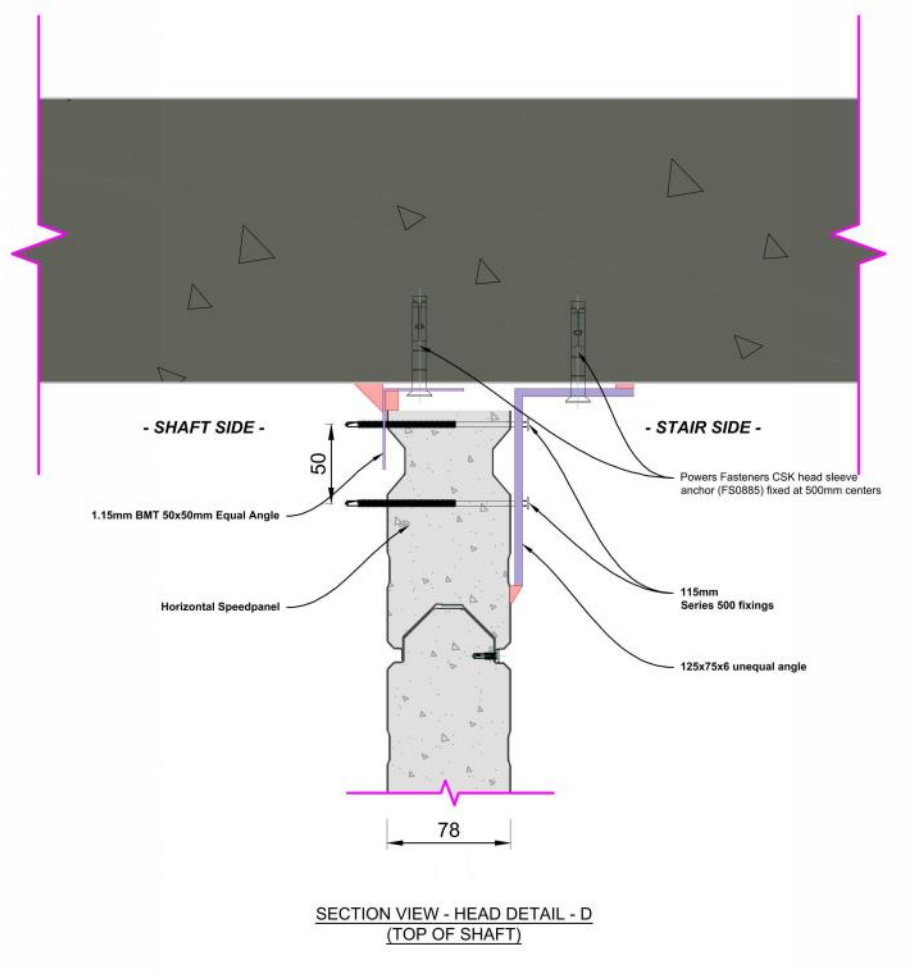
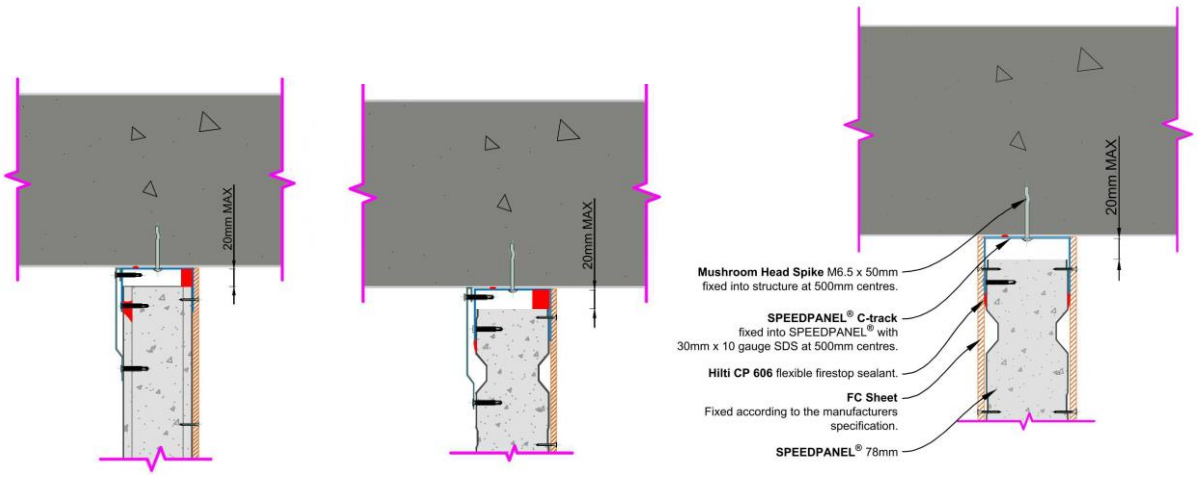


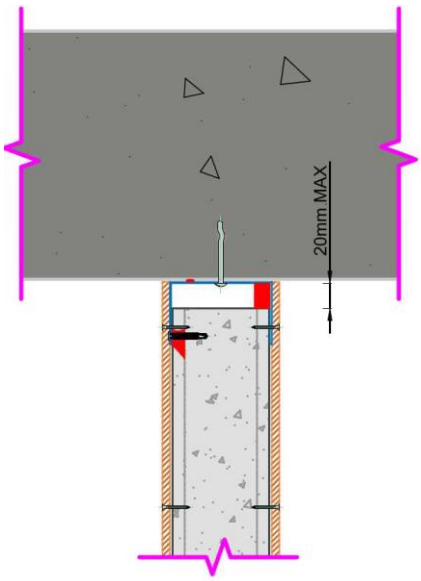
Figure 19: Details of Box Riser in Stair (5 of 10)



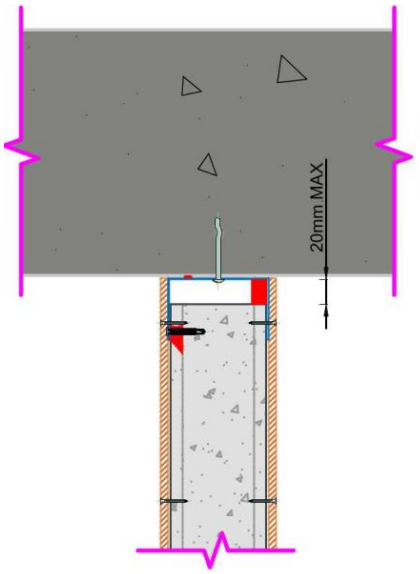
(vertical Speedpanel) (horizontal Speedpanel) (horizontal Speedpanel)

Alternative head details with with fibre cement sheet cladding

Figure 20: Details of Box Riser in Stair (6 of 10)



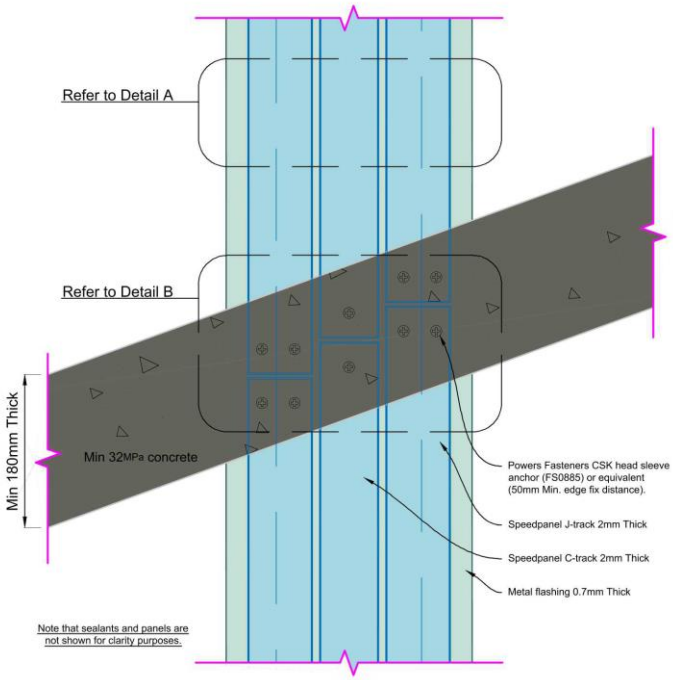
(vertical Speedpanel)



(vertical Speedpanel)

Alternative head details with fibre cement sheet cladding

Figure 21: Details of Box Riser in Stair (7 of 10)



(Elevation of J tracks and C tracks)

Figure 22: Details of Box Riser in Stair (8 of 10)

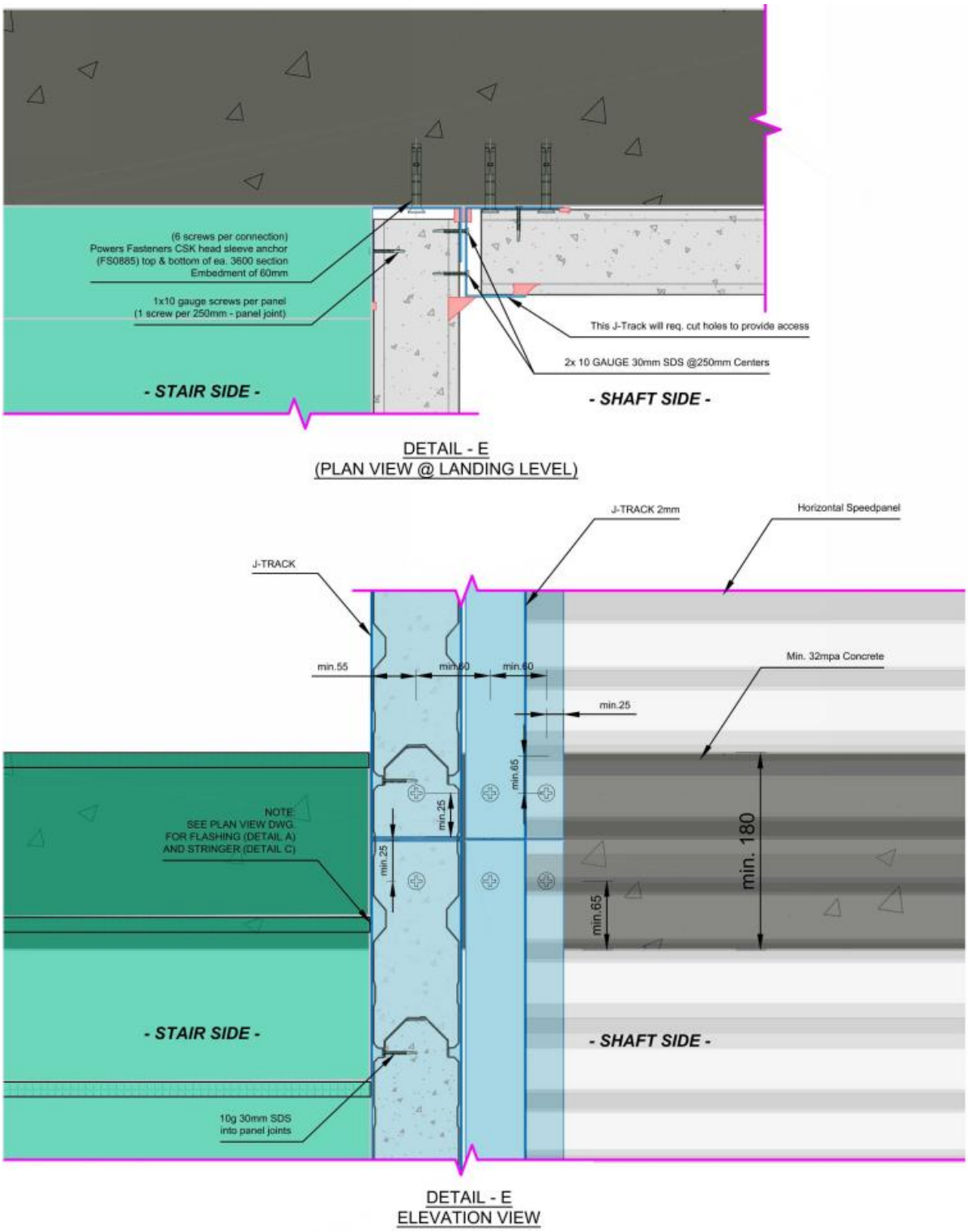


Figure 23: Details of Box Riser in Stair (9 of 10)

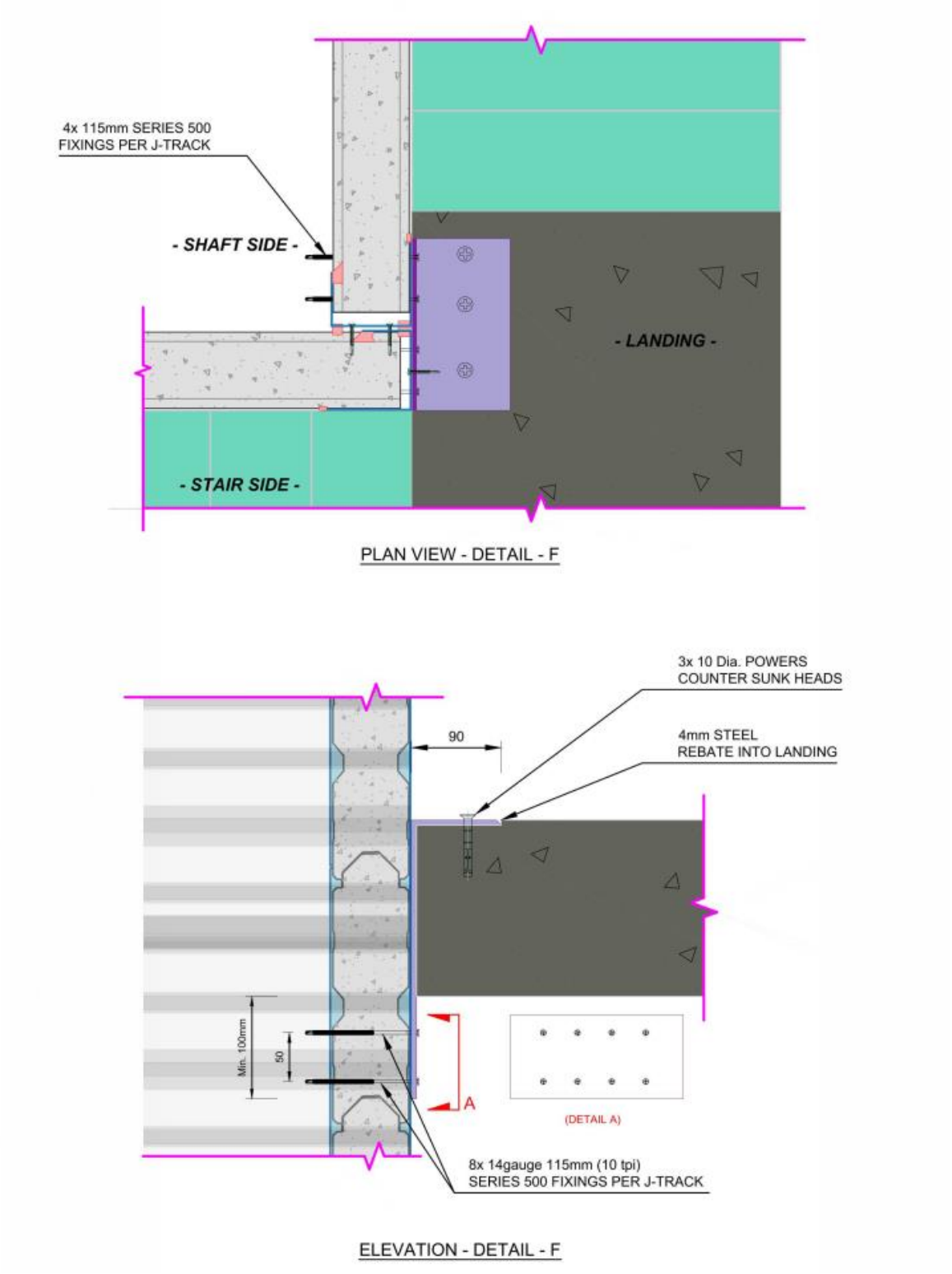


Figure 24: Details of Box Riser in Stair (10 of 10)

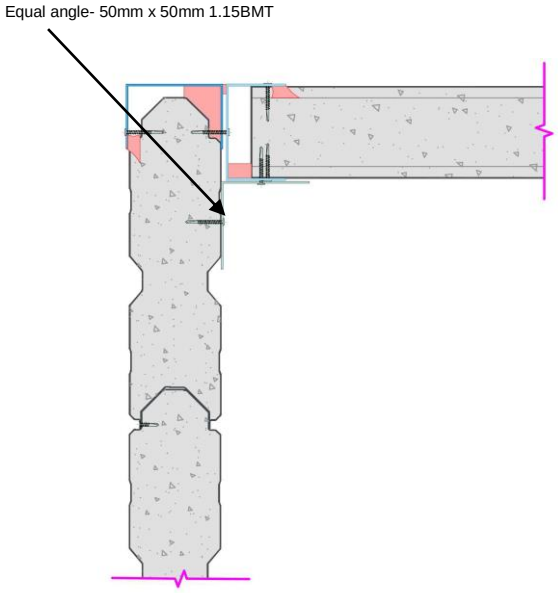


Figure 25 A- Corner connection details - Vertical to Horizontal panels.

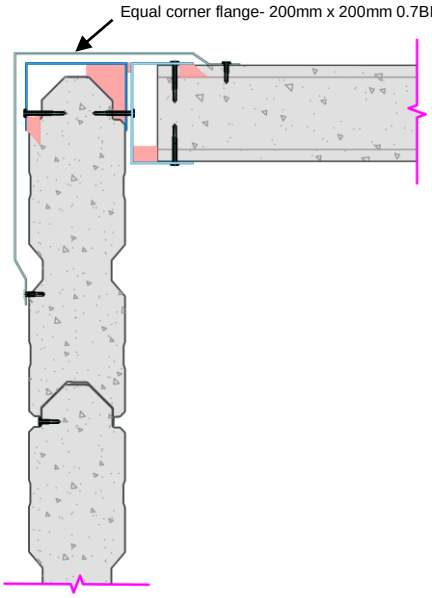


Figure 25 B- Corner connection details - Vertical to Horizontal panels with steel flashing

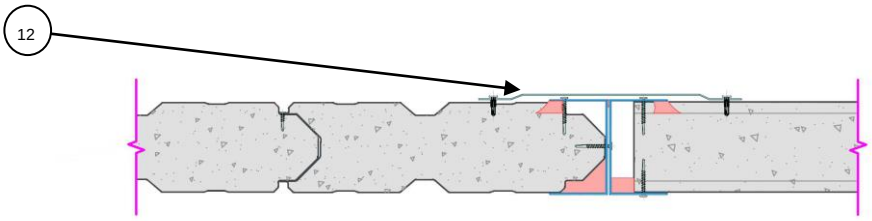


Figure 25 C- straight panel connection details Vertical to Horizontal panels with steel flashing

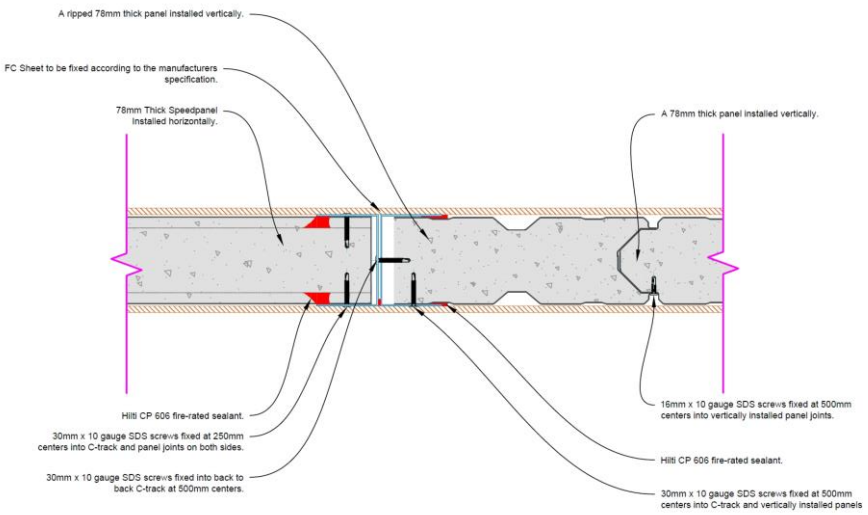


Figure 26- Joint between Vertical and horizontal Speedpanel walls lined with 6mm Fibre Cement sheets.

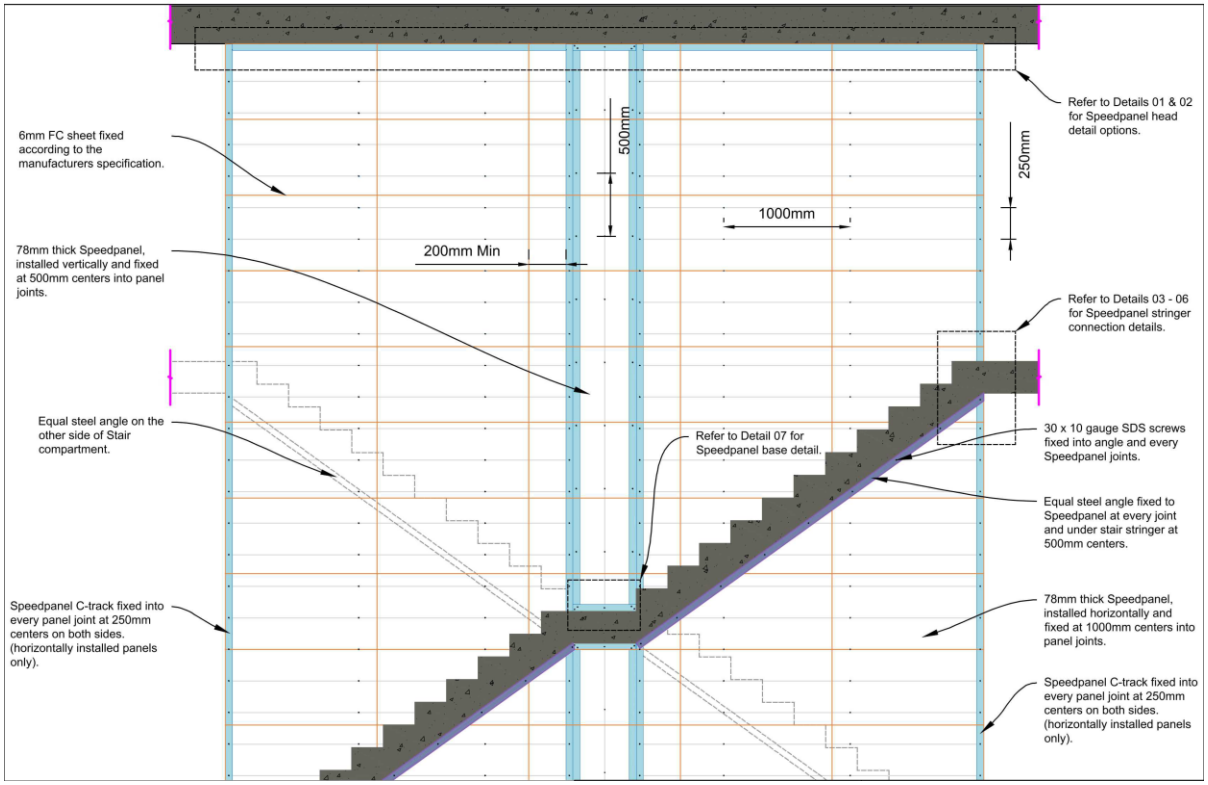


Figure 27- Dual stack scissor stair Elevation view (Speedpanel clad with Firbre cement sheeting)

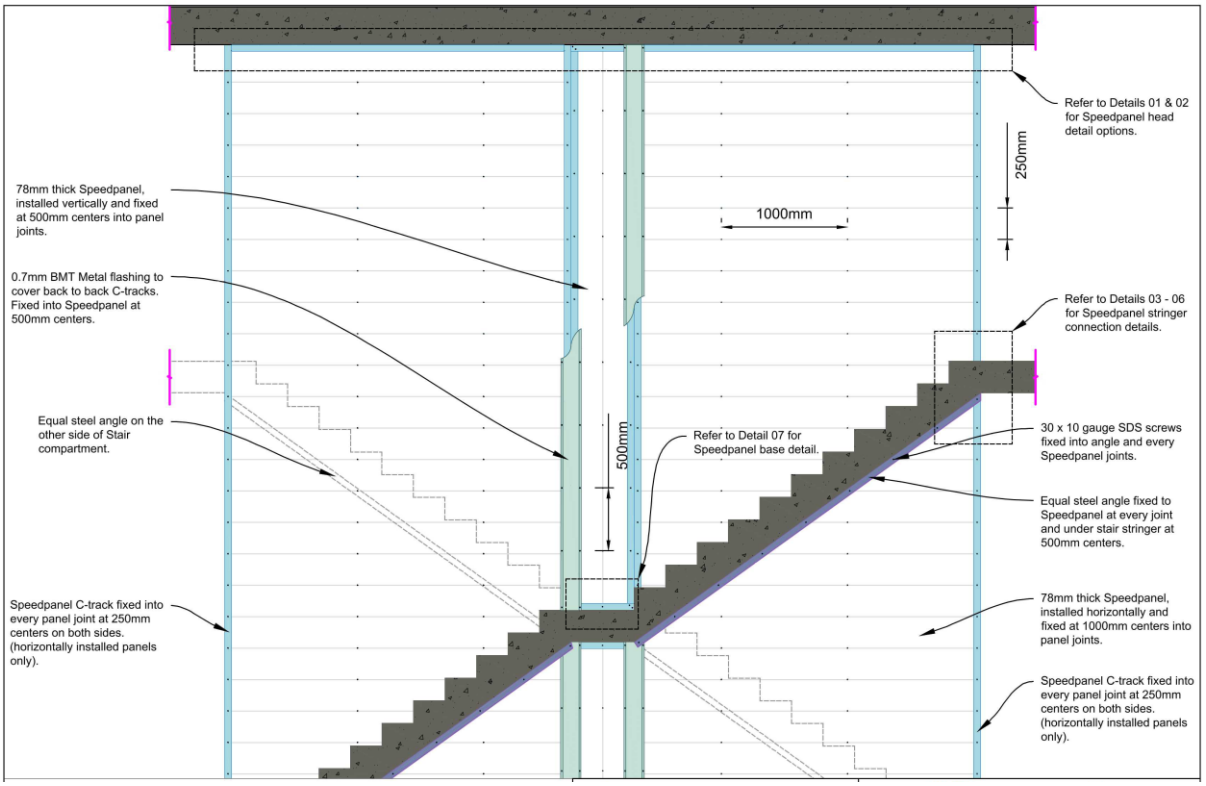


Figure 27A- Dual stack scissor stair Elevation view (Speedpanel without cladding)

Figure 28- Dual stack scissor stair Plan view (in reference to Figure 27 with FC cladding)

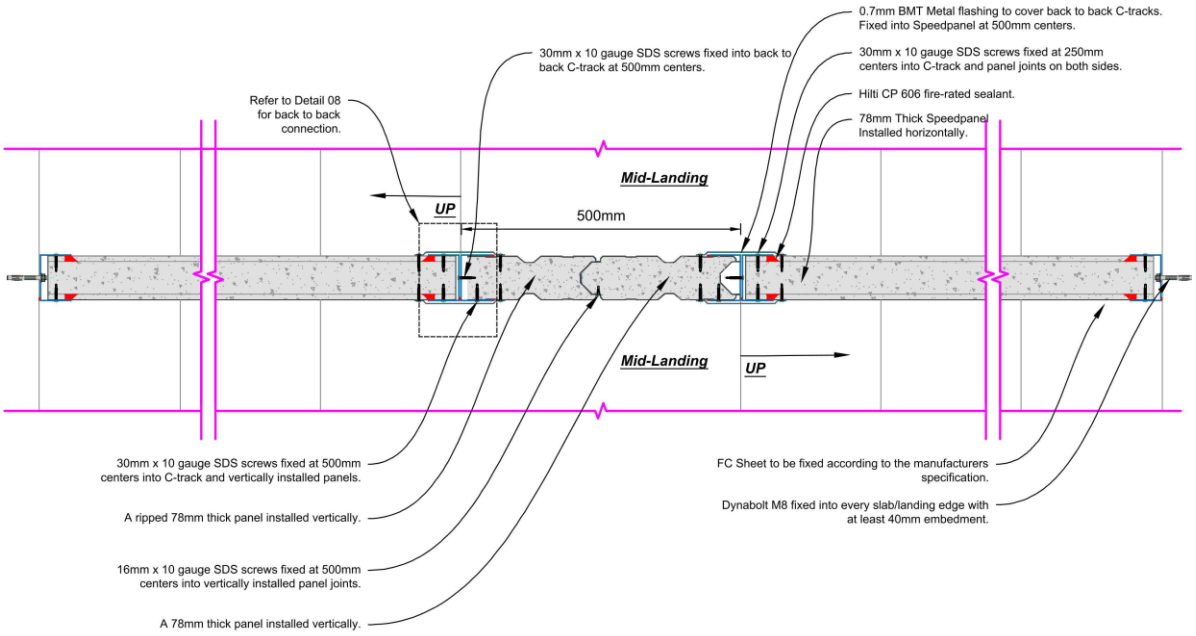


Figure 28A- Dual stack scissor stair Plan view (in reference to Figure 27A)

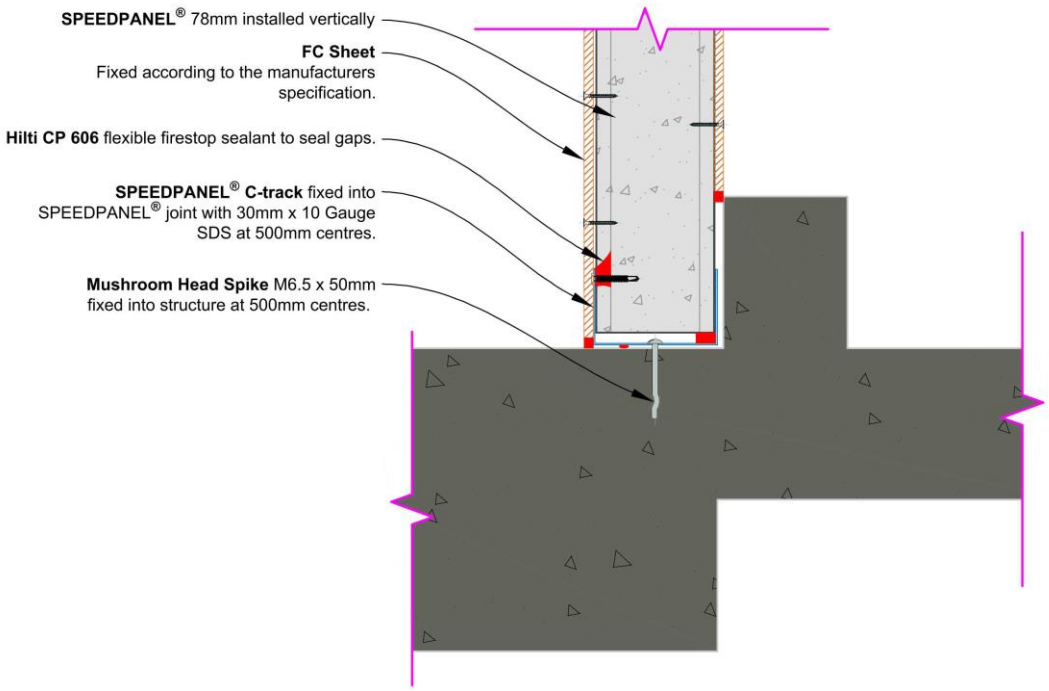


Figure 29- Typical Vertically installed Speedpanel Base Detail (detail 7 as indicated in Figure 27)

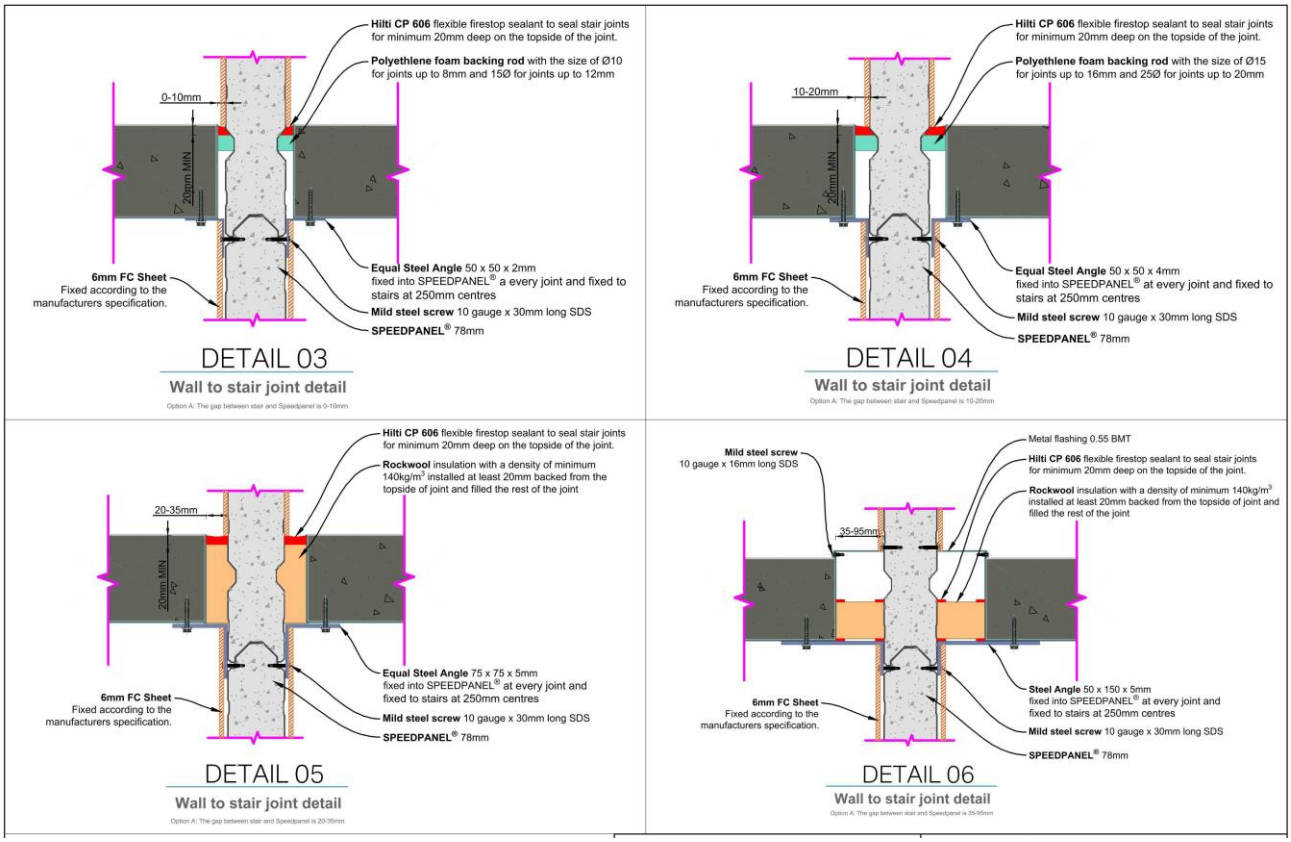


Figure 30- Wall to Stair joint detail variants (as referenced in Figure 27 with Fibre Cement cladding)

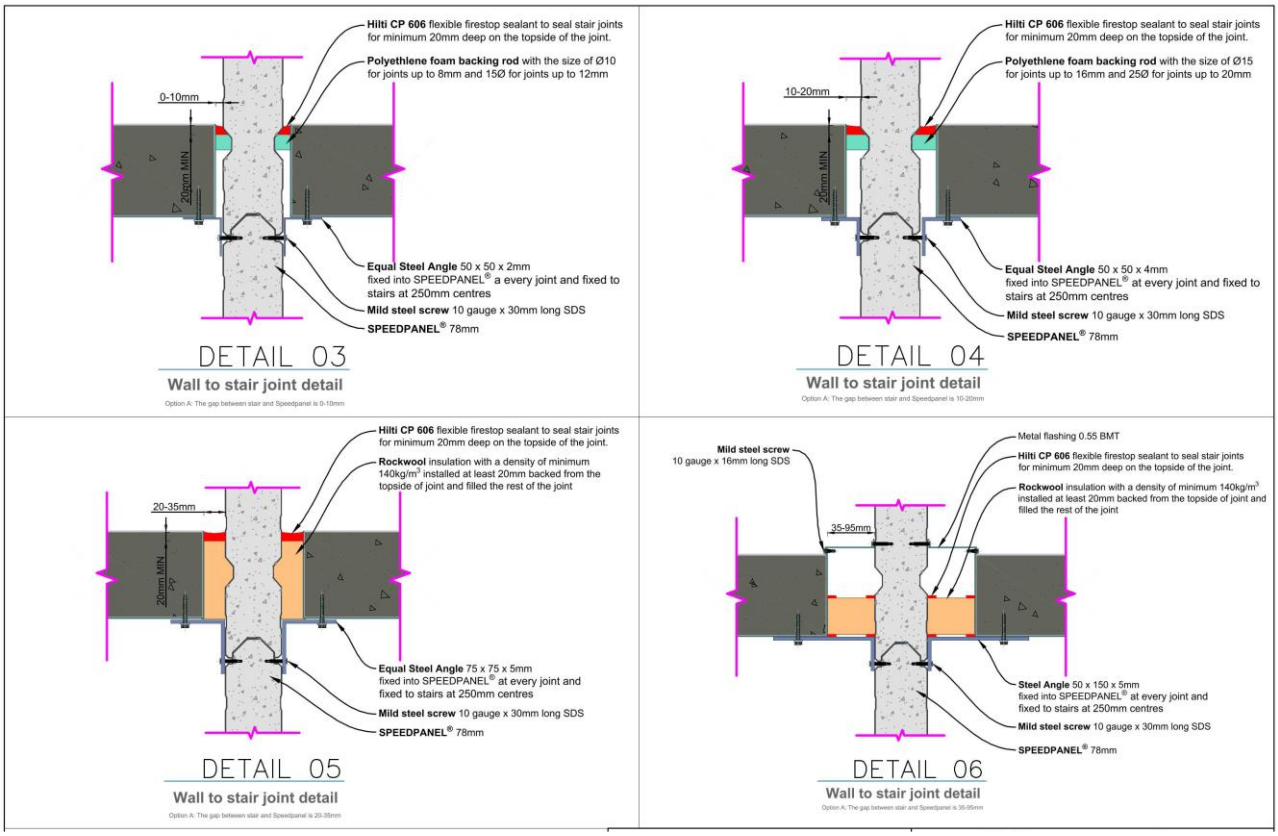


Figure 30A- Wall to Stair joint detail variants (as referenced in Figure 27A without panel cladding)

Table 1 – Schedule of Components

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td rowspan="3">1</td><td>Name</td><td>Trimming Channel (C-Track)</td></tr>
<tr><td>Material</td><td>Galvanised mild steel</td></tr>
<tr><td>Size</td><td>50mm x 50mm x 1.15BMT</td></tr>
<tr><td rowspan="3">2</td><td>Name</td><td>Speedpanel Panel</td></tr>
<tr><td>Material</td><td>Mild steel section filled with lightweight concrete as tested in BWA 2286900.5
  </td></tr>
<tr><td>Size</td><td>250mm wide × 78mm thickness</td></tr>
<tr><td rowspan="2">3</td><td>Name</td><td>Steel Angle</td></tr>
<tr><td>Size</td><td>
<table>
<tr><th>Wall-to-stair gap size (mm)</th><th>Min. Steel Angle Size (mm)</th></tr>
<tr><td>0 - 10</td><td>50 × 50 × 2</td></tr>
<tr><td>0 - 20</td><td>50 × 50 × 4</td></tr>
<tr><td>0 - 35</td><td>75 × 75 × 5</td></tr>
<tr><td>0 - 95</td><td>150 × 50 × 5</td></tr>
</table>
</td></tr>
<tr><td rowspan="3">4</td><td>Name</td><td>Fixings</td></tr>
<tr><td>Material</td><td>Flat-top, self-drilling, zinc-coated steel screws, 10g x 30mm.</td></tr>
<tr><td>Installation</td><td>Fixed steel angle to Speedpanel panels at every panel joint.</td></tr>
<tr><td rowspan="2">5</td><td>Name</td><td>Hilti CP 606 Flexible Firestop Sealant</td></tr>
<tr><td>Installation</td><td>Filled into the panel to stairs joints for minimum 20mm deep on the topside of the joint and in the normal Speedpanel installation locations.</td></tr>
<tr><td rowspan="4">6</td><td>Name</td><td>Backing Rod</td></tr>
<tr><td>Material</td><td>Polyethylene foam backing rod.</td></tr>
<tr><td>Size</td><td>
<table>
<tr><th>Max. Joint Width (mm)</th><th>Size of PE Rod (mm)</th></tr>
<tr><td>8</td><td>Ø10</td></tr>
<tr><td>12</td><td>Ø15</td></tr>
<tr><td>16</td><td>Ø15</td></tr>
<tr><td>20</td><td>Ø25</td></tr>
</table>
</td></tr>
<tr><td>Installation</td><td>Installed into the panel to stairs joints and at least 20mm back from the topside of joint.</td></tr>
<tr><td rowspan="3">7</td><td>Name</td><td>Backfilling Material</td></tr>
<tr><td>Material</td><td>Rockwool insulation with a density of minimum 140kg/m^3</td></tr>
<tr><td>Installation</td><td>At least 20mm backed from the topside of joint and filled the rest of the joint.</td></tr>
<tr><td rowspan="2">8</td><td>Name</td><td>Fixings</td></tr>
<tr><td>Material</td><td>Minimum 5mm mild steel bolt shall be in accordance with project engineer’s specification and at least 40mm embedment into concrete.</td></tr>
</table>

Item	Description	
	Installation	Mechanical fixed steel angel to concrete stairs at maximum 500mm.centres.
9	**Name**	**Firetherm/TBA Intubatt**
	Material	50mm thick Rockwool with nominal density of 180kg/m^3, coated on both sides with TBA Intumastic to a thickness of 1.0mm.
	Installation	One layer of batt shall be friction fitted into the gap and sitting on the top of the steel angle (item 3). Two large beads of TBA Intumastic shall be applied before the installation of the batt along the longitudinal ends and two fillets of TBA Intumastic shall be applied after the installation of the batt.
10	**Name**	**Steel Flashing**
	Size	0.55mm thick
	Installation	Capped on topside of the wall to stair joint between Speedpanel barrier and concrete stair and fixed at maximum 500mm centres by Flat-top, self-drilling, zinc-coated steel screws, 10g x 30mm.
11	**Name**	**Boss Bulkhead Batt**
	Material	50mm thick mineral fibre batt
	Installation	One layer of batt shall be friction fitted into the gap and sitting on the top of the steel angle (item 3). Two large beads of Firemastic 300 intumescent sealant shall be applied before the installation of the batt along the longitudinal ends and two fillets of Firemastic 300 intumescent sealant shall be applied after the installation of the batt.
12	**Name**	**Metal Flashing (Junction Protection)**
	Material	0.7mm thick galvanised mild steel
	Installation	Fixed to one side of the back to back C-tracks (Item #1)

4 REFERENCED TEST PROCEDURES

This report is prepared with reference to the requirements of AS 1530.4-2005 as appropriate for walls and floors.

5 FORMAL ASSESSMENT SUMMARY

Based on the discussion presented in this report, it is the opinion of this testing authority that if the specimen described in section 2 had been modified within the scope of section 3, it will achieve the performances as stated below when tested in accordance with the test method referenced in Section 4 and subject to the requirements of Section 7:

For scissors stairs with no void,

FRL of unlimited height Horizontal Fire Separation Figure 3 and 9: -/120/120

FRL of unlimited height Vertical Separation Floor to Floor Figure 4-7 and Figure 10 to 13: -120/120

Speedpanel Box riser with dual void of dimensions not longer than 6 metres and 1 metre wide with equally split horizontally orientated panels with back to back vertical J tracks; or where the long side is greater than 3 metres but less than 4.5 metres, the horizontal panels shall be fixed at each end and the panels fixed onto the stair stringers between floors- **FRL -/120/120**

Speedpanel Box riser with single void of dimensions not longer than 3 metres and 1 metre wide and with only horizontally orientated panels or with vertically orientated panels if the panels are fixed no higher than 6 metres-

FRL -/120/120

Speedpanel Box riser with single void of dimensions up to 6 metres long and 1 metre wide and with horizontally orientated panels split in half with back to back C or J tracks mid-supports (or with vertically orientated panels if the panels are fixed no higher than 6 metres)-

FRL -/120/120

6 DIRECT FIELD OF APPLICATION

This assessment applies to horizontally oriented Speedpanel panel wall system with exposed to fire from either side.

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 AS1530.4-2005.

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 Exova 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

This report may only be reproduced in full without modifications by the report sponsor. Copies, extracts or abridgments of this report in any form shall not be published by other organisations or individuals without the permission of Exova Warringtonfire Aus Pty Ltd.

9.3 AUTHORISATION ON BEHALF OF EXOVA WARRINGTONFIRE AUS PTY LTD

Prepared by:

H. Wong

Reviewed by:

C. McLean

9.4 DATE OF ISSUE

19/07/2018

9.5 EXPIRY DATE

31/07/2023

APPENDIX A – SUMMARY OF SUPPORTING DATA

A.1 TEST REPORT – EWFA 2736001.1

A.1.1 Test Sponsor

A.1.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.1.2 Test Laboratory

A.1.2.1 Bodycote Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.1.3 Test Date

A.1.3.1 The test was conducted on 26th June 2012

A.1.4 Test standard prescribed

A.1.4.1 The test was conducted in accordance with AS 1530.4-2005 Sections 2 & 3.

A.1.5 Variations to Test Standard

A.1.5.1 None

A.1.6 Description of Tested Assembly

A.1.6.1 The tested configuration 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.

A.1.6.2 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 panel section fixed and top vertical panel section with free vertical edges.

A.1.6.3 The head track made from 82mm × 50mm ×1.15 BMT galvanised C-track. At the head of the specimen, C-track fixed to the lintel only with galvanised steel spikes, mushroom head at 500mm centres and at the top of the horizontal panels, C-tracks fixed to the bottom track of the vertical wall section at 500mm centres.

A.1.6.4 The side tracks made from 82mm × 50mm ×1.15 BMT galvanised C-track. Side tracks for top vertical section of wall was not fixed to the support wall through was fixed to the panels with flat top self-drilling, zinc coated steel screws at 500mm centres on the non-fire side. Side track for bottom horizontal section of wall was fixed to perimeter block work using steel spikes, mushroom head 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.

A.1.6.5 The bottom track of vertical panels made from 82mm × 50mm ×1.15 BMT galvanised C-track and fixed to the panel with flat top self-drilling, zinc coated steel screws at 500mm centres and top track on the horizontal wall section at 500mm centres.

A.1.6.6 The bottom track of horizontal panels made from 82mm × 50mm ×0.55 BMT galvanised C-track fixed to the panel with flat top self-drilling, zinc coated steel screws at 500mm centres

A.1.7 Instrumentation

A.1.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.1.8 Test Results

A.1.8.1 The test was terminated at 151 minutes.

A.1.8.2 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.

A.1.8.3 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.2 TEST REPORT – WFRA 41162.1

A.2.1 Report Sponsor

A.2.1.1 Speedpanel Victoria Pty Ltd

A.2.2 Test Laboratory

A.2.2.1 Warrington Fire Research (Aust) Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong Victoria 3175, Australia.

A.2.3 Test Date

A.2.3.1 The fire resistance test was conducted on 13th December 2004.

A.2.4 Test standards

A.2.4.1 The test was performed in general accordance with AS1530.4-1997.

A.2.5 General description of tested specimen

A.2.5.1 The test assembly comprised a nominal 3000mm × 3000mm non-loadbearing partition system consisted of 12-off panels (295mm wide × 3000mm high) that were nominally 42mm thick having 0.4mm thick steel faces, encasing a lightweight concrete core of nominal density 470kg/m³.

A.2.5.2 The panels were fixed together and secured around the edges to the metal C-channels with 12mm long self-drill, button metal screws. The C-channels were secured to the concrete block lined steel restraint frame with 6.5 × 50mm long masonry anchors.

A.2.6 Instrumentation

A.2.6.1 In accordance with AS1530.4-1997

A.2.7 Test Results

A.2.7.1 Integrity failure (through gap) at 91 minutes at an opening that had formed at the top of the specimen between the C-channel and the concrete block surround. No integrity failure occurred between panel sections during the duration of the fire-resistance test.

A.2.7.2 Lateral deflection was approximately 180mm towards the furnace at 120 minutes.

A.2.7.3 The test was discontinued after a period of 244 minutes.

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 × 3000mm high × 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 from 0.42mm galvanized mild steel.

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

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.4 TEST REPORT – WARRES NO. 69754/C

A.4.1 Test Sponsor

A.4.1.1 Hilti Ag, Entwicklungsgesellschaft 2, Hiltistasse 26,86916 Kaufering, Germany

A.4.2 Test Laboratory

A.4.2.1 Warrington Fire Research, Holmsfield Road, Warrington, UK.

A.4.3 Date of Test

A.4.3.1 The fire resistant test was conducted on 14th November 1996.

A.4.4 Summary of test:

A.4.4.1 A fire resistance test to evaluate the ability of a proprietary linear gap sealing system to reinstate the fire resistance with respect to the integrity and insulation performance of a simulated floor construction. The test utilised the general principles of BS 476: Part 20: 1987, in conjunction with additional guidelines adopted from the draft document CEN/TC 127 N579.

A.4.4.2 The test was performed on four specimens; for the purpose of this assessment, only specimens 1 and 4 are relevant. The specimens were incorporated between aerated concrete gap faces. The gaps referenced 1 was of length 950mm and width 20mm, gap referenced 4 was of length 950mm and width 30mm. All gaps were sealed using Hilti CP 606 to various depths over a proprietary backing material.

A.4.4.3 The fire resistance performance of the penetration was monitored for the duration of the test and it satisfied the performance criteria in accordance with BS 476: Part 20: 1987 for the following periods:

Specimen Ref.	Gap Width (mm)	Sealant Depth (mm)	Backing Material	Integrity (min)	Insulation (min)
1	20	10	Ø24mm PE	240	130
4	30	15	70mm deep Rockwool insulation with a density of 140kg/m^3	240	216

A.4.4.4 The test was terminated after a period of 240 minutes.

A.5 TEST REPORT – CHILT/RF01120D

A.5.1 Test Sponsor

A.5.1.1 Firestopit.com Limited, Swadlincote Rd, Woodville, Swadlincote, Derbyshire, DE11 8DD, UK.

A.5.2 Test Laboratory

A.5.2.1 Chiltern International Fire, Chiltern House, Stocking Lane, Hughenden Valley, High Wycombe Buckinghamshire, HP14 4ND, UK.

A.5.3 Test Date

A.5.3.1 The test was conducted on 29th January 2002.

A.5.4 Test standard prescribed

A.5.4.1 The test was conducted in accordance with BS 476: Part 20 and 22: 1987.

A.5.5 Variations to Test Standard

A.5.5.1 None

A.5.6 Description of Tested Assembly

A.5.6.1 1 layer of 50mm x 900mm x 600mm mineral fibre batt 160kg/m^3 stated by the manufacturer to be identical to Boss Bulkhead Batt (160kg/m3) with a cable ladder and cables penetration. The batt was friction fitted and outer faces coated with a 1mm dry film thickness ablative coating stated by the manufacturer to be identical to Boss Ablative coating. The junction between the batt and surrounding aperture was sealed with intumescent sealant, a sealant stated by the manufacturer to be identical to Firemastic 300 intumescent sealant.

A.5.7 Instrumentation

A.5.7.1 Instrumentation was stated to be in accordance with BS 476: Part 22: 1987.

A.5.8 Results

A.5.8.1 The test duration was 265 minutes.

A.5.8.2 The specimen achieved the following performance:

Criteria	Performance
Integrity	No failure at 265 minutes
Insulation	142 minutes, the maximum temperature rise measured by any of the thermocouples exceeded the failure criterion of 180K

A.6 RELEVANCE OF BS476: PART 20: 1987 DATA WITH RESPECT TO AS1530.4-2005

A.6.1 General

A.6.1.1 The fire resistance tests WARRES 69754/C and Chilt/RF01120D were conducted using the heating and pressure conditions of BS 476: Part 22: 1987, which differs from AS1530.4 2005. The effect these differences have on fire resistance performance of the test specimen considered is discussed below.

Temperature Regime

A.6.1.2 The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4-2005 follows a similar trend to BS 476: Part 20: 1987.

A.6.1.3 The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2005 and BS 476: Part 20: 1987 are not appreciably different.

Furnace Thermocouples

A.6.1.4 The furnace thermocouples specified in AS1530.4-2005 are type K, mineral insulated metal sheathed (MIMS) with a stainless steel sheath having a wire of diameter of less than 1.0mm and an overall diameter of 3mm. The measuring junction protrudes at least 25mm from the supporting heat resistant tube.

A.6.1.5 The furnace thermocouple types in BS 476: Part 20: 1987 shall be one of the following two types:

- Bare nickel chromium/nickel aluminium wires, 0.75mm to 1.5mm in diameter, welded or crimped together at their ends and supported and insulated from each other in a twin bore porcelain insulator except that the wires for 25mm approximately from the weld/crimp shall be exposed and separated from each other by at least 5mm (replace or recalibrate after 6hrs of usage).
- Nickel chromium/nickel aluminium wire contained within a mineral insulation and in a heat resisting steel sheath of diameter 1.5mm, the hot junctions being electrically insulated from the sheath. The thermocouple hot junction shall project 25mm from a porcelain insulator. The assembly shall have a response time on cooling in air of not greater than 30s.

A.6.1.6 The relative location of the furnace thermocouples to the exposed face of the specimen, for both AS1530.4-2005 and BS 476: Part 20: 1987, is 100mm +10mm.

A.6.1.7 The variations in furnace thermocouples specification and responses are not considered to have significant effect on the outcome of the referenced fire resistance test.

Specimen Thermocouples

A.6.1.8 BS 476: Part 20 has no specific provisions for the location of thermocouples, whereas AS1530.4-2005 has specific requirements for the application of thermocouples.

A.6.1.9 AS1530.4-2005 specifies thermocouple locations for unpenetrated blank seals, as follows:

- At least three on the surface of the seal, with one thermocouple for each 0.3 m2 of surface area, up to a maximum of five, uniformly distributed over the area (one thermocouple being located at the centre of the seal).
- On the surface of the seal 25 mm from the edge of the opening, with one thermocouple for each 500 mm of the perimeter.
- On the surface of the separating element 25 mm from the edge of the opening, with one thermocouple for each 500 mm of the perimeter.
- If the seal is recessed on the unexposed side, thermocouples shall only be fitted to the seal when the joint width is greater than or equal to 12mm.

A.6.1.10 In the reference tests the thermocouples are not located in strict accordance with the requirements of AS1530.4-2005.

A.6.1.11 By inspection of the specimen thermocouple locations in tests WARRES 69754/C, it is concluded that the thermocouple locations differed from those prescribed in AS1530.4-2005 only slightly. By observation of test specimens, no shrinkage or hot spot was observed, it is therefore considered placing extra thermocouples on the seals or separating element would not likely have significantly altered the recorded specimen temperatures by margins.

Furnace Pressure

A.6.1.12 It is the requirement of AS1530.4-2005 that a pressure of 15+3 Pa to be maintained at the centre of vertical linear gap seal that is less than 1m in length.

A.6.1.13 For BS 476: Part 20: 1987 a neutral axis is maintained at a height of 1m from the notional floor level, subject to a pressure of 20Pa maintained in a horizontal plane 100+10mm below the soffit.

Performance Criteria

A.6.1.14 AS 1530.4-2005 specifies the following performance criteria for building materials and structures:

- Structural Adequacy – (Not relevant to the referenced test)
- Integrity
- Insulation

Integrity

A.6.1.15 Failure in relation to integrity shall be deemed to have occurred if the specimen:

- Collapses
- Sustained flaming on the non-fire side in excess of 10 seconds
- Ignition of cotton pad within 30 seconds when applied

Insulation

A.6.1.16 Failure in relation to insulation shall be deemed to have occurred when the temperature of any of the relevant thermocouples attached to the unexposed face of the test specimen rises by more than 180 K above the initial temperature.

A.6.1.17 The integrity and insulation criteria specified in BS 476: Part 20: 1987 are not appreciably different from AS1530.4:2005.

Specimen Size, Support and End Conditions

A.6.1.18 It is the requirement of AS1530.4-2005 that a control joint specimen be at least 1m long, this requirement has not been met by the specimens tested in WARRES 69754/C. The influence this has on the results is considered in A.5.2.

A.6.2 Application of Test Data to AS1530.4 -2005.

A.6.2.1 The variations in furnace heating regimes, furnace thermocouples and the responses of the different thermocouple types to the furnace conditions are not expected to have significant effect on the outcome of the referenced fire resistance tests.

A.6.2.2 The variations in furnace pressure conditions can theoretically be more onerous and could affect the performance of the test specimens. In particular, the upper area of the specimen after the formation of gaps cracks or fissures. Because no gaps formed in the upper area for the duration of the referenced tests, and because of the overall absence of combustible material in the test specimen, it is considered the difference in furnace pressure would not have a significant effect on the test results.

A.6.2.3 The additional pressure required by AS1530.4-2005 can be potentially more onerous however the tests in question were conducted at a pressure that met the AS1530.4 2005 requirements or there were no gaps and fissures in the specimen for the durations of the tests.

A.6.2.4 With reference to WARRES 69754/C, the test specimens comprised linear gaps with length in range of 800 to 950mm, which is less than as required by AS1530.4-2005.

A.6.2.5 When tested, no cracks, fissures or, through gaps formed that would indicate a potential for shrinkage or impending integrity failure during the test duration. The CP 606 sealant is stayed in place during the test.

A.6.2.6 Based on the above it is considered the performance of control joints tested in WARRES 69754/C can be used to assess the performance of similar specimens if tested in accordance with AS1530.4-2005 up to 120 minutes.

A.6.2.7 AS1530.4-2005 requires that linear gaps be of minimum 1000mm in length. The influence the length of specimen has on the performance is that it increases the shrinkage forces and tendency for a gap to form in the sealant material.

A.6.2.8 For specimen 4 in Chilt/RF01120D and specimen B in Chilt/IF03047 there were no gaps or fissures present or imminent signs of gaps or fissure forming in the specimens up to 240 minutes. With the apparent margin of integrity and insulation performance, it is considered that the linear gap seals would have achieved 240minute integrity performance if tested in accordance with AS1530.4-2005.

A.6.2.9 Based on the above discussion, and in absence of any foreseeable detrimental effects, it is considered that the results relating to the integrity and insulation performance of the tested mineral fibre batt seal in Chilt/RF01120D can be used to assess the integrity and insulation performance in accordance with AS1530.4-2005 for up to 240 minutes.

A.7 TEST REPORT- EWFA 2736000.1

A.7.1 Report Sponsor

A.7.1.1 Speedpanel (VIC) Pty. Ltd., 89-91 Canterbury Road, Kilsyth, VIC, 3137.

A.7.2 Test Laboratory

A.7.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.7.3 Test Date

A.7.3.1 The fire resistance test was conducted on 22nd June 2012.

A.7.4 Test standards prescribed

A.7.4.1 The test was performed in accordance with the requirements of AS1530.4-2005 sections 2, 3 and 10 as appropriate.

A.7.5 General description of tested specimens

A.7.5.1 The test assembly comprised a nominal 2950 mm wide × 3000 mm high × 78 mm thick loaded wall system that incorporated various apertures. The panels were stitched together on the unexposed side only at 1500mm centres.

A.7.5.2 The tested wall system incorporated three apertures and the apertures were filled with 50mm thick Firetherm Intubatt.

A.7.5.3 For the purpose of the assessment, only aperture A is relevant. 195mm high Aperture A comprised one layer of 50mm thick Firetherm Intubatt friction fitted into the aperture.

A.7.6 Instrumentation

A.7.6.1 The instrumentation was provided in accordance with AS1530.4-2005, except for the variations previously stated

A.7.7 Test Results

A.7.7.1 The maximum temperature measured on the unexposed side of 50mm thick Firetherm Intubatt at 120 minutes was 238°C.

A.7.7.2 The 50mm thick Firetherm Intubatt piece stayed in place in Aperture A for at least 120 minutes.

A.8 ASSESSMENT REPORT- FAR 3580

A.8.1 Report Sponsor

A.8.1.1 Speedpanel (VIC) Pty. Ltd., 89-91 Canterbury Road, Kilsyth, VIC, 3137.

A.8.2 Report Author

A.8.2.1 Branz Limited, 1222 Moonshine Road, Judgeford, Porirua, 5381, New Zealand 5381.

A.8.3 Summary of Assessment

A.8.3.1 The assessment report was conducted for non-loadbearing horizontal and vertical orientated Speedpanel wall systems with increased height and width variations based on a number of fire resistance test reports in accordance with AS1530.4-2005.

A.8.3.2 The assessment investigated the integrity and insulation performance of the various tested Speedpanel panels and proposed variations to the panel fixings to improve the fire resistance performance to at least 120 minutes in integrity and insulation. Summary of the assessed Speedpanel wall panels performance are as detailed in the table below.

Summary Installation Guide

	Up to 4,500 mm high perimeter walls between floor slabs (Y-Direction)	Minimum angle thickness and size for vertical panel orientation (Figure 1 page 17)	Minimum C-track thickness and size for vertical panel orientation (Figure 1 page 17)	Minimum C-track thickness and size for horizontal panel orientation	Above 4,500 mm up to 6,000mm high perimeter walls between floor slabs (Y-Direction)	Minimum angle thickness and size for vertical panel orientation (Figure 1 page 17)	Minimum bottom C-track thickness and size for vertical panel orientation (Figure 1 page 17)	Minimum C-track thickness and size for horizontal and head track application for walls in the Y-Direction (Figure 2 page 18)
Maximum width X direction	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	55x80 mm internal Clearance Bmt 1.2mm 250 Mpa *	50x50mm Bmt 1.2mm 250 Mpa *	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	50 X 80mm internal Clearance Bmt 1.2mm 250 Mpa *	90 X 80mm internal Clearance Bmt 1.2mm 250 Mpa * Shielded Ctrack
Maximum width z section between x directional cross walls	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	55x80 mm internal Clearance Bmt 1.2mm 250 Mpa *	50x50mm Bmt 1.2mm 250 Mpa *	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	50 X 80mm internal Clearance Bmt 1.2mm 250 Mpa *	90 X 80mm internal Clearance Bmt 1.2mm 250 Mpa * Shielded Ctrack 150mm Bmt 1.2mm 250 Mpa *
Screw fixing distance	1,500 mm				750 mm			
Minimum panel galv. Steel sheath thickness	0.44 mm				0.44 mm			
Vertical fixing distance side track	500 mm				250 mm			
Assessment report containing the minimum perimeter track design	FAR 3107, FAR 3561, FP 3904 and FR 3754				FAR 3525 and EWFA 22551-01			
Assessment report containing the minimum panel junction design details	FAR 3454 and FAR 3502				FAR 3454 and FAR 3502			

* 250 Mpa indicates that the Angle /C-Track is "Grade-250" mild steel

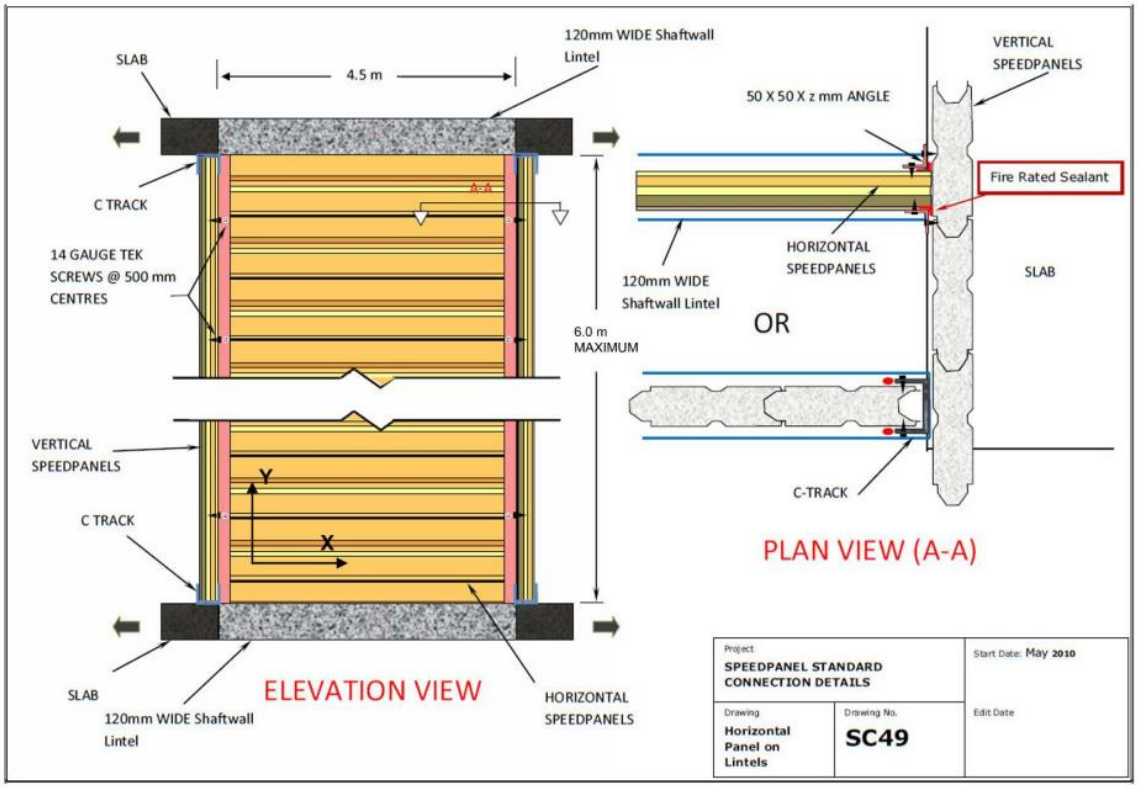


Figure 1 (FAR 3580)- Horizontal and Vertical Speedpanel configuration

A.9 ASSESSMENT REPORT- FAR 3583

A.9.1 Report Sponsor

A.9.1.1 Speedpanel (VIC) Pty. Ltd., 89-91 Canterbury Road, Kilsyth, VIC, 3137.

A.9.2 Report Author

A.9.2.1 Branz Limited, 1222 Moonshine Road, Judgeford, Porirua, 5381, New Zealand.

A.9.3 Summary of Assessment

A.9.3.1 The assessment report was conducted for a non-loadbearing continuous height horizontal orientated Speedpanel wall interfaced with a vertical Speedpanel wall based on various fire resistance test reports in accordance with AS1530.4-2005.

A.9.3.2 The assessment investigated the integrity and insulation performance of the various tested Speedpanel panels and proposed variations to the panel fixings to improve on the fire resistance performance to at least 120 minutes in integrity and insulation. Summary of the assessed Speedpanel wall panels performance are as detailed in the tables below.

Summary Installation Guide

	Up to 4,500 mm high side vertical panel walls between floor slabs (Y-Direction)	Minimum angle thickness and size for vertical panel orientation (Figure 1 page 13)	Minimum C-track thickness and size for vertical panel orientation (Figure 1 page 13)	Minimum C-track thickness and size for horizontal panel orientation	Above 4,500 mm up to 6,000mm high side vertical panel walls between floor slabs (Y-Direction)	Minimum angle thickness and size for vertical panel orientation (Figure 1 page 13)	Minimum bottom C-track thickness and size for vertical panel orientation (Figure 1 page 13)	Minimum C-track thickness and size for horizontal and head track application for walls in the Y-Direction (Figure 1 page 13)
Maximum width X direction	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	55x80 mm internal Clearance Bmt 1.2mm 250 Mpa *	50x50mm Bmt 1.2mm 250 Mpa *	4,500 mm	50x50mm Bmt 1.2mm 250 Mpa *	50 X 80mm internal Clearance Bmt 1.2mm 250 Mpa *	90 X 80mm internal Clearance Bmt 1.2mm 250 Mpa * Shielded Ctrack
Vertical side wall screw fixing distance	1,500 mm				750 mm			
Horizontal shaft wall screw fixing distance (panel to panel)	250 mm centre fixings on the bottom panel **and** 500 mm centre fixings on the second from the bottom panel **and** 1,500 mm centre fixings therafter				250 mm centre fixings on the bottom panel **and** 500 mm centre fixings on the second from the bottom panel **and** 1,500 mm centre fixings therafter			
Minimum panel galv. Steel sheath thickness	0.44 mm				0.44 mm			
Vertical fixing distance side track	Panels ≤ 3,000 mm wide - **500 mm** (every second panel) Panels >3,000 mm but ≤4,500 wide - **250 mm** (every panel)				Panels ≤ 3,000 mm wide - **500 mm** (every second panel) Panels >3,000 mm but ≤4,500 wide - **250 mm** (every panel)			
Assessment report containing the minimum perimeter track design	FAR 3107, FAR 3561, FP 3904 and FR 3754				FAR 3525 and EWFA 22551-01			
Assessment report containing the minimum panel junction design details	FAR 3454 and FAR 3502				FAR 3525 or EWFA 22551-01			

Maximum Wall Width (mm) NOTE **1** **X**	Maximum Wall Height between floor levels (mm) NOTE **1** **Y**	Minimum Panel Galv. Steel Sheath Thickness (mm)	Maximum Fixing Centres at the Panel Interlock Join NOTE **2** (mm)
Horizontal Orientated Speedpanel Walls			
4,500	Unlimited	0.44	1,500
Vertically Orientated Speedpanel Walls (Side Walls Between Floors)			
Unlimited	4,500	0.44	1,500
Unlimited	6,000	0.44	750

NOTE 1 Subject to similar design of Figure 1 where the horizontal panels are interfaced with vertical panels of the same construction. See Figure 1 for the location of the X and Y components

NOTE 2 Located at each interlocking panel junction.

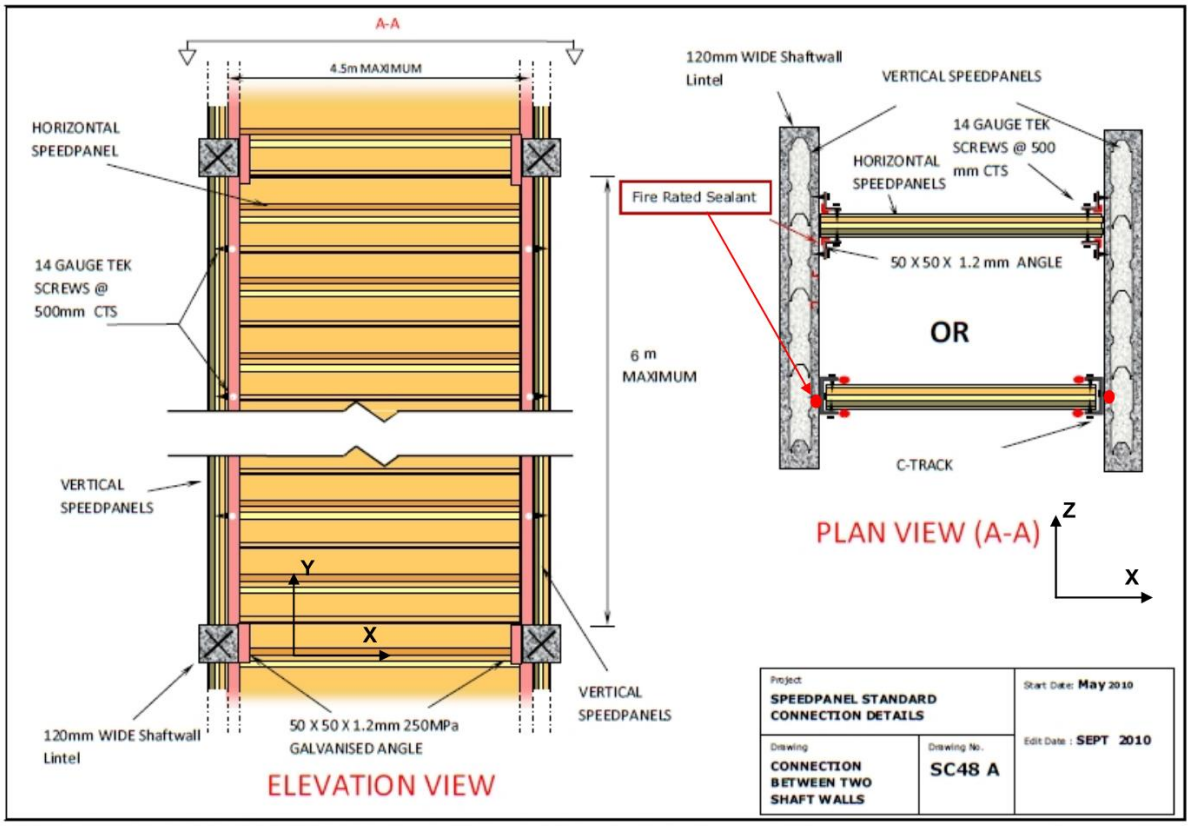


Figure 1 (FAR 3583)- Horizontal and Vertical Speedpanel configuration

APPENDIX B – ASSESSMENT OF SPECIFIC VARIATIONS

B.1 FIRE RESISTANCE PERFORMANCE OF SPEEDPANEL SCISSOR STAIR

B.1.1 Proposed Construction

Horizontally Orientated Speedpanel Wall

B.1.1.1 The configuration shown in figures 1, 2 and 3 cannot be tested directly in accordance with AS 1530.4-2005. Specifically, it is considered that in practice, all sections of the wall except for that highlighted in figure 3 would be subject to fire conditions on both sides of the wall.

B.1.1.2 In light of this, it is considered that the highlighted section of figure 3 is the only section of the proposed construction which can be assessed for an FRL. We break this into two parts:

- Fire resistance in the horizontal plane by the panels in the highlighted section of figure 3.
- Fire resistance in the vertical plane by the panel-to-stair edge conditions around the perimeter of the highlighted section of figure 3.
- The length of Speedpanel is maximum 5.0m wide and the height of Speedpanel wall is unlimited

Vertically Orientated Speedpanel Wall

B.1.1.3 The configuration shown in figures 8 and 9 cannot be tested directly in accordance with AS 1530.4-2005. Specifically, it is considered that in practice, all sections of the wall except for that highlighted in figure 9 would be subject to fire conditions on both sides of the wall.

B.1.1.4 In light of this, it is considered that the highlighted section of figure 9 is the only section of the proposed construction which can be assessed for an FRL. We break this into two parts:

- Fire resistance in the horizontal plane by the panels in the highlighted section of figure 9.
- Fire resistance in the vertical plane by the panel-to-stair edge conditions around the perimeter of the highlighted section of figure 9.
- The height of Speedpanel wall is unlimited and the maximum Speedpanel panel vertical span between concrete landings is 3m high.
- The width of Speedpanel wall is unlimited.
- The back to back C-tracks of wall panels shall be protected with a 0.7mm thick steel flashing on one side only.

B.1.2 Horizontal Fire Separation

Horizontally Orientated Speedpanel Wall

B.1.2.1 In this section we consider the fire resistance in the horizontal plane of the horizontally orientated Speedpanel panels that provide horizontal fire separation which are highlighted in figure 3.

B.1.2.2 If we consider the highlighted diamond section in isolation, it is noted that each of the horizontally orientated Speedpanel panels will contain fixings in the form of the stair-to-wall joint detail: one fixing on each side of the panel. Due to the angle of the stairs and the proposed width of the system, the panels will span between these fixings between 2.5m and 5m.

B.1.2.3 The proposed horizontally orientated Speedpanel panels were tested in EWFA 2736001.1. The test specimen comprised an upper wall section of vertical Speedpanel which was supported by a lower wall section of horizontal Speedpanel. As such, it is considered that the horizontal panel section simulated the loading conditions of a self-supported span greater than that which was tested. It has been calculated that the simulated greater span was in excess of 5m. During the test, the horizontal panels remained stable for the 151 minute test duration.

B.1.2.4 The tested horizontal panels were fixed to the side track on both sides of the wall at both ends of the panel, though only at every second panel joint.

B.1.2.5 In the proposed construction, the fixings are such that end of each panel (highlighted section in figure 3) will be fixed on one side of the wall only: at one end of the panel, the fixings will be on one side and at the other end of the panel they will be on the other side but at every panel joints.

B.1.2.6 Based on the above it is considered that when Speedpanel wall section (diamond shape in figure 3) is exposed to fire from one side, there will be the same number of fixings per panel on the unexposed side in the proposed construction to support the wall section as there were in the construction tested in EWFA 2736001.1.

B.1.2.7 In light of the above, it is considered that the construction tested in EWFA 2736001.1 has sufficiently demonstrated the Speedpanel ability to remain stable for at least 120 minutes if installed as per the proposed configuration.

B.1.2.8 In the proposed construction the panels do extend past the section relevant to fire separation. Exposure on both sides will tend to reduce deflection and instability of the panels and as they are made from mostly inorganic materials, it is not expected that fire on both side would result in consumption, collapse or the introduction of gaps or potential flaming weakness.

B.1.2.9 Based on the above it is considered that the impact of the additional panel on one end being exposed on both sides will not introduce a detrimental influence to the parts of the panel in the shaded section of figure 3.

B.1.2.10 The insulation performance in the field of the Speedpanel panels has been demonstrated on a full-scale wall specimen in reference test 2286900.5 in excess of 120 minutes and is not expected to be affected..

B.1.2.11 Based on the above it considered the integrity and insulation performance of the proposed construction in figure 3 will maintain integrity and insulation for at least 120 minutes when tested in accordance with AS1530.4-2005.

Vertically Orientated Speedpanel Wall

B.1.2.12 In this section we consider the fire resistance in the horizontal plane of the vertically orientated Speedpanel panels that provide horizontal fire separation which are highlighted in figure 9.

B.1.2.13 If we consider the highlighted diamond section in isolation, it is noted that each of the Speedpanel panels will contain fixings in the form of the stair-to-wall joint detail: one fixing on each side of the panel. Due to the angle of the stairs and the proposed width of the system, the panels will span between these fixings maximum 3m high in vertical direction.

B.1.2.14 The proposed vertically orientated Speedpanel panels were tested in BWA 2286900.5. The test specimen comprised a 3m × 3m vertically orientated Speedpanel wall fixed at top and bottom. When test, the wall system achieved integrity and insulation performance of at least 120 minutes.

B.1.2.15 In the proposed construction, the vertically orientated Speedpanel panels were fixed at every 3m span between concrete ladings. The fixings are fixed on one side of the wall only: at one end of the panel, the fixings will be on one side and at the other end of the panel they will be on the other side but at every panel joints.

B.1.2.16 The proposed fixing manner is similar to horizontally orientated Speedpanel wall discussed above.

B.1.2.17 As discussed previously, it is considered that when the maximum 3m high vertically orientated Speedpanel wall section (diamond shape in figure 9) is exposed to fire from one side, there will be the same number of fixings per panel on the unexposed side in the proposed construction to support the wall section as there were in the construction tested in EWFA 2736001.1.

B.1.2.18 In light of the above, it is considered that the construction tested in EWFA 2736001.1 and BWA 2286900.5 has sufficiently demonstrated the fixing capacity and vertically orientated Speedpanel wall ability to remain stable for at least 120 minutes if installed as per the proposed configuration.

B.1.2.19 Although in the proposed construction the panels do extend past the section relevant to fire separation. Exposure on both sides will tend to reduce deflection and instability of the panels and as they are made from mostly inorganic materials, it is not expected that fire on both side would result in consumption, collapse or the introduction of gaps or potential flaming weakness.

B.1.2.20 Based on the above it is considered that the impact of the additional panel on one end being exposed on both sides will not introduce a detrimental influence to the parts of the panel in the shaded section of figure 9.

B.1.2.21 The proposed junction detail for two vertically orientated Speedpanel wall spans is protected by a 0.7mm BMT galvanised steel flashing fixed to one side of the junction.

B.1.2.22 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.1.2.23 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.1.2.24 The proposed flashing at the junction has the similar material and 0.3mm thicker than the head track protection tested in EWFA 2741700. It is therefore considered the proposed detail will maintain integrity and insulation performance for 120 minutes.

B.1.2.25 The insulation performance in the field of the Speedpanel panels has been demonstrated on a full-scale wall specimen in reference test 2286900.5 in excess of 120 minutes and is not expected to be affected.

B.1.2.26 Based on the above it considered the integrity and insulation performance of the proposed construction in figure 9 will maintain integrity and insulation for at least 120 minutes when tested in accordance with AS1530.4-2005.

B.1.3 Vertical Fire Separation

B.1.3.1 In this section we consider the fire resistance in the vertical plane of the wall-to-stair joint, i.e. the boundary of the Speedpanel panels highlighted in figure 3.

B.1.3.2 The joint detail varies based on the width of the joint between the horizontally orientated Speedpanel wall and stairs as shown in figures 4 to 7. The joint details of the vertically orientated Speedpanel wall and stairs are as shown in figures 10 to 13.

B.1.3.3 For joint width of 0-10mm wide, the proposed detail prescribes a steel angle on the under (fire) side and a backing rod and sealant on the upper (non-fire) side. AS1530.4-2005 Claude 10.5.3 stipulates thermocouples are not required on the unexposed side of the seal which is recessed within the separating element when the joint width is less than 12mm. it is therefore expected the performance is restricted to an evaluation of integrity only.

B.1.3.4 With reference to WARRES 69754/C specimen 1 which comprised a 150mm thick concrete floor incorporating a 20mm wide control joint protected with 10mm deep Hilti Flexible Firestop Sealant CP 606 sealant on the topside of floor slab and backed with Ø24mm polyethylene foam rod.

B.1.3.5 When tested, the control joint maintained integrity and insulation performance of 240 minutes and 130 minutes respectively.

B.1.3.6 When tested, no cracks, fissures or through gaps formed that would indicate a potential for shrinkage or impending integrity failure before 240 minutes. The CP 606 sealant remained in place throughout period of the test.

B.1.3.7 The proposed concrete stair thickness is 30mm less than the tested 150mm thick concrete floor slab. Theoretically, reducing the separating element thickness is likely to increase the possibility of joint sealing system exposed to heating source earlier than tested.

B.1.3.8 Due to the reduction in gap size and additional protection afforded by the proposed steel angle, it is expected the proposed sealing system on the upper (non-fire) side will not be directly exposed to heating source for at 120 minutes and hence the integrity performance of proposed joint detail would be similar to the tested specimen reference 1 in WARRES 69754/C for at least 120 minutes when tested in accordance with AS1530.4-2005.

B.1.3.9 For joint widths of 0-20mm wide, the proposed detail is similar to the Specimen reference 1 in WARRES 69754/C though a continuous steel angle is fixed on the under (fire) side and the proposed Hilti Flexible Firestop Sealant CP 606 is 20mm deep.

B.1.3.10 The significance of the presence of steel angle will prevent the proposed sealant from directly exposure and improve the effectiveness of sealant on upper side.

B.1.3.11 Confidence is also addressed by the increased depth of proposed sealant will resist more heat to heat up the unexposed side of sealing system.

B.1.3.12 Taken into account of the above, it is expected the integrity and insulation performance of proposed joint detail would be at least the same as the tested specimen reference 1 in WARRES 69754/C for 120 minutes when tested in accordance with AS1530.4-2005.

B.1.3.13 For joint widths of 0-35mm wide, the proposed detail prescribes a steel angle on the under (fire) side and 20mm deep Hilti Flexible Firestop Sealant CP 606 is filled on the upper (non-fire) side and the gap in the joint between sealant and steel angle is sealed with Rockwool insulation with a density of 140kg/m^3.

B.1.3.14 The tested Specimen reference 4 in WARRES 69754/C comprised a 150mm thick concrete floor incorporating a 30mm wide control joint protected with 15mm deep Hilti Flexible Firestop Sealant CP 606 sealant on the topside of floor slab and backed with 70mm deep Rockwool insulation with a density of 140kg/m^3.

B.1.3.15 When tested, the control joint maintained integrity and insulation performance of 240 minutes and 216 minutes respectively.

B.1.3.16 The proposed joint width is 17% wider than Specimen reference 4 tested in WARRES 69754/C.

B.1.3.17 The significance of the presence of steel angle will prevent the proposed sealant from directly exposure and improve the effectiveness of sealant on upper side.

B.1.3.18 Confidence is also addressed by the increased depth of proposed sealant and backfilling Rockwool insulation will both resist more heat to heat up the unexposed side of sealing system.

B.1.3.19 Taken into account of the above, it is expected the integrity and insulation performance of proposed joint detail would be at least the same as the tested specimen reference 4 in WARRES 69754/C for at least 120 minutes when tested in accordance with AS1530.4-2005.

B.1.3.20 For joint widths of 0-95mm wide, the proposed detail prescribes a steel angle on the under (fire) side and 50mm thick TBA Intubatt is friction fitted into the gap and sit on steel angle. The wall to stair joint is then capped with 0.55mm thick steel flashing at the topside.

B.1.3.21 The significance of the presence of the rigid steel angle will support the Intubatt batt in place for the duration of the fire and prevent the batt from directly exposure hence improve the effectiveness of the batt on upper side.

B.1.3.22 With reference to the test EWFA 2736000.1, the tested 78mm thick Speedpanel wall system comprised an aperture and the aperture was protected by one layer of 50mm thick Intubatt.

B.1.3.23 When tested, the friction fitted 195mm high and 50mm thick Firetherm Intubatt stayed in the aperture for at least 120 minutes and the maximum temperature measured on the unexposed side of Firetherm Intubatt piece at 120 minutes was 238°C.

B.1.3.24 Based on the above, it is expected the proposed Intubatt seal which is in horizontal orientation though is supported by the rigid steel angle will stay in place for at least 120 minutes.

B.1.3.25 The proposed Intubatt batt is not directly exposed to fire and it is expected the unexposed side of Intubatt seal would have a much lower unexposed side temperature than that tested in EWFA 2736000.1.

B.1.3.26 In addition, the presence of the steel flashing at the top side of the wall to stair joint will provide a notional barrier to reduce the rate of heat transfer to the unexposed side.

B.1.3.27 Taken into account of the above, it is considered the proposed seal construction will maintain insulation performance for at least 120 minutes.

B.1.3.28 For joint width 0-95mm wide, the proposed 50mm thick TBA Intubatt batt can optionally be substituted with 50mm thick Boss Bulkhead batt and caulked by Firemastic 300 intumescent sealant in a similar manner.

B.1.3.29 With reference to test Chilt/RF01120D, 1 layer of 50mm thick Boss Bulkhead Batt was friction fitted centrally within a 900mm by 600mm aperture in an AAC wall construction. The Boss Bulkhead Batt maintained insulation and integrity performance in excess of 120 minutes.

B.1.3.30 Based on the above, it is expected the proposed batt seal which is in horizontal orientation though is supported by the rigid steel angle will stay in place for at least 120 minutes.

B.1.3.31 The proposed Boss bulkhead batt is not directly exposed to fire and it is expected the unexposed side of batt seal would have a much lower unexposed side temperature than that tested in Chilt/RF01120D.

B.1.3.32 Based on the above it considered the integrity and insulation performance of the proposed construction in figure 4-7 and 10 to 13 will achieve an integrity and insulation for at least 120 minutes when tested in accordance with AS1530.4-2005.

B.1.4 Proposed construction of box riser and dual stack riser

B.1.4.1 The function of the Speedpanel in the construction of the scissor stair and the addition of the box riser and dual stack riser is to maintain continuity in compartmentation, with each fire stairwell compartment fire isolated for the full height of the set of stairs. It provides the required FRL for the internal compartmentation within the confines of the surrounding stairwell external shaft walls.

B.1.4.2 As discussed earlier, due to the nature of the stairwell construction and the direction of exposure of the panel wall changing in directions continually rising up the stairs, it is not possible to have the entire wall system tested as a whole unit.

B.1.4.3 In the box riser construction, the box riser is basically the build-up of 2 horizontally orientated continuous height Speedpanel wall panels along the long sides and 2 horizontally or vertically orientated panels at the short ends with corner joints, previously tested and assessed in B1.2 except that the Speedpanel wall will be exposed from one side only.

B.1.4.4 The proposed box riser consists of a similar Speedpanel wall panel providing a 120 minutes fire resistant barrier for the stair's compartmentation and forming a fire isolated box within the stairwell.

B.1.4.5 This assessment only addresses the impact of exposure of the non-loadbearing Speedpanel infill wall panels to fire from the outside of the stairwell compartmentation. The assessment provides confirmation that the Speedpanel wall panels installed will perform to the required FRL of -/120/120. The actual structural strength of the stairs and the surrounding non-Speedpanel walls and their ability to handle the design loads will be validated by structural engineers engaged by others or by the relevant building project construction managers and is not part of this assessment.

B.1.4.6 The long sections of the box riser are similar to the normal scissor stair with the Speedpanel wall providing a barrier for separating the stair's separate fire compartment (as shown in figure 9 separating the two risers). In the case of the box riser the separation is between the two stair compartments and the void within the box riser. The entire wall sections are required to have a fire resistance performance for fire originating from within the void area. It is considered that the intent is to fire isolate the stairwell area against any fire from outside of the compartment. The requirement would therefore be that no combustibles are to be allowed inside the stair well of the scissor stair.

B.1.4.7 Assessment reports FAR 3580 and FAR 3583 looked into the requirements for fixings at the interlocking joints and the tracks over the tested Speedpanel walls to provide stability of both the horizontally and vertically orientated panels to enable the walls to be built to unlimited heights. They also provided limitations to the maximum widths of wall panels that can be constructed.

B.1.4.8 The discussions in Report FAR 3583 outlines the requirements for fixings and supports in order for the Speedpanel walls (both horizontal and vertically orientated) to be built to heights above the tested 3 metres.

B.1.4.9 In the case of the vertically orientated panels, the wall height is limited to a maximum of 6 metres. The vertical panels are then designed to maximum panel heights of 6 metres. At the top of the vertical panel twin or back to back C-tracks are installed and supported at both ends of the C-tracks to the permanent stable structure, in the case of the scissor stair, the edge of the stair landing slab. The panel above can be installed up to 6 metres supported by the C-track above. This is then repeated to an indefinite height or to the top of the designed stairwell.

B.1.4.10 Similarly, the horizontally orientated panels as discussed in FAR 3583, can be built to indefinite heights provided they are supported at the ends by fixing the panels' interlock joints onto the vertical supports (C- or J-tracks as applicable) at 500mm centres. The support channels or C- or J-tracks are in turn secured to the landing slab's edge at every level.

B.1.4.11 The box may either be with a single void or divided centrally into two voids. With a single void the maximum width of the Speedpanel panels shall be 3000mm with vertical steel C-tracks supports at each end.

B.1.4.12 With the box riser, the long sides are stacked with horizontally orientated Speedpanel panels and up to a maximum of 4.5 metres in width. Where the panels are wider than 3 metres, the panels require intermediate tee supports as the width is more than 3 metres as tested with no supports in between. An intermediate horizontally orientated panel infill wall is fitted as shown in Figure 16. The infill panel wall provides stability to the long side by limiting the lateral deflection when exposed. This has been assessed basing on the proviso that the supporting C- tracks are fixed at each floor level and in this case onto the stair stringer (which is a permanent structure).

B.1.4.13 With the design of the scissor stair as shown, the supports for the intermediate infill panel are fixed onto the sides of the long panels. The long panels are held onto the stair stringers with steel angles in the stair side. An intermediate infill panel is fixed to the long panels via equal steel angles as shown in Figure 17. As discussed earlier, the 78mm thickness Speedpanel panel when tested, is capable of performing to at least 120minutes in both insulation and integrity performance. The weakness in insulation is only at the joints where a steel flashing needs to be provided (only where C-tracks are installed; not required at the mid-wall when 2 equal angles are installed) as a barrier against the early ingress of hot gases through the core of the panels. In the event of a fire in the void, the infill panel wall would be exposed to one side of the twin void. The function of the panel is to provide stability to the long panel. Where installed fixed to the one-piece long panel (on each side of the void) of up to 4.5metres in length, there are no vertical panel joints to require additional consideration for insulation performance. The main consideration would be the integrity of the joints between the infill panel and the long panel. In order to maintain continuity in the integrity performance when exposed, the fixings are to be via separate steel equal angles on both sides of the joint. When one side of the joint is exposed the steel angle on the unexposed side is not exposed to elevated temperatures and therefore provides continued support for the infill panel. This in turn provides continuity in stabilising the infill panel and thus continues to limit the lateral deflection (into the void) for at least for the required 120minutes duration of exposure.

B.1.4.14 The horizontal panels are held in position at each end by J- or C-tracks mounted vertically and fixed onto the stair landing at each level. The panels are in turn fixed onto the vertical J or C-tracks at 250mm centres as previously accessed in FAR 3583. The connection details between the stairs are per detail C in Figure 16.

B.1.4.15 The long side may be built up to 6 metres in length by splitting the horizontal panel equally in two each of 3 metres or less. The panels are joined in the midsection by back to back J-tracks which are firmly fixed onto the stair stringers between alternate floors. This is detailed in Figure 18 which incorporates steel flashing on the unexposed or stair side in order to achieve the required insulation performance.

B.1.4.16 As explained earlier, the exposure of the panels will be from the void of the box riser towards the interior of the stairwell (the stair side). The fixings can be adequately protected and maintain an FRL of at least -/120/120 with steel flashings fitted on the unexposed side (refer

to B.1.2.23). The panel fixings apart from the fixings onto the slab edges of the stair landing shall be from the stair side together with steel flashings over the fixings.

B.1.4.17 From the discussion in B.1.2.3 and B.1.2.23, it is confirmed that the Speedpanel wall with steel flashings over the joints on the fire side will perform to at least 120minutes in integrity and insulation when tested in accordance with AS1530.4-2014. It is therefore considered that the Speedpanel wall surrounding the box riser will perform equally to FRL -/120/120 for exposure from either the void or from within the stairwell area.

B.1.4.18 The short ends of the box riser may be filled with either horizontally or vertically orientated Speedpanel panels. The corner joints between the vertical and horizontal panels are as shown and detailed in Figure 16. The panels are fixed between the stair landing floor slabs and if vertical orientated panels are installed they shall be limited to a maximum height of 6 metres. Figure 15 indicates that the panels on the ground floor and at the top level are up to 6600m in height in which case only horizontally orientated panels can be installed at the ends. Alternatively, vertically orientated panels could be installed at every level for the short ends of the box riser except for the top and ground floors.

B.1.4.19 A similar issue arises with the horizontally orientated panels for the long side of the box at the top floor. There will be up to 10 metres of no lateral fixed supports for one of the long sides (no intermediate stair stringer, intermediate floor or landing slab between the last floor to the plant room access). As per Figure 15 where the long side of the box exceeds 3000mm, the panel needs to be split as indicated for option 2, Detail C.

B.1.4.20 This assessment only deals with the impact of fire exposure to the Speedpanel walls and is based on the assumption that the loads imposed on the stair landing slabs by the support members for providing stability and rigidity in the Speedpanel wall panels have been accounted for in the structural design calculations to be performed by others engaged specifically for the construction of the stair system,

B.1.4.21 The joint and fixings for the proposed box riser construction are as detailed in figures 15 to 26 and the fixing screws and bolts shall be not less than those tested.

B.1.5 Proposed Head track detail (refer to Figure 19)

B.1.5.1 The Head Details in Figure 19 outlines the provision of a steel angle over the joint gap on the unexposed side of the box riser. Discussion in B.1.2.23 refers to the head details similar to that in Figure 19 except that the unexposed side of the panel is fitted with a steel flashing and assessed as being capable of maintaining the required FRL of -/120/120.

B.1.5.2 It is proposed that the steel flashing on the unexposed side be replaced with equivalent unequal steel angle of 6mm plate thickness. The angle is much thicker than the 0.55mm steel flashing and is expected to perform better as it is more rigid and stronger. As the treatment of the steel angle installation with sealants is the same as that with the steel flashing, the head details with the steel angle on the unexposed side will similarly provide sufficient cover to maintain 120 minutes in integrity and insulation.

B.1.6 Optional lining of Speedpanel external surfaces with 6mm fibre cement sheets.

B.1.6.1 It is proposed that the Speedpanel wall surfaces be optionally lined with 6mm fibre cement sheets.

B.1.6.2 The fibre cement sheets are non-combustible and will not add to the combustion fuel load of the wall when exposed to fire. The panel will act as a decorative panel and simply break up into fragments and crumble after more than 6 minutes more of exposure. The fibre cement sheet lining on the unexposed side will remain integral for the full duration of the 120 minute of required FRL as the temperature on unexposed side is insufficient to cause deterioration or deformation of the fibre cement sheets.

B.1.6.3 The fibre cement sheets will act as a fire resistant barrier on the unexposed side and can substitute for the steel flashing over the panel joints on the unexposed side.

B.1.7 Fixings and supports

B.1.7.1 Generally, the support C- sections and J tracks shall not be less than 1.15BMT unless otherwise noted on the proposed drawings. Gaps along walls and ceiling slabs. The fixings of the panels to the main supports shall be mainly from the stair side and be covered with 0.7mm galvanised steel flashings. Fixing of the supports shall be either to the stair structure (via stair stringer) or landing slabs at each level or between floors. Installers are to be aware of the limitations in height and widths of the panels as detailed in the summary tables below.

B.1.7.2 Where the C- or J- tracks are exposed with fixings in the void side, they shall be covered over with steel flashings incorporating fire sealants to avoid direct heat exposure and to maintain insulation performance. Similarly, joints and fixings on the exposed side shall be covered over with steel flashings. Where the panels are lined with fibre cement sheeting and the fixings are covered, the steel flashings may be omitted.

B.1.8 Summary of assessment of box riser in scissor stair

B.1.8.1 The assessment of the scissor stair including dual stack and box riser is as summarised below:

Dual void box riser in scissor stair				**FRL**
Horizontally orientated Speedpanel panels		**Vertically orientated Speedpanel panels**		
Maximum width	**Comments and requirements**	**Max. height**	**Comments and requirements**	
4500mm with mid stiffening panel or support at 90° and supports at each end. Or up to 6 metres if panel is split at mid-point into two of 3 metres or less each incorporating back to back J tracks, fixed to stair stringers between levels.	Generally, 4500mm max width when incorporating intermediate stiffeners at 90° and adequately fixed mid width at each level up to 4000mm vertically. However, where the firm fixing point spacing extends beyond 4000mm vertically such as in the case of the proposed dual stack riser with up to 6600mm in height, the long side panels will need to be split and be held in position with back to back J tracks. Each of the half panel will then be 2 metres in length or less than 3 metres.	6000mm	Generally, 6000mm max height and to infinite width. Panels to be fixed to C or J tracks support members at 250mm centres. Fixings from stair side with 0.7mmBMT steel flashings over track joints. With the proposed dual stack riser, the vertical wall panels extend up to 6600mm in which case the panels must be horizontally orientated only.	**-/120/120 (exposure from void side)**
Requirement: Maximum box riser length 4500mm with mid-point infill panel wall or-stiffener, or 6000mm maximum width if the panels are split equally in two with mid-point supports.				

Single void box riser in scissor stair				**FRL**
Horizontally orientated Speedpanel panels		**Vertically orientated Speedpanel panels**		
Maximum width	**Comments and requirements**	**Max.height**	**Comments and requirements**	
3000mm with supports at each end. Or up to 6 metres if panel is split at mid-point into two of 3 metres or less each incorporating back to back J tracks fixed to stair stringers between levels.	Where any side is >3000mm the long panels need to be split with mid-point supports. C tracks shall generally not extend beyond 4000mm vertically unsupported unless reinforced and verified by structural engineers. Panel fixings to support C tracks spaced @ 250mm centres vertically.	6000mm	Panels are to be <6000mm in height	**-/120/120 (exposure from void side)**