ASSESSMENT REPORT

The fire resistance performance of cable penetrations in Speedpanel walls tested in accordance with AS1530.4-2005 and assessed in accordance with AS4072.1-2005

EWFA Report No:

26500-08

Report Sponsor:

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Testing. Advising. Assuring.

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1 INTRODUCTION

This report was previously issued on 16/07/2015 with reference number 26500-06. Since the previous issue, a review of the technical basis of the assessment was undertaken and validity extended for a further 5 years. Refer to Assessment Review EWFA 44712700.

This report presents an assessment of the fire resistance performance of cable penetrations in Speedpanel walls if tested in accordance with AS1530.4-2005 and assessed in accordance with AS4072.1-2005

The tested prototypes described in Section 2 of this report, when 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 Appendix A 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 reference test reports FSV 1523, FSV 1506, FSV 1482, FSV 1466, FSV 1458, EWFA 2492900.1, EWFA 2517300.4, EWFA 2373800.1, EWFA 2524100.1 and FP 4060.

The tests were sponsored by Bovis Lend Lease Pty Ltd, Lend Lease Project Management and Construction Pty Ltd, Speedpanel Pty Ltd and Promat Australia Pty Ltd.

This assessment is also referenced to test report EWFA 2683500 that was sponsored and conducted by Exova Warringtonfire Aus Pty Ltd, test report No. 14244A that was sponsored by Hilti AG and was conducted by Warringtonfiregent and test report iBMB 3681-6818 was sponsored by Hilti Deutschland GmbH.

Permission has been granted by Bovis Lend Lease Pty Ltd and Lend Lease Project Management and Construction Pty Ltd for the reference reports FSV 1523 FSV 1056 FSV 1482, FSV 1466, FSV 1458, EWFA 2492900.1, EWFA 2373800.1 and EWFA 2524100.1 to be used for the purpose of this assessment report.

Permission has been granted by Promat Pty Ltd for the reference report FP 4060 to be used for the purpose of this assessment report.

Permission has been granted by Hilti AG and Hilti Deutschland GmbH for the reference reports No. 14244A and iBMB 3681-6818 to be used for the purpose of this assessment report.

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

3 VARIATION TO TESTED PROTOTYPES

The proposed construction is summarised as follows:

Cable Penetrations:

- Specimens A, H, I and L as per FSV 1482 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens B, C and F as per FSV 1482
- Specimens 2 and 5 as per FSV 1466 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimen 3 as per FSV 1458 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimen A as per EWFA 2492900.1 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens B and C as per EWFA 2492900.1
- Specimen J as per EWFA 2517300.4 though the blanket wrap replaced with 600mm Rockwool insulation as tested in EWFA 2683500.

- Specimen F as per EWFA 2373800.1.
- Specimens A, B and C as per EWFA 2524100.1 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens H, I, J, K and M as per FSV 1506
- Specimens 1 through 13 as per FSV 1523
- Maximum Ø75mm cable and pair coil bundle consists of maximum three pairs of Ø8mm and Ø15mm copper pipes insulated with 10mm thick Armaflex insulation and maximum three of Ø10mm 4 core and earth 1.5mm2 cables into a maximum Ø100mm aperture. The minimum 10mm gap annular gap between penetrating service and the wall shall be fully sealed with Hilti Firestop Intumescent Sealant CP 611A.

Wall Construction:

- ***Speedpanel Wall Option 1:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad locally with 2 x 16mm thick Powerscape or fire grade plasterboard each side of wall.
- ***Speedpanel Wall Option 2:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad with 2 × 16mm thick Powerscape or fire grade plasterboard on one side and 3 × 16mm thick Powerscape or fire grade plasterboard on the other side to make a total thickness of 157mm.
- ***Speedpanel Wall Option 3:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture sealed with sealant only, no board required.
- ***Speedpanel Wall Option 4:*** the wall system shall incorporate a 78mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm Powerscape or fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 156mm.
- ***Speedpanel Wall Option 5:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad on one side with one layer of 60mm thick PROMATECT® Vermiculux board and one layer of 20mm thick PROMATECT® Vermiculux board on to make a total thickness of 157mm.
- ***Speedpanel Wall Option 6:*** the wall system shall incorporate a 78mm thick Speedpanel wall and the service aperture clad locally with 1 × 13mm thick fire grade plasterboard on each side of wall.
- ***Speedpanel Wall Option 7:*** the wall system shall incorporate a 78mm thick Speedpanel wall and the service aperture clad locally with 2 × 13mm thick fire grade plasterboard on one side of wall.
- ***Speedpanel Wall Option 8:*** the wall system shall incorporate a 51mm or 64mm thick Speedpanel wall and the service aperture clad locally with 1 × 16mm thick fire grade plasterboard on each side of wall.
- ***Speedpanel Wall Option 9:*** the wall system shall incorporate a 51mm or 64mm thick Speedpanel wall and the service aperture clad locally with 2 × 16mm thick fire grade plasterboard on one side of wall.

Cable Protection Measures:

- For -/120/120 penetrations – Optional cylindrical mesh (2mm min. steel) shall be installed around each service on both sides of the wall such that the distance between any part of the service and the mesh is not less than 100mm. The mesh shall extend between 200mm and 1000mm each side of the wall, depending on the service in question. The mesh shall be suitably fixed to the wall and supported at 250mm and 750mm from the wall face if the mesh length is more than 250mm.
- For -/120/- penetrations, no mesh is required.
- Service penetrations shall be spaced at a minimum of 40mm apart

Table 1: Cable Specimen Specifications

Des. #	Specification / Installation	Test Specimen
1	A single TPS cable penetrating the wall system through a 10-mm diameter hole. The gap between the cable penetration and the wall is left unsealed. The specimen is sealed on both sides of the wall with a 25-mm × 25-mm fillet of Bostik Fireban One Sealant. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1482 spec. A
2	Bunch of BMS cables approximately 80-mm in diameter, penetrating the wall system through a 100-mm high x 150- mm wide opening. The resulting gap around the cables is protected by Fyreplug pillows and sealed on both sides of the wall with a 25-mm x 25- mm fillet of Bostik Fireban One sealant. Refer to referenced test report for complete drawing.	FSV 1482 spec. B
3	Three Cat. 7 cables penetrating the wall through a 25-mm diameter hole. The resulting gap around the cables is sealed on both sides of the wall with a 25-mm x 25-mm fillet of Bostik Fireban One sealant. Refer to referenced test report for complete drawing.	FSV 1482 spec. C
4	Bunch of 5 FireSense Fire Rated Cables penetrating the wall through a 35-mm diameter hole. The resulting gap around the cables is sealed on both sides with a 25-mm x 25-mm Promat Promaseal Supa Mastic fillet. The sealant was applied to the depth of two layers of board. Refer to referenced test report for complete drawing.	FSV 1482 spec. F
5	One bunch of Cat. 7 shielded data cables and three bunches of communication cables penetrating the wall system through a 100mm high × 200mm wide opening. Each bunch of cables measures approximately 50mm in diameter. The total thickness of the wall, where the cables penetrated it, is increased by adding three 16mm thick layers of Powerscape board on both faces. The extra boards, nominally 300mm high × 400mm wide, are fixed onto the wall with 8 gauge laminating screws. Bostik Fireban one is applied between every extra layer of Powerscape board. The resulting gap around the cables is protected by Promat Fire Pillows and sealed on both sides of the wall with Bostik Fireban One sealant. Cables are supported by a 200mm wide steel cable tray fixed to a steel bracket on both sides on the wall that does not penetrate the wall. The specimen is then sealed on both sides of the wall with a 25-mm × 25-mm fillet of Bostik Fireban One Sealant. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1482 spec. H
6	One bunch of Cat. 7 shielded data cables and four bunches of communication cables penetrating the wall system through a 150-mm high x 300-mm wide opening. Each bunch of cables measures approximately 50-mm in diameter. The total thickness of the wall where the cables penetrated it is increased by adding three 16-mm thick layers of Powerscape board on both faces. The extra boards, nominally 350-mm high x 500-mm wide, are fixed onto the wall with 8 gauge laminating screws. Bostik Fireban one is applied between every extra layer of Powerscape board. The resulting gap around the cables is protected by Promat Fire pillows and sealed on both sides of the wall with Bostik Fireban One sealant with size of 25-mm × 25-mm fillet. Cables are supported by a 300mm	FSV 1482 spec. I

Des. #	Specification / Installation	Test Specimen
	wide steel cable tray fixed to a steel bracket on both sides on the wall and that does not penetrate the wall. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	
7	Specimen comprises 264 Cat 7 shielded cables penetrating the wall system through a 150-mm high x 600-mm wide opening framed with 0.75-mm thick Rondo studs. The total thickness of the wall where the cables penetrated it is increased by adding three 16-mm thick layers of Powerscape board on both faces. The extra boards, nominally 350-mm high x 800-mm wide, are fixed onto the wall with 8 gauge laminating screws. Bostik Fireban One is applied between every extra layer of Powerscape board. The resulting gap around the cables is protected by Promat Fire pillows and sealed on both sides of the wall with Bostik Fireban One sealant with size of 25-mm × 25-mm fillet. Cables are supported by a 600mm wide steel cable tray fixed to a steel bracket on both sides on the wall and that does not penetrate the wall. For mesh protection refers to Refer to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1482 spec. L
8	Specimen comprises a single TPS cable penetration, approximately 10mm in diameter, penetrating the wall system through a 21mm diameter hole. The penetration is sealed on both sides of the wall with PROMASEAL® Supa Mastic with a size of 25-mm × 25-mm fillet, such that it extends 40-mm along the cable from the wall and 30-mm along the wall from the cable penetration. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1466 spec. 2
9	Ø25mm × 2.5mm thick PVC conduit filled with TPS cables and protected with collars. The PROMASEAL® CFC32 collars are fixed to each side of the wall in a back-to-back configuration using two No. 7 gauge bugle head screws. The resulting gap between the conduit and the wall is sealed with PROMASEAL® Supa Mastic with a size of 25-mm × 25-mm fillet. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1466 spec. 5
10	Cat7 shielded security cables, Ø80-mm, penetrating the wall system through an Ø90mm hole. The total thickness of the wall where the cables penetrate it is increased by adding two 16mm thick layers of Powerscape board on the exposed face and four 16-mm thick layers of Powerscape board on the unexposed face. The penetration is sealed on both sides of the wall with PROMASEAL® Super Mastic with a size of 25-mm × 25-mm fillet. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	FSV 1458 spec. 3

Des. #	Specification / Installation	Test Specimen
11	Security cable bundle, nominal 60mm – 70mm in diameter in an Ø80mm aperture. Cables consist of 12-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick and 56-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness • Between the cable bundles and wall aperture at a thickness of approximately 10mm • To the exposed and unexposed sides of the wall system around the cable bundle to approximately 85mm from the wall, and approximately 230mm diameter around the cable bundle, and form a 25-mm ×25mm fillet of Bostik Fireban One sealant on both sides. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 70mm from the wall. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	EWFA 2492900.1 spec. A
12	Communications cable bundle, nominal 50mm – 70mm diameter in an Ø80mm aperture. Cables consist of 48 cables made up of two separated packs of 24 cables. Each cable core consisted of 4-pairs with nominal overall diameter 6.5mm - 8.2mm. Within this pack of cables, a steel suspending cable was also laid made up of 5 strands of wire with a nominal diameter of 2.7mm. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness. • Between the cable bundles and wall aperture at a thickness of approximately 15mm at the top and bottom down to approximately 5mm at the sides. • To the exposed and unexposed sides of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 230mm diameter around the cable bundle. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 50mm from the wall. Refer to referenced test report for complete drawing.	EWFA 2492900.1 spec. B
13	Red sheathed 2 Core EWIS cable bundle, nominal 55mm diameter in an Ø80mm aperture. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness • Between the cable bundles and wall aperture at a thickness of approximately 15mm.	EWFA 2492900.1 spec. C

Des. #	Specification / Installation	Test Specimen
	• To the exposed side of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 100mm from the wall on the cable bundle to the unexposed side, and approximately 200mm diameter around the cable bundle. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 30mm from the wall. Refer to referenced test report for complete drawing.	
14	PVC-insulated power cables, as per AS1530.4-2005 Appendix D1 Group A. Cables are secured to LT3-300-3 Burndy® Ladder-tray. The cable tray is discontinuous (cut) across the thickness of the wall. The tray sections on each side of the wall are supported at 100mm and 400mm from the face of the wall. The annular space between penetrating service and wall is filled with PROMASEAL® IBS™ material. PROMASEAL® Supa Mastic sealant is applied on both exposed and unexposed sides to 10mm depth. The sealant was then formed into a fillet that extends nominally 50mm along the cables and on the wall. Refer to Figures 9 and 10 and referenced test report for complete drawing.	EWFA 2517300.4 spec. J
15	D1 cable and D2 cables installed onto Ladder-tray nominally 600mm wide × 47mm high. The cable tray is made from 1.0mm thick steel. The cable tray is positioned on top of a piece of Fire Grade plasterboard that is cut to the same width and length of the cable tray, through from the exposed side to the unexposed side The opening in the wall is sealed with Promat PROMASEAL® Fire Pillows. The pillows are packed in tight through the wall system on the upper side of the cables only, to the size of the aperture. Bostik Fireban One Polyurethane sealant is then applied to the interface of the following, on both exposed and unexposed sides of the specimen: • The cables and the pillows • The pillow and the wall system • The cable tray and the wall system • The plasterboard base and the wall system Refer to referenced test report for complete drawing.	EWFA 2373800.1 spec. F
16	Security cable bundle, nominal 45mm – 55mm in diameter in an Ø80mm aperture. The cables consist of 14-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick, 16-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm and 17-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness between the cable bundle and wall aperture at a thickness of approximately 15mm. • To the exposed and unexposed sides of the wall system	EWFA 2524100.1 spec.A

Des. #	Specification / Installation	Test Specimen
	around the cable bundle to approximately 85mm from the wall, and approximately 200mm diameter around the cable bundle and form a 25-mm ×25mm fillet of Bostik Fireban One sealant on both sides. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 80mm from the wall. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	
17	Security cable bundle, nominal 60mm – 70mm in diameter in an Ø80mm aperture. The cables consist of 16-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick, 49-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm and 3-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick. Promat PROMASEAL® FC65 Fire collar is fixed to the fire side. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness between the cable bundle and wall aperture to the unexposed side at a thickness of approximately 15mm. • Between the cable bundle and fire collar to the exposed side at a thickness of approximately 5mm. • To the exposed and unexposed sides of the wall system around the cable bundle to approximately 50mm from the wall and approximately 200mm diameter around the cable bundle to the unexposed side only and form a 25-mm ×25mm fillet of Bostik Fireban One sealant on both sides. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 70mm from the wall. • Between the flange of the collar and the wall. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	EWFA 2524100.1 spec.B
18	Security cable bundle, nominal 50mm – 60mm in diameter in an Ø90mm aperture. The cables consist of 17-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick, 28-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm and 18-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick. Bostik Fireban One Polyurethane sealant is applied around the cable bundle in the following manner: • Through the full width of the wall at an approximate 10mm thickness • Between the cable bundle and wall aperture at a thickness of approximately 20mm. • To the exposed side of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 100mm from the wall on the cable bundle to the	EWFA 2524100.1 spec

Des. #	Specification / Installation	Test Specimen
	unexposed side, and approximately 230mm diameter around the cable bundle and form a 25-mm ×25mm fillet of Bostik Fireban One sealant on both sides.. • Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 80mm from the wall. For mesh protection refers to Figures 1 to 2. Without mesh protection refers to Figures 7 to 8, or 11, 14 and 15, or 16 and 17 and referenced test report for complete drawing.	
19	Seven bunches of Category 7 shielded data cables penetrating the wall system through a 150mm high × 600mm wide opening. Each bunch contains twelve 7mm diameter cables. The resulting gap around cables is protected by Promat Fire Pillows and sealed on both sides of the wall with Bostik Fireban One sealant. The communication cables, 1200mm long, projected approximately 520mm on each side of the wall and are supported by a 600mm wide steel cable tray fixed to a steel bracket on both sides of the wall that does not penetrate the wall. Refer to referenced test report for complete drawing.	FSV 1506 spec H
20	A bunch of seventy two 7mm thick Category 7 cables penetrating the wall through a 100mm diameter hole. The cables are wrapped with a layer of 3mm thick ZZ-Wrap NE to a 150mm length from the face of the wall on both sides of the specimen. The resulting gap around the cables is sealed on both sides with a 25mm × 25mm Bostik Fireban One sealant fillet. The cables, 1200mm long, projected approximately 520mm on each side of the wall. Refer to referenced test report for complete drawing.	FSV 1506 spec I
21	A bunch of seventy two 7mm thick Category 7 cables penetrating the wall through a 100mm diameter hole. The total thickness of the wall, there the cable penetrated it, shall be increased by adding a 300mm × 300mm × 60mm thick Vermiculux board fixed on both faces by 8 gauge laminating screws. The resulting gap around the cables is sealed on both sides with a 25mm × 25mm Bostik Fireban One sealant fillet. The cables, 1200mm long, projected approximately 520mm on each side of the wall. Refer to referenced test report for complete drawing.	FSV 1506 spec J
22	A bunch of BMS cables penetrating the wall system through an 80mm diameter hole. The bunch of cables is approx. 60mm in diameter. The resulting gap around the cable is protected with a 25mm × 25mm Promat Promaseal Supa Mastic fillet to a 32mm depth of each side of the wall. The communication cables, 1200mm long, projected approx. 520mm on each side of the wall, and supported by a steel bracket on both sides of the wall. Refer to referenced test report for complete drawing.	FSV 1506 spec K

Des. #	Specification / Installation	Test Specimen
23	A 30mm diameter coaxial cable penetrating the wall through a 50mm diameter hole. The cable is wrapped with a layer of 3mm thick ZZ-Wrap NE to a 150mm length from the face of the wall on both sides. The resulting gap around the cable was sealed on both sides with a 25mm × 25mm Bostik FireBan One sealant fillet. Refer to referenced test report for complete drawing.	FSV 1506 spec M
24	Appendix D1 configuration PVC insulated cables penetrating the wall system through a 150mm high × 650mm wide opening. The resulting gap between the cables and wall is protected by two layers of 50mm thick Intubatt1 friction fitted on both sides of the wall, the cables are then wrapped with 25mm thick TBA Fortaglas felt covering 300mm of cables on both sides of the wall. The cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by a 600mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 1
25	Four 25mm diameter SDI (Single Double Insulated) cables, four 4mm2 copper cables and ninety TPS (Thermo Plastic Sheathed) cables penetrating the wall through a 150mm high by 650mm wide opening. The resulting gap around the cables is sealed on both sides of the wall, with a nominal 100mm by 100mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The communication cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables were supported by a 600mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 2
26	Three bunches of five TPS cables, each one penetrating the wall through a 40mm diameter hole. The total thickness of the wall, where the cables penetrated it, is increased by adding two 16mm thick layers of Powerscape board on both faces. The extra boards are fixed onto the wall with 8 gauge laminating screws. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 60mm by 60mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cable, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by a 300mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 3
27	Fifty TPS cables and seventy five SDI cables penetrating the wall through a 75mm high by 300mm wide opening. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The communication cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables were supported by a 300mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 3a

Des. #	Specification / Installation	Test Specimen
28	Sixty five TPS cables penetrating the wall through a 75mm high by 300mm wide opening. The resulting gap around the cables is sealed, on both sides of the wall with a nominal 100mm by 100mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables were supported by a 300mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 4
29	Four of 75mm high by 300mm wide openings spaced 100mm from each other. The opening are protected by two layers 350mm high by 800mm wide by 16mm thick Powerscape board fixed to both sides of the wall with 40mm long 8 gauge screws. Refer to referenced test report for complete drawing.	FSV 1523 spec 5
30	Seventy six TPS cables tied with cable ties in bunches of five, penetrating the wall through a 125mm diameter hole. The resulting gap around the cables is sealed, on both sides of the wall with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by steel bracket. Refer to referenced test report for complete drawing.	FSV 1523 spec 6
31	Three bunches of five TPS cables, each one penetrating the wall through a 40mm diameter hole. The holes are located 25mm each other. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by a 300mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 8
32	Two Fibre Optic cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic, controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by steel brackets. Refer to referenced test report for complete drawing.	FSV 1523 spec 9

Des. #	Specification / Installation	Test Specimen
33	The Appendix D1 configuration PVC insulated cables penetrating the wall system through a 150mm high by 650mm wide opening. The resulting gap between the cables and the wall is protected by 300mm long Promaseal Fire Pillows installed on next to each other to protrude 200mm on both sides of the wall. The resulting gaps around the cables and pillows are sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic. The cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by a 600mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to Figures 11 to 13, or 16 and 17 and referenced test report for complete drawing.	FSV 1523 spec 10
34	Two 10mm diameter braided electrical cables penetrating the wall through a 40mm diameter hole. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Braided electrical cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables were supported by a 600mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 11
35	Two 25mm diameter Coaxial cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 70mm by 70mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Coaxial cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by steel bracket. Refer to referenced test report for complete drawing.	FSV 1523 spec 12
36	Thirty six Cat7 cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables is sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Cat7 cables, 1200mm long, projected approximately 520mm on each side of the wall. The cables are supported by a 600mm wide cable tray. The cable tray is discontinuous (cut) across the thickness of the wall. Refer to referenced test report for complete drawing.	FSV 1523 spec 13

Table 2 – Schedule of Components

Item	Description	
37	**Name**	**Cable Penetrations**
	Specification	Note: For the purpose of this report, the assessed specimens have been allocated designation numbers. Refer to table 1 for details.
38	**Name**	**USG Powerscape or Fire Grade Plasterboard**
	Thickness	16mm thick
	Installation	***For Wall Option 1 and 2,*** Two layers of 16mm thick Powerscape or fire grade plasterboard sheets shall be fixed to each side of 78mm Speedpanel wall using 45mm long x 6g plasterboard screws at max. 200mm centres (min. 4 fixings) and *for wall option 2,* additional layer of 16mm thick Powerscape or fire grade plasterboard is fixed on one side. ***For Wall Option 8,*** One layer of 16mm thick fire grade plasterboard sheets shall be fixed to each side of 51mm or 64mm thick Speedpanel panel wall using 25mm long x 6g plasterboard screws at max. 200mm centres (min. 4 fixings) ***For Wall Option 9,*** Two layers of 16mm thick fire grade plasterboard sheets shall be fixed to one side of 51mm or 64mm thick Speedpanel wall using 25mm long x 6g plasterboard screws at maximum 200mm centres (min. 4 fixings) for the inner layer and 45mm long x 6g plasterboards for outer layer at maximum 200mm centres. The fire grade plasterboard shall be otherwise tested or assessed to achieve the required FRL for that wall system.
39	**Name**	**Speedpanel Wall**
	Thickness	78mm
	Service Aperture	There shall be at least 10mm clearance between cable service and aperture surface.
	Specification	Speedpanel wall shall be tested or assessed by others for an FRL of -/120/120 in accordance with AS1530.4-2005.
40	**Name**	**Speedpanel Channel**
	Material	Galvanised mild steel
	Size	83mm wide × 50mm high × 1.2mm thick
	Sealant	Gap between channel and Speedpanel produced by Speedpanel profile to be filled with Bostik Fireban One or Promat Supamastic sealant. *Speedpanel channel is not required around those apertures when cables are in circular bunches or square penetrations smaller than 300mm passing through Speedpanel wall.*
41	**Name**	**Mesh**
	Material	2mm (min.) steel
	Installation	Located around service such that the distance between any part of the service and mesh is at least 100mm. Mesh shall be mechanically fixed to the wall and supported via fixing to support rods.
42	**Name**	**Rockwool Insulation**
	Material	38mm Bradford Fibretex 450 Rockwool
	Installation	Wrapped around Appendix D1 cables with cable tray (as Specimen J tested in EWFA 2517300.4) for a length of 600mm each side of the wall and then sealed with a 25mm fillet of Supa Mastic Sealant on each side;

Item	Description	
43	**Name**	**Steel-stud Framing**
	Material	51mm steel stud (or 55mm box track) or 64mm steel stud Two layers of 16mm fire grade plasterboard installed for a steel-stud partition
	Size	Maximum 100mm coverage around service penetrations and the total length including the service penetrations shall be maximum 600mm.
	Installation	**Option 1:** 2 × 16mm layers of fire rated plasterboard lined surround service penetrations and 55mm C-track fitted into C-track surrounding penetrations to form 55mm frame from face of Speedpanel. Gap between Speedpanel and fire grade plasterboard is filled with Promat PROMASEAL® Supa Mastic. *or* **Option 2:** 2 × 16mm layers of fire rated plasterboard lined surround service penetrations and 51mm or 64mm steel stud fixed to 1.2 BMT equal angle surrounding penetrations to form 51mm or 64mm frame from face of Speedpanel. Gap between Speedpanel and fire grade plasterboard is filled Promat PROMASEAL® Supa Mastic.
44	**Name**	**PROMATECT® Vermiculux Board**
	Thickness	60mm thick and 20mm thick
	Installation	***For Wall Option 5*** One layer of 60mm thick and one layer of 20mm thick PROMATECT® Vermiculux boards shall be fixed to one side of Speedpanel wall using 16 gauge × 115mm long SDS screws at max. 200mm centres (min. 4 fixings)
45	**Name**	**Pair Coil and Cable Bundle**
	Size	Maximum Ø80mm
	Material	***Pair coil:*** Maximum three pairs of Ø8mm (OD) × 0.81mm and Ø15mm (OD) x 0.91mm copper pipe fully insulated with 10mm Armaflex insulation, as tested in iBMB 3681-6818. ***Cable:*** Maximum three of Ø10mm four core & earth 1.5mm^2
	Installation	The cable and pair coil bundle penetrating the wall through a maximum Ø100mm hole. The annular gap between penetrating service and the wall shall be fully sealed with Hilti Firestop Intumescent Sealant CP 611A.
46	**Name**	**Speedpanel Wall**
	Thickness	64mm
	Service Aperture	There shall be at least 10mm clearance between cable service and aperture surface.
	Specification	Speedpanel wall shall be tested or assessed by others for an FRL of -/90/90 in accordance with AS1530.4-2005.
47	**Name**	**Speedpanel Wall**
	Thickness	51mm
	Service Aperture	There shall be at least 10mm clearance between cable service and aperture surface.
	Specification	Speedpanel wall shall be tested or assessed by others for an FRL of -/60/60 in accordance with AS1530.4-2005.

Item	Description	
48	**Name**	**Fire Grade Plasterboard**
	Thickness	13mm
	Installation	***For Wall Option 6*** One layer of 13mm thick fire grade plasterboard sheets shall be fixed to each side of 78mm Speedpanel wall using 25mm long x 6g plasterboard screws at max. 200mm centres (min. 4 fixings) ***For Wall Option 7*** Two layers of 13mm thick fire grade plasterboard sheets shall be fixed to one side of 78mm thick Speedpanel wall using 25mm long x 6g plasterboard screws at maximum 200mm centres (min. 4 fixings) for the inner layer and 45mm long x 6g plasterboards for outer layer at maximum 200mm centres.
49	**Name**	**Sealant**
	Product	**Hilti Firestop Intumescent sealant CP 611A**
	Installation	The annular gap between penetrating service (item 45) and the wall element shall be fully sealed with Hilti Firestop Intumescent Sealant CP 611A.

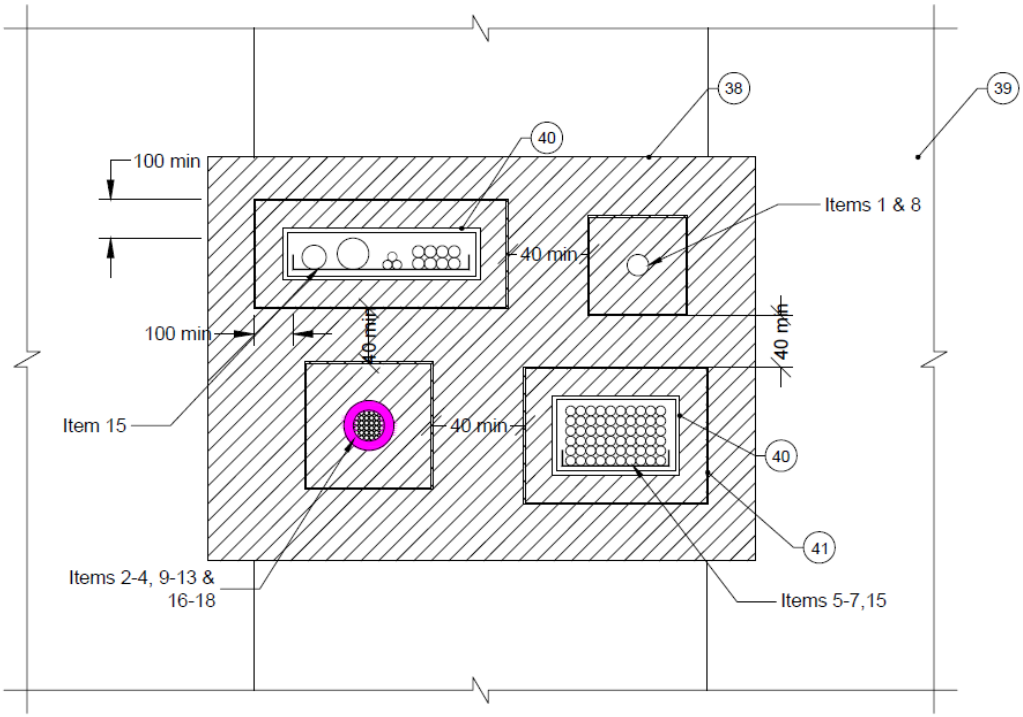


Figure 1 – Cable Penetrations in Wall Constructions Option 1 with Mesh (Elevation)

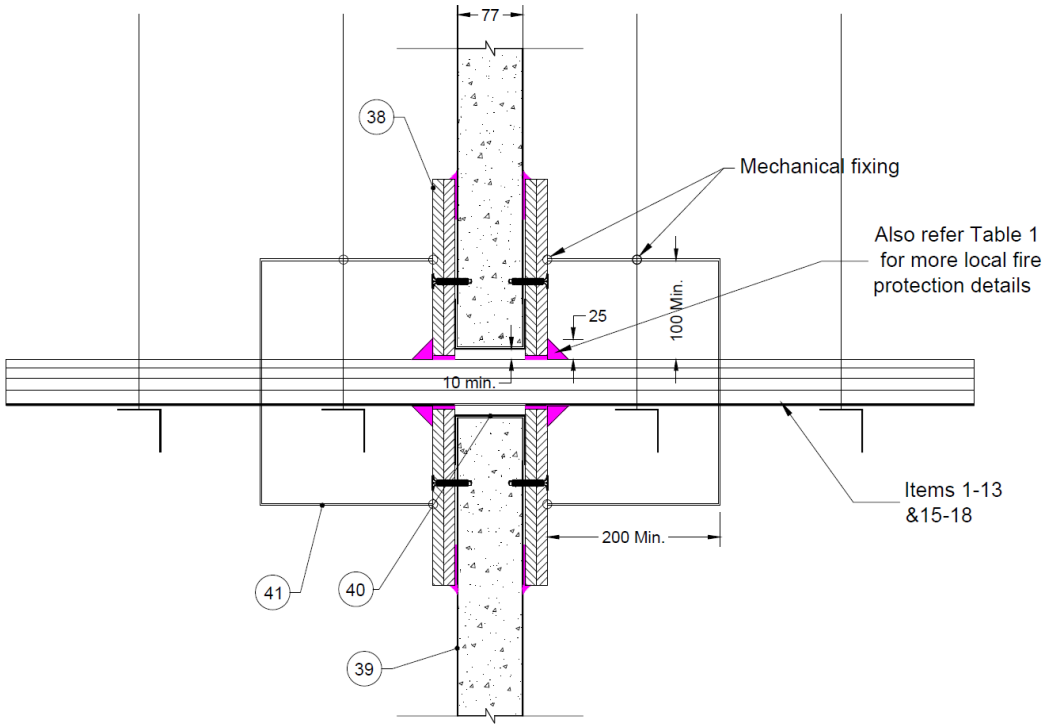


Figure 2 – Cable Penetrations in Speedpanel Wall Option 1 with Mesh (Sectional View)

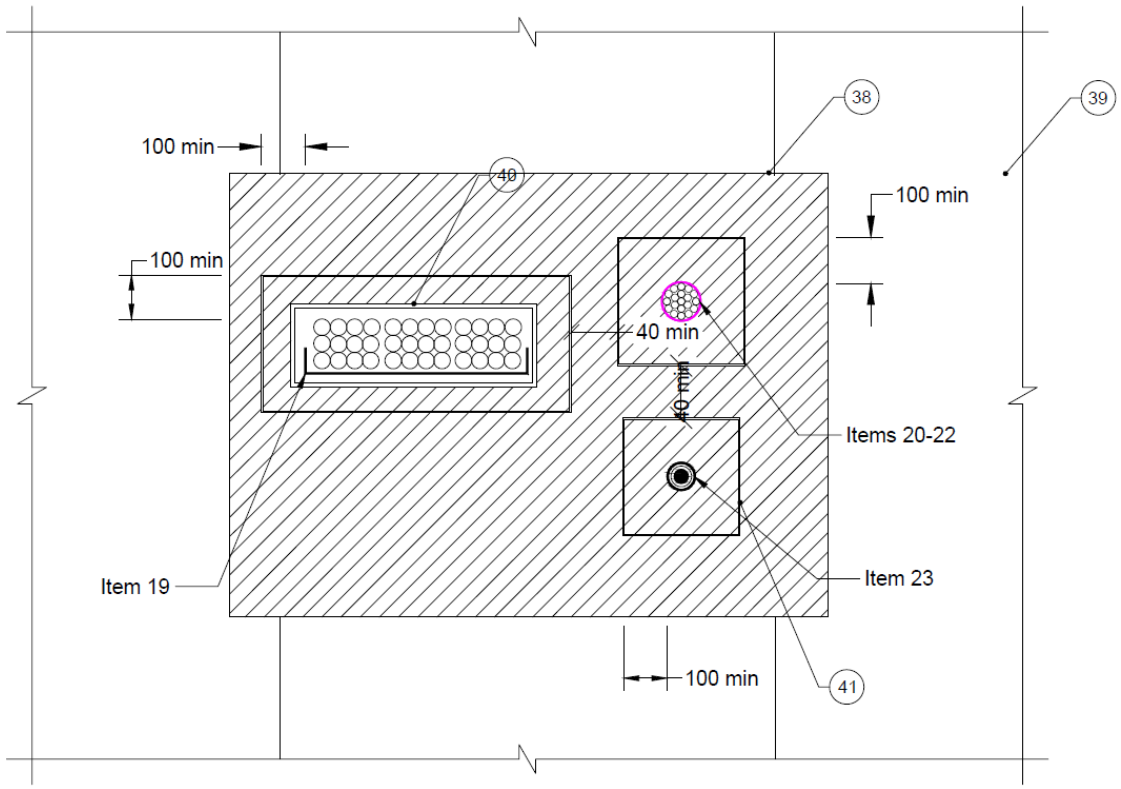


Figure 3 – Cable Penetrations in Wall Constructions Option 2 with Mesh (Elevation)

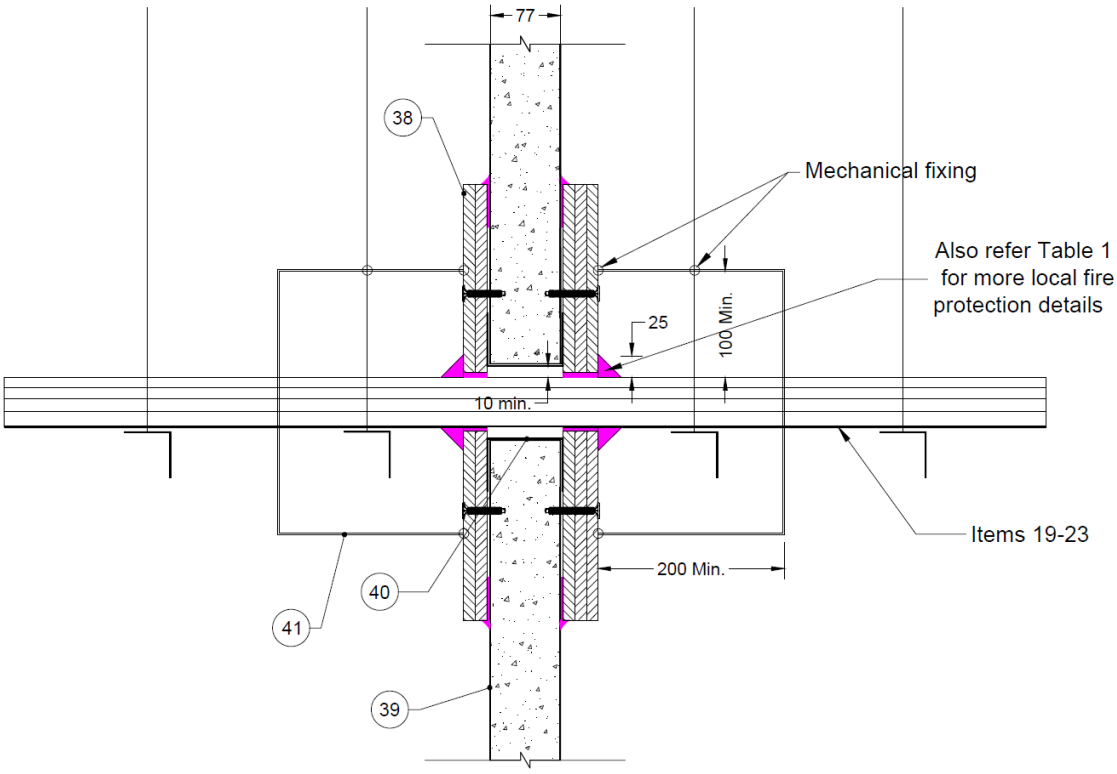


Figure 4 – Cable Penetrations in Speedpanel Wall Option 2 with Mesh (Sectional View)

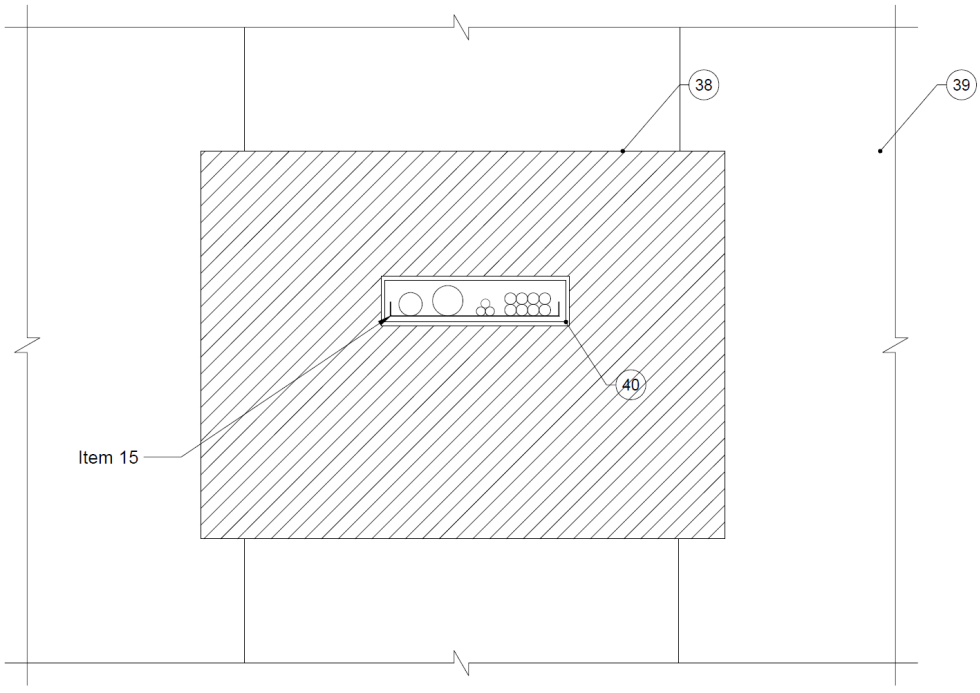


Figure 5 – Cable Penetrations in Speedpanel Wall Option 1 without Mesh (Elevation)

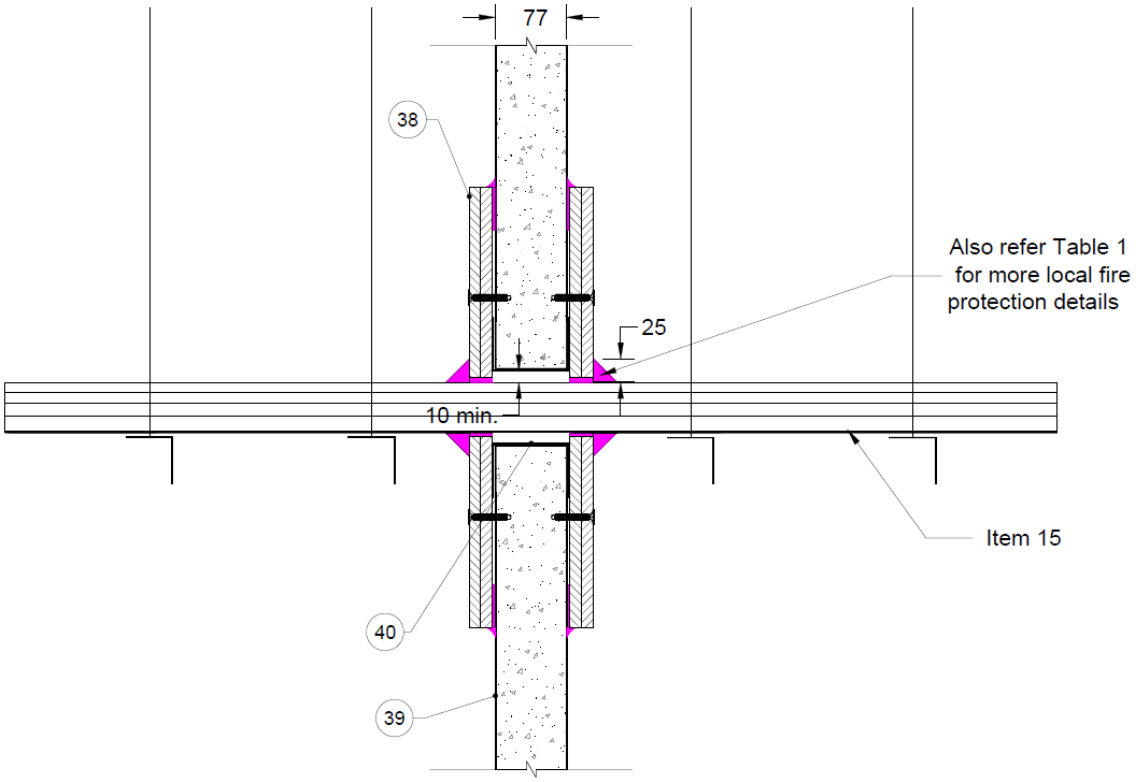


Figure 6 – Cable Penetrations in Speedpanel Wall Option 1 without Mesh (Sectional View)

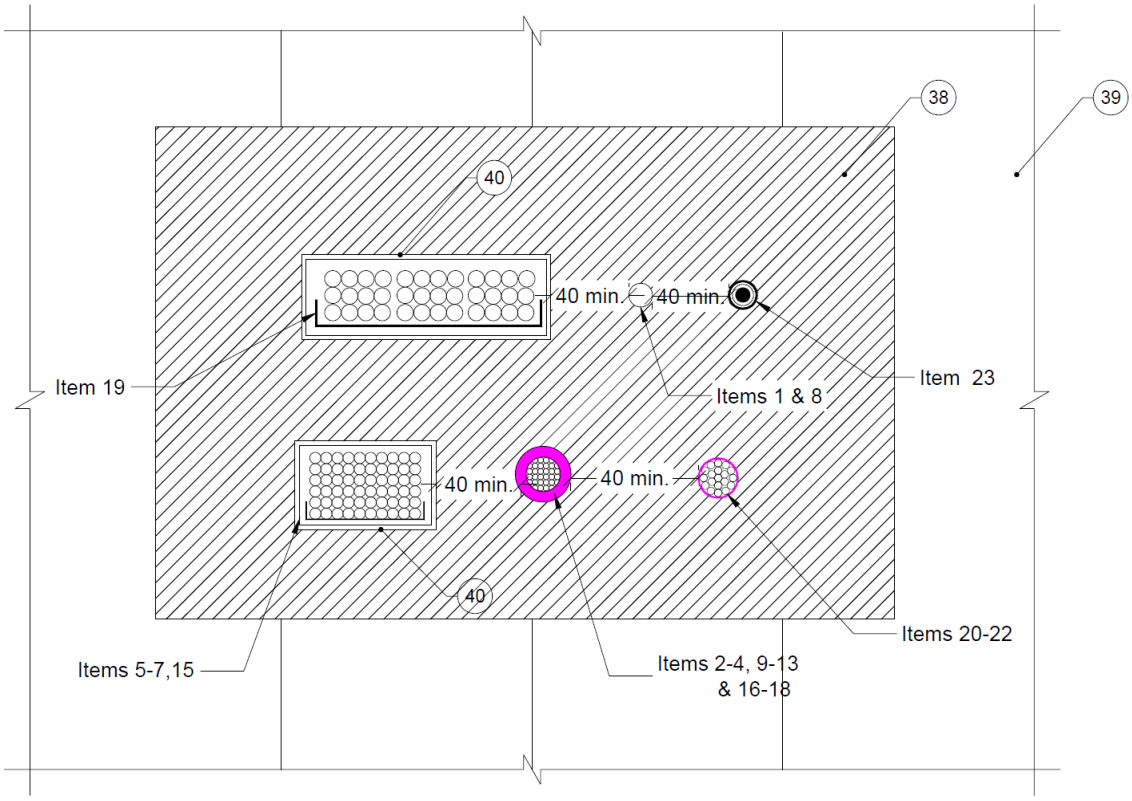


Figure 7 – Cable Penetrations in Speedpanel Wall Option 2 without Mesh (Elevation)

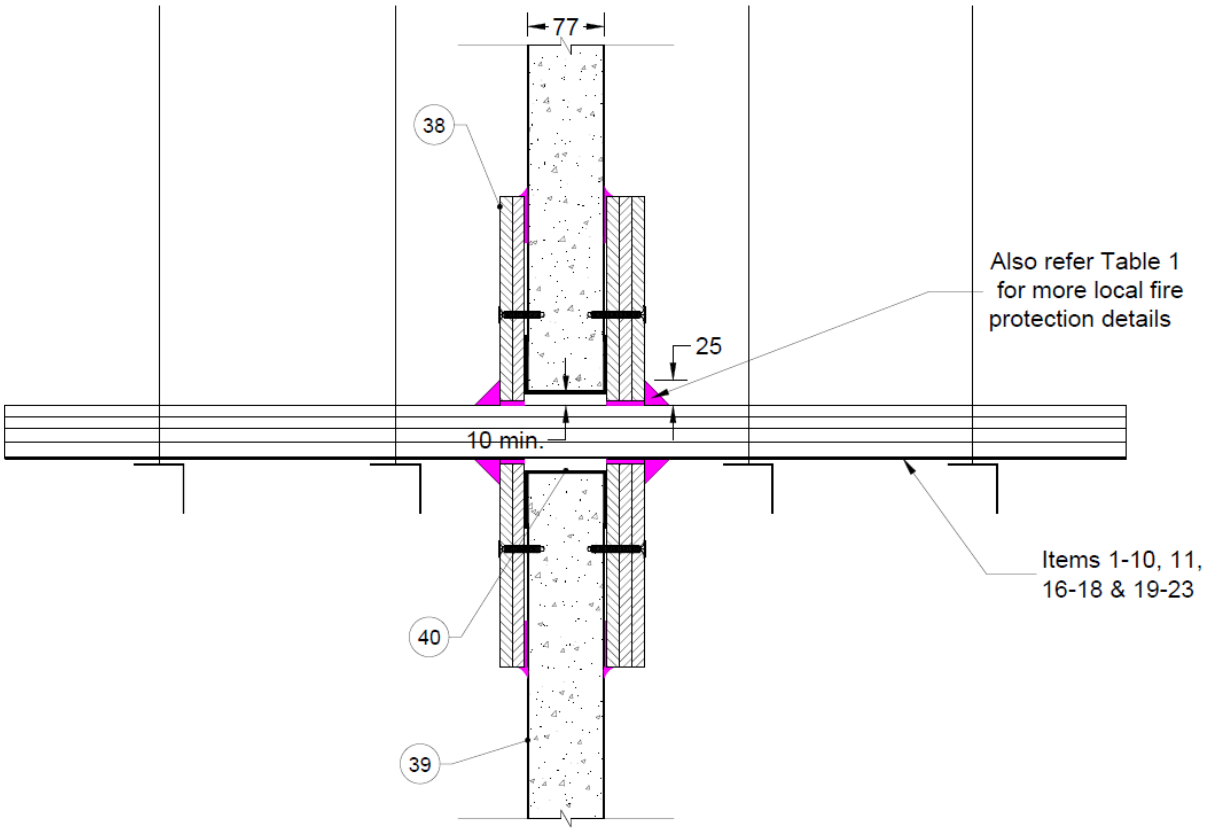


Figure 8 – Cable Penetrations in Speedpanel Wall Option 2 without Mesh (Sectional View)

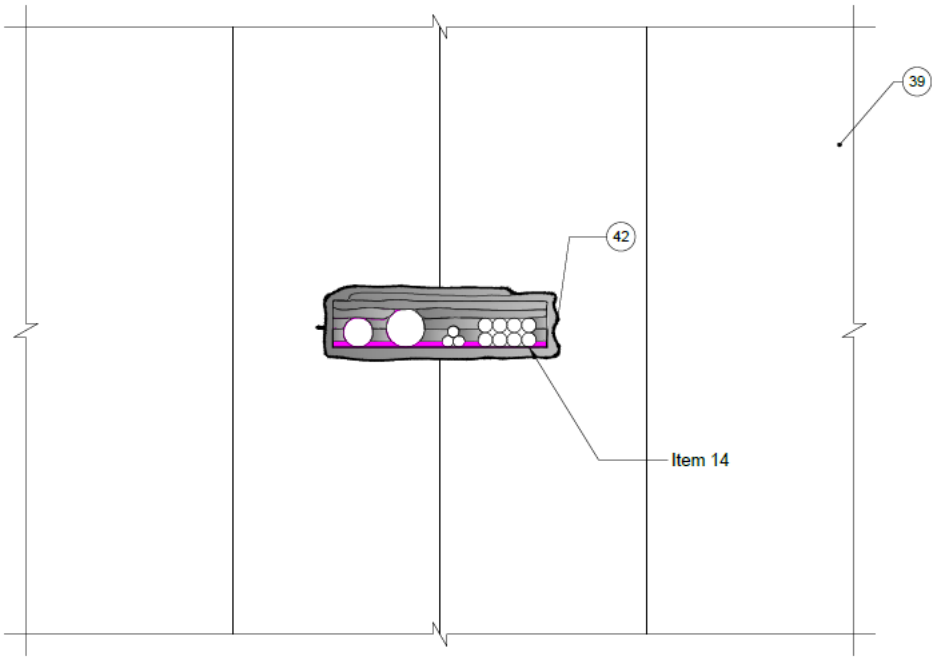


Figure 9 – Cable Penetrations in Speedpanel Wall Option 3 without Mesh (Elevation)

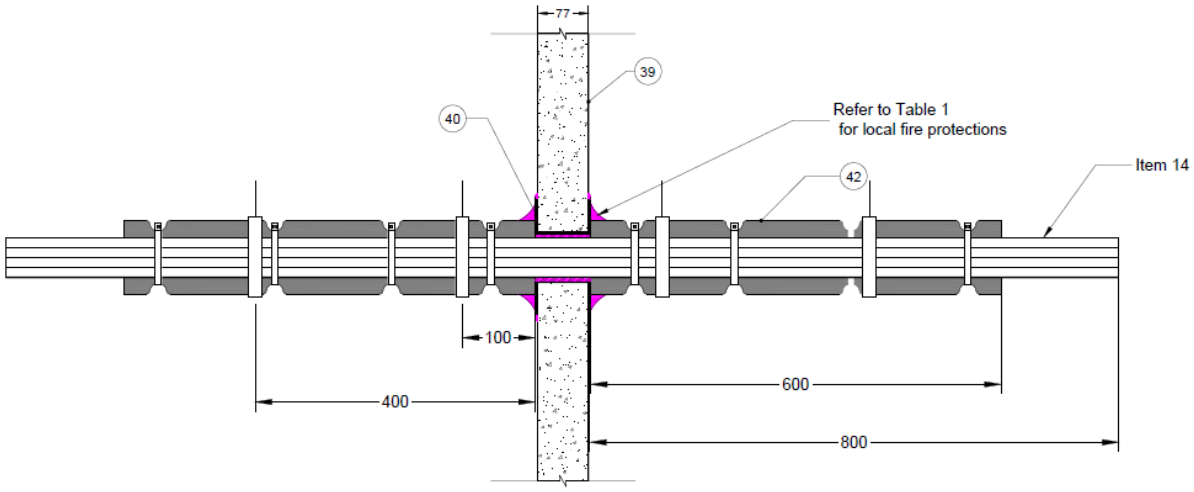


Figure 10 – Cable Penetrations in Speedpanel Wall Option 3 without Mesh (Sectional View)

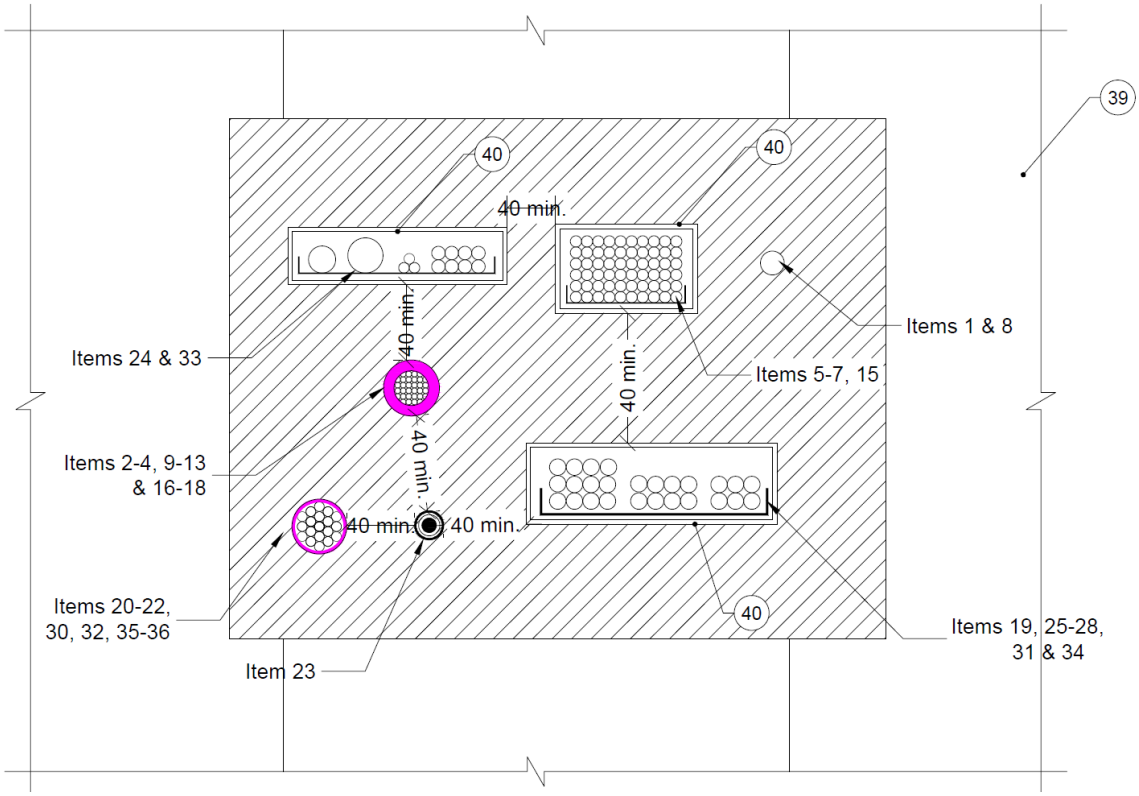


Figure 11 – Cable Penetrations in Speedpanel Wall Option 4 without Mesh (Elevation)

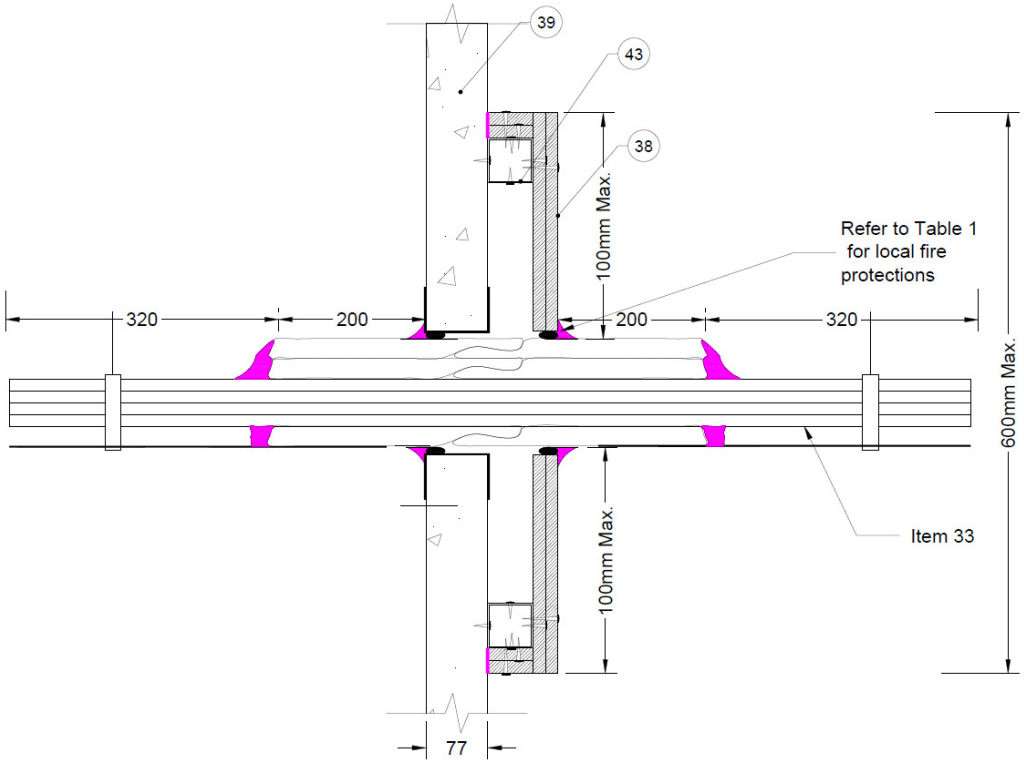


Figure 12 – Speedpanel Wall Option 4 with C-track lined partition for Service with pillow protection (Service 33)

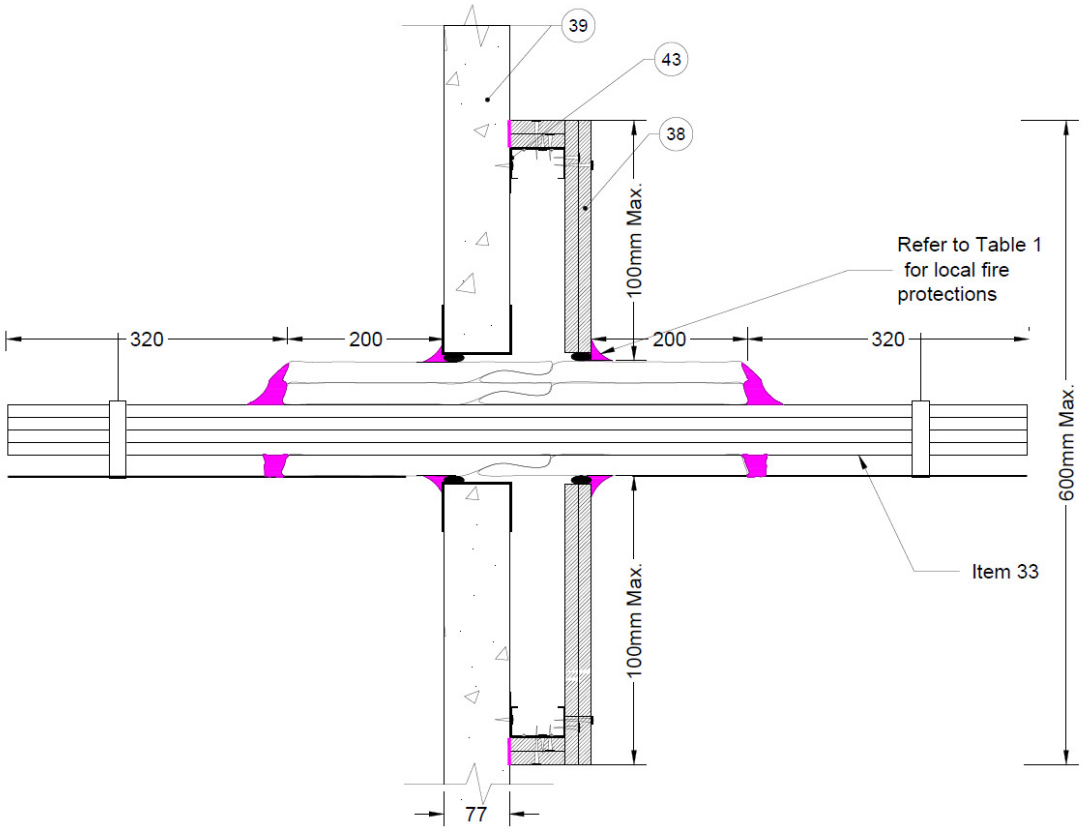


Figure 13 – Speedpanel Wall Option 4 with Steel-stud lined partition for Service with pillow protection (Service 33)

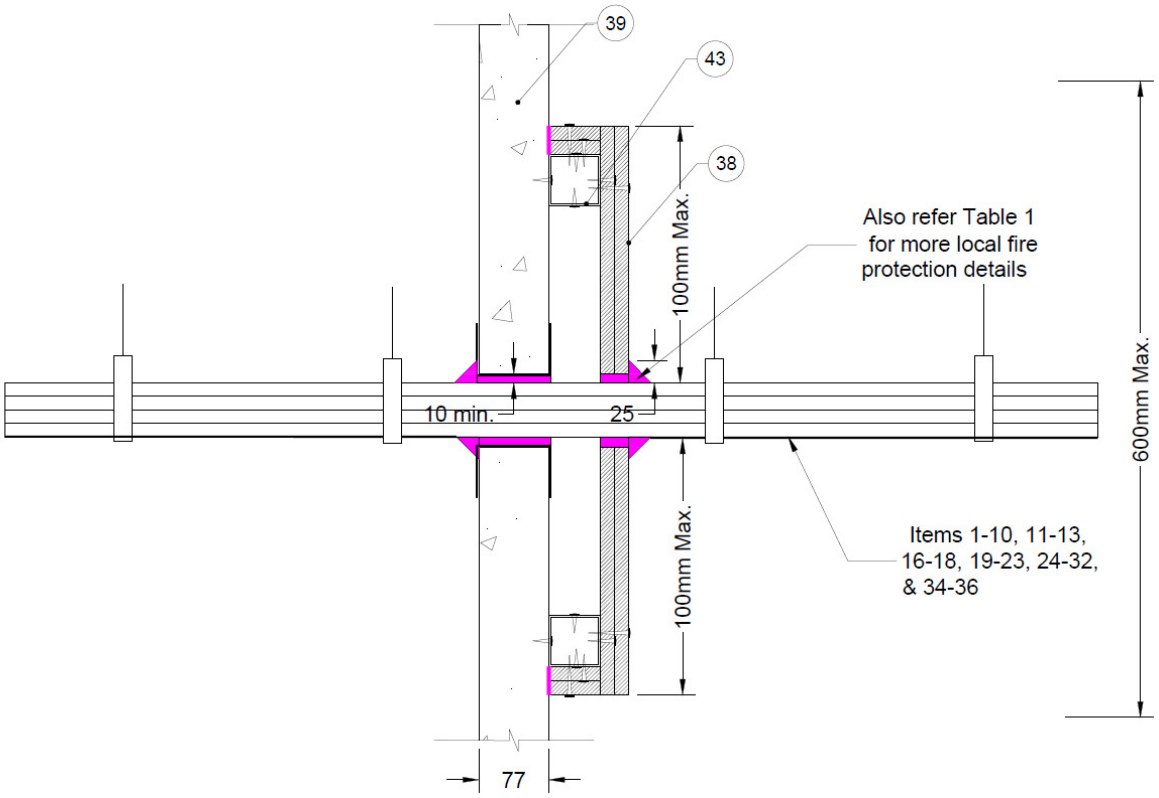


Figure 14 - Speedpanel Wall Option 4 with C-track lined partition for Services

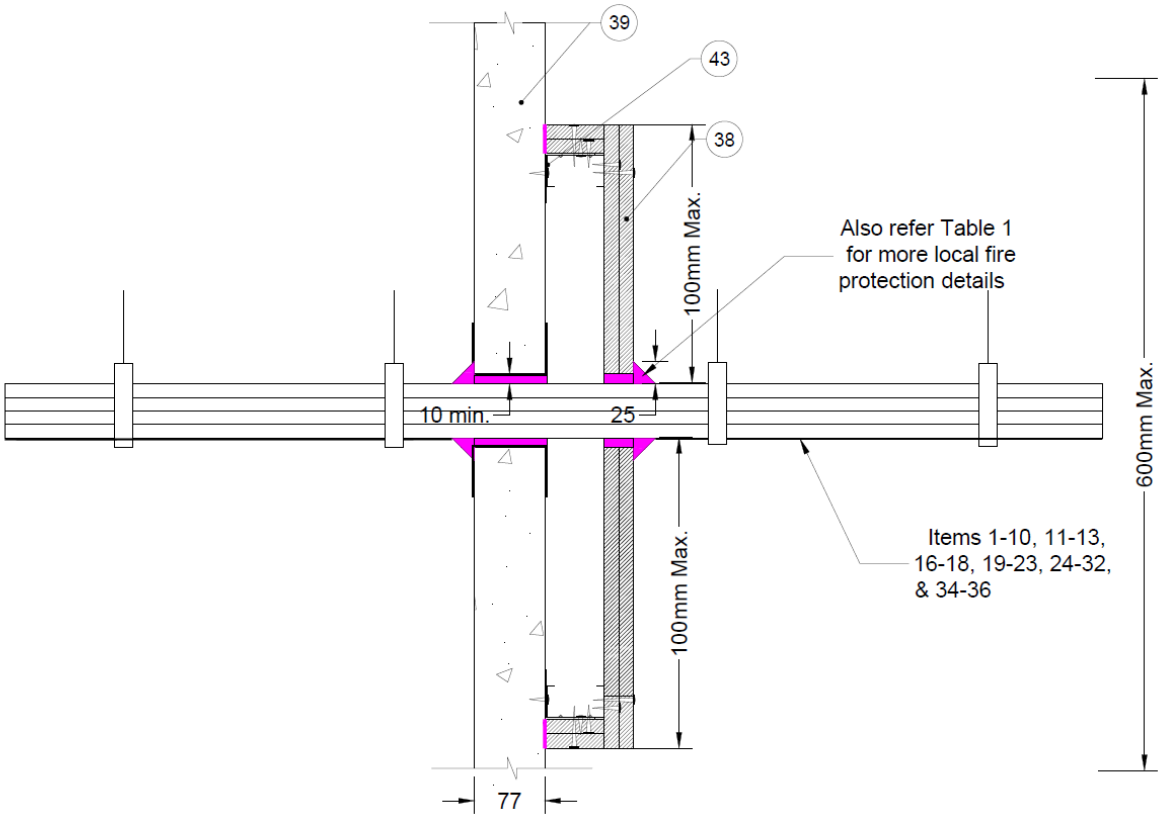


Figure 15 - Speedpanel Wall Option 4 with Steel-stud lined partition for Services.

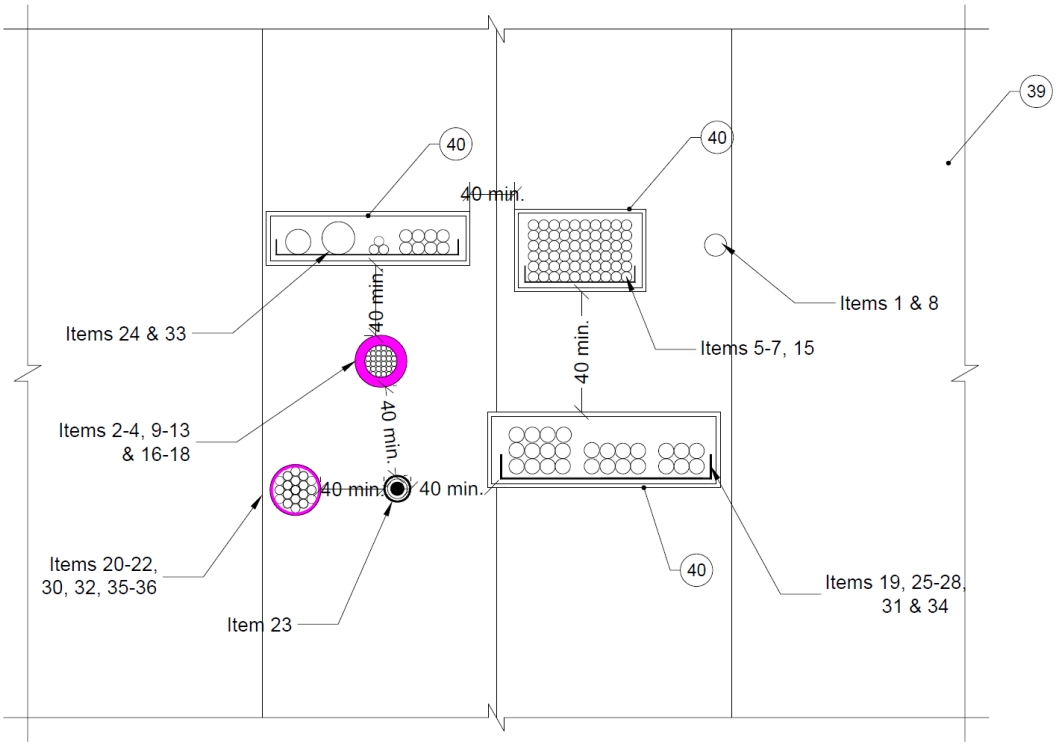


Figure 16 – Cable Penetrations in Speedpanel Wall Option 5 without Mesh (without Promat board plasterboard side)

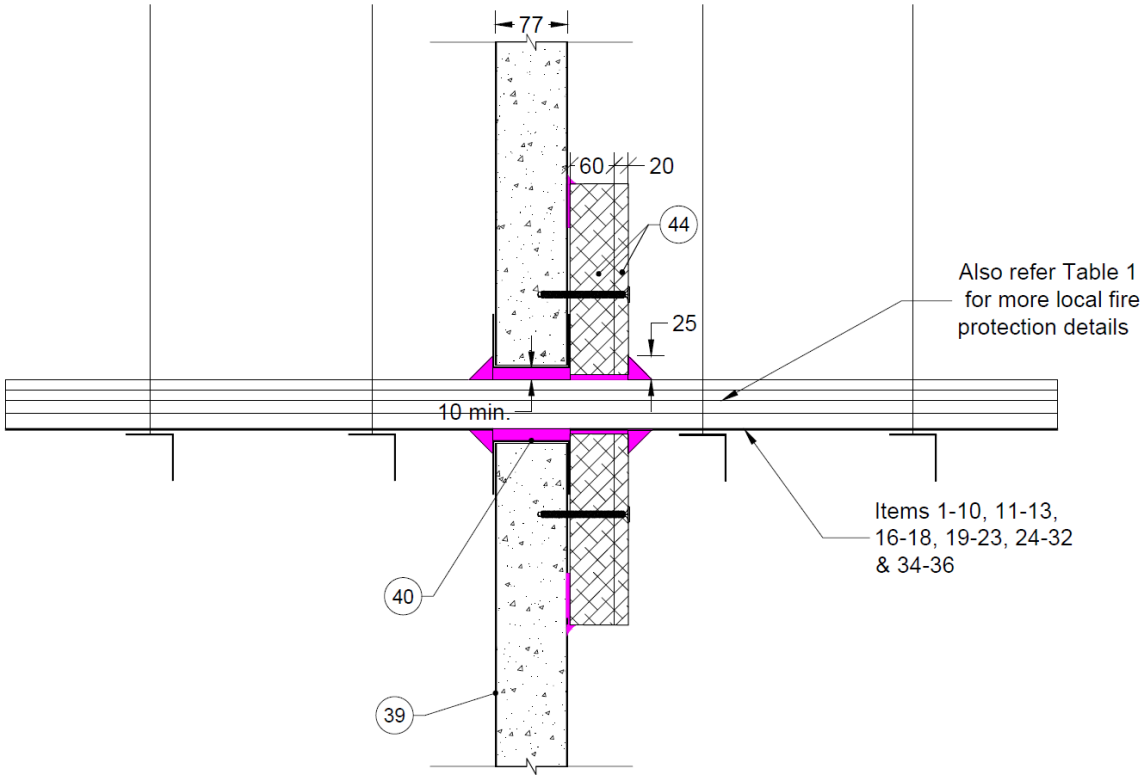


Figure 17 – Cable Penetrations in Speedpanel Wall Option 5 without Mesh (Sectional View)

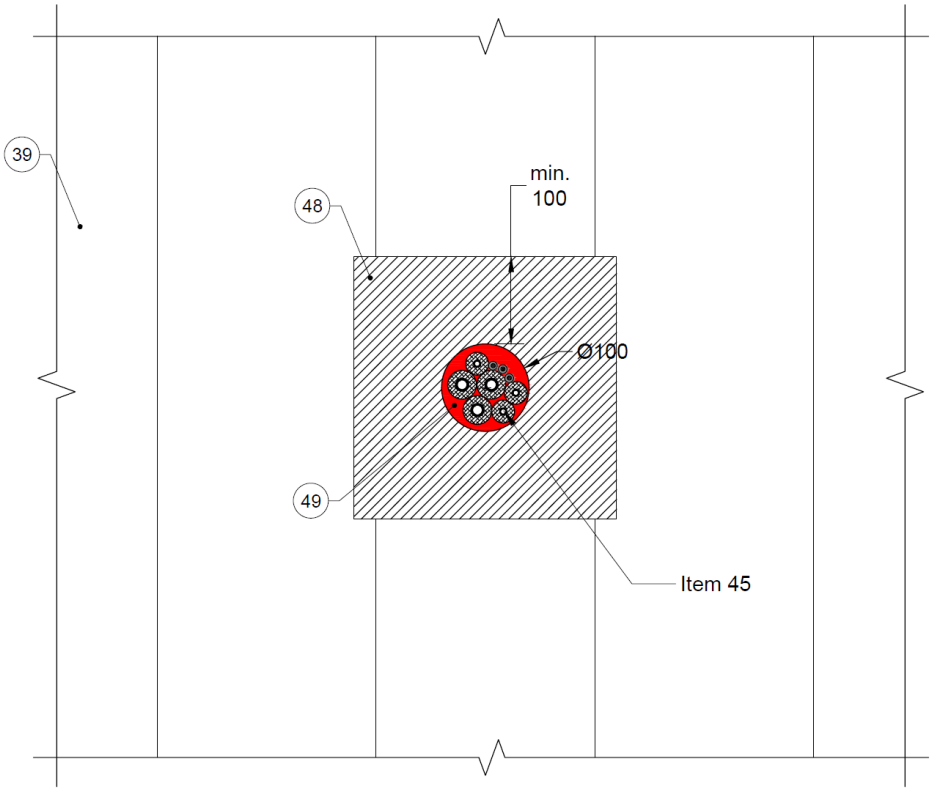


Figure 18 – Pair Coil and Cable Bundle in 78mm Speedpanel Wall Option 6 and 7

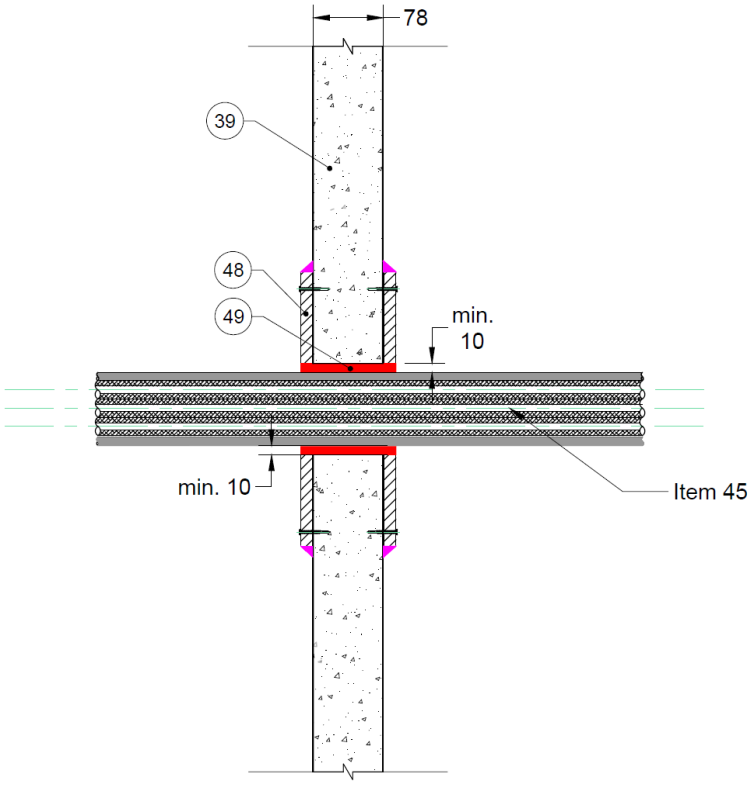


Figure 19 – Pair Coil and Cable Bundle in 78mm Speedpanel Wall Option 6 (Section View)

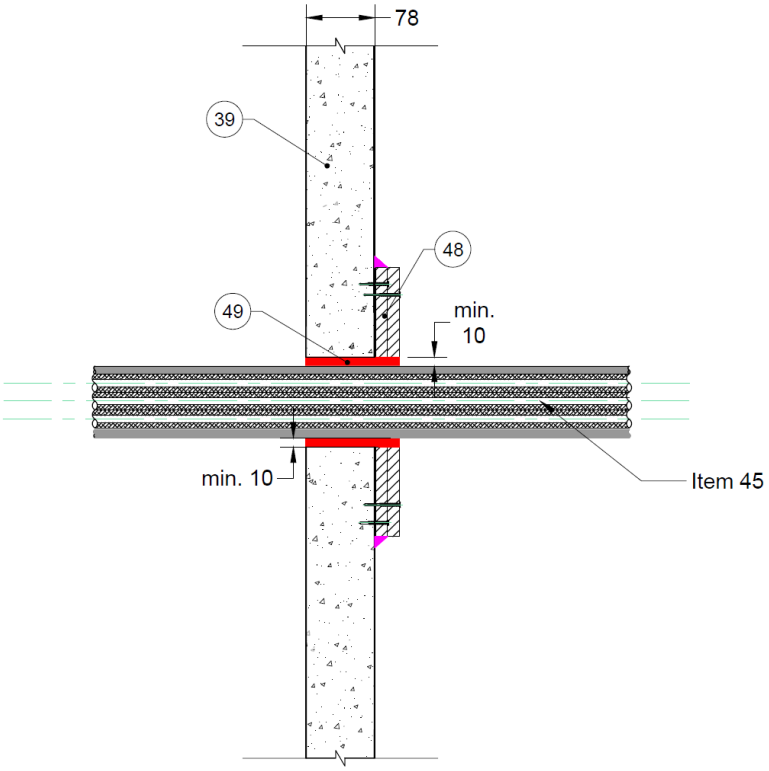


Figure 20 – Pair Coil and Cable Bundle in Speedpanel Wall Option 7 (Section View)

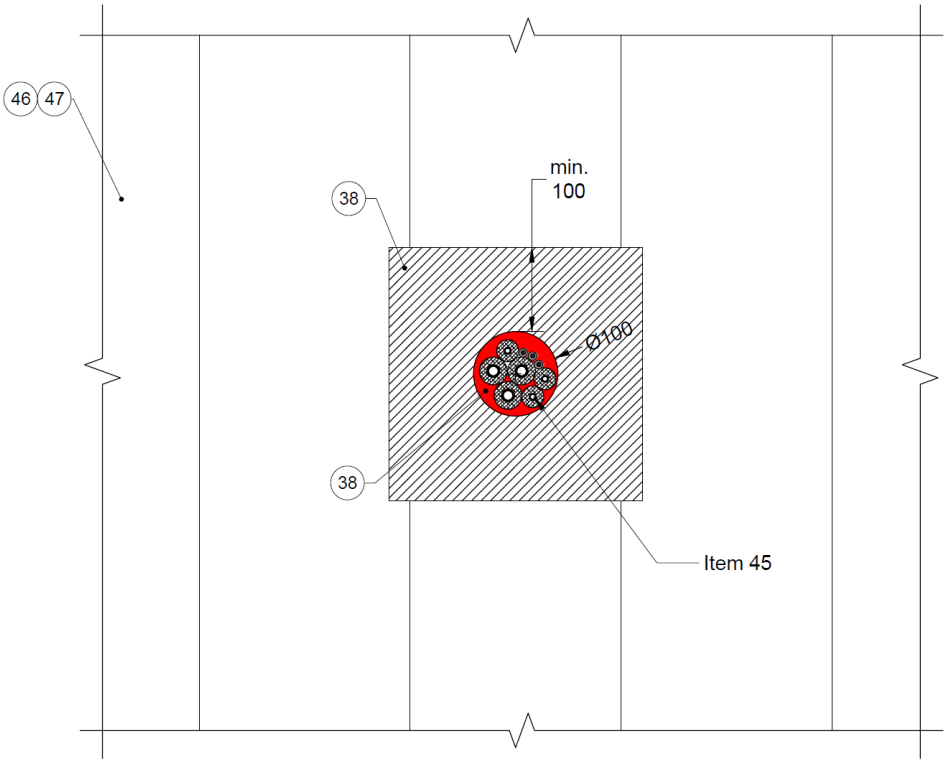


Figure 21 – Pair Coil and Cable Bundle in Speedpanel Wall Option 8 and 9

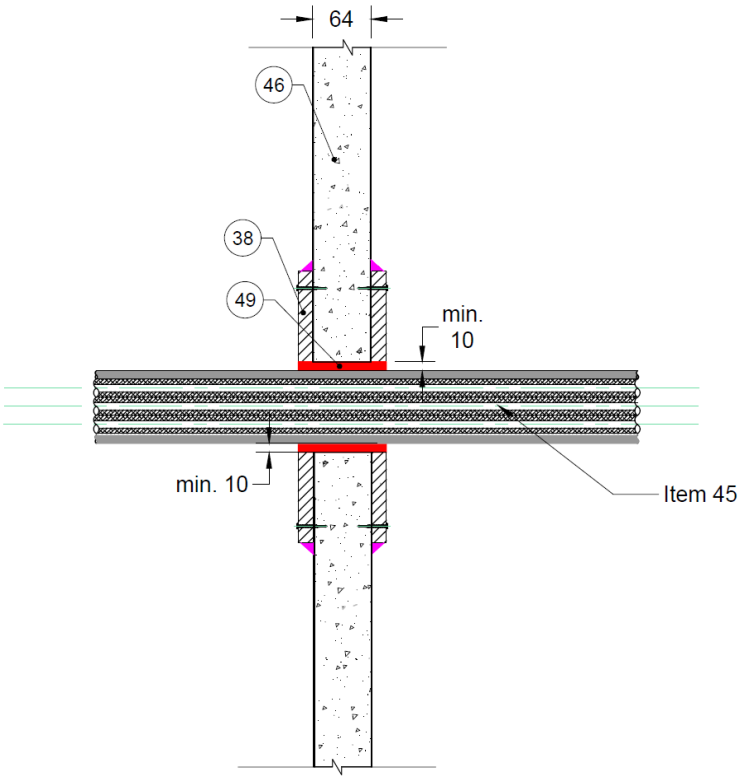


Figure 22 – Pair Coil and Cable Bundle in 64mm Speedpanel Wall Option 8 (Section View)

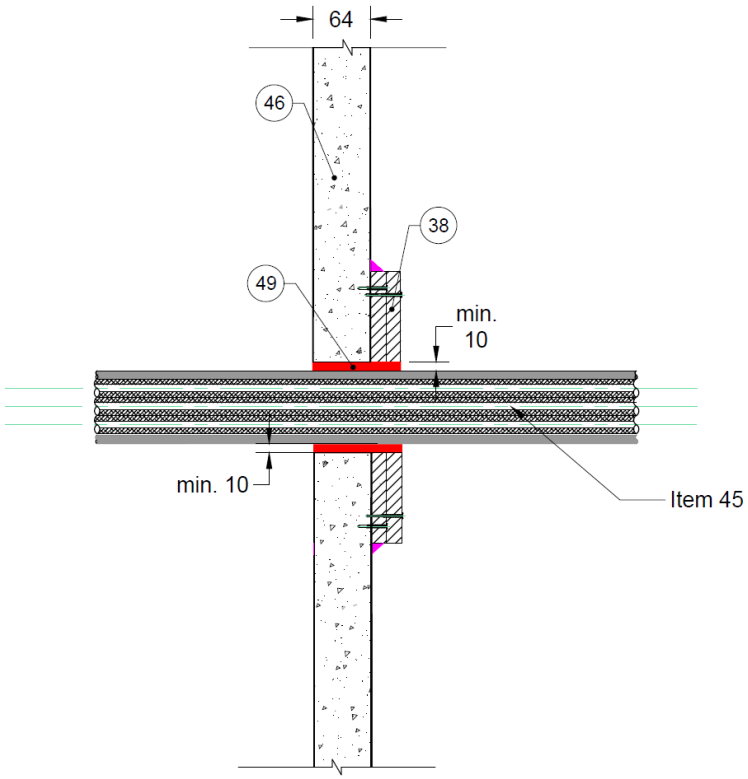


Figure 23 – Pair Coil and Cable Bundle in 64mm Speedpanel Wall Option 9 (Section View)

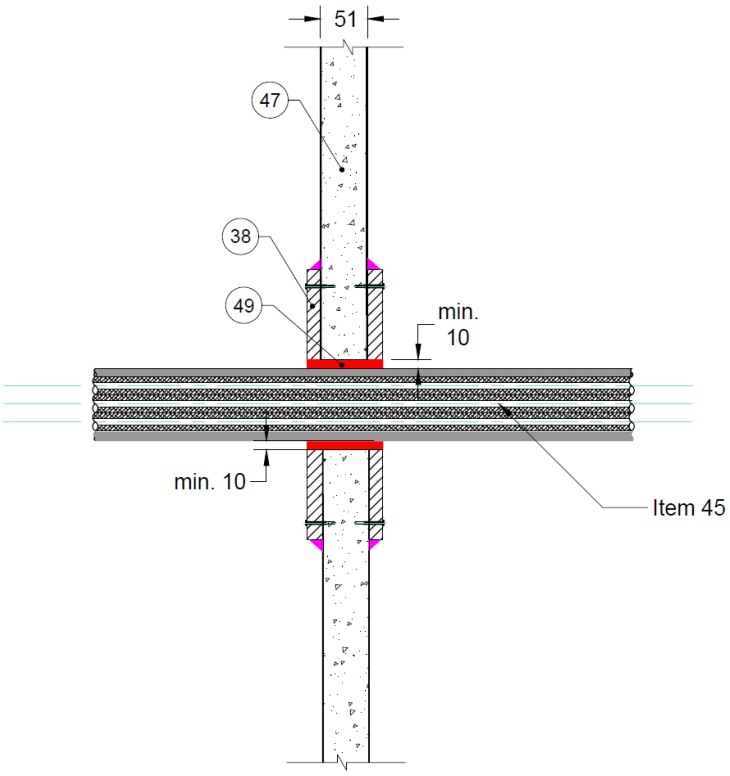


Figure 24 – Pair Coil and Cable Bundle in 51mm Speedpanel Wall Option 8 (Section View)

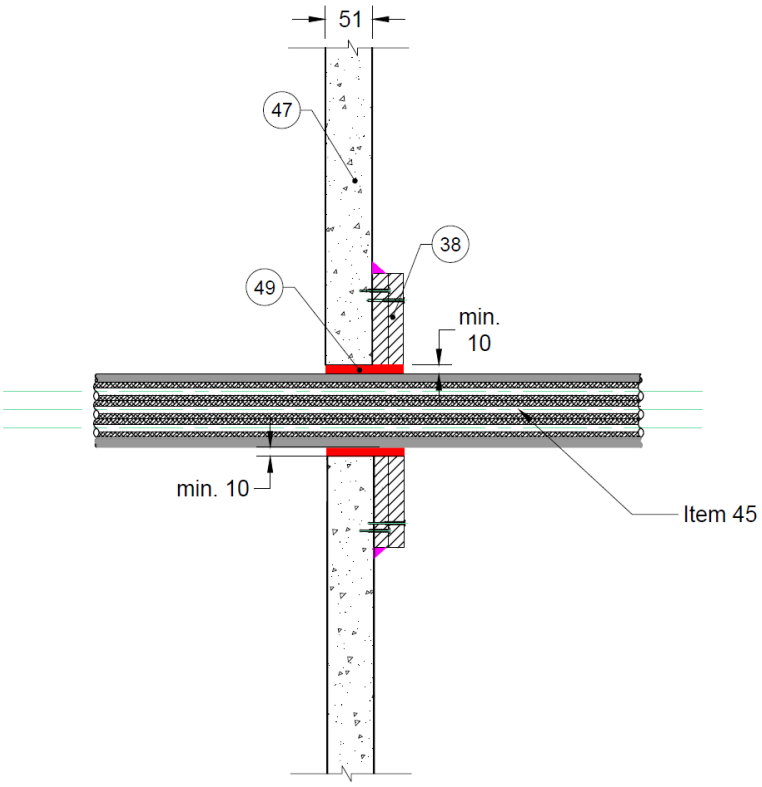


Figure 25 – Pair Coil and Cable Bundle in 51mm Speedpanel Wall Option 9 (Section View)

4 REFERENCED TEST PROCEDURES

This report is prepared with reference to the requirements of AS1530.4-2005 Section 10 and AS4072.1-2005.

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 1 had been modified within the scope of section 3, it will achieve the performance as stated below in if tested in accordance with the test method referenced in Section 4 and subject to the requirements of Section 7:

Cable Services Penetrating Speedpanel Wall Constructions.

Des. # (from Table 1)	Wall Support Construction	Speedpanel panel thickness	Mesh (Item 28)	Refer Figure	FRL
1 to 10	Option 1	78mm	yes	1 & 2	-/120/120
11					-/120/120
12 and 13					-/120/120
15	Option 1		no	5 & 6	-/120/-
			yes	1 & 2	-/120/30 -/120/120 (with min. 350mm Mesh)
16 to 18	Option 1		yes	1 & 2	-/120/120
19 to 23	Option 2		yes	3 & 4	-/120/120
1 to 10	Option 2, 4 or 5		no	7 & 8 or 11, 14 & 15 or 16 & 17	-/120/120
11					-/120/120
12 and 13					-/120/120
14	Option 3		no	9 & 10	-/120/120
16 to 18	Option 2, 4 or 5		no	7 & 8 or 11, 14 & 15 or 16 & 17	-/120/120
19 to 23					-/120/120
24 to 32	Option 4 or 5		no	11, 14 & 15 or 16 & 17	-/120/120
33				11, 12 & 13 or 16 & 17	-/120/120
34 to 36				11, 14 & 15 or 16 & 17	-/120/120
45	Option 6 or 7	78mm	no	18, 19 & 20	-/120/120
	Option 8 or 9	64mm		21, 22, & 23	-/90/90
		51mm		21, 24 & 25	-/60/60

6 DIRECT FIELD OF APPLICATION

This assessment applies to penetrations in walls exposed to fire from either side or from the direction in the corresponding reference tests.

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.

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.

It is required that the Speedpanel supporting construction of thickness 51mm, 64mm and 78mm be otherwise tested or assessed to achieve the required FRL in accordance with AS1530.4-2005.

It is required that Speedpanel panels located above an aperture be supported or otherwise detailed as for a damper of the size of the aperture.

It is required that the cable trays be supported on both sides of the wall.

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:

D. Nicholson

Reviewed by:

C. McLean

9.4 DATE OF ISSUE

25/09/2016

9.5 EXPIRY DATE

31/08/2021

APPENDIX A - SUMMARY OF SUPPORTING DATA

A.1 TEST REPORT – EWFA 2517300.4

A.1.1 Report 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 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.1.3 Test Date

A.1.3.1 The fire resistance test was conducted on 27th October, 2010.

A.1.4 Test Standard

A.1.4.1 The test was conducted in accordance with AS1530.4-2005.

A.1.5 Variations to Test Method

A.1.5.1 The dampers were not tested in full accordance with AS1530.4-2005, as a pressure difference was not applied across the dampers.

A.1.5.2 The cable system included cables which protruded 75mm (less than the required 200mm minimum) beyond the extents of the penetration sealing system.

A.1.6 General Description of Tested Specimen

A.1.6.1 The supporting construction comprised 78mm thick Speedpanel panels vertically oriented to form a vertical wall system.

A.1.6.2 Several penetrations were included within the wall system. Only the cable and plastic pipe penetrations are relevant to this assessment, the details of which are provided below:

Specimen	Description	Protection	Support
E	Ø158mm × 4.3mm uPVC pipe	Annular gap between pipe and wall sealed to 5mm depth with PROMASEAL® SupaMastic sealant. PROMASEAL® FC150 collar fixed to both sides of the wall.	On unexposed side, 500mm and 1500mm from the unexposed face.
G	Ø105mm × 3.5mm uPVC pipe	Annular gap between pipe and wall sealed to 5mm depth with PROMASEAL® SupaMastic sealant. PROMASEAL® FC100 collar fixed to both sides of the wall.	On unexposed side, 500mm and 1500mm from the unexposed face.
H	Ø42.8mm × 2.2mm uPVC pipe	Annular gap between pipe and wall sealed to 5mm depth with PROMASEAL® SupaMastic sealant. PROMASEAL® FC40 collar fixed to both sides of the wall.	On unexposed side, 500mm and 1500mm from the unexposed face.
J	PVC-insulated power cables, as per AS1530.4-2005 Appendix D1 Group A. Cables were secured to LT3-300-3 Burndy® Ladder-tray.	Annular space between penetrating service and wall filled with PROMASEAL® IBS™ material. PROMASEAL® SupaMastic sealant applied on both exposed and unexposed sides to 10mm depth. Entire service wrapped in PromaBlanket® CS, which was secured with 25mm wide hook-and-loop fabric straps at 250mm centres. The sealant was then formed into a fillet that extended nominally 50mm along the blanket and on the wall.	On unexposed side, 200mm, 500mm and 1400mm from the unexposed face.

A.1.6.3 The plastic pipes above extended 525mm and 2000mm on the exposed and unexposed sides respectively, and were capped on the exposed side.

A.1.6.4 The cable penetration extended 525mm and 1400mm on the exposed and unexposed sides respectively.

A.1.7 Instrumentation

A.1.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.1.8 Test Results

A.1.8.1 The test duration was 195 minutes.

A.1.8.2 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-2005:

Specimen	Integrity	Insulation
E	147 minutes – flaming for 10 seconds or more at wall-collar interface.	67 minutes on side of collar
G	No failure at 195 minutes.	76 minutes on wall 25mm from collar edge
H	No failure at 195 minutes.	139 minutes on wall 25mm from collar
J	142 minutes – flaming for 10 seconds or more at wall-collar interface.	102 minutes

A.1.8.3 The cable service was instrumented with thermocouples at several locations on the blanket material and on the surface of the cables (inside the blanket).

A.1.8.4 A thermocouple was placed on a cable (single-core, 630mm2) in line with the exposed face of the wall, and one was placed on the same cable in line with the unexposed face of the wall. The difference between the temperatures measured at these locations remained below 50°C for approximately 53 minutes, at which time the difference rose steadily to approximately 240°C at around 90 minutes. The difference then decreased steadily to approximately 170°C at 120 minutes. At 120 minutes, the temperatures measured on the cable in line with the exposed and unexposed wall faces were 853°C and 683°C respectively.

A.1.8.5 A thermocouple was positioned on the blanket material directly above the single-core, 630mm2 cable, 25mm from the edge of the sealant fillet. The temperature measured at this location rose reasonable steadily to 253°C at 120 minutes.

A.2 RELEVANCE OF EWFA 2517300.4 TEST DATA TO AS1530.4-2005

A.2.1 Specimen Size

A.2.1.1 AS1530.4-2005 specifies that the cable service shall project a minimum of 500mm on both sides of the supporting construction, of which at least 200mm (and maximum 500mm on the unexposed side) must extend beyond the extremities of the penetration sealing system (any coating, wrapping or other protection to the service).

A.2.1.2 The cable system tested in EWFA 2517300.4 included cables that penetrated 75mm from the penetration sealing system on the unexposed side (125mm shorter than the minimum required by the standard). The cable tray itself extended 1400mm on the unexposed side of the wall, and was supported at 200mm, 500mm and 1400mm from the unexposed face.

A.2.1.3 In this particular case, the variation in unprotected cable length is not considered to be a less onerous condition than the standard requires in regard to thermal performance. The AS1530.4-2005 standard requires thermocouples to be placed 25mm after the termination of the penetration sealing system only. It is considered having less cable length after this point than is required allows less heat transfer out of the cables via radiation and convection.

A.2.1.4 It is noted that less copper volume is less onerous in regard to the structural performance of the cable tray. The tested cable system was supported at 200mm, 500mm and 1400mm from the unexposed face. The proposed construction prescribes support at 200mm from the unexposed wall face, then at 300mm from the face of the wall.

A.2.1.5 In light of the above discussion it is considered that the behaviour of the cable specimen tested in EWFA 2517300.4 may be used as indicative of the likely behaviour of a similar specimen, with supports as described above, tested in full accordance with AS1530.4-2005.

A.3 TEST REPORT – EWFA 2373800.1

A.3.1 Report Sponsor

A.3.1.1 Bovis Lend Lease, 30 The Bond, 30 Hickson Road, Millers Point, NSW, 2000.

A.3.2 Test Laboratory

A.3.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.3.3 Test Date

A.3.3.1 The test was conducted on 14th July 2009.

A.3.4 Test standards prescribed

A.3.4.1 The test was conducted in general accordance with AS1530.4- 1997 (for the damper penetration) and AS1530.4- 2005 (for all other services).

A.3.5 General Description of Specimen

A.3.5.1 The specimen comprised a 156mm overall thickness steel stud wall lined with two layers of 16mm thick USG Powerscape. The wall incorporated a number of service penetrations.

A.3.5.2 The studs were 92mm Rondo studs of 0.55mm bmt spaced to suit the penetrations, with a maximum spacing of 1000mm. The tracks were 92mm Rondo tracks of 0.70mm bmt located at the top and bottom of the studs and around some of the penetrations.

A.3.5.3 The studs were clad with two layers of 16mm USG Powerscape each side, installed such that the joins were staggered. The sheets were fixed to the steel frame using 45mm long x 6 Gauge plasterboard screws at maximum 250mm centres in field and maximum 200mm centres at the perimeter and butt joints. All sheet joins were taped in with paper tape and one coat of CSR Base Coat 60. A nominal 10mm gap was retained around the perimeter of the partition, between the sheet and concrete block surround.

ID	Service Description	Sealing system
A	Bullock Curtain Type Fire Damper, 550mm wide × 550mm high × 156mm deep	Bostik Fireban One Polyurethane sealant A nominal 10mm deep fillet at the interface of the damper and wall system on both sides of the specimen
B	Single switched socket	None
C	Aquatherm Fusiotherm 90 × 8.2mm Polypropylene pipe	FIREPRO collar comprising of two parts: FIREPRO B303 – Steel band FIREPRO B306-100 (Flexible Intumescent Seal Located within the steel band to the unexposed edge of the FIREPRO B303) The collar was installed centrally within the cavity of the wall. The annular gap of the collar and the wall opening was approximately 5mm on both exposed and unexposed sides of the wall, and was filled to a nominal depth of 10mm with Bostik Fireban One.
F	D1 cable and D2 cables installed onto Ladder-tray nominal 600mm wide × 47mm high. The cable tray was made from 1.0mm thick steel. The cable tray was positioned on top of a piece of Fire Grade plasterboard that was cut to the same width and length of the cable tray, through from the exposed side to the unexposed side	The opening in the wall was sealed with Promat PROMASEAL® Fire Pillows. The pillows were packed in tight through the wall system on the upper side of the cables only, to the size of the aperture. Bostik Fireban One Polyurethane sealant was then applied to the interface of the following, on both exposed and unexposed sides of the specimen: The cables and the pillows The pillow and the wall system The cable tray and the wall system The plasterboard base and the wall system

ID	Service Description	Sealing system
G	E-Plus Maxi door system	Bostik Fireban One Polyurethane sealant (5mm × 5mm) was applied to the perimeter interface of the door frame and wall system on both sides.

A.3.6 Test Results

A.3.6.1 The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2005, Section 2 & 10.

Service	Criteria	Result
B	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
C	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
F	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	47 minutes
G	Structural Adequacy	Not applicable
	Integrity	failure at 67 minutes
	Insulation	failure at 46 minutes

A.3.6.2 For the purpose of this assessment, the critical temperatures of Specimen F at 120 minutes are listed below:

- The temperature recorded at 25mm from the face of the wall on the tray was 328°C at 120 minutes
- The temperature recorded at 25mm from the pillow on the single core cable was 302°C at 120 minutes.

A.3.6.3 The specimen listed below achieved the following performance when tested in accordance with AS 1530.4-1997, Section 2 & 7.

Service	Criteria	Result
A	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Not applicable

A.4 TEST REPORT - EWFA 2492900.1

A.4.1 Report Sponsor

A.4.1.1 Bovis Lend Lease, 30 The Bond, 30 Hickson Road, Millers Point, NSW, 2000.

A.4.2 Test Laboratory

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

A.4.3 Test Date

A.4.3.1 The test was conducted on 29th July 2010.

A.4.4 Test standards prescribed

A.4.4.1 The test was conducted in general accordance with AS1530.4- 2005.

A.4.5 General Description of Specimen

A.4.5.1 The specimen comprised a 128mm overall thickness steel stud wall lined with two layers of 16mm thick Boral FireStop. The wall incorporated a number of service penetrations.

A.4.5.2 The studs were 64mm Rondo studs of 0.55mm bmt spaced to suit the penetrations. The tracks were 64mm Rondo tracks of 0.70mm bmt located at the top and bottom of the studs.

A.4.5.3 The sheets were fixed to the steel frame using 45mm long × 6 Gauge plasterboard screws.

ID	Service Description	Sealing system
A	Security cable bundle, nominal 60mm – 70mm in diameter in a Ø80mm aperture 12-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick 56-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm	Bostik Fireban One Polyurethane sealant The sealant was applied around the cable bundle in the following manner: through the full width of the wall at an approximate 10mm thickness between the cable bundles and wall aperture at a thickness of approximately 10mm to the exposed and unexposed sides of the wall system around the cable bundle to approximately 85mm from the wall, and approximately 230mm diameter around the cable bundle. Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 70mm from the wall.
B	Communications cable bundle, nominal 50mm – 70mm diameter in a Ø80mm aperture 48 cables made up of two separated packs of 24 cables. Each cable core consisted of 4-pairs with nominal overall diameter 6.5mm - 8.2mm. Within this pack of cables, a steel suspending cable was also laid made up of 5 strands of wire with a nominal diameter of 2.7mm.	Bostik Fireban One Polyurethane sealant The sealant was applied around the cable bundle in the following manner: through the full width of the wall at an approximate 10mm thickness. between the cable bundles and wall aperture at a thickness of approximately 15mm at the top and bottom down to approximately 5mm at the sides. To the exposed and unexposed sides of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 230mm diameter around the cable bundle. Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 50mm from the wall.
C	Red sheathed 2 Core EWIS cable bundle, nominal 55mm in a Ø80mm aperture	Bostik Fireban One Polyurethane sealant The sealant was applied around the cable bundle in the following manner: through the full width of the wall at an approximate

ID	Service Description	Sealing system
		10mm thickness Between the cable bundles and wall aperture at a thickness of approximately 15mm. To the exposed side of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 100mm from the wall on the cable bundle to the unexposed side, and approximately 200mm diameter around the cable bundle. Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 30mm from the wall.

A.4.6 Test Results

A.4.6.1 The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2005, Section 2 & 10.

Service	Criteria	Result
A	**Structural Adequacy**	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	86 minutes
B	**Structural Adequacy**	Not applicable
	Integrity	No Failure at 121 minutes
	Insulation	No Failure at 121 minutes
C	**Structural Adequacy**	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes

A.5 TEST REPORT - EWFA 2524100.1

A.5.1 Report Sponsor

A.5.1.1 Bovis Lend Lease, 30 The Bond, 30 Hickson Road, Millers Point, NSW, 2000.

A.5.2 Test Laboratory

A.5.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.5.3 Test Date

A.5.3.1 The test was conducted on 5th October 2010.

A.5.4 Test standards prescribed

A.5.4.1 The test was conducted in general accordance with AS1530.4- 2005.

A.5.5 General Description of Specimen

A.5.5.1 The specimen comprised a 128mm overall thickness steel stud wall lined with two layers of 16mm thick Boral FireStop. The wall incorporated a number of service penetrations.

A.5.5.2 The studs were 64mm Rondo studs of 0.55mm bmt spaced to suit the penetrations. The tracks were 64mm Rondo tracks of 0.70mm bmt located at the top and bottom of the studs.

A.5.5.3 The sheets were fixed to the steel frame using 45mm long × 6 Gauge plasterboard screws.

ID	Service Description	Sealing system
A	Security cable bundle, nominal 45mm – 55mm in diameter in a Ø80mm aperture 14-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick 16-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm 17-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick	Bostik Fireban One Polyurethane sealant was applied around the cable bundle in the following manner: through the full width of the wall at an approximate 10mm thickness between the cable bundle and wall aperture at a thickness of approximately 15mm. To the exposed and unexposed sides of the wall system around the cable bundle to approximately 85mm from the wall, and approximately 200mm diameter around the cable bundle. Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 80mm from the wall.
B	Security cable bundle, nominal 60mm – 70mm in diameter in a Ø80mm aperture 16-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick 49-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm 3-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick.	Promat PROMASEAL® FC65 Fire collar fixed to the fire side. Bostik Fireban One Polyurethane sealant was applied around the cable bundle in the following manner: Through the full width of the wall at an approximate 10mm thickness between the cable bundle and wall aperture to the unexposed side at a thickness of approximately 15mm. Between the cable bundle and fire collar to the exposed side at a thickness of approximately 5mm. To the exposed and unexposed sides of the wall system around the cable bundle to approximately 50mm from the wall and approximately 200mm diameter around the cable bundle to the unexposed side only. Within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 70mm from the wall. Applied between the flange of the collar and the wall.
C	Security cable bundle, nominal 50mm – 60mm in diameter in a Ø90mm aperture 17-off 2 Core flat cables (red) having nominal size of 4.8mm wide × 2.2mm thick 28-off 7 Core cables (mix of dark grey and light grey sheath) having nominal diameter of 6.2mm 18-off 2 Core cables (black) having nominal size of 6.5mm wide × 4.8mm thick	Bostik Fireban One Polyurethane sealant was applied around the cable bundle in the following manner: through the full width of the wall at an approximate 10mm thickness between the cable bundle and wall aperture at a thickness of approximately 20mm. to the exposed side of the wall system around the cable bundle to approximately 50mm from the wall, and approximately 100mm from the wall on the cable bundle to the unexposed side, and approximately 230mm diameter around the cable bundle. within the cable bundle to the exposed and unexposed sides, from the internal face of the plasterboard up to approximately 80mm from the wall.

A.5.6 Test Results

A.5.6.1 The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2005, Section 2 & 10.

Service	Criteria	Result
A	**Structural Adequacy**	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 102 minutes
B	**Structural Adequacy**	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 84 minutes
C	**Structural Adequacy**	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 80 minutes

A.6 TEST REPORT - FSP 1458

A.6.1 Report Sponsor

A.6.1.1 Lend Lease Project Management and Construction (Australia) Pty Ltd.

A.6.2 Test Laboratory

A.6.2.1 CSIRO, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.6.3 Test Date

A.6.3.1 The fire resistance test was conducted on 14th February 2011.

A.6.4 Test Standard

A.6.4.1 The test was conducted in general accordance with AS1530.4-1997 and AS1530.4- 2005.

A.6.5 Variations to Test Method

A.6.5.1 None stated.

A.6.6 General Description of Tested Specimen

A.6.6.1 For the purpose of the test, the wall system used was a Powerscape steel framed wall system, consisting of 92mm wide metal stud clad on both sides with two layers of 16mm thick Powerscape board, with a stated fire-resistance level of -/120/120.

A.6.6.2 Several penetrations were included within the wall system. These specimens are summarised below:

ID	Description	Protection
1	Bullock Prefco Motorised fire damper assembly	PROMASEAL® Super Mastic was applied along the retaining angle legs in contact with the wall.
2	Ø160mm × 3.2mm thick Kuro Hard uPVC	The PROMASEAL® FCW 150 fire collar was inserted into an Ø205mm opening and located centrally within the wall. The gap between the outer casing of the collar and the board was sealed with PROMASEAL® Super Mastic.
3	Cat7 shielded security cables, Ø80-mm, penetrated the wall system through a Ø90mm hole	The total thickness of the wall where the cables penetrated it was increased by adding two 16mm thick layers of Powerscape board on the exposed face and four 16-mm thick layers of Powerscape board on the unexposed face. The penetration was sealed on both sides of the wall with PROMASEAL® Super Mastic.

ID	Description	Protection
4	deflection head, 92mm × 50mm × 1.15mm thick deflection head track	The board finished 25mm short of the p structure. The resulting gap was filled with Hilti CP606 Acrylic sealant controlled by a 15-mm diameter backer rod installed first against the head track.
5	letterbox opening, measuring 400mm wide × 200mm	The wall opening was protected with six tightly packed PROMASEAL® Fire Pillows and further sealed with PROMASEAL® Supa Mastic.

A.6.7 Instrumentation

A.6.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.6.8 Test Results

A.6.8.1 The test duration was 121 minutes.

A.6.8.2 The temperature of the test area was 20°C at the commencement of the test.

A.6.8.3 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-1997:

Service	Criteria	Result
1	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 3 minutes
2	Structural Adequacy	Not applicable
	Integrity	Failure at 4 minutes
	Insulation	Not applicable
3	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
4	Structural Adequacy	Not applicable
	Integrity	Failure at 118 minutes
	Insulation	Failure at 83 minutes
5	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes

A.7 TEST REPORT – FSP 1466

A.7.1 Report Sponsor

A.7.1.1 Lend Lease Project Management and Construction (Australia) Pty Ltd.

A.7.2 Test Laboratory

A.7.2.1 CSIRO, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.7.3 Test Date

A.7.3.1 The fire resistance test was conducted on 28th March 2011.

A.7.4 Test Standard

A.7.4.1 The test was conducted in general accordance with AS1530.4-1997 and AS1530.4- 2005.

A.7.5 Variations to Test Method

A.7.5.1 None stated.

A.7.6 General Description of Tested Specimen

A.7.6.1 For the purpose of the test, the wall system used was a Powerscape steel framed wall system, consisting of 92mm wide metal stud clad on both sides with two layers of 16mm thick Powerscape board, with a stated fire-resistance level of -/120/120.

A.7.6.2 Several penetrations were included within the wall system. These specimens are summarised below:

Specimen	Description	Protection
1	Deflection head	The head detail of the wall comprised of a 92mm x 50mm x 1.15mm thick deflection head track with the board finished 25-mm short of the top structure. The resulting gap was filled with Bostik Fireban 1 Polyurethane sealant controlled by a 15mm diameter backer rod installed first against the head track
2	Single TPS cable penetration	A single TPS cable, approximately 10mm in diameter, penetrated the wall system through a 21mm diameter hole. The penetration was sealed on both sides of the wall with PROMASEAL® SupaMastic, such that it extended 40-mm along the cable from the wall and 30-mm along the wall from the cable penetration.
3	Blendair Motorised Fire Damper Installation; 500-mm wide 500-mm high Blendair Motorized Fire Damper protecting a 520-mm wide x 520-mm high opening	The opening was framed with 92mm x 30mm x 1.15mm thick metal studs in all four sides. The resulting 10mm gap between the opening and damper was not sealed. The retaining angles were fixed to the damper casing using 10/12 hex head Tek screws at nominally 150-mm centres. Lorient acrylic fire rated sealant was applied along the retaining angle legs in contact with the wall.
4	Holyoake Fire Damper Installation; 1200-mm wide 600-mm high Holyoake Fire Damper Model HFS-R-146 protecting a 1220-mm wide x 620-mm high opening	The opening was lined with 92mm x 30mm x 1.15mm thick metal studs in all four sides. The resulting 10-mm gap between the opening and damper was not sealed. The retaining angles were bolted to the damper casing using bolts, 6-mm in diameter, at nominally 200-mm centres. PROMASEAL® Supa Mastic was applied along the retaining angle legs in contact with the wall.
5	Ø25mm × 2.5mm thick PVC conduit filled with TPS cables	The PROMASEAL® CFC32 collars were fixed to each side of the wall in a back-to-back configuration using two No. 7 gauge bugle head screws. The resulting gap between the conduit and the wall was sealed with PROMASEAL® SupaMastic.
6	Ø50mm × 1mm thick copper pipe	The specimen comprised a 500-mm long x 35-mm thick Rockwool protecting a copper pipe. The Rockwool was wrapped centrally around the pipe and shielded on the outside by a 0.8-mm thick steel sheath. The Rockwool was projected from the wall 200-mm on the unexposed face and 150-mm on the exposed face.
7	Ø150mm × 3mm thick copper pipe	The specimen comprised a 500-mm long x 35-mm thick Rockwool protecting a copper pipe. The Rockwool was wrapped centrally around the pipe and shielded on the outside by a 0.8-mm thick steel sheath. The Rockwool was projected from the wall 200-mm on the unexposed face and 150-mm on the exposed face.
8	Ø160mm × 3mm	The Promat PROMASEAL® FC150 fire collars were

Specimen	Description	Protection
	thick PVC pneumatic pipe	fixed to each side of the wall in a back-to-back configuration using four 40-mm long stitching screws and 40-mm diameter washers, on both faces of the wall. The resulting gap around the pipe was sealed with PROMASEAL® Supa Mastic polyurethane sealant on both sides of the wall, before fitting of the fire collars.
9	Ø160mm × 3mm thick PVC pneumatic pipe	The PROMASEAL® FCW 150 wall collar was inserted into a 210-mm diameter opening and located centrally within the wall. The resulting gap between the outer casing of the collar and the board was sealed with PROMASEAL® Supa Mastic.
10	Penetrating services comprised: one Ø102mm × 2.5mm thick copper pipe, one Ø63mm × 2mm thick copper pipe three Ø32mm × 2mm thick copper pipes one Ø25mm × 1.5mm thick copper pipe	An opening, measuring 500-mm wide x 150-mm high, lined with 92-mm x 30-mm x 1.15-mm thick metal studs on all four sides was penetrated by six medical gas copper pipes and protected by fire pillows. The opening was not lined on the inside with Powerscape board. The resulting gaps between the pipes, wall and pillows were sealed with PROMASEAL® Supa Mastic in both ends of the penetration.
11	Penetrating services comprised: one 25-mm (OD), three 32-mm (OD), one 65-mm (OD) one 102-mm (OD) copper pipe Pipes were spaced at 15-mm between each other.	The specimen comprised six medical gas copper pipes penetrating the wall through different diameter openings and protected by of PROMASEAL® Supa Mastic on both sides of the penetration. The Ø25mm × 2mm thick copper pipe was fitted through a 30-mm diameter hole and protected by PROMASEAL® Supa Mastic against a 10-mm thick PROMASEAL® IBS rod, set flush with the face of the wall. The three Ø32mm × 2mm thick copper pipes were fitted through a 45-mm diameter hole and protected by PROMASEAL® Supa Mastic against a 10-mm thick PROMASEAL® IBS rod, set flush with the face of the wall. The Ø65mm × 2mm thick copper pipe was fitted through a 90-mm diameter hole and protected by PROMASEAL® Supa Mastic against a 29-mm thick PROMASEAL® IBS rod, set flush with the face of the wall. The Ø102mm × 2.5mm thick copper pipe was fitted through a 130mm diameter hole and protected by PROMASEAL® Supa Mastic against a 29-mm thick PROMASEAL® IBS rod, set flush with the face of the wall.
12	Clipsal Fire Box configurations: Twelve 96-mm wide x 52-mm high x 50-mm deep Clipsal 157F	The specimen boxes were mounted through 96-mm x 52-mm openings and spaced at 50-mm to each other in a back to back configuration. The resulting gaps between the wall and boxes were not sealed. The Clipsal 157 Series fire wall box comprised

Specimen	Description	Protection
	Series fire wall boxes	internally of a 9-mm thick intumescent material on the bottom of the box. On the exposed face, 600-mm above the fire boxes, the boxes' TPS cables penetrated the wall through four 25-mm diameter holes. The resulting gaps between the TPS cables and wall were sealed with PROMASEAL® Supa Mastic.

A.7.7 Instrumentation

A.7.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.7.8 Test Results

A.7.8.1 The test duration was 121 minutes.

A.7.8.2 The temperature of the test area was 18°C at the commencement of the test

A.7.8.3 The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2005, Section 2 & 10.

Service	Criteria	Result
1	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
2	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
5	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
6	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 52 minutes
7	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 25 minutes
8	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 120 minutes
9	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
10	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 16 minutes
11	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 28 minutes
12	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 120 minutes

A.7.8.4 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-1997:

Service	Criteria	Result
3	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 4 minutes
4	Structural Adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 3 minutes

A.8 TEST REPORT – FSV 1482

A.8.1 Report Sponsor

A.8.1.1 Lend Lease Project Management and Construction (Australia) Pty Ltd.

A.8.2 Test Laboratory

A.8.2.1 CSIRO, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.8.3 Test Date

A.8.3.1 The fire resistance test was conducted on 6th June 2011.

A.8.4 Test Standard

A.8.4.1 The test was conducted in accordance with AS1530.4-2005.

A.8.5 Variations to Test Method

A.8.5.1 None stated.

A.8.6 General Description of Tested Specimen

A.8.6.1 The wall system used in the test was a Powerscape steel framed wall system, consisting of 92-mm wide metal studs clad on both sides with two layers of 16mm thick Powerscape board, with stated fire-resistance levels of -/120/120. The wall was penetrated by thirteen service penetrations, though only ten of these were described in the report; further, only five of the tested specimens are relevant to this report.

A.8.6.2 The specimens relevant to this report are summarised below:

ID	Description
A	A single TPS cable penetrating the wall system through a 10-mm diameter hole. The gap between the cable penetration and the wall was left unsealed.
B	Bunch of BMS cables approximately 80-mm in diameter, penetrating the wall system through a 100-mm high x 150- mm wide opening. The resulting gap around the cables was protected by Fyreplug pillows and sealed on both sides of the wall with a 25-mm x 25- mm fillet of Bostik Fireban One sealant.
C	Three Cat 7 cables penetrating the wall through a 25-mm diameter hole. The resulting gap around the cables was sealed on both sides of the wall with a 25-mm x 25-mm fillet of Bostik Fireban One sealant.
E	Nominally ø110 x 4.5mm steel pipe penetrating the wall through a 130-mm diameter hole. The resulting gap around the pipe was sealed on both sides of the wall with a 20-mm x 20-mm fillet of Bostik Fireban One sealant. The sealant was also applied through the width of the wall.
F	Bunch of 5 FireSense Fire Rated Cables penetrating the wall through a 35-mm diameter hole. The resulting gap around the cables was sealed on both sides with a 25-mm x 25-mm Promat Promaseal Supa Mastic fillet. The sealant was applied to the depth of two layers of board.
H	One bunch of Category 7 shielded data cables and three bunches of communication cables penetrating the wall system through a 100mm high × 200mm wide opening. Each bunch of cables measured approximately 50mm in diameter. The total thickness of the wall, where the cables penetrated it, was increased by adding three16mm thick layers of Powerscape board on both faces. The extra boards, nominally 300mm high × 400mm wide, were fixed onto the wall with 8 gauge laminating screws. Bostik Fireban one was applied between every extra layer of Powerscape board. The resulting gap around the cables was protected by Promat Fire Pillows and sealed on both sides of the wall with Bostik Fireban One sealant.
I	One bunch of Category 7 shielded data cables and four bunches of communication cables penetrating the wall system through a 150-mm high x 300-mm wide opening. Each bunch of cables measured approximately 50-mm in diameter. The total thickness of the wall where the cables penetrated it was increased by adding three16-mm thick layers of Powerscape board on both faces. The extra boards, nominally 350-mm high x 500-mm wide, were fixed onto the wall with 8 gauge laminating screws. Bostik Fireban one was applied between every extra layer of Powerscape board. The resulting gap around the cables was protected by Promat Fire pillows and sealed on both sides of the wall with Bostik Fireban One sealant.
K	Nominally ø160 x 2.5mm copper pipe penetrating the wall through a 170-mm diameter hole. The resulting gap around the pipe was sealed on both sides of the wall with a 20-mm x 20-mm fillet of Bostik Fireban One sealant. The sealant was applied through the width of the wall.
L	The specimen comprised 264 Cat 7 shielded cables penetrating the wall system through a 150-mm high x 600-mm wide opening framed with 0.75-mm thick Rondo studs. The total thickness of the wall where the cables penetrated it was increased by adding three16-mm thick layers of Powerscape board on both faces. The extra boards, nominally 350-mm high x 800-mm wide, were fixed onto the wall with 8 gauge laminating screws. Bostik Fireban One was applied between every extra layer of Powerscape board. The resulting gap around the cables was protected by Promat Fire pillows and sealed on both sides of the wall with Bostik Fireban One sealant.

A.8.7 Instrumentation

A.8.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.8.8 Test Results

A.8.8.1 The test duration was 121 minutes.

A.8.8.2 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-2005:

Service	Integrity (minutes)	Insulation (minutes)
A	121*	121*
B	121*	121*
C	121*	121*
E	121*	39
F	121*	121*
H	121*	121*
I	121*	121*
K	121*	13
L	121*	121*

* No failure

A.9 TEST REPORT - EWFA 2683500

A.9.1 Report Sponsor

A.9.1.1 Exova Warringtonfire Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.9.2 Test Laboratory

A.9.2.1 Exova Warringtonfire Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.9.3 Test Date

A.9.3.1 The fire resistance test was conducted on 11th January, 2012.

A.9.4 Test Standard

A.9.4.1 The test was conducted in accordance with AS1530.4-2005 and AS4072.1-2005.

A.9.5 Variations to Test Method

A.9.5.1 None stated.

A.9.6 General Description of Tested Specimen

A.9.6.1 The supporting construction comprised a 1.2m × 1.2m steel-framed plasterboard wall. The studs were 64mm studs in box configuration and were clad with three layers of 13mm thick CSR Gyprock Fyrchek on the exposed side and two layers of 13mm thick CSR Gyprock Fyrchek on the unexposed side. The overall thickness of the specimen was 97mm.

A.9.6.2 Two penetrations were included within the wall system, for the purpose of this assessment, only specimen 1 is considered and the detail of which is provided below:

ID	Description	Protection	Support
1	Single-core XLPE insulated, PVC sheathed 0.6/1 kV 630mm^2 cable	PROMASEAL® Supa Mastic sealant in annular gap between cable and plasterboard to depth of plasterboard in addition to a 30mm fillet around cable-wall interface. Cable was wrapped with a single layer of Bradford Fibertex 450 blanket with a nominal 50mm overlap, with the wrap extending from the wall, 500mm down the cable. The wrap was secured using 3-off metal cable ties 50mm from each end and at the centre.	On unexposed side, 200mm and 550mm from the unexposed face.

A.9.6.3 The cable extended 700mm (with 200mm un-insulated) on the unexposed side and 700mm (with 200mm un-insulated) on the exposed side.

A.9.7 Instrumentation

A.9.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005 with additional thermocouples at the unexposed ends of both specimens.

A.9.8 Test Results

A.9.8.1 The test duration was 241 minutes.

A.9.8.2 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-2005:

Specimen	Integrity	Insulation
1	No failure at 241 minutes	67 minutes.

A.9.8.3 For Specimen 1 (cable penetration) some critical temperatures are listed:

- The maximum temperature on the insulation 25mm from the wall at 120 minutes was 182°C.
- The maximum temperature on the pipe 25mm from the end of the insulation at 120 minutes was 225°C.
- The maximum temperature on the insulation 25mm from the end of the insulation at 120 minutes was 78°C.

A.10 TEST REPORT – FSV 1506

A.10.1 Report Sponsor

A.10.1.1 Lend Lease Project Management and Construction (Australia) Pty Ltd.

A.10.2 Test Laboratory

A.10.2.1 CSIRO, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.10.3 Test Date

A.10.3.1 The fire resistance test was conducted on 5th October 2011.

A.10.4 Test Standard

A.10.4.1 The test was conducted in general accordance with AS1530.4-1997 and AS1530.4- 2005.

A.10.5 Variations to Test Method

A.10.5.1 None stated.

A.10.6 General Description of Tested Specimen

A.10.6.1 The specimen comprised a control joint and various service penetrations in and through a 156mm thick USG Powerscape wall system.

A.10.6.2 For the purpose of the test, the wall system used was a Powerscape steel framed wall system, consisting of 92mm wide metal stud clad on both sides with two layers of 16mm thick Powerscape board, with a stated fire-resistance level of -/120/120.

A.10.6.3 For the purpose of this assessment, only Specimens H, I, J, K and M in the test are considered and are summarised below:

ID	Description
H	The specimen comprised seven bunches of Category 7 shielded data cables penetrating the wall system through a 150mm high × 600mm wide opening framed with 0.75mm thick Rondo studs. Each bunch contained twelve 7mm diameter cables. The resulting gap around cables was protected by Promat Fire Pillows and sealed on both sides of the wall with Bostik Fireban One sealant. The communication cables, 120mm long, projected approximately 520mm on each side of the wall and supported by a 600mm wide steel cable tray fixed to a steel bracket on both sides of the wall. The cable tray did not penetrate the wall.

ID	Description
I	The specimen comprised a bunch of seventy two 7mm thick Category 7 cables penetrating the wall through a 100mm diameter hole. The cables were wrapped with a layer of 3mm thick ZZ-Wrap NE to a 150mm length from the face of the wall on both sides of the specimen. The resulting gap around the cables was sealed on both sides with a 25mm × 15mm Bostik Fireban one fillet The cables, 120mm long, projected approx. 520mm each side of the wall.
J	The specimen comprised a bunch of seventy two 7mm thick Category 7 cables penetrating the wall through a 100mm diameter hole. The total thickness of the wall where cables penetrated it was increased by adding a 300mm × 300mm × 60mm thick Vermiculux board fixed on both faces by 8 gauge laminating screws. The resulting gap around the cables was sealed on both sides with a 25mm × 15mm Bostik Fireban one fillet The cables, 120mm long, projected approx. 520mm each side of the wall.
K	The specimen comprised a bunch of BMS cables penetrating the wall system through an 80mm diameter hole. The bunch of cables measured approx. 60mm in diameter. The resulting gap around the cables was protected by a 25mm × 25mm Promat Promaseal Supa Mastic fillet to a 32mm depth of each side of the wall, The communication cables, 1200mm long, projected approx.520mm on each side of the wall and were supported by a steel bracket on both sides of the wall.
M	The specimen comprised a 30mm diameter coaxial cable penetrating the wall through a 50mm diameter hole. The cable was wrapped with a layer of 3mm thick ZZ-Wrap NE to a 150mm length from the face of the wall on both sides of the specimen. The resulting gap around the cable was sealed on both sides with a 25mm × 25mm Bostik Fireban One sealant fillet.

A.10.7 Instrumentation

A.10.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.10.8 Test Results

A.10.8.1 The test duration was 121 minutes.

A.10.8.2 The temperature of the test area was 15°C at the commencement of the test.

A.10.8.3 The specimens achieved the following performance when tested:

Service	Integrity Performance	Insulation Performance
H	No failure at 121 minutes	No failure at 121 minutes
I	No failure at 121 minutes	No failure at 121 minutes
J	No failure at 121 minutes	No failure at 121 minutes
K	No failure at 121 minutes	No failure at 121 minutes
M	No failure at 121 minutes	No failure at 121 minutes

A.11 TEST REPORT – FSV 1523

A.11.1 Report Sponsor

A.11.1.1 Lend Lease Project Management and Construction (Australia) Pty Ltd.

A.11.2 Test Laboratory

A.11.2.1 CSIRO, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.11.3 Test Date

A.11.3.1 The fire resistance test was conducted on 22nd December 2011.

A.11.4 Test Standard

A.11.4.1 The test was conducted in general accordance with AS1530.4-1997 and AS1530.4- 2005.

A.11.5 Variations to Test Method

A.11.5.1 None stated.

A.11.6 General Description of Tested Specimen

A.11.6.1 The specimen comprised various service penetrations in and through a 156mm thick USG Powerscape wall system.

A.11.6.2 For the purpose of the test, the wall system used was a Powerscape steel framed wall system, consisting of 92mm wide metal stud clad on both sides with two layers of 16mm thick Powerscape board, with a stated fire-resistance level of -/120/120.

A.11.6.3 For the purpose of this assessment, Specimens 1 through 13 in the test are considered and are summarised below:

ID	Description
1	The specimen comprised PVC insulated cables with specifications in accordance with Appendix D1 of AS1530.4-2005. The Appendix D1 cable configuration penetrated the wall system through a 150mm high × 650mm wide opening. The opening was framed with 92mm × 30mm × 1.15mm thick metal studs on all four sides and lined on the inside with two layers of 16mm thick Powerscape board. The resulting gap between the cables and wall was protected by two layers of 50mm thick Intubatt1 friction fitted on both sides of the wall, the cables were then wrapped with 25mm thick TBA Fortaglas felt covering 300mm of cables on both sides of the wall. The cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 600mm wide by 640mm long cable tray.
2	The specimen comprised four 25mm diameter SDI (Single Double Insulated) cables, four 4mm^2 copper cables and ninety TPS (Thermo Plastic Sheathed) cables penetrating the wall through a 150mm high by 650mm wide opening. The resulting gap around the cables was sealed on both sides of the wall, with a nominal 100mm by 100mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The communication cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 600mm wide by 640mm long cable tray.
3	The specimen comprised three bunches of five TPS cables, each one penetrating the wall through a 40mm diameter hole. The total thickness of the wall, where the cables penetrated it, was increased by adding two 16mm thick layers of Powerscape board on both faces. The extra boards were fixed onto the wall with 8 gauge laminating screws. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 60mm by 60mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cable, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 300mm wide by 500mm long cable tray.

ID	Description
3a	The specimen comprised fifty TPS cables and seventy five SDI cables penetrating the wall through a 75mm high by 300mm wide opening. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The communication cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 300mm wide by 500mm long cable tray.
4	The specimen comprised sixty five TPS cables penetrating the wall through a 75mm high by 300mm wide opening. The resulting gap around the cables was sealed, on both sides of the wall with a nominal 100mm by 100mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 300mm wide by 590mm long cable tray.
5	The specimen comprised four of 75mm high by 300mm wide openings spaced 100mm from each other. The opening were protected by two layers 350mm high by 800mm wide by 16mm thick Powerscape board fixed to both sides of the wall with 40mm long 8 gauge screws.
6	The specimen comprised seventy six TPS cables, tied with cable ties in bunches of five, penetrating the wall through a 125mm diameter hole. The resulting gap around the cables was sealed, on both sides of the wall with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by steel bracket.
8	The specimen comprised three bunches of five TPS cables, each one penetrating the wall through a 40mm diameter hole. The holes were located 25mm each other. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 300mm wide by 500mm long cable tray.
9	The specimen comprised two Fibre Optic cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic, controlled by an IBS rod. The TPS cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by steel brackets.
10	The specimen comprised PVC insulated cables with specifications in accordance with Appendix D1 of AS1530.4-2005. The Appendix D1 cable configuration penetrated the wall system through a 150mm high by 650mm wide opening. The opening was framed with 92mm by 30mm by 1.15mm thick metal studs on all four sides. The resulting gap between the cables and the wall was protected by 300mm long Promaseal Fire Pillows installed on next to each other to protrude 200mm on both sides of the wall. The resulting gaps around the cables and pillows were sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic. The cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 600mm wide by 640mm long cable tray.

ID	Description
11	The specimen comprised two 10mm diameter braided electrical cables penetrating the wall through a 40mm diameter hole. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Braided electrical cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 600mm wide by 640mm long cable tray.
12	The specimen comprised two 25mm diameter Coaxial cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 70mm by 70mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Coaxial cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by steel bracket.
13	The specimen comprised thirty six Cat7 cables penetrating the wall through a 73mm diameter hole. The resulting gap around the cables was sealed, on both sides of the wall, with a nominal 50mm by 50mm fillet of Promat Promaseal Supa Mastic controlled by an IBS rod. The Cat7 cables, 1200mm long, projected approximately 520mm on each side of the wall. For the purpose of the test, the cables were supported by a 600mm wide by 640mm long cable tray.

A.11.7 Instrumentation

A.11.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.11.8 Test Results

A.11.8.1 The test duration was 121 minutes.

A.11.8.2 The temperature of the test area was 21°C at the commencement of the test.

A.11.8.3 The specimens achieved the following performance when tested:

Service	Integrity Performance	Insulation Performance
1	No failure at 121 minutes	No failure at 121 minutes
2	No failure at 121 minutes	No failure at 121 minutes
3	No failure at 121 minutes	No failure at 121 minutes
3a	No failure at 121 minutes	No failure at 121 minutes
4	No failure at 121 minutes	No failure at 121 minutes
5	No failure at 121 minutes	No failure at 121 minutes
6	No failure at 121 minutes	No failure at 121 minutes
8	No failure at 121 minutes	No failure at 121 minutes
9	No failure at 121 minutes	No failure at 121 minutes
10	No failure at 121 minutes	No failure at 121 minutes

Service	Integrity Performance	Insulation Performance
11	No failure at 121 minutes	No failure at 121 minutes
12	No failure at 121 minutes	No failure at 121 minutes
13	No failure at 121 minutes	No failure at 121 minutes

A.12 TEST REPORT – FP 4060

A.12.1 Report Sponsor

A.12.1.1 Promat Australia Pty Ltd, 1 Scotland Road, Mile End South SA 5031, Australia.

A.12.2 Test Laboratory

A.12.2.1 BRANZ Limited, Moonshine Road, Judgeford, Private Bag 50908, Porirua City, New Zealand.

A.12.3 Test Date

A.12.3.1 The fire resistance test was conducted on 28th August 2011.

A.12.4 Test Standard

A.12.4.1 The test was conducted in general accordance with AS1530.4- 2005.

A.12.5 Variations to Test Method

A.12.5.1 None stated.

A.12.6 General Description of Tested Specimen

A.12.6.1 The test specimens comprised of a single panel of PROMATECT® Vermiculux and a single pane of L500 the panel sizes are summarised below;

a) (Top Panel) L500 – 1100mm × 1020mm × nominally 52mm thick

b) (Bottom Panel) Vermiculux – 1100mm × 1020mm × nominally 60mm thick.

A.12.6.2 The panels were screw fixed to a frame made from Rondo 64mm galvanised steel framing studs and tracks. The frame was fabricated to fit within the specimen frame and allowance was made for Kaowool insulation between the stud and the specimen frame. Two sections of track were located mid height of the wall and were secured back to back with a layer of Kaowool sandwiched between them. The galvanised framing members were secured at the joints with button head screws. The frame was secured within the specimen with M12 bolts through the top, bottom and side members.

A.12.6.3 For the purpose of this assessment, only the Vermiculux panel is considered. The bottom panel was secured with 10 gauge × 75mm long. The orientation of the wall was such that the face of the panels was exposed to the fire.

A.12.7 Instrumentation

A.12.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.12.8 Test Results

A.12.8.1 The test duration was 250 minutes.

A.12.8.2 The temperature of the test area was 12°C at the commencement of the test.

A.12.8.3 The specimens achieved the following performance when tested:

Specimen	Integrity performance	Insulation performance
PROMATECT® Vermiculux board	No failure at 250 minutes	Failure at 106 minutes, average temperature rise in excess of 140K.

A.13 TEST REPORT – NO. 14244A

A.13.1 Report Sponsor

A.13.1.1 HILTI AG, Feldkircherstraβe 100, FL-9494 SCHAAN, Liechtenstein.

A.13.2 Test Laboratory

A.13.2.1 Warringtonfiregent, Ottergemsesteenweg-Zuid 711, B-9000 Gent, België.

A.13.3 Test Date

A.13.3.1 The fire resistance test was conducted on 11th May 2010.

A.13.4 Test Standard

A.13.4.1 The test was conducted in accordance with EN 1363-1: 2000 and EN 1366-3:2009.

A.13.5 General Description of Tested Specimen

A.13.5.1 The test assembly consisted of 17 cable and conduit penetration sealing systems in an aerated concrete wall and 8 cables and conduit penetration sealing systems in a flexible wall. On both sides of the wall the penetrations were supported by steel service support constructions at a distance of 300mm from the wall on the exposed side and at a distance of 250mm and 400mm from the wall on the unexposed side. The service supporting construction was composed of channels, brackets and pipe rings.

A.13.5.2 All the penetrations had lengths of 1150mm and were placed with a length of 500mm on the exposed side and a length of 500mm on the unexposed side of the wall.

A.13.5.3 Two 3000mm high by 875mm wide by 150mm thick aerated concrete wall with density of 550kg/m^3 are constructed as prescribed in the European standard 1366-3: 2009. A 3000mm high by 1250mm wide by 100mm thick plasterboard lined wall was installed between the two concrete walls. The flexible wall was composed of a 50mm wide steel frame clad with two layers of 12.5mm thick Type F gypsum board on both sides. The wall was insulated with 50mm thick and 100kg/m^3 stone wool board within the wall cavity. No stone wool insulation was placed 100mm around the openings in the flexible wall. This pace had been partially filled when the backfilling stone wool has been installed and compressed.

A.13.5.4 All the ends of the cables were covered with Hilti CP606 mastic on the non-exposed side.

A.13.5.5 All the ends of the conduits were filled with stone wool and covered with Hilti CP 606 mastic on the unexposed side and were uncapped on the exposed side.

A.13.5.6 All the ends of the steel conduits were filled with stone wool and covered with Hilti CP 606 mastic on the exposed side and were uncapped on the unexposed side.

A.13.5.7 The cable and conduit penetrations were sealed with Hilti CP 611A on both sides. For the purpose of the assessment, the following tested specimens in flexible wall is relevant and the details of the penetration is summarised below:

NO.	Opening Size w × h or Ø (mm)	SERVICE	PENETRATION SEAL
9	150 × 150	BLANK SEAL	Sealant on both sides: 25mm thick Hilti CP 611A
10	50 × 50	1 X $E_{(1)}$	Sealant on both sides: 25mm thick Hilti CP 611A Backfilling: 50mm thick Isover Universalstopfwolle
11	150 × 150	3 × (A1, A2, A3)$_{(1)}$ + $B_{(1)}$	Sealant on both sides: 25mm thick Hilti CP 611A Backfilling: 50mm thick Paroc Pro Loose Wool
13	150 × 150	1 X (C1, C2, C3) + $E_{(1)}$	Sealant on both sides: 25mm thick Hilti CP 611A Backfilling: 50mm thick Heralan LS
14	150 × 150	1 X (D1, D2, D3)$_{(1)}$	Sealant on both sides: 25mm thick Hilti CP 611A Backfilling: 50mm thick Rockwool

NO.	Opening Size w × h or Ø (mm)	SERVICE	PENETRATION SEAL
15	150 × 150	FULL WITH SMALL CABLES A1(1), A2(1), A3(1), + B(1)	Sealant on both sides: 25mm thick Hilti CP 611A Backfilling: 50mm thick Rockwool RL

A.13.5.8 (1)Standard Cable types in accordance with EN 1366-3: 2009 :

Cable	Type of Cable	Diameter Range (mm)	Dimensions
A1	Small sheathed	14	5 × 1.5mm^2
A2	Small sheathed	11.2-15	5 × 1.5mm^2
A3	Small sheathed	13	5 × 1.5mm^2
B	Small sheathed	18-21	1 × 95mm^2
C1	Medium sheathed	40-47	4 × 95mm^2
C2	Medium sheathed	48.4-61	4 × 95mm^2
C3	Medium sheathed	42	4 × 95mm^2
D1	Large sheathed	52	4 × 185mm^2
D2	Large sheathed	64-80	4 × 185mm^2
D3	Large sheathed	58	4 × 185mm^2
E	Medium sheathed	23-27	1 × 185mm^2
F	Bundle of cables (telecommunication cables	1 bundle of cables with diameter of 100mm	20mm × 2mm × 0.6mm shielded

A.13.6 Instrumentation

A.13.6.1 The instrumentation was provided and applied in accordance with EN 1366-3: 2009.

A.13.7 Test Results

A.13.7.1 The overpressure in the furnace was set at 13.6Pa ± 3Pa at a height of two meters, which is equivalent to an overpressure in the furnace of 10Pa ± 3Pa at the bottom of the lowermost penetration seal.

A.13.7.2 The test was terminated at 132 minutes and the ambient temperature was 17.1°C.

A.13.7.3 The specimens achieved the following performance:

No.	Integrity	Insulation
9	No failure at 132 minutes	No failure at 132 minutes
10	No failure at 132 minutes	124 minutes, maximum rise in temperature exceeded 180K measured on the cable 25mm from the CP 611A cable protection.
11	No failure at 132 minutes	122 minutes, maximum rise in temperature exceeded 180K measured on the cable 25mm from the CP 611A cable protection.
13	No failure at 132 minutes	67 minutes, maximum rise in temperature exceeded 180K measured on the cable 25mm from the CP 611A cable protection.
14	No failure at 132 minutes	80 minutes, maximum rise in temperature exceeded 180K measured on the cable 25mm from the CP 611A cable protection.
15	No failure at 132 minutes	No failure at 132 minutes

A.14 RELEVANCE OF EN 1363-1: 1999 TEST DATA WITH RESPECT TO AS1530.4-2005

A.14.1 General

A.14.1.1 The fire resistance No. 14244A was conducted in accordance with EN 1366-3: 2009 and EN 1363-1: 1999. These standards differ from AS1530.4-2005. The effect of these differences have on the fire resistance performance of test specimens is discussed below:

A.14.2 Specimen Configuration

A.14.2.1 AS1530.4-2005 specifies that the service(s) shall be installed so that it projects a minimum 500mm on each side of the supporting construction, of which at least 200mm shall extend beyond the extremities of the penetration sealing system. The penetration sealing system shall include any coating, wrapping or other protections to the services. The length of unprotected service on the unexposed face shall not be greater than 500mm.

A.14.2.2 It is stated in No. 14244A that all cables, conduits with and without cables with a minimum 500mm protruding from each face of the wall and floor.

A.14.2.3 Based on the above, it is considered there are no significant differences between relevant part of the tested construction and the specification in AS1530.4-2005.

A.14.3 Furnace Temperature Measurement

A.14.3.1 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.14.3.2 The furnace thermocouple specified in EN1363.1:1999 is made from folded steel plate that faces the furnace chamber. A thermocouple is fixed to the side of the plate facing the specimen with the thermocouple hot junction protected by a pad of insulating material.

A.14.3.3 The plate part is to be constructed from 150 ±1 mm long by 100 ±1 mm wide by 0.7 ±0.1 mm thick nickel alloy sheet strips.

A.14.3.4 The measuring junction is to consist of nickel chromium/nickel aluminium (Type K) wire as defined in IEC 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter 1 mm, the hot junctions being electrically insulated from the sheath.

A.14.3.5 The thermocouple hot junction is to be fixed to the geometric centre of the plate, by a small steel strip made from the same material as the plate. The steel strip can be welded to the plate or may be screwed to it to facilitate replacement of the thermocouple. The strip should be approximately 18 mm by 6 mm if it is spot-welded to the plate, and nominally 25 mm by 6 mm if it is to be screwed to the plate. The screw is to be 2 mm in diameter.

A.14.3.6 The assembly of plate and thermocouple should be fitted with a pad of inorganic insulation material 97 ±1 mm by 97 ±1 mm by 10 ±1 mm thick with a density of 280 ±30 kg/m3.

A.14.3.7 The relative location of the furnace thermocouples for the exposed face of the specimen, for AS1530.4-2005 and EN1363.1:1999, is 100mm +10mm and 100mm +50mm respectively.

A.14.3.8 The furnace control thermocouples required by EN1363.1:1999 are less responsive than those specified by AS1530.4-2005. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN1363.1:1999, particularly when the furnace temperature is changing quickly in the early stages of the test.

A.14.4 Furnace Temperature Regime

A.14.4.1 The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4-2005 follows the same trend as EN1363-1:1999.

A.14.4.2 The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2005 and EN1363-1:1999 are not appreciably different.

A.14.5 Furnace Pressure Regime

A.14.5.1 It is a requirement of AS1530.4-2005 that for vertical elements, a furnace gauge pressure of 15+3 Pa is established at the centre of lowest penetration. In contrast, EN1366-3:2009 requires minimum 10Pa at the lowest point of lowest service.

A.14.5.2 The parameters outlining the accuracy of control of the furnace pressure in AS1530.4-2005 and EN1363-1:1999 are also not appreciably different.

A.14.6 Integrity Performance Criteria

A.14.6.1 The integrity criteria differ slightly between AS 1530.4-2005 and EN1363.1:1999

A.14.6.2 While a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4-2005 if it collapses or sustains flaming or other conditions on the unexposed face, which ignite the cotton pad when applied for up to 30 seconds.

A.14.6.3 Specimens shall be deemed to have failed the integrity criterion in accordance with AS 1530.4-2005 when any of the following occur:

- sustained flaming for 10 seconds.
- a gap forms that allows the passage of hot gases to the unexposed face and ignite the cotton pad when applied for up to 30 seconds.
- a gap forms that allows the penetration of a 25mm gap gauge anywhere on the specimen.
- a gap forms that allows a 6mm × 150mm gap gauge to penetrate the specimen anywhere on the specimen.

A.14.6.4 Except for minor technical variations, the integrity criteria in EN1363.1:1999 are generally applied in a comparable manner to AS1530.4-2005.

A.14.7 Specimen Temperature Measurement

A.14.7.1 The specimen thermocouple specification of service penetrations is generally the same for AS1530.4-2005 and EN1366-3.

A.14.7.2 For the penetration construction considered, AS1530.4-2005 specifies the following locations for thermocouples to be placed:

- At not less than two points located approximately 25mm from the edge of the hole made for the passage of the service (one in uppermost vertical plane).
- On the surface of the penetrating service, at least two thermocouples located approximately 25mm from the plane of the general surface of the penetrated element (one in uppermost vertical plane).
- At least two positions 25 mm from the interface of the separating element and the main penetration seal.

A.14.7.3 For penetration sealing systems, EN 1363-1 specifies thermocouples are fixed in generally similar locations on the unexposed face: on the supporting construction and/or seal and on the penetrating service adjacent at the plane of penetration, and on the penetrating service some distance from the plane of penetration.

A.14.7.4 Based on the above, the effect of the differences on the thermocouple locations of the tested construction and the specifications in AS1530.4-2005 is discussed on case by case basis.

A.14.8 Insulation Performance Criteria

A.14.8.1 The insulation criteria of AS 1530.4-2005 and EN1363.1:1999 are not appreciably different.

A.14.9 Application of Test Data to AS1530.4-2005

A.14.9.1 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 test.

A.14.9.2 In the reference tests some specimens incorporated sheathed cables that were not in accordance with the cable specification of AS1530.4-2005 Appendix D. The performance achieved is applicable to only the cables tested.

A.14.9.3 Based on the above discussion it is considered that the results relating to the integrity and insulation performance of the referenced tests can be used as a basis to assess the FRL of the specimens if tested in accordance with AS1530.4-2005.

A.15 TEST REPORT – IBMB 3681/6818

A.15.1 Report Sponsor

A.15.1.1 Hilti Deutschland GmbH, Hiltistr.2 86916 Kaufering, Germany

A.15.2 Test Laboratory

A.15.2.1 MPA Braunschweig

A.15.3 Test Date

A.15.3.1 The test was conducted on 4th December 1997

A.15.4 Test standards prescribed

A.15.4.1 The test was conducted in accordance with DIN 4102.

A.15.5 Variations to Test Standard

A.15.5.1 None Nominated

A.15.6 Description of Tested Assembly

A.15.6.1 The report includes the results of two tests, the first being of a horizontal specimen of 4500mm x 3000mm comprising 150mm thick aerated concrete panels that incorporated various metal pipe and cable service penetrations.

A.15.6.2 The second test was of a vertical specimen of 3000mm x 3000mm comprising a combination of 150mm thick aerated concrete panels and 100mm thick plasterboard partition lined each side with 2 layers of 12.5mm fire grade plasterboard. The specimen incorporated various metal pipe and cable service penetrations.

A.15.6.3 The relevant tested specimens are summarised below;

ID	Penetration	Insulation	Insulation Thickness	Aperture Size	Support Element	Local Protection
7	10 x 1.0 copper pipe	HT/Armaflex	10mm	80mm	100mm thick Flexible wall	The gaps between pipes and plasterboard linings were filled with 25mm deep CP 611A and backed with mineral wool
8	42 x 1.5 copper pipe		10mm	100mm		
7	10 x 1.0 copper pipe		10mm	80mm	150mm thick concrete floor	50mm deep CP 611A filled on the top side of floor and backed with 100mm deep mineral wool
9	42 x 1.5 copper pipe		10mm	100mm		

A.15.6.4 The insulated metal pipe protruded 500mm into the furnace and was capped on the fire side, and protruded 500mm on the non-fire side and was uncapped.

A.15.7 Instrumentation

A.15.7.1 The test instrumentation was in accordance with DIN 4102:1985

A.15.8 Test Results

ID	Brief Description	Flaming or ignition of a cotton pad	Insulation
100mm thick Flexible Wall			
7	10mm x 1mm Copper pipe with 10mm thick Armaflex insulation	No failure 94 minutes (test termination)	No failure at 94 minutes (test termination)
8	42mm x 1.5mm Copper pipe with 10mm thick Armaflex insulation	No failure 94 minutes	74 minutes on Wall Element, No failure before 94 minutes on insulated pipe
150mm thick Concrete Floor			
7	10mm x 1mm Copper pipe with 10mm thick Armaflex insulation	No failure 122 minutes	No failure at 122 minutes
9	42mm x 1.5mm Copper pipe with 10mm thick Armaflex insulation	No failure 122 minutes	No failure at 122 minutes

A.16 RELEVANCE OF DIN 4102 PART 11:1985 TEST DATA TO AS 1530.4-2005

A.16.1 General

A.16.1.1 The fire resistance test IBMB 3681/6818 was conducted in general accordance with DIN 4102 Part 11:1985. The requirements of these standards differ from AS 1530.4-2005. The effect these differences have on fire resistance performance is discussed below.

Temperature Regime

A.16.1.2 The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4-2005 follows a similar trend to DIN 4102 Part 11:1985

A.16.1.3 The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4-2005 and DIN 4102 Part 11:1985 are not appreciably different.

Furnace Thermocouples

A.16.1.4 The furnace thermocouples specified in AS 1530.4-2005 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.16.1.5 The furnace thermocouple types in DIN 4102 Part 11:1985 are of the jacketed type in accordance with DIN 43710, of outside diameter 3.2mm and with at least 25mm of exposed measuring tip.

A.16.1.6 The response of the different thermocouple types to the furnace conditions is not expected to have significantly affected the recorded test result.

A.16.1.7 Variations due to the difference in heat transfer conditions between furnaces (which are not fully controlled by the current fire resistance test standards) would be more likely to influence results rather than the minor differences in the thermocouple construction described as above.

Furnace Pressure

A.16.1.8 It is a requirement of AS 1530.4-2005 that for vertical elements, a furnace gauge pressure of zero (0) Pa is established at a height 500mm above the notional floor level. DIN 4102 Part 11:1985, a pressure of 10Pa is maintained at the lowest penetration, which in this case is 1000mm from the floor.

A.16.1.9 Therefore, based on an average pressure gradient of 8.5Pa/metre height, at a particular height above the notional floor level the AS 1530.4-2005 would require the pressure to be approximately 9Pa higher than DIN 4102 Part 11:1985, which can be more onerous.

Performance Criteria

A.16.1.10 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.16.1.11 The integrity criteria of AS 1530.4-2005 and DIN 4102 Part 11:1985 are not appreciably different.

Insulation

A.16.1.12 The insulation criteria of AS1530.4-2005 and DIN 4102 Part 11: 1985 are not appreciably different.

A.16.2 Application of Test Data from IBMB 3681/6818 to AS 1530.4-2005.

A.16.2.1 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 a significant effect on the outcome of the referenced fire resistance test.

A.16.2.2 The variations in furnace pressure conditions can theoretically be more onerous and could affect the performance of the test specimens in the upper area of the specimen after the formation of gaps cracks or fissures. As the location of the particular specimens of interest (pipe 7 and Pipe 8 in flexible wall) are at least 2000mm from the floor of the furnace it can be

calculated that the furnace pressure at this location would be 10+8.5 = 18.5Pa, which is in excess for the requirements of AS1530.4-2005.

A.16.2.3 Based on the above discussion, it is considered that the results relating to the integrity and insulation performance of the pipe 7 and Pipe 8 in flexible wall and pipe 7 and 9 in concrete floor in IBMB 3681/6818 can be used to assess the integrity and insulation performance of tested specimen in accordance with AS 1530.4-2005 for up to 120 minutes.

APPENDIX B - ASSESSMENT OF SPECIFIC VARIATIONS

B.1 PERFORMANCE OF CABLE PENETRATIONS IN SPEEDPANEL CONSTRUCTION

B.1.1 Proposal

B.1.1.1 The proposed construction is summarised as follows:

Cable Penetrations:

- Specimens A, H, I and L as per FSV 1482 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens B, C and F as per FSV 1482
- Specimens 2 and 5 as per FSV 1466 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimen 3 as per FSV 1458 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimen A as per EWFA 2492900.1 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens B and C as per EWFA 2492900.1
- Specimen J as per EWFA 2517300.4 though the blanket wrap replaced with 600mm Rockwool insulation as tested in EWFA 2683500.
- Specimen F as per EWFA 2373800.1.
- Specimens A, B and C as per EWFA 2524100.1 with a 25mm × 25mm thick fillet of sealant each side of wall
- Specimens H, I, J, K and M as per FSV 1506
- Specimens 1 through 13 as per FSV 1523

Wall Construction:

- ***Speedpanel Wall Option 1:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad locally with 2 x 16mm thick Powerscape or fire grade plasterboard each side of wall.
- ***Speedpanel Wall Option 2:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad with 2 × 16mm thick Powerscape or fire grade plasterboard on one side and 3 × 16mm thick Powerscape or fire grade plasterboard on the other side to make a total thickness of 157mm.
- ***Speedpanel Wall Option 3:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture sealed with sealant only no board required.
- ***Speedpanel Wall Option 4:*** the wall system shall incorporate a 78mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm Powerscape or fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 156mm.
- ***Speedpanel Wall Option 5:*** the wall system shall incorporate a 78mm Speedpanel wall, and the service aperture clad with one layer of 60mm thick PROMATECT® Vermiculux board and one layer of 20mm thick PROMATECT® Vermiculux board on one side of Speedpanel wall to make a total thickness of 157mm.

Cable Protection Measures:

- For -/120/120 penetrations – Optional cylindrical mesh (2mm min. steel) shall be installed around each service on both sides of the wall such that the distance between any part of the service and the mesh is not less than 100mm. The mesh shall extend between 200mm and 1000mm each side of the wall, depending on the service in question. The mesh shall be suitably fixed to the wall and supported at 250mm and 750mm from the wall face if the mesh length is more than 250mm.
- For -/120/- penetrations, no mesh is required

B.1.2 Discussion

General

B.1.2.1 By observation, the proposed specimens typically comprise cable bundles, sometimes located on a tray, which penetrate the wall and are sealed to it on both sides with sealant.

Services in Speedpanel Wall Option 1

Insulation Performance of Services

B.1.2.2 It has been proposed that the above-mentioned cable specimens except Specimen J as per EWFA 2517300.4 and Specimens H, I, J, K and M as per FSV 1506 pass through an aperture in a 78mm thick Speedpanel wall which is clad locally on both sides with two layers of 16mm thick Powerscape board.

B.1.2.3 The proposed services were tested in differing supporting elements. The services from FSV 1482, FSV 1466, FSV 1458 and EWFA 2373800.1 were tested in a framed wall system with 92mm studs clad with two layers of USG Powerscape board each side (156mm total thickness). The services from EWFA 2492900.1 and EWFA 2524100.1 were tested in a framed wall system with 64mm studs clad with two layers of Boral Firestop plasterboard each side (128mm total thickness).

B.1.2.4 By observation, when installed in the proposed support construction, the proposed services will be exposed to a combination of:

- Variation in support construction thickness
- Smaller air cavity in the case of the services tested in framed walls, since the proposed air cavity will only be localised to services.

B.1.2.5 One could argue that the proposed construction (small cavity) is more onerous compared to installation in a larger (full size framed wall- as most were tested) cavity since the larger cavity would have a larger area of non-fire side board, which could cool down the air which inevitably enters said cavity. This argument could be offset, at least to some degree, by noting that the steaming effects of the Speedpanel panel edges could have a positive effect on cavity gas temperatures.

B.1.2.6 In light of the above, it is considered that the performance of the proposed cables installed in the proposed Speedpanel aperture would be approximately equivalent to that in a full scale framed wall of equivalent thickness. By extension, it is considered that the insulation performance recorded for the specimens tested in the 128mm framed wall and the Speedpanel wall remain valid in the proposed (thicker) wall.

B.1.2.7 For the type of specimen tested i.e. highly conductive material (copper) passing through the barrier, the dominant mode of heat transfer is conduction along said material (in the direction of the service). Heat transfer laterally – in the direction of the Speedpanel (via an insulating blanket) in the case of EWFA 2517300.4 or partition cavity in the case of all other reference tests – is weak as the thermal resistance is much higher. Substitution of the lateral material/gas for a more thermally-insulating material/condition may, however, present a slightly more onerous condition in regard to insulation performance.

B.1.2.8 At later stages of the test, when the furnace temperature gradient is low, a quasi-steady state heat transfer condition will be set up for the proposed specimens. The temperature measured on a point on the surface of the services will be (nonlinearly) proportional to the distance of said point from the exposed face of the wall.

B.1.2.9 The proposed clad Speedpanel system is nominally 141mm thick in the vicinity of the service. Many of the tested cable services (those from FSV 1482, FSV 1466, FSV 1458 and EWFA 2373800.1) were done so in a 156mm thick framed wall.

B.1.2.10 In order to offset this thickness difference, it has been proposed that a steel wire mesh be located on each side of the wall around the cable services. The mesh will extend a minimum 200mm each side of the wall and its effect will be to exclude the location of thermocouples (in practice, combustible material) directly on the service proximate the wall. It is not considered likely that the mesh itself (being a high surface area to mass ratio radiator located minimum 100mm from the surface of the services) would receive enough heat to induce failure locally.

B.1.2.11 The insulation performance recorded for the specimens tested in the 156mm thick framed walls is thus considered to remain valid in the proposed construction provided the cylindrical mesh is present. When said mesh is not present, the specimens must assume a zero performance value for insulation.

B.1.2.12 With reference to test 2373800.1, the cable service specimen F maintained insulation performance for 47 minutes and it is also observed the temperature recorded at 25mm away from the pillow on the cable was 302°C at 120 minutes. The effect of the non-fire side extension of cylindrical mesh on the cables has been calculated and the calculation indicates the temperature on the unexposed cable side would not exceed the limiting temperature rise of 180K at 120 minutes if the mesh has a minimum length of 350mm each side of the wall.

B.1.2.13 It is therefore expected the specimen F in 2373800 would achieve 30 minutes insulation performance with 200mm long mesh each side and would achieve 120 minutes insulation performance with 350mm long mesh each side if tested in the proposed construction.

B.1.2.14 Additionally, it is noted that four of the specimens tested in 128mm thick framed walls, namely specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100.1, achieved insulation performances between 60 and 90 minutes. It is noted, however, that these failures were localised to the thermocouples most adjacent to the wall- the temperatures measured a little farther out (25mm from aperture) remained below 180K rises for at least 120 minutes.

B.1.2.15 In light of the above, it is considered that when the proposed mesh is present, the insulation performance of the specimens noted above would not be below 120 minutes.

B.1.2.16 The above ideas are summarized in the following table;

Reference Test (Wall Thickness)	Specimen	Insulation Performance in Test	Insulation Performance Expected in Proposed Construction
FSV 1482 (156mm)	A, B, C, F, H, I, L	120	120 with mesh
			0 without mesh
FSV 1466 (156mm)	2, 5	120	120 with mesh
			0 without mesh
FSV 1458 (156mm)	3	120	120 with mesh
			0 without mesh
EWFA 2492900.1 (128mm)	A	60	120 with and without mesh
	B, C	120	120 with and without mesh
EWFA 2373800.1 (156mm)	F	30	30 with 200mm mesh
			120 with 350mm mesh
			0 without mesh
EWFA 2524100.1 (128mm)	A	90	120 with and without mesh
	B, C	60	120 with and without mesh

Integrity Performance of Seals

B.1.2.17 When thinning the support construction and reducing the wall cavity size, one must also consider the performance of the non-fire side seal, since it will be exposed to a more onerous condition. Specifically, the conductor adjacent to the seal will be hotter (since it is closer to the fire side); the effects of hot gas permeating into the cavity and attacking the seal will also be greater.

B.1.2.18 There are two types of sealant used in the reference test reports- Promaseal Supamastic and Bostik Fireban One. Fire pillows (FSV 1482, EWFA 2373800.1) are also utilised as a seal material.

B.1.2.19 EWFA 2517300.4 included an ø101.6 x 1.22mm copper pipe specimen (service I). On both sides of the wall a fillet of Supamastic sealant was applied. The service maintained integrity

for 195 minutes, demonstrating the ability of Supamastic to remain largely in place even under high temperatures- approximately 500°C was measured on the pipe on the unexposed side.

B.1.2.20 FSV 1482 included an ø160mm copper pipe specimen (service K). In this instance, Fireban One sealant was used to seal the pipe to the support construction. The service recorded temperatures as high as 475°C and maintained integrity for the 121 minute test duration, during which no observations were made which suggest a significant sealant weakness.

B.1.2.21 FSV 1466 included a number of copper pipe specimens which passed through the fire pillows in the proposed construction. The pipes recorded temperatures as high as 580°C and maintained integrity for the 121 minute test duration, during which no observations were made which suggest a weakness of the pillows.

B.1.2.22 The temperatures measured on the non-fire side of the cables in the referenced tests ranged between 120°C and 325°C at 120 minutes. The proposed cable specimens are not considered likely to transfer more heat to the surrounding sealant than did the copper pipe specimens mentioned above, even if the wall is thinned effectively by 13mm in the case of the specimens tested in the 156mm walls.

B.1.2.23 In light of this, it is considered that the seals would not be a source of integrity weakness in the proposed construction up to 120 minutes. The previous insulation-related discussion thus remains valid.

B.1.2.24 In passing, it is noted that one of the proposed specimens- service B in EWFA 2524100.1, included a fire collar on the fire side. Since, as when it was tested, the collar shall be attached to plasterboard, it is not considered that the collar performance would be significantly different in the proposed wall construction compared to when tested.

Services in Speedpanel Wall Option 2

Insulation performance of Services

B.1.2.25 It is proposed that the specimens summarised in Table 1 except Specimen J as per test EWFA 2517300.4, Specimen F as per test 2373800.1 and Specimens 1 through 13 as per test FSV 1523 pass through an aperture in a wall system incorporates a 78mm thick Speedpanel wall which is clad with two layers of 16mm thick USG Powerscape boards or fire grade plasterboard on one side and three layers of 16mm thick USG Powerscape or fire grade plasterboards on the other side with a total wall thickness of 157mm.

B.1.2.26 The proposed services were tested in differing support elements. The service from FSV 1482, FSV 1466, FSV 1458 and FSV 1506 were tested in a frame wall system with 92m studs clad with two layers of USG Powerscape board each side (156mm total thickness). The services from EWFA 2492900.1 and EWFA 2524100.1 were tested in a framed wall system with 64mm steel studs clad with two layers of Boral FireSTOP plasterboard each side (128mm total thickness).

B.1.2.27 With reference to the test results of tests FSV 1482, FSV 1466, FSV 1458 and FSV 1506, all proposed services tested achieved insulation performance of 121 minutes with no insulation failure occurred during the test durations.

B.1.2.28 With reference to the test results of tests EWFA 2492900.1 and EWFA 2524100.1, specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100 achieved insulation performance between 60 and 90 minutes. Specimens B and C tested in EWFA 2492900.1 achieve insulation performance of 121 minutes with no insulation failure occurred during the test duration.

B.1.2.29 By inspection of test observations of specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100, it is noted, that these failures were localised to the thermocouples most adjacent to wall, the thermocouples measured a little farther out (25mm from aperture) remained below 180K rises for at least 120 minutes.

B.1.2.30 As discussed previously, it is confirmed that the performance of the proposed cables installed in the proposed Speedpanel aperture would be approximately equivalent to that in a full scale framed wall of equivalent thickness. By extension, it is considered that the insulation performance recorded for the specimens tested in the 156mm framed wall remain valid in the proposed (thicker) wall.

B.1.2.31 It is proposed that a 25mm × 25mm thick fillet sealant is applied on each side of the all construction around the cable services. The sealant fillet will exclude the location of thermocouples (in practice, combustible material) directly on the service proximate the wall. It is considered likely that the 25mm thick sealant fillet would receive enough heat to induce failure locally.

B.1.2.32 Based on the above discussion, and on balance of reinforced contribution of wall thickness and 25mm thick sealant fillet, it is considered that when the proposed wall and sealant fillet are present, the insulation performance of the specimens mention above in tests EWFA 2492900.1 and EWFA 2524100.1 would not be below 120 minutes.

B.1.2.33 In addition, it is considered the proposed 25mm thick sealant fillet will not have a detrimental effect or if not slightly improve the insulation performance of specimens tested in FSV 1482, FSV 1466, FSV 1458 and FSV 1506.

B.1.2.34 In light of above, the proposed construction will achieve an insulation performance of 120 minutes without steel mesh if tested in accordance with AS1530.4-2005.

Integrity performance of Services

B.1.2.35 With reference to the tested constructions of specimens in test FSV 1506, there were two types of sealant used in the reference test reports- Promaseal Supamastic and Bostik Fireban One. Fire pillows (Specimen H) and ZZ-Wrap NE protections (Specimens I and M) were also utilized as seal materials.

B.1.2.36 With reference to the tested construction of specimens in tests FSV 1458, EWFA 2492900 and EWFA 2524100.1, there were also two types of sealant used- Promaseal Supamastic and Bostik Fireban One.

B.1.2.37 With reference to the tested performance in the tests, it is observed that proposed specimens all achieved an integrity performance of 121 minutes with no sign of impending cracks, fissure or gap formations during the test durations.

B.1.2.38 As discussed previously that it is confirmed that the seals in test EWFA FSV1482. FSV 1466 would not be a source of integrity weakness in the proposed construction up to 120 minutes.

B.1.2.39 It is proposal the proposed support construction is 157mm thick which is at least 1mm thicker than the tested constructions (156mm thick or 141mm thick). It is considered that widening the wall will not have a detrimental effect on the integrity performance of penetrating services.

B.1.2.40 In light of above, it is considered the proposed construction will achieve an integrity performance of 120 minutes if tested in accordance with AS1530.4-2005.

Service in Speedpanel Wall Option 3

Insulation performance of Service

B.1.2.41 It has been proposed that Specimen J as per test EWFA 2517300.4 passes through an aperture in a 78mm thick Speedpanel wall with Promat Promaseal sealant applied on both exposed and unexposed sides. It is also proposed that the tested blanket wrapped around service shall be replace with 38mm thick Fibretex 450 Rockwool insulation for a length of 600mm each side of the wall.

B.1.2.42 The proposed service was tested in a 78mm thick Speedpanel wall and with reference to test EWFA 2517300.4, the service maintained integrity in excess of 120 minutes, however insulation was exceeded on the blanket wrapping at 102 minutes (as recorded by thermocouple located 25mm from the separate element) and on the wall at 105 minutes (as recorded by thermocouple located above the service 25mm from insulation).

B.1.2.43 With reference to the results of EWFA 2517300.4, it is observed that the 42mm single core cable was the hottest cable of this in the AS1530.4-2005 D1 cables.

B.1.2.44 Based on the above discussion, it is considered that the insulation performance of the 42mm single core cable construction tested in EWFA 2683500 can be used to conservatively assess the insulation performance all the cables in the AS1530.4-2005 D1 cables specification.

B.1.2.45 With reference to EWFA 2683500, the specimen included the larger single core conductor cable from AS1530.4-2005 Appendix D1 cables which was wrapped with 38mm thick Fibretex 450 Rockwool Insulation for a distance of 500mm from the barrier each side of the wall,

leaving 200mm of the conductor exposed on each side is strict accordance with AS1530.4-2005.

B.1.2.46 When tested the cable achieved 189 minutes integrity and the following insulation performance at 120 minutes.

Report	Cable Measured	Barrier	Temperatures on cable at 120 minutes the distances (mm) shown		
EWFA 2683500	Single core PVC insulated OD 42mm AS 1530.4-2005 Appendix D1 cable a)	97mm thick plasterboard lined wall	25 (mm)	475 (mm)	525 (mm)
			182°C	78°C	225°C

B.1.2.47 The proposed construction comprises cables insulated with 600mm length of insulation in lieu of the 500mm tested and fixed with 4 cable ties. The additional length of insulation will reduce the temperature of the part of the cable that emerges from the insulation on the non-fire side by virtue of a number of simultaneously acting effect. Firstly the length of the protection on the exposed side that sees the radiation effects of the furnace will be longer thereby increasing the distance the heat needs to conduct. Secondly the protection on the non-fire side being further from the furnace will similarly provide a longer distance for the heat to conduct down the cable.

B.1.2.48 Based on the decrease in exposed temperature of the insulation, the effect of the non-fire side extension of insulation on the exposed pipe can be calculated as below:

$$T_{rise} = \{[182°C-(182°C-78°C) \times (550/450)] \times (225°C/78°C)\}-24°C = 140K$$

B.1.2.49 The above estimate meets the limiting temperature rise of 180K at 120 minutes, and conservatively ignores the additional protection offered by the additional insulation on the fire side.

B.1.2.50 Based on the above discussion, it is confirmed that a 42mm single core cable insulation each side with 600mm of 38mm Fibretex 450mm Rockwool when penetrating a 97mm plasterboard barrier will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

B.1.2.51 In addition, it is noted at 90 minutes the temperature on the insulation 25mm from wall was 58°C whereas the temperature at the end of the cable was 102°C. It is expected that for plasterboard lined wall the plasterboard progressively falls away and when this happens in can allow more venting of hot gasses to the non-side which can raise the temperature of non-fire side thermocouples.

B.1.2.52 It is apparent that the fall of the plasterboard layers occurred at or around 105 minutes and this increased the exposure of the cables to the furnace and potentially increased the venting around the cable.

B.1.2.53 The proposed barrier seal comprised a 78mm thick Speedpanel wall, it is not expected that this break down and allow venting like plasterboard lined partitions.

B.1.2.54 The proposed construction comprises 38mm thick Fibretex Rockwool insulation wrapped around cables with cable tray each side of the wall.

B.1.2.55 The temperature measured on the unexposed surface of the support element depends on insulation performance of partition and distances of thermocouples from exposed side. In other word, the effective thickness of the proposed Rockwool practically furthers the thermocouples from the service that would record a lower temperature.

B.1.2.56 Based on the above discussion, it is considered that the combined effect of the proposed variation to the penetration support construction and extension of the insulation on the non-fire side would keep the temperature rise measured on the proposed cables 25mm from the barrier less than 180K rise at 120 minutes.

B.1.2.57 Based on the above discussion, it is considered the proposed construction including Appendix D1 cable packs will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

Integrity performance of Services

B.1.2.58 With reference to the performance of specimen J as tested in EWFA 2517300.4, it is observed the cables pack maintained an integrity performance of 142 minutes.

B.1.2.59 With reference to the performance of cable specimen as tested in EWFA 2683500, it is observed the cable specimen insulated with Rockwool maintained an integrity performance of 189 minutes.

B.1.2.60 The proposed construction is similar to that tested in EWFA 2517300.4 with Rockwool insulation wrapped around cable packs with similar sealant manner to that tested in EWFA 2683500.

B.1.2.61 It is therefore considered the wall construction will not have a detrimental effect on the integrity performance of cable service.

B.1.2.62 In light of the above, it is considered the proposed construction will achieve an integrity performance of 120 minutes if tested in accordance with AS1530.4-2005.

Services in Speedpanel Wall Option 4

Insulation performance of Services

B.1.2.63 It is proposed that the specimens summarised in Table 1 except Specimen J as per test EWFA 2517300.4 and Specimen F as per test 2373800.1 pass through an aperture in a wall system incorporates a 78mm thick Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm thick Powerscape or fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 156mm.

B.1.2.64 The proposed services were tested in differing support elements. The service from FSV 1482, FSV 1466, FSV 1458, FSV 1506 and FSV 1523 were tested in a frame wall system with 92m studs clad with two layers of USG Powerscape board each side (156mm total thickness). The services from EWFA 2492900.1 and EWFA 2524100.1 were tested in a framed wall system with 64mm steel studs clad with two layers of Boral FireStop plasterboard each side (128mm total thickness).

B.1.2.65 With reference to the test results of tests FSV 1482, FSV 1466, FSV 1458 and FSV 1506, all proposed services tested achieved insulation performance of 121 minutes with no insulation failure occurred during the test durations.

B.1.2.66 With reference to the test results of tests EWFA 2492900.1 and EWFA 2524100.1, specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100 achieved insulation performance between 60 and 90 minutes. Specimens B and C tested in EWFA 2492900.1 achieve insulation performance of 121 minutes with no insulation failure occurred during the test duration.

B.1.2.67 By inspection of test observations of specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100, it is noted, that these failures were localised to the thermocouples most adjacent to wall, the thermocouples measured a little farther out (25mm from aperture) remained below 180K rises for at least 120 minutes.

B.1.2.68 As discussed previously, it is confirmed that the performance of the proposed cables installed in the proposed Speedpanel aperture would be approximately equivalent to that in a full scale framed wall of equivalent thickness. By extension, it is considered that the insulation performance recorded for the specimens tested in the 156mm framed wall remain valid in the proposed wall.

B.1.2.69 It is therefore considered the proposed wall construction will not have a detrimental effect on the insulation performance of specimens tested in FSV 1482, FSV 1466, FSV 1458, FSV 1506 and FSV 1523.

B.1.2.70 It is proposed that a 25mm × 25mm thick fillet sealant is applied on each side of the all construction around the cable services. The sealant fillet will exclude the location of thermocouples (in practice, combustible material) directly on the service proximate the wall. It is considered likely that the 25mm thick sealant fillet would receive enough heat to induce failure locally.

B.1.2.71 Based on the above discussion, and on balance of reinforced contribution of wall thickness and 25mm thick sealant fillet, it is considered that when the proposed wall and sealant fillet are present, the insulation performance of the specimens mention above in tests EWFA 2492900.1 and EWFA 2524100.1 would not be below 120 minutes.

B.1.2.72 In addition, it is considered the proposed 25mm thick sealant fillet will not have a detrimental effect or if not slightly improve the insulation performance of specimens tested in FSV 1482, FSV 1466, FSV 1458 and FSV 1506.

B.1.2.73 In light of above, it is considered the proposed construction will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

Integrity performance of Services

B.1.2.74 The proposed cable penetrations were as that tested in FSV 1523. With reference to test FSV 1523, Promat PROMASEAL® Supa Mastic was installed around all cable packs and sealed to the lined plasterboard wall. When tested, all cable packs achieved integrity performance of 121 minutes with no sign of impending cracks, fissures or gap formations.

B.1.2.75 With reference to test EWFA 2517300, Promat PROMASEAL® Supa Mastic was installed around cables and sealed to the Speedpanel surface. When tested, it achieved an integrity performance in excess of 120 minutes. It demonstrates compatibility of Promat PROMASEAL® Supa Mastic with Speedpanel.

B.1.2.76 With reference to the tested constructions of specimens in test FSV 1506, there were two types of sealant used in the reference test reports- Promaseal Supamastic and Bostik Fireban One. Fire pillows (Specimen H) and ZZ-Wrap NE protections (Specimens I and M) were also utilized as seal materials.

B.1.2.77 With reference to the tested construction of specimens in tests FSV 1458, EWFA 2492900 and EWFA 2524100.1, there were also two types of sealant used- Promaseal Supamastic and Bostik Fireban One.

B.1.2.78 With reference to the tested performance in the tests, it is observed that proposed specimens all achieved an integrity performance of 121 minutes with no sign of impending cracks, fissure or gap formations during the test durations.

B.1.2.79 As discussed previously that it is confirmed that the seals in test EWFA FSV1482. FSV 1466 would not be a source of integrity weakness in the proposed construction up to 120 minutes.

B.1.2.80 The proposed support construction is 157mm thick which is at least 1mm thicker than the tested constructions (156mm thick or 141mm thick). It is considered that widening the wall will not have a detrimental effect on the integrity performance of penetrating services.

B.1.2.81 In light of above, it is considered that the proposed sealant could be sealed directly to the Speedpanel without reducing the integrity performance.

B.1.2.82 Based on the above, it is concluded that the proposed construction will achieve an integrity performance of 120 minutes if tested in accordance with AS1530.4-2005.

Services in Speedpanel Wall Option 5

Insulation performance of Services

B.1.2.83 The tested specimen is test FP 4060 comprised a single panel of 60mm thick PROMATECT® Vermiculux board with a size of 1100mm × 1020mm clad on one side of a 64mm Rondo galvanised steel-stud frame. When tested, the PROMATECT® Vermiculux board side was exposed to the fire.

B.1.2.84 With reference to the test results of FP 4060, the 60mm thick PROMATECT® Vermiculux board achieved an integrity performance of 250 minutes with no sign of impending cracks, fissure and gap formation during the test duration whereas the insulation performance failed at 106 minutes that the average temperature rise on the unexposed side of PROMATECT® Vermiculux board was in excess of 140K.

B.1.2.85 The proposed construction consisted one layer of 60mm thick and one layer of 20mm thick PROMATECT® Vermiculux on one side of Speedpanel wall.

B.1.2.86 It is considered the additional one layer of 20mm thick PROMATECT® Vermiculux board will contribute to remain the insulation performance for at least 14 minutes.

B.1.2.87 Based on the above discussion, it is reasonable and expected the proposed construction will maintain the insulation performance for at least 120 minutes.

B.1.2.88 The proposed services were tested in differing support elements. The service from FSV 1482, FSV 1466, FSV 1458, FSV 1506 and FSV 1523 were tested in wall systems with wall thicknesses of 156mm. The services from EWFA 2492900.1 and EWFA 2524100.1 were tested in wall systems with wall thicknesses of 128mm.

B.1.2.89 With reference to the test results of tests FSV 1482, FSV 1466, FSV 1458 and FSV 1506, all proposed services tested achieved insulation performance of 121 minutes with no insulation failure occurred during the test durations.

B.1.2.90 With reference to the test results of tests EWFA 2492900.1 and EWFA 2524100.1, specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100 achieved insulation performance between 60 and 90 minutes. Specimens B and C tested in EWFA 2492900.1 achieve insulation performance of 121 minutes with no insulation failure occurred during the test duration.

B.1.2.91 By inspection of test observations of specimen A in EWFA 2492900.1 and specimens A, B and C in EWFA 2524100, it is noted, that these failures were localised to the thermocouples most adjacent to wall, the thermocouples measured a little farther out (25mm from aperture) remained below 180K rises for at least 120 minutes.

B.1.2.92 As discussed previously, it is confirmed that the performance of the proposed cables installed in the proposed Speedpanel aperture would be approximately equivalent to that in a full scale framed wall of equivalent thickness. By extension, it is considered that the insulation performance recorded for the specimens tested in the 156mm framed wall remain valid in the proposed wall.

B.1.2.93 It is therefore considered the proposed wall construction will not have a detrimental effect on the insulation performance of specimens tested in FSV 1482, FSV 1466, FSV 1458, FSV 1506 and FSV 1523.

B.1.2.94 It is proposed that a 25mm × 25mm thick fillet sealant is applied on each side of the all construction around the cable services. The sealant fillet will exclude the location of thermocouples (in practice, combustible material) directly on the service proximate the wall. It is considered likely that the 25mm thick sealant fillet would receive enough heat to induce failure locally.

B.1.2.95 Based on the above discussion, and on balance of reinforced contribution of wall thickness and 25mm thick sealant fillet, it is considered that when the proposed wall and sealant fillet are present, the insulation performance of the specimens mention above in tests EWFA 2492900.1 and EWFA 2524100.1 would not be below 120 minutes.

B.1.2.96 In addition, it is considered the proposed 25mm thick sealant fillet will not have a detrimental effect or if not slightly improve the insulation performance of specimens tested in FSV 1482, FSV 1466, FSV 1458 and FSV 1506.

B.1.2.97 In light of above, it is considered the proposed construction will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

Integrity performance of Services

B.1.2.98 With reference to test EWFA 2517300 which was constructed with a 78mm thick Speedpanel wall system, consisting various penetrations. When tested, an integrity failure was measured at 145 minutes due to flaming for greater than 10 seconds was observed at mid with of the wall system between the top track and concrete lintel.

B.1.2.99 When the proposed wall conjunction construction is exposed from the Speedpanel side, the additional two layers of PROMATECT® Vermiculux boards will not introduce any foreseeable integrity weakness to the proposed system.

B.1.2.100 When the proposed wall construction is exposed from the two layers of PROMATECT® Vermiculux side, the Speedpanel wall system will not receive direct heating from the furnace and therefore the performance of wall system would be expected to be similarly or slightly better than the barrier tested in EWFA 2517300.4

B.1.2.101 As discussed previously that it is confirmed that the seals in tests FSV1523, EWFA 2517300, FSV 1506, FSV 1458, EWFA 2492900, EWFA 2524100.1 FSV1482, and FSV 1466 would not be a source of integrity weakness in the proposed construction up to 120 minutes.

B.1.2.102 The proposed support construction is 157mm thick which is at least 1mm thicker than the tested constructions (156mm thick or 141mm thick). It is considered that widening the wall will not have a detrimental effect on the integrity performance of penetrating services.

B.1.2.103 In light of above, it is considered that the proposed sealant could be sealed directly to the Speedpanel without reducing the integrity performance.

B.1.2.104 Based on the above, it is concluded that the proposed construction will achieve an integrity performance of 120 minutes if tested in accordance with AS1530.4-2005.

B.2 CABLE TRAY CUT AT WALLS

B.2.1 Proposal

B.2.1.1 It is proposed that the cable trays in the specimens discussed above be optionally terminated each side of the wall and not pass through the penetration seal. The tray sections on each side of the wall shall be supported tested.

B.2.2 Discussion

B.2.2.1 Since the tray sections are proposed to be supported on both sides of the wall, and since the wall itself is capable of supporting the cables within it, the absence of the able tray within the wall as proposed is not considered to have a detrimental effect on the performance of the cables tested with continuous cable trays. The variation is thus positively assessed.

B.3 PERFORMANCE OF PAIR COIL AND CABLE BUNDLE IN SPEEDPANEL WALLS

B.3.1 Proposal

B.3.1.1 The proposed construction is summarised as follows:

Cable Penetrations:

- Maximum Ø75mm cable and pair coil bundle consists of maximum three pairs of Ø8mm and Ø15mm copper pipes insulated with 10mm thick Armaflex insulation and maximum three of Ø10mm 4 core and earth 1.5mm^2 cables into a maximum Ø100mm aperture. The minimum 10mm gap annular gap between penetrating service and the wall shall be fully sealed with Hilti Firestop Intumescent Sealant CP 611A.

Wall Construction:

- ***Speedpanel Wall Option 6:*** the wall system shall incorporate a 78mm thick Speedpanel wall and the service aperture clad locally with 1 × 13mm thick fire grade plasterboard on each side of wall.
- ***Speedpanel Wall Option 7:*** the wall system shall incorporate a 78mm thick Speedpanel wall and the service aperture clad locally with 2 × 13mm thick fire grade plasterboard on one side of wall.
- ***Speedpanel Wall Option 8:*** the wall system shall incorporate a 51mm or 64mm thick Speedpanel wall and the service aperture clad locally with 1 × 16mm thick fire grade plasterboard on each side of wall.
- ***Speedpanel Wall Option 9:*** the wall system shall incorporate a 51mm or 64mm thick Speedpanel wall and the service aperture clad locally with 2 × 16mm thick fire grade plasterboard on one side of wall.

B.3.2 Discussion

Service in Speedpanel Wall Option 6 or 7

B.3.2.1 There are number important aspects of the integrity performance of the proposed insulated copper pipe and cable , these include:

- The potential for the CP611A to close against the pipe and cable on the fire initially preventing the passage of hot gases and fire.
- The integrity performance of CP 611A to expand and remain a stable integrity seal for the required performance period.
- The potential ignition risk of the Armaflex insulation on a copper pipe on the non-fire side due to the heat conducted through the pipe.

B.3.2.2 With reference to test specimen 15 in test No. 14244A, over 80% of the aperture of the specimen was filled with Ø10mm to Ø15mm cables in an aperture of 150mm × 150mm of a 100mm thick plasterboard lined wall construction. Hilti Firestop Intumescent sealant CP 611A filled around the cable bundle and 25mm deep into the annular gap on each side. The ratio of the area of cable insulation material is approximately 3.5 times more than the CP 611A seal area.

B.3.2.3 When tested, the Hilti Firestop Intumescent sealant CP 611A around the cable bundle maintain the integrity performance of 132 minutes without gap formation, cracks or flaming occurred on the on unexposed side of specimen. The maximum temperature rise measured on the cable bundle at 120 minutes was 138K.

B.3.2.4 The above results demonstrate the ability of 50mm deep seal of CP 611A to close voids created by degradation of cable insulation material and to maintain the integrity of penetration for at least 120 minutes.

B.3.2.5 With reference to test No. 14244A, it was observed the sealant CP 611A started to swell in the plasterboard lined wall and there was no evidence shown the fire side sealant CP 611A fallen away during the test duration of 132 minutes.

B.3.2.6 The significance of the test results of test No. 14244A demonstrates the proposed Hilti Firestop Intumescent sealant CP 611A has its ability to stay in place around the penetration service for at least 120 minutes even though the plasterboard lining detached at some stage of the test.

B.3.2.7 The proposed maximum Ø80mm pair coil and cable bundle is installed in a Ø100mm with minimum 10mm gap between aperture and penetration. The annular gap is fully filled with Hilti Firestop Intumescent CP 611A.

B.3.2.8 Upon inspection of the proposed penetration, the proposed penetration fills 63% aperture of the aperture and the ratio of the area of insulation material is approximately 1.5 times more than the proposed CP 611A area.

B.3.2.9 It is therefore expected the proposed construction has more intumescent sealant around the penetration is likely to stay in place and preventing gap formation to be occurred on the unexposed side before 120 minutes.

B.3.2.10 The proposed seal depth of 100mm thick compared with the tested total depth of 50mm is considered to more efficient to close the void and maintain the integrity.

B.3.2.11 The proposed construction comprises maximum three pair of Ø8mm and Ø15mm copper pipes insulated with 10mm thick Armaflex insulation as tested in IBMB 3681/6818.

B.3.2.12 Copper pipes conduct heat when exposed to fire, and when insulated, they will retain this heat as they pass through the seal. For seals that incorporate intumescent materials this will tend to increase the activation of the seal, though when the pipe emerges on to the non-fire side it may be so hot as to present an insulation risk to the unexposed side and potential ignition risk to the proposed pipe insulation.

B.3.2.13 With reference to test report IBMB 3681/6818, a 100mm thick vertical plasterboard lined wall partition included a Ø10mm x 1mm and a Ø42mm x 1.5nm copper pipe, each insulated with 10mm Armaflex insulation. The insulated pipes were sealed with 25mm deep Hilti CP 611A in holes of 80mm and 100mm diameter respectively.

B.3.2.14 When tested, both insulated copper pipes maintained integrity performance of 94 minutes with no sign of cracks, fissures or gap formation during the test duration.

B.3.2.15 With reference to test report IBMB 3681/6818, a 150mm thick concrete floor included a Ø10mm x 1mm and a Ø42mm x 1.5nm copper pipe, each insulated with 10mm Armaflex insulation. The insulated pipes were sealed with 50mm deep Hilti CP 611A on topside of floor and backed with 100mm thick mineral wool insulation in holes of 80mm and 100mm diameter respectively.

B.3.2.16 When tested, both insulated copper pipes maintained integrity performance of 122 minutes with no sign of cracks, fissures or gap formation during the test duration.

B.3.2.17 In light of the above, it is expected though the test of insulated copper pipes in 100mm thick flexible wall terminated at 94 minutes, the results of same copper pipes in floor construction demonstrates the ability of 50mm deep CP 611A successfully close off the void created by the degradation of 10mm thick Armaflex insulation and maintained integrity performance for at least 120 minutes.

B.3.2.18 It is expected the flow of heat energy through the copper pipe is proportional to the cross section area of copper pipes and calculation is taken to determine the unexposed side temperature rise on the proposed Ø15mm copper pipe.

B.3.2.19 With reference to test IBMB 3681/6818, the maximum unexposed side temperature rise measured on the 10mm copper pipe at 94 minutes was 62K.

B.3.2.20 Conservative approach is taken that the temperature on the unexposed side of the tested 10mm copper pipe will rise and follow a similar temperature rise trend for the next 30 minutes if no integrity failure would occur before 120 minutes, and the maximum temperature rise is expected to be 71K at 120 minutes.

B.3.2.21 The proposed Ø15mm copper pipe is similar to tested Ø10mm copper pipe tested in IBMB 3681/6818, though the conductor area is 42% more than tested copper size. Based on the above it is reasonable to expect the unexposed side temperature rise on a 15mm copper pipe insulated with 10mm Armaflex insulation would maintain insulation performance of 120 minutes.

B.3.2.22 Further confidence is added by the tested Ø25mm EN type E cable in No. 14244A, which comprise more copper conductor than proposed pair coil and cable bundle but with less insulation material. The tested cable protected with 25mm deep CP 611A sealant on each side in a 100mm thick flexible wall achieved insulation performance of 124 minutes.

B.3.2.23 It is considered the proposed CP611A sealant installed to a depth of 100mm would be capable of closing across a void left by the insulation as it degrades and maintain the integrity and insulation performance for a period of 120 minutes.

B.3.2.24 Based on the above, it is considered the proposed construction would maintain integrity and insulation performance of 120 minutes if installed in a 78mm thick Speedpanel wall with 13mm thick fire grade plasterboard build-up each side if tested in accordance with AS1530.4-2005.

Service in Speedpanel Wall Option 8 or 9

B.3.2.25 The proposed construction also comprises 51mm or 64mm thick Speedpanel wall and the service locally clad with one layer of 16mm thick fire grade plasterboard strip each side or two layers of 16mm thick fire grade plasterboard strips on one side. It is therefore calculated the total protection length for the proposed penetration is 83mm in a 51mm thick Speedpanel wall and 96mm in a 64mm thick Speedpanel wall.

B.3.2.26 When thinning the support construction, it is considered the performance of the non-fire side seal, since it will be exposed to a more onerous condition. Specifically, the conductor adjacent to the seal will be hotter (since it is closer to the fire side); the effects of hot gas permeating into the cavity and attacking the seal will also be greater.

B.3.2.27 The proposed sealing protection is then 17% less than that tested in No. 14244A. It is considered that shorter protection of penetration is likely to have an effect on the thermocouple located on the unexposed side and the non-fire side seal to be exposed to a more onerous condition. Specifically, the conductor adjacent to the seal will be hotter (since it is closer to the fire side).

B.3.2.28 As discussed previously, the thermal conductivity of the tested Ø25mm cable with copper conductor is higher than the proposed pair coil and cable bundle, hence tend to carry more heat via conduction to the non-fire side of the penetration service.

B.3.2.29 With reference to the test result of tested Ø25mm cable in No. 14244A, it was observed the maximum temperature measured at 60 minutes and 90 minutes was 138K rise and 155K rise respectively; both were below the maximum temperature rise limit with margins.

B.3.2.30 Based on the above, for 64mm thick Speedpanel wall with build-up strips, it is considered the penetration passing through a wall substrate with 4mm reduced protection length would maintain insulation performance for at least 90 minutes.

B.3.2.31 With reference to test No. 14244A and it was observed the temperature rise rate between 60 minutes and 120 minutes is about 0.66°C per minutes.

B.3.2.32 For 51mm thick Speedpanel wall with build-up strips, reducing 17% of tested wall thickness will increase the temperature on the seal and service penetration and it is therefore conservatively expected the temperature measured on the unexposed side of the proposed service penetration at 60 minutes would be similar to that tested in No. 14244A at 90 minutes.

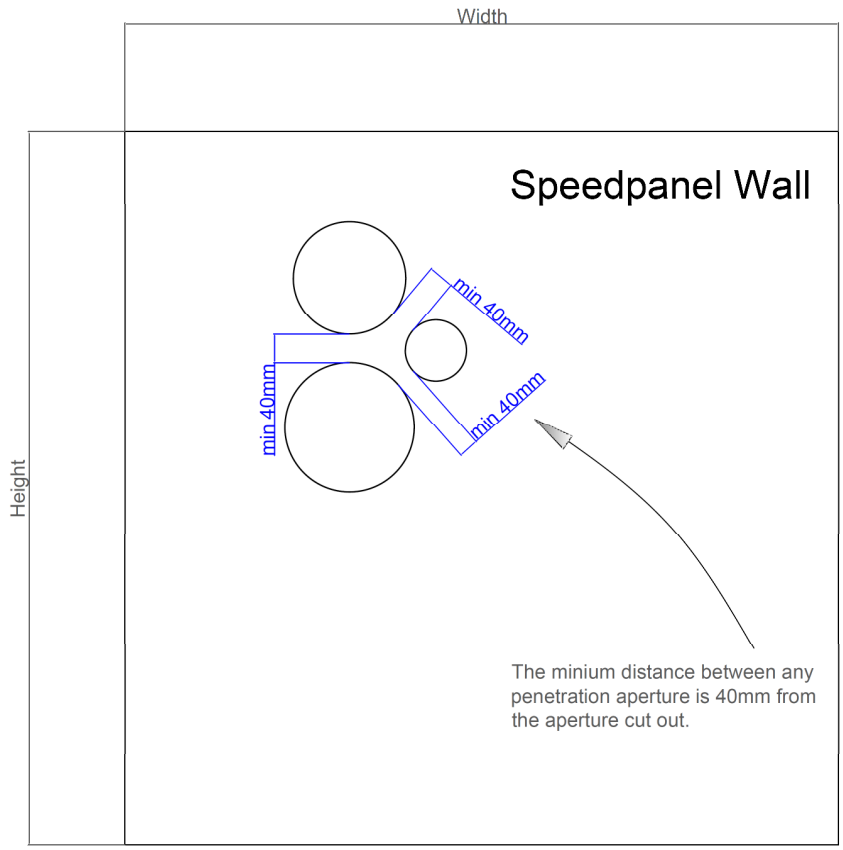
B.3.2.33 Based on the above, it is considered the proposed construction would maintain integrity and insulation performance of 90 minutes if installed in a 64mm thick Speedpanel wall with 16mm thick fire grade plasterboard build-up if tested in accordance with AS1530.4-2005.

B.3.2.34 Based on the above, it is considered the proposed construction would maintain integrity and insulation performance of 60 minutes if installed in a 51mm thick Speedpanel wall with 16mm thick fire grade plasterboard build-up if tested in accordance with AS1530.4-2005.

B.4 SERVICE SEPARATION REQUIREMENTS

B.4.1 Proposal

B.4.1.1 It is proposed that specimens be located as close as 40mm aperture to aperture.



B.4.2 Discussion

B.4.2.1 AS4072.1-2005 (clause 4.9.3) states that “the minimum distance between penetrations in a modular system shall be not less than 40mm, unless otherwise tested in specimen form”. It is noted that AS4072.1-2005 (clause 1.4.10) defines a “penetration” as “an aperture through a fire-separating element for the passage of a service or services”.

B.4.2.2 Reference test EWFA 2517300.4, comprising the proposed Speedpanel wall, included a cluster of damper penetrations. The cluster nominally measured 680mm wide × 1130mm high, and demonstrated that the Speedpanel wall is capable of remaining viable as a support construction, even when a significant portion is removed, in excess of 120 minutes.

B.4.2.3 In light of the above, it is considered that the AS4072.1-2005 clause mentioned is applicable to the specimens considered in this assessment report. The minimum spacing of said specimens is thus 40mm from aperture-to-aperture. The specimen cluster size shall be limited to a maximum 600mm wide × 1130mm high, to limit the span between board fixings to approximately that which was tested.